6° Congresso Nazionale della *Societas Herpetologica Italica*

Riassunti

A cura di:
Marco A. Bologna, Massimo Capula, Giuseppe M. Carpaneto, Luca Luiselli, Carla Marangoni, Alberto Venchi

Stilgrafica, Roma

Retrocopertina

Bianca, non stampata

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Stilgrafica, Roma

LOGO UNIVERSITA' ROMA TRE **LOGO COMUNE DI ROMA**

LOGO DIPARTIMENTO DI BIOLOGIA UNIVERSITA' ROMA TRE **LOGO MUSEO DI ZOOLOGIA**

6° Congresso Nazionale
SOCIETAS HERPETOLOGICA ITALICA

Roma, Museo Civico di Zoologia, 27 settembre - 1 ottobre 2006

Comitato organizzatore
Marco A. Bologna, Massimo Capula, Giuseppe M. Carpaneto, Luca Luiselli, Carla Marangoni, Alberto Venchi

Segreteria organizzativa
Carla Marangoni, Pierluigi Bombi, Manuela D'Amen, Daniele Salvi, Leonardo Vignoli

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PROGRAMMA

Mercoledì 27.IX.2006

17,00-19,00: APERTURA SEGRETERIA, REGISTRAZIONE PARTECIPANTI E COLLOCAZIONE POSTER

Giovedì 28.IX.2006

8,30-9,30: REGISTRAZIONE DEI PARTECIPANTI

9,30-10,00: SALUTI E APERTURA CONVEGNO, CONSEGNA PREMIO "FRANCESCO BARBIERI"

I - ERPETOFAUNA MEDITERRANEA
I - *MEDITERRANEAN HERPETOFAUNA*
(Convenor: Miguel A. Carretero, Roberto Sindaco)

10,00-11,00: COMUNICAZIONI

10,00-10,20
IBERIAN *PODARCIS*: THE STATE-OF-THE-ART
Miguel A. CARRETERO

10,20-10,35
DISTRIBUZIONE, MORFOMETRIA E DIETA DEL COLUBRO LACERTINO (*MALPOLON MONSPESSULANUS MONSPESSULANUS*) NELL'ITALIA NORD OCCIDENTALE
Dario OTTONELLO, Fabrizio ONETO, Sebastiano SALVIDIO, Luca LAMAGNI

10,35-10,50
DIETA E STUDIO MORFOMETRICO DI UNA POPOLAZIONE ITALIANA DI ULULONE DAL VENTRE GIALLO APPENNINICO, *BOMBINA PACHYPUS*
Emanuele BIGGI, Sebastiano SALVIDIO, Edoardo RAZZETTI

10,50-11,00: DISCUSSIONE

11,00-11,30: COFFEE BREAK

11,30-13,00: POSTER

11,30-11,35
NOTES ON THE MORPHOLOGY OF *PODARCIS SICULA COERULEA*, THE BLUE LIZARD OF THE FARAGLIONI DI CAPRI
Silvia BRUSCHI, Riccardo Maria CIPOLLA, Claudia CORTI, Armando NAPPI

11,35-11,40
THE HERPETOFAUNA OF THE AREA MARINA PROTETTA DI TAVOLARA E PUNTA CODA CAVALLO (NE SARDINIA, ITALY)
Claudia CORTI, Giovanna SPANO, Massimo PUTZU, Lara BASSU, Silvia BRUSCHI, Carmen FRESI, Augusto NAVONE

11,40-11,45
SEASONAL VARIATION IN COLOUR OF THE SICILIAN WALL LIZARD *PODARCIS WAGLERIANA*
Francesco Paolo FARAONE, Mario LO VALVO

11,45-11,50
SEGNALAZIONE DI UN SITO DI SVERNAMENTO E BIOMETRIA DI *HIEROPHIS VIRIDIFLAVUS* (REPTILIA, SERPENTES, COLUBRIDAE) IN PROVINCIA DI BRESCIA
Vincenzo FERRI, Christiana SOCCINI

11,50-11,55
STATUS E DISTRIBUZIONE DI *EUROTESTUDO HERMANNI* IN MOLISE
Cosmo DI FLORIO, Anna LOY, Massimo CAPULA

11,55-12,00
STUDIO RADIOTELEMETRICO SU UNA POPOLAZIONE DI *TESTUDO HERMANNI* IN UN PSIC DELL'ITALIA MERIDIONALE.
Fabio MASTROPASQUA, Rocco SORINO, Pasquale VENTRELLA, Giovanni SCILLITANI

12,00-12,05
***SALAMANDRINA PERSPICILLATA* NELLE MARCHE: COROLOGIA, ECOLOGIA E ASPETTI DELLA CONSERVAZIONE**
David FIACCHINI, Vincenzo DI MARTINO

12,05-12,10
NOTES ON THE DISTRIBUTION AND ECOLOGY OF THE APENNINE YELLOW-BELLIED TOAD *BOMBINA PACHYPUS* IN CALABRIA AND LUCANIA
Emilio SPERONE**,** Antonella BONACCI, Barbara CORAPI, Sandro TRIPEPI

12,10-12,15
INDAGINE PRELIMINARE SULLA POPOLAZIONE RIPRODUTTIVA DI ROSPO SMERALDINO (*BUFO VIRIDIS*) NELLA RISERVA NATURALE REGIONALE ORIENTATA DEI "LAGHI DI CONVERSANO" (PUGLIA, ITALIA)
Alessandro VLORA, Cristiano LIUZZI, Leonardo LORUSSO, Sandro FRISENDA

12,15-12,20
ANALISI BIOMETRICA DI UNA POPOLAZIONE DI *BUFO BUFO SPINOSUS* DEL LAGO D'IDRO (LOMBARDIA, ITALIA).
Christiana SOCCINI & Vincenzo FERRI

12,20-12,25
GLI ANFIBI E I RETTILI DELLA ZONA DI PROTEZIONE SPECIALE "LAGO TRASIMENO" (IT 5210070)
Silvia CARLETTI, Cristiano SPILINGA

12,25-12,30
L'ERPETOFAUNA DELLA SELVA DI CASTELFIDARDO E DELLA BASSA VALLE DEL FIUME MUSONE (MARCHE CENTRALI)
David FIACCHINI, Gessica FOGLIA

12,30-12,35
L'ERPETOFAUNA NEI SITI DI IMPORTANZA COMUNITARIA (SIC) DELLA PROVINCIA DI LODI
Manuela MARCHESI, Luca CANOVA

12,35-13,00: DISCUSSIONE

13,00-14,00: PAUSA PRANZO

II - ASPETTI MORFOLOGICI E FUNZIONALI DI ANFIBI E RETTILI
II - *MORPHOLOGICAL AND FUNCTIONAL ASPECTS OF AMPHIBIANS AND REPTILES*
(Convenor: Fabio M. Guarino, Benedetto Lanza, Gaetano Odierna)

10,00-11,00: COMUNICAZIONI

10,00-10,20
MHC CLASS I VARIATION ASSOCIATES WITH PARASITE RESISTANCE AND LONGEVITY IN TROPICAL PYTHONS
Thomas MADSEN, Beata UJVARI

10,20-10,40
MOLECULAR CLONING AND EVOLUTION OF METALLOTHIONEIN GENE IN SQUAMATES (REPTILIA, SQUAMATA)
Francesca TRINCHELLA, Marilisa RIGGIO, Silvana FILOSA, Elio PARISI, Rosaria SCUDIERO

10,40-11,00
SEXUALLY DIMORPHIC GLANDS IN AMPHIBIANS
Rossana BRIZZI, Claudia CORTI, Gianfranco TANTERI

11,00-11,30: COFFEE BREAK

11,30-13,00: POSTER

11,30-11,37
A COMPARATIVE KARYOLOGYCAL STUDY OF *VIPERA* (*PELIAS*) *NIKOLSKII* (SERPENTES, VIPERIDAE) FROM FLOODED LANDS OF VOLGA AND DON BASIN RIVERS
Evgeni ZAVIALOV, Elmira KAYBELEVA, Vasily TABACHISHIN

11,37-11,44
DUPLICATION EVENTS AND THE EVOLUTION OF THE ASPARTIC PROTEINASE GENE FAMILIES WITH SPECIAL REFERENCE TO LIZARD NOTHEPSIN GENE
Lucia BORRELLI, Roberta DE STASIO, Silvana FILOSA, Elio PARISI, Marilisa RIGGIO, Rosaria SCUDIERO, Francesca TRINCHELLA

11,44-11,51
CADMIUM CYTOXICITY IN *PODARCIS SICULA* LIVER
Palma SIMONIELLO, Stefania TAMMARO, Chiara Maria MOTTA, Vincenzo FREZZA, Silvana FILOSA

11,51-11,58
CADMIUM EFFECTS ON GTH CELLS IN THE PITUITARY GLAND OF *PODARCIS SICULA*.
Ida FERRANDINO, Rossana FAVORITO, Maria Consiglio GRIMALDI

11,58-12,05
COLOUR MORPHS AND IMMUNITY IN MALE WALL LIZARDS (*PODARCIS MURALIS*)
Roberto SACCHI, Diego RUBOLINI, Augusto GENTILLI, Fabio PUPIN, Edoardo RAZZETTI, Stefano SCALI, Paolo GALEOTTI, Mauro FASOLA

12,05-12,12
MALFORMATION OCCURRENCE IN TWO *TRITURUS* SPECIES (*T. CARNIFEX* AND *T. VULGARIS*) FROM THREE LOCALITIES IN CENTRAL ITALY: DESCRIPTION AND POSSIBLE CAUSES
Manuela D'AMEN, Daniele SALVI, Leonardo VIGNOLI, Pierluigi BOMBI, Marco. A. BOLOGNA

12,12-12,19

HEPATIC PROFILE OF HEAT SHOCK PROTEINS IN A *TRITURUS CARNIFEX* POPULATION CONTINUOUSLY EXPOSED TO NATURAL RADON RADIATION
Valentina BORDONI, Manuela D'AMEN, Daniele SALVI, Maria MARINO

12,19-12,26
EFFETTI DELLE EMISSIONI NATURALI DI RADON SUL SISTEMA TEGUMENTARIO E SULLE GONADI DI UNA POPOLAZIONE DI *TRITURUS CARNIFEX* DELLA RISERVA NATURALE REGIONALE MONTERANO
Massimiliano SCALICI, Stefania CHIESA, Giancarlo GIBERTINI

12,26-12,33
DEVELOPMENT OF A MICRONUCLEUS ASSAY THAT USE *TRITURUS CARNIFEX* TO DETECT GENOTOXICITY OF WATER
Caterina TANZARELLA, Antonio ANTOCCIA, Alessandro RUZZA

12,33-12,40
SOUND DISCRIMINATION AND ORIENTATION IN SMOOTH NEWTS (*LISSOTRITON VULGARIS*)
Fabio PUPIN, Augusto GENTILLI, Roberto SACCHI, Mauro FASOLA

12,40-12,47
PRELIMINARY OBSERVATIONS ON TAIL AUTOTOMY IN SARDINIAN CAVE SALAMANDER (*SPELEOMANTES IMPERIALIS SARRABUSENSIS*)
Marco FAVELLI, Rafael REPETTO, Giuseppe SOTGIU, Stefano BOVERO

12,47-12,54
SEXUAL DIMORPHISM IN *BOMBINA V. VARIEGATA*: A BIOMETRIC MULTIVARIATE APPROACH
Anna Rita DI CERBO, Carlo Massimo BIANCARDI

12,54-13,01
CHANGES IN GILL ULTRASTRUCTURE OF *BUFO BUFO* TADPOLES, INDUCED BY ENDOSULPHAN
Ilaria BERNABO', Antonella BONACCI, Elvira BRUNELLI, Sandro TRIPEPI

13,00-14,00: PAUSA PRANZO

III - TASSONOMIA, FILOGENESI E PALEONTOLOGIA
III - *TAXONOMY, PHYLOGENY AND PALEONTOLOGY*
(Convenor: Marco A. Bologna, Tassos Kotsakis, Mario García-París)

15,00-17,00: COMUNICAZIONI

15,00-15,30
GREEN TOADS FROM MOST OF SICILY ARE AN OLD SISTER TAXON OF AFRICAN GREEN TOADS AND REPRESENT A NEW EUROPEAN VERTEBRATE SPECIES (*BUFO* N.SP.)
Matthias STÖCK, Alessandra SICILIA, Natalia M. BELFIORE, Sabrina Lo BRUTTO, Mario LO VALVO, Marco ARCULEO

15,30-16,00
PHYLOGEOGRAPHY OF THE COMMON SPADEFOOT TOAD (*PELOBATES FUSCUS*) BASED ON CYT *b* MITOCHONDRIAL GENE
Angelica CROTTINI, Franco ANDREONE, Joachim KOSUCH, Leo BORKIN, Spartak N. LITVINCHUK, Christophe EGGERT, Michael VEITH

16,00-16,30
A GENETIC PERSPECTIVE ON DIVERSITY WITHIN THE *TESTUDO GRAECA* COMPLEX

Uwe FRITZ, Anna K. HUNDSDÖRFER, Pavel ŠIROKÝ, Markus AUER, Hajigholi KAMI, Jan LEHMANN, Lyudmila F. MAZANEVA, Oğuz TŰRKOZAN, Michael WINK

16,30-17,00
DEVELOPMENTAL GEOMETRIC MORPHOMETRICS FOR *GAVIALIS-TOMISTOMA* DEBATE: A THIRD APPROACH
Paolo PIRAS, Angela BUSCALIONI, Dennis SLICE, Tassos KOTSAKIS and Pasquale RAIA

17,00-17,30: COFFEE BREAK

17,30-18,00: COMUNICAZIONI

17,30-18,00
FOSSIL SEA TURTLES FROM ITALY
Francesco CHESI, Massimo DELFINO

18,00-19,30: POSTER

18,00-18,10
MOLECULAR DISSECTION OF GAMETOGENESIS IN THE HYBRIDOGENETIC *RANA ESCULENTA* COMPLEX
Silvia MARRACCI, Matilde RAGGHIANTI, Stefania BUCCI, Giorgio MANCINO.

18,10-18,20
PRELIMINARY DATA ON THE MORPHOLOGY AND SEXUAL DIMORPHISM IN *HYLA SARDA* (AMPHIBIA: ANURA)
Silvia BRUSCHI, Claudia CORTI

18,20-18,30
PRELIMINARY DATA ON MORPHOLOGICAL DIFFERENCES BETWEEN *HYLA SARDA* AND *HYLA MERIDIONALIS* (AMPHIBIA: ANURA)
Silvia BRUSCHI, Claudia CORTI, Sebastiano SALVIDIO

18,30-18,40
EOCENE *NEOCHELYS* (PODOCNEMIDAE, PLEURODIRA, TESTUDINATA) OF ITALY AND THEIR PALAEOBIOGEOGRAPHY
Tassos KOTSAKIS, Leonardo MAJORINO, Elisa PETRINI

18,40-18,50
ON THE EXTINCTION OF *MAUREMYS* IN THE CENTRAL MEDITERRANEAN AREA
Francesco CHESI, Massimo DELFINO

18,50-19,00
CARATTERIZZAZIONE E DISCRIMINAZIONE BIOMETRICA TRA LUCERTOLA CAMPESTRE *PODARCIS SICULA* E LUCERTOLA DI WAGLER *PODARCIS WAGLERIANA*
Francesco Paolo FARAONE, Mario LO VALVO

19,00-19,10
GEOGRAPHIC VARIATION AND DISTRIBUTION OF *ZAMENIS LONGISSIMUS* AND *Z. LINEATUS* (REPTILIA: COLUBRIDAE) IN ITALY
Massimo CAPULA, Sophia VALENTI, Anna LOY

Venerdì 29.IX.2006

IV - ECOLOGIA E CONSERVAZIONE DEI RETTILI
IV - *ECOLOGY AND CONSERVATION OF REPTILES*
(Convenor: Claudia Corti, Thomas Madsen, Valentin Perez Mellado)

9,00-10,30: COMUNICAZIONI

9,00-9,25
GENETIC RESTORATION OF AN INBRED POPULATION OF ADDERS (*VIPERA BERUS*)
Thomas MADSEN, Beata UJVARI

9,25-9,40
HABITAT SELECTION IN A SNAKE GUILD OVER TEN YEARS
Stefano SCALI, Oscar DONELLI, Fabrizia DE LEO, Ileana NEGRI

9,40-10,05
DIET SPECTRUM, PREY ENERGETICS, AND BODY SIZE IN THE EUROPEAN WHIP SNAKE, *HIEROPHIS VIRIDIFLAVUS*
Marco A.L. ZUFFI, Riccardo PICCHIOTTI, Sara FORNASIERO, Marcello MELE

10,05-10,30
MEDITERRANEAN REPTILES: STATE OF KNOWLEDGE, HOT SPOTS, AREAS OF ENDEMISM, CONSERVATION
Roberto SINDACO, Valery K. EREMČENKO, Alberto VENCHI

10,30-11,00: COFFEE BREAK

11,00- 13,00: POSTER

11,00-11,10
FEEDING HABITS OF THE GRASS SNAKE *(NATRIX NATRIX*) IN NORTH OF LOWER-VOLGA REGION (RUSSIAN FEDERATION)
Gennady SHLYAKHTIN, Vasily TABACHISHIN, Evgeni ZAVIALOV

11,10-11,20
INTERANNUAL VARIATION OF LIFE REPRODUCTIVE TRAITS IN THE EUROPEAN POND TURTLE, *EMYS ORBICULARIS* FROM MEDITERRANEAN AREAS
Marco A.L. ZUFFI, Elena FOSCHI

11,20-11,30
POPULATION ECOLOGY AND STATUS OF *LIOLAEMUS MULTIMACULATUS* (SAURIA, TROPIDURIDAE) IN COASTAL DUNES OF ARGENTINA: A PRELIMINARY STUDY.
Federico KACOLIRIS, Gianluca GUAITOLI

11,30-11,40
ESCAPE DISTANCE IN RELATION TO SUBSTRATUM TYPE, SEX, REPRODUCTIVE STATUS AND TAIL CONDITION IN TWO LACERTIDS WITH CONTRASTED HABITS: *ZOOTOCA VIVIPARA* AND *IBEROLACERTA HORVATHI*
Dario CAPIZZI, Luca LUISELLI, Leonardo VIGNOLI

11,40-11,50
MICROHABITAT CHOICES OF *ARCHAEOLACERTA BEDRIAGAE*: LOCAL PREFERENCES AND ADAPTATIONS
Pierluigi BOMBI, Daniele SALVI, Marco A. BOLOGNA

11,50-12,00
IL RUOLO DEI SEGNALI VISIVI NELLA DISCRIMINAZIONE DELLE RISORSE ALIMENTARI IN *TESTUDO HERMANNI*
Daniele PELLITTERI ROSA, Roberto SACCHI, Paolo GALEOTTI, Manuela MARCHESI, Mauro FASOLA

12,00-12,10
WEIGHT VARIATION RELATED TO SEASON AND TO ACTIVITY IN *TESTUDO HERMANNI* (REPTILIA, TESTUDINIDAE)
Stefano MAZZOTTI, Cristiano BERTOLUCCI, Sara MANTOVANI, Mauro FASOLA

12,10-12,20
PRELIMINARY DATA ON THE ECOLOGY OF *TESTUDO HERMANNI* OF ASINARA ISLAND (NW SARDINIA, ITALY)
Claudia CORTI, Lara BASSU, Carmen FRESI, Valeria NULCHIS, Maria Grazia SATTA, Antonio ADOLFI, Rossana BRIZZI, Miguel Angel CARRETERO, Marco A.L. ZUFFI

12,20-12,30
DEMOGRAPHY OF A RESIDUAL POPULATION OF *TESTUDO HERMANNI* (REPTILIA, TESTUDINIDAE) AT BOSCO MESOLA (PO DELTA RIVER, NORTHERN ITALY)
Irene LISI, Mauro FASOLA, Stefano MAZZOTTI

12,30-12,40
PRELIMINARY DATA ON MORPHOLOGY AND ECOLOGY OF *TESTUDO GRAECA GRAECA* OF MAL DI VENTRE ISLAND (W SARDINIA, ITALY)
Claudia CORTI, Lara BASSU, Valeria NULCHIS, Maria Grazia SATTA, Miguel A. CARRETERO, Bruno PALIAGA

12,40-12,50
IL PROGETTO TESTUDINATI: LA CONOSCENZA E LA CONSERVAZIONE, PER UNO SVILUPPO ECOSOSTENIBILE DEL TERRITORIO
Pasquale VENTRELLA, Giovanni SCILLITANI, Vincenzo RIZZI, Maurizio GIOIOSA, Matteo CALDARELLA, Giuseppe FLORE, Maurizio MARRESE, Fabio MASTROPASQUA, Teodoro MASELLI, Rocco SORINO.

12,50-13,00
ESTIMATION OF SICILIAN POND TURTLE POPULATION IN THE NATURAL RESERVE "TORRE SALSA" (SOUTH-WESTERN SICILY)
Stefania D'ANGELO, Giovanna REGINA, Francesco GALIA, Mario LO VALVO

13,00-14,00: PAUSA PRANZO

14,00-14,10
A REVISED SOUTHERN BOUNDARY OF *VIPERA* (*PELIAS*) *NIKOLSKII* HABITAT IN EUROPEAN RUSSIA
Vasily TABACHISHIN, Irina TABACHISHIN, Evgeni ZAVIALOV

14,10-14.20
VARIATION IN A MEDIUM TERM PERIOD OF A SNAKE COMMUNITY STRUCTURE IN THE PO PLAIN (NORTHERN ITALY)
Augusto GENTILLI, Marco A. L. ZUFFI

14.20-14,30
ANALISI DELLA COMUNITA' OFIDICA DI UNA RISERVA NATURALE URBANA E CONSIDERAZIONI SU *HIEROPHIS VIRIDIFLAVUS* QUALE SPECIE DOMINANTE NELLE AREE AD ELEVATO IMPATTO ANTROPICO
Lorenzo RUGIERO

14,30-14,40
ANFIBI E RETTILI DELLA ZONA DI PROTEZIONE SPECIALE "MONTE SAN VICINO – MONTE CANFAITO" (IT5330025 - MARCHE)
David FIACCHINI

V - METODOLOGIE DI RACCOLTA E ANALISI DEI DATI

V - *SAMPLING METHODOLOGIES AND DATA ANALYSIS*
(Convenor: Sebastiano Salvidio, Alberto Venchi)

9,00-10,20: COMUNICAZIONI

9,00-9,20

APPLICABILITÀ DELLA POPULATION VIABILITY ANALYSIS (PVA) AGLI ANFIBI: IL CASO DI *SALAMANDRA LANZAI*
Paolo EUSEBIO BERGÓ, Marco FAVELLI, Vincenzo MERCURIO, Franco ANDREONE

9,20-9,40

LOOKING FOR DISCONTINUITIES AND BREAKING POINTS IN THE RELATIONSHIPS BETWEEN SPECIES AND HABITAT
Gentile Francesco FICETOLA, Mathieu DENOEL

9,40-10,00

PHEROMONE TRAILING BEHAVIOUR IN MALES EUROPEAN WHIP SNAKE, *HIEROPHIS VIRIDIFLAVUS*: CHARACTERIZATION AND EFFECTS OF INSULARITY
Sara FORNASIERO, Elisa BRESCIANI, Federica DENDI, Marco A.L. ZUFFI

10,00-10,20

GROWTH OF *SALAMANDRINA PERSPICILLATA*: A STUDY OF FIVE-YEARS
Leonardo VIGNOLI, Massimiliano SCALICI, Francesca DELLA ROCCA, Marco A. BOLOGNA

10,20-11,00: COFFEE BREAK

11,00-13,00: POSTER

11,00-11,15

AMPHIBIANS AND REPTILES IN ROME: IS THE URBANIZATION OF A BIG CITY COMPATIBLE WITH THE DISPERSION OF A SPECIES-RICH HERPETOFAUNA?
Leonardo VIGNOLI, Ingrid MOCAER, Karine GILON & Marco A. BOLOGNA

11,15-11,30

MODELLING THE POTENTIAL WESTERN RANGE OF THE MEADOW VIPER, *VIPERA URSINII*
Pierluigi BOMBI, Arnaud LYET, Luca LUISELLI, Fabio CORSI, Marc CHEYLAN, Ernesto FILIPPI, Andrew K. SKIDMORE, Albert G. TOXOPEUS, Marco A. BOLOGNA

11,30-11,45

STABLE FEMALE, UNSTABLE MALE: ABOUT THE PLASTICITY OF THE TURTLE MODEL
Marco A.L. ZUFFI, Annalisa PLAITANO

11,45-12,00

IS COLOUR PATTERN A VALID CHARACTER TO DISCRIMINATE BETWEEN *SALAMANDRINA PERSPICILLATA* POPULATIONS? A PRELIMINARY IMAGE ANALYSIS (AMPHIBIA, SALAMANDRIDAE)
Corrado COSTA, Claudio ANGELINI, Carlo UTZERI

12,00-12,15

A NEW MEDITERRANEAN STATION OF *SPELEOMANTES* STRINATII (AMPHIBIA, PLETHODONTIDAE), FIRST DATA ON POPULATION STRUCTURE AND HABITAT CHARACTERIZATION
Fabrizio ONETO, Dario OTTONELLO

12,15-12,30
ACCRESCIMENTO IN *SALAMANDRINA PERSPICILLATA*
Antonio ROMANO, Marco MATTOCCIA

12,30-13,00: DISCUSSIONE

13,00-14,00: PAUSA PRANZO

15,00-16,30: **FORUM: NUOVE METODOLOGIE DI INDAGINE, PROBLEMATICHE ED EVOLUZIONE DELLA SISTEMATICA ERPETOLOGICA**
MODERN METHODOLOGIES OF INVESTIGATION AND EVOLUTION OF HERPETOLOGICAL SYSTEMATICS, Interventi/talks: Emilio Balletto, Mario García-París, Benedetto Lanza, Valerio Sbordoni (Convenor Massimo Capula)

16,00-17,00: DIRETTIVO DELLA SHI

17,00-17,30: COFFEE BREAK

17,30-19,30: ASSEMBLEA DEI SOCI SHI

21,00: CENA SOCIALE

Sabato 30.IX.2006

VI – ECOLOGIA E CONSERVAZIONE DEGLI ANFIBI
VI – *ECOLOGY AND CONSERVATION OF AMPHIBIANS*
(Convenor: Giuseppe M. Carpaneto, Richard Griffiths)

9,00-11,00: POSTER SU *SALAMANDRINA PERSPICILLATA*

9,00-9,10
ATTIVITÀ TERRESTRE DI *SALAMANDRINA PERSPICILLATA*: DISTRIBUZIONE SPAZIALE E TEMPORALE
Claudio ANGELINI, Carlo UTZERI

9,10-9,20
IL DOPPIO PERIODO DI OVIDEPOSIZIONE IN *SALAMANDRINA PERSPICILLATA*: CORRELATI ECOLOGICI
Claudio ANGELINI, Laura MANCINI, Elio PIERDOMINICI, Annamaria D'ANGELO, Carlo UTZERI

9,20-9,30
PREDAZIONE DI UOVA DI *SALAMANDRINA PERSPICILLATA* DA PARTE DI IRUDINEI
Antonio ROMANO, Anna Rita DI CERBO, Carmine ESPOSITO

9,30-9,40
IL RUOLO DELL'OLFATTO NELLA SCELTA DEL SITO RIPRODUTTIVO IN *SALAMANDRINA PERSPICILLATA*
Antonio ROMANO, Giovanni FORCINA, Filippo BARBANERA, Marco A.L. ZUFFI

9,40-9,50
CAPACITÀ DI DISCRIMINAZIONE OLFATTIVA NELLE FEMMINE DI *SALAMANDRINA PERSPICILLATA* A LIVELLO INTRASPECIFICO

Antonio ROMANO, Antonio RUGGIERO

9,50-10,00
STATUS AND CONSERVATION OF TWO POPULATIONS OF *SALAMANDRINA PERSPICILLATA* IN THE PROVINCE OF BOLOGNA
Alessandro DALL'ALPI, Marco SAZZINI

10,00-10,10
PREDAZIONE DI UOVA DI *SALAMANDRINA PERSPICILLATA* (AMPHIBIA, CAUDATA) DA PARTE DI GIRINI DI *RANA ITALICA* (AMPHIBIA, ANURA)
Paolo LAGHI, Christian PASTORELLI

10,10- 10,15- DISCUSSIONE SUI CONTRIBUTI RELATIVI A *SALAMANDRINA PERSPICILLATA*

10,15-10,25
HABITAT FEATURES AND DISTRIBUTION OF THE FIRE SALAMANDER (*SALAMANDRA SALAMANDRA*): FROM STREAM QUALITY TO LANDSCAPE STRUCTURE
Gentile Francesco FICETOLA, Laura NUDO, Ilaria MAZZOLENI, Laura MARZIALI, Bruno ROSSARO, Fiorenza DE BERNARDI

10,25-10,35
SEASONAL AQUATIC POPULATION-SIZE AND SEX-RATIO VARIATIONS IN SARDINIAN NEWT (*EUPROCTUS PLATYCEPHALUS*) FROM A POOL ON "SUPRAMONTE OF URZULEI"
Giuseppe SOTGIU, Stefano BOVERO, Claudio ANGELINI, Stefano DOGLIO, Enrico GAZZANIGA, Giulia TESSA

10,35-10,45
MONITORAGGIO DI UNA POPOLAZIONE DI *SPELEOMANTES ITALICUS* IN UNA CAVITA' IPOGEA DELL'UMBRIA
Cristiano SPILINGA, Silvia CARLETTI, Egidio FULCO

10,45-10,55
PRELIMINARY DATA ON THE TERRITORIAL BEHAVIOUR OF *SPELEOMANTES STRINATII*
Lucia ZANETTI, Sebastiano SALVIDIO

10,55-11,05
PREDAZIONE DI *SPELEOMANTES ITALICUS* (AMPHIBIA, CAUDATA, PLETHODONTIDAE) DA PARTE DI *META MENARDI* (ARACHNIDA, ARANEAE, METIDAE)
Christian PASTORELLI, Paolo LAGHI, Dino SCARAVELLI

11,05-11,30: COFFEE BREAK

11,30-13,30: POSTER SU ANURI

11,30-11,39
STRUTTURA E DINAMICA DI POPOLAZIONI DI *BOMBINA PACHYPUS* NELL'APPENNINO ROMAGNOLO
Claudia COLLIVA, Guglielmo STAGNI, Stefano MAZZOTTI, Francesco ZACCANTI, Rosanna FALCONI

11,39-11,48
VOLUNTEERING TO MONITOR AN ISOLATED POPULATION OF *PELOBATES FUSCUS* IN NW ITALY
Angelica CROTTINI, Franco ANDREONE

11,48-12,57
DIFFERENZE SESSUALI NELL'UTILIZZO SPAZIO-TEMPORALE DEL TERRITORIO IN UNA POPOLAZIONE DI *BUFO VIRIDIS* IN SICILIA
Francesco LILLO, Alessandra SICILIA, Bruno ZAVA, Franco BERNINI

12,57-12,06
DINAMICA SPAZIALE E FEDELTÀ TERRITORIALE AL SITO POST-RIPRODUTTIVO DI ROSPO SMERALDINO (*BUFO VIRIDIS*)
Mario LO VALVO, Maria CARVUTTO, Gabriele GIACALONE

12,06-12,15
EFFECT OF MOONLIGHT ON THE REPRODUCTIVE MIGRATIONS OF A COMMON TOAD (*BUFO BUFO*) POPULATION
Silvia MACCHI, Stefano SCALI, Adriano MARTINOLI, Guido TOSI

12,15-12,24
ANALISI DI CONTENUTI STOMACALI DI *BUFO BUFO:* CONSIDERAZIONI ECOLOGICHE E COMPORTAMENTALI
Gabriele GIACALONE, Francesco LAPIANA, Francesco LILLO, Mario LO VALVO

12,24-12,33
BREEDING ACTIVITY OF *RANA TEMPORARIA* AT LOW ALTITUDE
Anna Rita DI CERBO, Carlo Massimo BIANCARDI

12,33-12,42
PRELIMINARY DATA ABOUT DIET AND DISTRIBUTION OF AN ALLOCHTHONOUS POPULATION OF *XENOPUS LAEVIS* IN SICILY
Francesco Paolo FARAONE, Francesco LILLO, Gabriele GIACALONE, Mario LO VALVO

12,42-12,51
RISICOLTURA E RANE VERDI: POSSIBILI IMPATTI NEGATIVI
Alessandra ROSSO, Cristina GIACOMA

12,51-13,00
MARKETING AMBIENTALE E CONSERVAZIONE DELL'ERPETOFAUNA; OVVERO: COME QUADRUPLICARE LE POPOLAZIONI ITALIANE DI *HYLA ARBOREA*
Nicola BRESSI, Alessandro PILLEPICH, Maurizio BOBINI, Sergio DOLCE, Gaia FIOR, Carlo FONDA

13,00-13,09
RISULTATI PRELIMINARI DEL PROGETTO INTERREG III A ITALIA – AUSTRIA "SALVAGUARDIA DELL'ERPETOFAUNA NEL TERRITORIO DI ALPE –ADRIA"
Stefano FABIAN, Luca LAPINI

13,09-13,18
UNA BANCA DATI SUI VERTEBRATI ENDEMICI ITALIANI: ANFIBI
Barbara SERRA

13,18-13,27
DIET AND TROPHIC NICHE OVERLAP OF TWO HYLID SPECIES IN A SUBTROPICAL WETLAND OF NE ARGENTINA
Daniele MACALE, Leonardo VIGNOLI, Giuseppe M. CARPANETO

13,30-14,30: PAUSA PRANZO

VII - ERPETOLOGIA AFRICANA
VII - AFRICAN HERPETOLOGY
(Convenor: Godfrey C. Akani, Franco Andreone, Luca Luiselli)

15,00-17,00: COMUNICAZIONI

15,00-15,25

A PILOT PROJECT BOOSTS THE AMPHIBIAN CONSERVATION IN MADAGASCAR
Franco ANDREONE

15,25-15,50
THE PLACE OF REPTILIAN TRADE IN THE BUSHMEAT CRISIS FROM THE FOREST MARKETS OF SOUTH-EASTERN NIGERIA
Edem A. ENIANG, Ernest C. EGWALI, Luca LUISELLI, Ibrahim A. AYODELE, Godfrey C. AKANI, Francesco M. ANGELICI, Nic PACINI

15,50-16,15
THE HERPETOFAUNA OF THE EASTERN SIDE OF THE LAKE TURKANA (NORTHERN KENYA)
Ugo ZILIANI, Roberto SINDACO, Edoardo RAZZETTI, Victor WASONGA, David MODRÝ, Petr NECAS, Caterina CARUGATI, Mauro FASOLA

16,15-16,40
ECOLOGICAL RELATIONSHIPS BETWEEN SYMPATRIC CHAMELEONS IN SOUTH-EASTERN NIGERIA AND WESTERN CAMEROON AS REVEALED BY MONTE CARLO SIMULATIONS AND NULL MODEL ANALYSES
Luca LUISELLI, Godfrey C. AKANI, O.K. OGBALU, Edem A. ENIANG

17,00-17,30: COFFEE BREAK

17,30-18,20: COMUNICAZIONI

17,30-17,55
DISTRIBUTION OF *AUSTRALOLACERTA AUSTRALIS*: FROM KNOWN TO POTENTIAL RANGE THROUGH A BIOCLIMATIC ANALYSIS
Pierluigi BOMBI, Daniele SALVI, Leonardo VIGNOLI, P. le Fras N. MOUTON

17,55- 18,20
KARYOLOGICAL ANALYSIS ON FOUR TUNISIAN SPECIES OF ANURA (AMPHIBIA)
Nabil AMOR, Noureddine CHATTI, Gennaro APREA, Gaetano ODIERNA, Khaled SAID

18,20-19,20: POSTER

18,20-18,30
HABITAT SELECTION OF ANURANS IN SMALL PONDS AROUND THE VICTORIA LAKE, KENYA
Francesca PAU, Leonardo VIGNOLI, Giuseppe M. CARPANETO

18,30-18,40
MALAWI: A BRIEF OVERVIEW OF HERPETOLOGICAL STUDIES
Vincenzo MERCURIO

18,40-18,50
THE SIGNIFICANCE OF SOLITARY INDIVIDUALS IN POPULATIONS OF THE GROUP-LIVING LIZARD, *CORDYLUS CATAPHRACTUS*
Amanda ALBLAS, P. le Fras N. MOUTON, Janine L. GLOVER, Alexander F. FLEMMING

18,50-19,00
MODELLING OCCUPANCY RATES, DETECTION PROBABILITIES AND DENSITY OF *KINIXYS EROSA* AND *K. HOMEANA* (TESTUDINIDAE) ALONG LINE-TRANSECTS IN WEST AFRICA (GHANA, BENIN, AND NIGERIA)
Luca LUISELLI, Godfrey C. AKANI, Augustine LAWAYI, Lorenzo RUGIERO, Edem A. ENIANG

19,00-19,10

MOLECULAR AND KARYOLOGICAL HOMOGENEITY IN *TRACHYLEPIS STRIATA* AND *TRACHYLEPIS WAHLBERGII* (SCINCIDAE, REPTILIA).
Riccardo CASTIGLIA, Marco CORTI, Flavia ANNESI

19,10-19,20
DISCOVERY OF PARASITIC NEMATODES OF THE GENUS *TRICHINELLA* (*T. PAPUAE* AND *T. ZIMBABWENSIS*) INFECTING BOTH REPTILES AND MAMMALS AND THEIR ZOONOTIC POTENTIAL
Edoardo POZIO

VIII - RETTILI MARINI
VIII - *SEA REPTILES*
(Convenor: Emilio Balletto, Cristina Giacoma)

17,30-19,30: COMUNICAZIONI

17,30-17,50
BEACH FEATURES INFLUENCING NESTING ACTIVITY IN *ERETMOCHELYS IMBRICATA*
Gentile Francesco FICETOLA

17,50-18,10
DISTRIBUZIONE DI *CARETTA CARETTA* IN FUNZIONE DI PARAMETRI ECOLOGICI RILEVATI DA SATELLITE
Roberto LIGI, Gabriele MURCHIO, Achille CIAPPA, Giorgia COMPARETTO, Irene GALANTE, Marta AZZOLIN, Susanna PIOVANO, Giacoma CRISTINA

18,10-18,30
IMPATTO DELLA PESCA CON PALANGARO SU *CARETTA CARETTA*: ANALISI DATI DEL CENTRO DI LINOSA
Stefano NANNARELLI, Alberto DOMINICI, Ludovico POZZI, Paolo ARENA, Alessandro VALENTINI, Susanna PIOVANO, Cristina GIACOMA.

18,30-18,50
UNA BANCA DATI SULLE TARTARUGHE MARINE IN ITALIA
Stefano NANNARELLI, Simona CLÒ, Irene GALANTE, Stefano DI MARCO, Susanna PIOVANO, Cristina GIACOMA, Carla BARBERA, Felice CAPPELLUTI

18,50-19,00: DISCUSSIONE

19,00-19,30: POSTER

19,00-19,05
MORPHOMETRIC DESCRIPTION OF NUCHAL AND CRANIAL MORPHOLOGY OF THE LOGGERHEAD HATCHLINGS IN ITALY
Susanna PIOVANO, Roberta BUSIELLO, Elena BUCCI, Stefano NANNARELLI, Giusi NICOLINI, Cristina GIACOMA

19,05-19,10
LE ATTIVITA' DEL CENTRO DI RECUPERO TARTARUGHE MARINE DELL'ACQUARIO DI LIVORNO DAL 1990 AD OGGI
Paola MESCHINI, Paolo LUSCHI, Cecilia MANCUSI

19,10-19,15
TARTARUGHE COMUNI (*CARETTA CARETTA*) ALL'OSPEDALE DELLE TARTARUGHE DELLA FONDAZIONE CETACEA DAL 1993 AL 2005: CASISTICA
Marco AFFRONTE, Giordano NARDINI, Dino SCARAVELLI

19,15-19,20
SPIAGGIAMENTI DI *CARETTA CARETTA* NELLA SARDEGNA MERIDIONALE
Daniela FADDA, Giovanni LENTI, Giuseppe OLLANO & Alberto RUSSO

19,20-19,25
LOGGERHEAD TURTLE NESTING ON A BEACH COAST IN SOUTH-WESTERN SICILY
Francesco GALIA, Daniela FREGGI, Stefania D'ANGELO, Mario LO VALVO

19,25-19,30: DISCUSSIONE

19,30: PREMIAZIONI POSTER E FOTOGRAFIE

21,00: SPETTACOLO DI MUSICA DAL VIVO

Domenica 1.X.2006

9,00-13,00: VISITA GUIDATA AL RETTILARIO DEL BIOPARCO

I - Erpetofauna mediterranea

I - Mediterranean Herpetofauna

(Convenor: Miguel A. Carretero, Roberto Sindaco)

IBERIAN *PODARCIS*: THE STATE-OF-THE-ART

Miguel A. CARRETERO

CIBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos da Universidade do Porto, Campus Agrário de Vairão, 4485-661 Vairão, Portugal

The lacertid lizards of the genus *Podarcis* constitute a relevant herpetofaunal element of the Mediterranean ecosystems, the Southern European peninsulas and associated arciipelagos harbouring the highest degree of endemicity and species richness. During the last decade, the generalisation of molecular tools is gradually revealing more evolutionary complexity than previously thought. The Iberian Peninsula, a region with high habitat diversity and complex geological history, is not an exception.

An update of the current knowledge on the evolutionary biology of the Iberian and North African members of this genus is here presented based on a multidisciplinary approach which integrates evidences coming from studies on phylogeny, phylogeography, morphometrics, ecology, behaviour, ecophysiology and GIS modelling,

The region is inhabited by as many as 12 different evolutionary lineages which, except *P. muralis*, group into a monophyletic clade. Despite the appearances, the saxicolous "*Podarcis hispanica*" as presently considered is paraphyletic with respect to *P. bocagei* and *P. carbonelli*, two currently recognised species. Nodes in the phylogenetic tree are deep, resulting from old divergences, clearly preceding the Pleistocene. Nevertheless, recent range changes after the glaciations are also evident. Although parapatry is the rule, sympatry and even syntopy are frequent but usually between ground-dwelling and saxicolous forms. Contacts between forms with similar habitat use are only punctual.

Morphological distinctiveness between lineages has been demonstrated when properly analysed. Some characters reveal strong historical influence whereas others repetitively evolve in the same way under the same environmental pressures, independently of the evolutionary lineage. Strong sexual dimorphism derives from sexual selection and is attained before sexual maturity although developmental restrictions exist. Variation between populations is also important and derives from local variation in both natural (habitat, climate) and sexual (density) selective pressures. Evidence for short term changes has already being found, particularly for insular populations. Phenotypic plasticity is now being investigated.

Reproductive isolation between syntopic forms and partner recognition within each population are based on male-male competition and female recognition by conspecific males. Both chemical and visual stimuli are used. Nevertheless, hybridisation between forms may occur although is limited. Evidence of introgression has been found. On the other hand, observations do not support current exploitative competition but behavioural interference between forms. However, morphological differentiation between those with extensive range overlap suggests character displacement in the past.

An evolutionary scenario for this group is given taking into account the geological and climatic changes since the end the Miocene which have successively promoted vicariance and dispersal. Directions for further research are suggested.

Key words: *Phylogeny, morphometrics, reproductive isolation,* Podarcis, *Iberian Peninsula*.

DISTRIBUZIONE, MORFOMETRIA E DIETA DEL COLUBRO LACERTINO (*MALPOLON MONSPESSULANUS MONSPESSULANUS)* NELL'ITALIA NORD OCCIDENTALE

Dario OTTONELLO*, Fabrizio ONETO*, Sebastiano SALVIDIO* & Luca LAMAGNI**

** DIP.TE.RIS, Università degli Studi di Genova, Genova; ** PRO NATURA GENOVA, Genova*

Malpolon monspessulanus monspessulanus raggiunge in Liguria il limite orientale del suo areale di distribuzione (Sindaco et al., 2006, Atlante degli Anfibi e Rettili d'Italia, SHI, Polistampa). In questo lavoro sono analizzati i dati sulla distribuzione, morfologia e dieta di questo serpente in questa regione.

Per la distribuzione l'analisi si è basata su 142 osservazioni: 65 estrapolati dall'Atlante degli Anfibi e Rettili della Liguria (Doria e Salvidio, 1994) di cui si disponeva dei soli dati sulla localizzazione e 77 esemplari osservati: 54 trovati morti lungo strade carrabili e 23 custoditi nella collezione del Museo di Storia Naturale di Genova. Sono state annotate lunghezza totale (Ltot), lunghezza dall'apice del muso alla cloaca (Lmc), data di rinvenimento, luogo di rinvenimento e sesso. Gli adulti sono stati distinti dai giovani in base ai differenti pattern cromatici (Pleguezuelos e Moreno, 1988, Rev. Esp. Herpetol., 3(2): 31- 40). Inoltre, di questi esemplari è stata studiata la dieta mediante dissezione: il contenuto dello stomaco e dell'intestino è stato rimosso e le prede determinate al microscopio binoculare fino la più basso livello tassonomico possibile, confrontandole con una collezione di riferimento.

La maggior parte delle osservazioni è compresa tra il livello del mare. ed i 200 metri (78%) ma la specie è presente fino a 700 metri s.l.m.. Bisogna però segnalare un giovane individuo, conservato al Museo di Genova, raccolto nei pressi di Verdeggia (IM) a circa 1000 metri s.l.m. Se confermato, questo dato rappresenterebbe il limite assoluto per la specie in Italia. La distribuzione del colubro lacertino è continua dal confine francese sino ad Arenzano (GE), dove è abbastanza comune e si può rinvenire anche in nei centri abitati. Gli animali sembrano attivi a partire dalla seconda metà di Marzo e l'attività aumenta nei mesi tardo primaverili fino alla prima metà di Luglio. Nel periodo più caldo (Luglio/Agosto) il numero di osservazioni diminuisce drasticamente per ritornare sui più alti valori primaverili nei mesi di Settembre ed Ottobre. L'attività sembra interrompersi fra Dicembre e Marzo, salvo rare osservazioni in giornate eccezionalmente calde. L'esemplare di maggiori dimensioni è un maschio che presentava una Ltot di 170 cm (Lmc 134 cm), mentre la femmina di maggiori dimensioni raggiunge i 106 cm (Lmc 81 cm).

I maschi sono mediamente più grandi delle femmine (Mann-Whitney; $P < 0.001$), presentando una lunghezza media di 111.9 cm (range 75 – 170 cm) contro i 77,3 cm (range 50 – 106 cm) delle femmine.. Gli esemplari giovani presentano ben evidente la cicatrice del riassobimento del sacco vitellino fino ad una Ltot di circa 36 cm. Dei 77 esemplari esaminati nello studio della dieta, 38 presentavano almeno una preda. I taxa di prede identificati sono dieci: *Podarcis muralis*, *Lacerta bilineata*, *Tarentola mauritanica*, *Anguis fragilis*, *Chalcides* sp., *Malpolon monspessulanus*, *Hierophis viridiflavus*, *Rattus* sp., *Pitymys* sp. e *Turdus merula.* In generale la dieta è caratterizzata da una prevalenza di Sauri (76% delle prede). Tra questi la Lucertola muraiola (*Podarcis muralis*) rappresenta ben il 92% delle prede estratte dagli esemplari giovani, indipendentemente dal periodo di rinvenimento. Gli esemplari adulti sembrano invece mostrare una variazione stagionale nella scelta delle prede (Fig. 1) che in estate è costituita esclusivamente da Rettili.

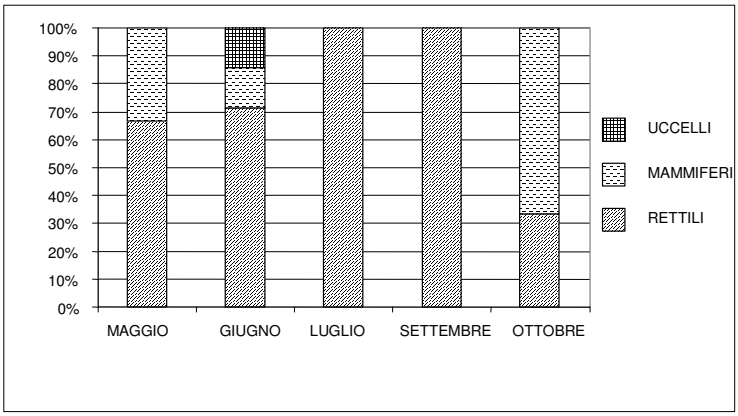

Fig. 1**.** Composizione stagionale della dieta in 22 esemplari adulti di *Malpolon monspessulanus monspessulanus* della Liguria.

Nella popolazione ligure di *M. m. monspessulanus* è confermato il dimorfismo sessuale descritto con maschi dimensionalmente più grandi delle femmine (de Haan, 1999, Handbuch der Reptilien und Amphibien Europas, 3/IIA). Nella dieta è preponderante la presenza di Rettili, soprattutto Sauri, anche se sembrerebbe esistere un certo opportunismo nella scelta delle prede, in base alla più facile reperibilità ed alle esigenze legate al periodo di attività. La presenza fra le prede di Mammiferi, animali con un alto valore calorico, è stata rilevata solo negli adulti in Maggio subito dopo il periodo di ibernazione e in autunno prima di affrontare nuovamente l'inverno, mentre Sauri e Serpenti diventerebbero l'alimento esclusivo sia per adulti sia per giovani nei mesi estivi. Tali risultati sono simili a quelli riportati in altre parti dell'areale (de Haan, 1999, Handbuch der Reptilien und Amphibien Europas, 3/IIA).

Key words: Malpolon monspessulanus monspessulanus, *Liguria, distribuzione, morfologia, dieta.*

DIETA E STUDIO MORFOMETRICO DI UNA POPOLAZIONE ITALIANA DI ULULONE DAL VENTRE GIALLO APPENNINICO, *BOMBINA PACHYPUS*

Emanuele BIGGI*, Sebastiano SALVIDIO* & Edoardo RAZZETTI**

** DIP.TE.RIS Corso Europa 26 University of Genoa, Genoa (Italy); ** Museo di Storia Naturale, Università degli Studi di Pavia, Piazza Botta 9, I-27100 Pavia, Italia*

Alcuni aspetti dell'ecologia di una popolazione ligure di *Bombina pachypus* (Bonaparte, 1838) sono stati investigati nella Liguria centrale, al limite settentrionale dell'areale di distribuzione della specie (Sindaco et al., 2006, Atlante degli Anfibi e Rettili d'Italia, SHI, Polistampa).
Lo studio è stato condotto da maggio 2003 a ottobre 2004. Per la stima di abbondanza di popolazione si è tenuto conto solo dei dati del 2004 (suddivisi nei periodi "aprile-maggio", "giugno" e "luglio"), non essendoci un numero sufficiente di ricatture per il 2003. Il riconoscimento è stato effettuato mediante riconoscimento del pattern ventrale. L'abbondanza della popolazione adulta è stata stimata tramite il programma CAPTURE (White et al., 1992; Rexstad & Burnhan, 1991) per ogni singola stagione di attività.
Per lo studio della dieta è stata utilizzata la lavanda gastrica (Fraser, 1976): il prelievo del contenuto stomacale è stato eseguito sul posto e gli animali sono stati subito rilasciati. L'analisi della dieta è stata effettuata utilizzando un solo contenuto stomacale per individuo. L'analisi morfometrica è stata eseguita su individui adulti, maschi e femmine, della stessa popolazione ligure. Sono stati misurati mediante calibro decimale da un unico operatore 12 caratteri morfologici. Tali dati sono stati poi analizzati mediante analisi in componenti principali (ACP), utilizzando i residui delle regressione di ciascun carattere con la lunghezza muso-urostilo, per aver eliminato l'effetto della dimensione (bibliografia).
La seguente tabella mostra i risultati ottenuti mediante tre diversi modelli:

Modello	Popol. Stimata	Errore Standard	Prob. di cattura
Null (M_0)	73	22.66	0.174
Jackknife (M_h)	68	7.95	0.216
Darroch (M_t)	60	16.17	0.17 – 0.08 – 0.38

Vista la relativa omogeneità dei risultati dei tre modelli la stima si può ritenere attendibile e pertanto la popolazione risulta di circa 70 individui.
La lavanda gastrica è stata effettuata su 30 individui (18 maschi, 12 femmine) di cui 19 (63%) risultavano aver ingerito almeno una preda. Le proporzioni di maschi e femmine considerati digiuni non sono differenti (test del χ^2= 1.53; P=0.32), mostrando che l'efficacia della lavanda è simile nei due sessi. É interessante notare che la dieta della popolazione studiata è costituita sia da Artropodi acquatici sia terrestri. Le categorie più rappresentate sono i Coleotteri, i Collemboli e i Formicidi. In totale sono stati osservati 18 gruppi tassonomici. Le prede sono state ulteriormente suddivise in prede acquatiche, terrestri e con habitat indeterminato (es. Acari o larve di Ditteri).
Il valore del test del χ^2 (χ^2 = 11.481; df = 2; P = 0.003) ha mostrato come vi sia una differenza statisticamente significativa nelle modalità trofiche dei maschi rispetto alle femmine. É interessante notare infatti, come le prede acquatiche siano più abbondanti nei maschi che nelle femmine. Questo lascia supporre una maggiore propensione dei maschi a nutrirsi all'interno della colonna d'acqua, mentre le femmine si alimenterebbero maggiormente a terra. Il numero

medio di prede, il volume medio e la relazione tra dimensioni degli individui e il volume totale e il numero delle prede ingerite non ha mostrato sostanziali differenze tra i sessi.
In queste analisi è stato escluso il diametro del radio per l'elevata variabilità. Le proiezioni degli individui maschi e femmine sul piano delimitato dai primi due assi, che spiegano il 44% della variabilità totale, mostrano una netta differenziazione delle due popolazioni sull'asse 1 per quanto riguarda la loro forma corporea. Tali differenze risultano statisticamente significative (MANOVA sui primi tre assi: $F = 24.64$; $df = 3.55$; $P<0.001$). Le variabili che maggiormente determinano la differenziazione sul primo asse sono la lunghezza di radio e tibia.
L'analisi della relazione tra dimensioni corporee (SUL) e lunghezza degli arti mostra infatti che in entrambi i casi i maschi possiedono arti anteriori e posteriori più lunghi rispetto alle femmine di dimensioni simili (Analisi della covarianza sul radio $F= 46.69$; $P<0.01$ e sulla tibia $F=32.09$; $P<0.01$)
La popolazione di *B. pachypus* risultava essere composta da circa 70 individui nell'anno 2004.
Nel sito di studio *B. pachypus* si nutre di Artropodi sia terrestri sia acquatici. Tali risultati differiscono qualitativamente da quelli riscontrati per popolazioni rumene di *Bombina variegata* da Nemes & Petràss (2003), che hanno osservato solo prede terrestri, con prevalenza di Formicidae e Collemboli. In Nemes & Petràss (2003) è sottolineato anche come in habitat differenti si hanno contenuti stomacali diversi: *Bombina variegata* è una specie insettivora tendenzialmente opportunista, in grado di predare qualsiasi preda che abbia dimensioni adeguate. Risulta quindi plausibile una situazione analoga anche per *B. pachypus*. Nella popolazione studiata è interessante notare che uno stesso individuo può nutrirsi indifferentemente di prede acquatiche e terrestri, mostrando una notevole adattabilità trofica. Inoltre dalle analisi della dieta si è potuto osservare che non sembrano esserci grandi differenze nelle modalità trofiche di maschi e femmine, eccezione fatta per una maggior propensione dei maschi a nutrirsi di prede acquatiche. Questo potrebbe essere dovuto al fatto che i maschi sostano per più tempo in acqua, avendo un'attività riproduttiva di maggior durata rispetto alle femmine. Tali dati, relazionabili a differenti comportamenti dei due sessi, sono però legati ad un numero limitato d'individui e quindi ulteriori studi andrebbero eseguiti per verificare l'ipotesi.
I risultati delle analisi morfometriche hanno mostrato evidenti differenze morfologiche tra i sessi in *B. pachypus.* Tali differenze sono principalmente legate alla lunghezza degli arti, che risultano più lunghi nei maschi rispetto a femmine di pari lunghezza totale.

Key words: Bombina, pachypus*, cattura-ricattura, dieta, lavanda gastrica, dimorfismo sessuale, Liguria*.

NOTES ON THE MORPHOLOGY OF *PODARCIS SICULA COERULEA*, THE BLUE LIZARD OF THE FARAGLIONI DI CAPRI

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P. sicula is a widespread species and a huge number of subspecies have been described (Henle K. and Klaver C.J.J. 1986, in Böhme W., Handbuch der Reptilien und Amphibien Europas, Band 2/II Echsen III Podarcis, AULA-Verlag) One of the most famous and the first that has been described is *P. s. coerulea* (Eimer, 1872) of the Faraglioni di Capri, just outside the Gulf of Naples. Since the last works on this population date back to the the 50s, it is interesting to re-examine these populations studing their morphological traits with modern multivariate statistical analysis.

A total of 177 specimens were measured (89 males, 88 females). The samples came from the two Faraglioni rocks (Faraglione Esterno and Faraglione di Mezzo), Naples and other three islands of the Gulf of Naples (Ischia, Vivara, Capri), for a total of 6 localities. Eleven pholidotic and 3 morphometric characters were studied: dorsal (DORS), ventral (VENT), collar (COLL), gular (GUL), supraciliar (SCS), supratemporal and supralabial scales (SL), femoral pores (FPOR), scales under the IV toe (4TOE), supraciliar granules (SCG), scales between the masseteric shield and the supratemporal scales (SM), snout-to-vent (SVL), trunk (TRL) and head length from the tip of the snout to the posterior margin of the collar (HL). The pholidotic characters have been analysed (separately for males and females) with Mahalanobis Distances analyses and with AN(C)OVA (morphometric characters were eventually used as covariates).

The Mahalanobis Distances analysis has shown a clear differentiation of the two Faraglioni rocks. The total percentages of correct classification keeping the 6 localities separated was 66% for males and 65% for females, showing a low capacity of discriminating among populations. When considering two groups (the first with the two Faraglioni rocks' populations and the second with the other localities), the above mentioned total values rose up to 98% for males and 97% for females. More in detail, the Faraglioni rocks showed 100% of correct classification for both sexes, while the other localities 97% for males and 82% for females.

Many subsequent ANOVAs have shown that the following variables were significantly different in both sexes between the two groups: DORS, VENT, COLL (significant only in males), GUL, SCG and SM (see table). Correlations have been detected (between populations) between the following couples of pholidotic and morphometric variables: DORS and SVL (males R^2=0.92, p=0.02; females R^2=0.096, p=0.28), VENT and TRL (males R^2=0.59, p=0.047; females R^2=0.82, p=0.008), GUL and HL (males R^2=0.75, p=0.02; females R^2=0.61, p=0.04), SCG and SVL (males R^2=0.73, p=0.02; females R^2=0.57, p=0.049). Consequently, ANCOVAs of the polidotic variables using the relative morphometric variable as covariate have been calculated, but the pholidotic variables still showed significant differences between the two groups (Tab. 1).

The analysis showed a clear differentiation between the two Faraglioni rocks and the other islets, with the two Faraglioni rocks' populations which resulted almost identical. As shown by the ANOVAs, the populations of *P. s. coerulea* have more dorsal, ventral and gular scales, more scales between the masseteric shield and the supratemporal scales, less supraciliar granules and less collar scales (this last only in males). These differences are probably partly due to differences in size and relative lentgh of body parts, but also to phylogeny: this has been proved by the facts that ANOVAs and ANCOVAs gave the same results, and that the number of

supraciliar granules decreases with the increase of body size. Anyway, it is still too early to give further consideration on the meaning of these differences in the pholidosis: further analyses are required. both morphological and genetical.

Table 1

	ANOVA						ANCOVA					
	Males			Females			Males			Females		
Variables	df	F	*p*	df	F	*p*	df	F	*p*	df	F	*p*
DORS	1.87	42.16	<0.0001	1.86	26.12	<0.0001	1.86	23.95	<0.0001	1.85	19.13	0.0003
VENT	1.87	70.69	<0.0001	1.86	10.08	0.002	1.83	32.66	<0.0001	1.84	4.85	0.03
COLL	1.87	8.73	0.004	-	-	-	-	-	-	-	-	-
GUL	1.87	60.98	<0.0001	1. 86	40.65	<0.0001	1.83	51.22	<0.0001	1.84	26.41	<0.0001
SCG	1.87	13.75	0.0004	1.86	13.54	0.0004	1.86	11.70	<0.0001	1.85	6.42	0.01
SM	1.87	51.35	<0.0001	1.86	22.88	<0.0001	-	-	-	-	-	-

Key words: *Lacertidae,* Podarcis, *islands, morphology*.

THE HERPETOFAUNA OF THE "AREA MARINA PROTETTA DI TAVOLARA E PUNTA CODA CAVALLO" (NE SARDINIA, ITALY)

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The marine protected area "*Area Marina Protetta di Tavolara Punta Coda Cavallo*" (Fig.1), which has been created in 1997 by the Ministery of the Environment, includes 15.000 hectares of sea and coastal habitats. Geologically differentiated, this territory is mainly characterized by pink granite and quartz-feldspatic beaches, while Tavolara Island is characterized by calcareous-dolomitic relief. Along the coastal area, in the backdune system, ponds and lagoons are formed thanks to streams and channels which connect the sea with the inshore. Molara Island and many other islets as well, show the typical geology of granitic relief. The vegetation is typically Mediterranean. Many protected species of Amphibians, Reptiles and Birds are present in this area.

In the present work we will review the herpetofauna of the whole protected area mentioning all species present in each locality. Following Poggesi et al. 1995 (Erpetologia delle isole circumsarde. Biogeographica, (N.S.) 18 [1994]: 583-618), we will give an updated list of the herpetofauna of each single island and islet of this territory [I.la Tavolara, I.to Spalmatore (= I.la dei Porri), I.la Piana di Tavolara, I.la Verde (=I.la dei Topi), I.la Cavalli, I.la Reulino (=I.to Rosso), I.la Cana, I.to del Fico, I.la Molara, I.to Molarotto, Scogli i Cerri (=I tre Fratelli), I.la Proratora, I.la Brandinchi)].

As follow the species which were at present recorded in the whole area: *Hyla sarda*, *Euleptes europaea*, *Hemidactylus turcicus*, *Emys orbicularis*, *Testudo hermanni*, *Testudo marginata*, *Algyroides fitzingeri, Podarcis sicula*, *Podarcis tiliguerta*, *Chalcides chalcides*, *Chalcides ocellatus*, *Natrix maura*, *Hierophis viridiflavus*.

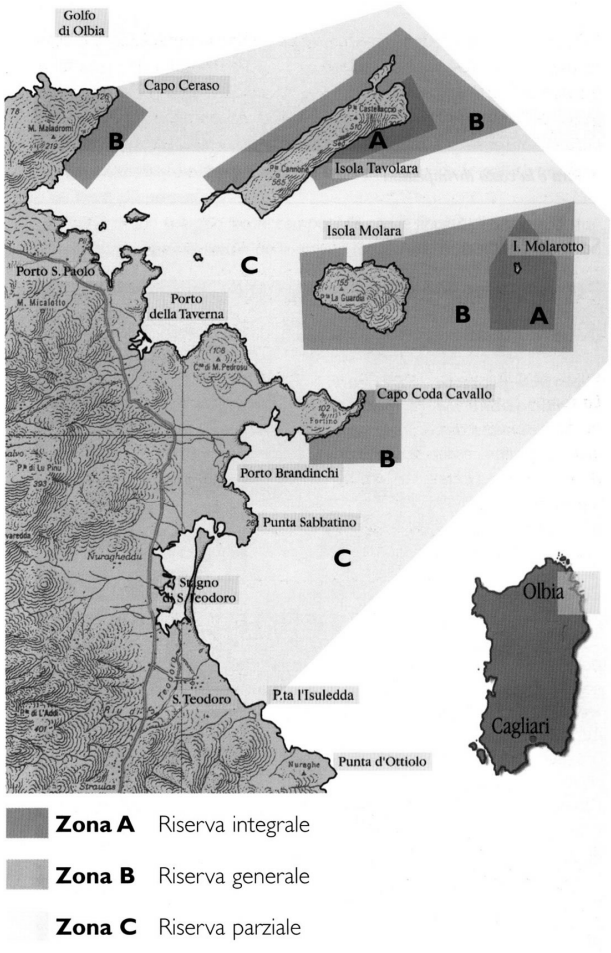

Fig. 1. Map of the Area Marina Protetta di Tavolara Punta Coda Cavallo.

Key words: *Tavolara Island; Amphibians, Reptiles.*

SEASONAL VARIATION IN COLOUR OF THE SICILIAN WALL LIZARD *PODARCIS WAGLERIANA*

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Variation in colour is well known in lacertid lizard, but until now it has been observed in the reproductive period in which, males especially, tend to develop intense chromatism. In this paper the colour variation of the Sicilian endemic *Podarcis wagleriana* (Gistel, 1868) in relation with seasonal variations is reported.

Between May and October 2002, we captured lizards in an area close to Scanzano Lake (province of Palermo). Every lizard was photo-identified and the dorsal colour was codified comparing with colour models reported by F.B. Smithe's guide tables (1975, Naturalist's color guide. The American Museum of Natural History. New York).

During the period of study, 78 lizards were photo-identified (21 males, 19 females, and 37 juveniles) of which 19 (6 males, 9 females and 4 juveniles) were recaptured from 1 to 5 times. There was a high prevalence of green tonalities in spring (100%), a larger percentage of olive green-brown tonalities in summertime (89.79%), and a following increment of green tonalities in autumn (88.54%). These chromatic variations are confirmed by the repeated observation of recaptured specimens, 16 of which (5 males, 7 females e 4 juveniles) showed a variation in back colour.

The results we obtained seems to underline an interesting chromatic adaptation in Sicilian Wall Lizard which could be explained as a kind of seasonal mimicry; this variation runs parallel with chromatic changes that come out in mediterranean habitats and favourite *substrata* referring to this *taxon*. That's why it should be interesting to search into processes that regulate this cyclic chromatic variation and into environmental parameters which should be determinant in relation with these changes in colour.

Key words: *Lacertids,* Podarcis wagleriana*, chromatic variability.*

SEGNALAZIONE DI UN SITO DI SVERNAMENTO E BIOMETRIA DI *HIEROPHIS VIRIDIFLAVUS* (REPTILIA, SERPENTES, COLUBRIDAE) IN PROVINCIA DI BRESCIA

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Nonostante la grande diffusione in Italia *Hierophis viridiflavus* (Lacépède, 1789) è una specie relativamente poco studiata e diversi aspetti della sua biologia, ecologia ed etologia sono ancora aneddotici (Scali et al., 2002, Biota, 161-166). Riveste pertanto un certo interesse il ritrovamento, all'inizio della latenza, di un sito di svernamento composto da soli esemplari adulti.

Il ritrovamento è avvenuto a fine novembre 2005, a Poncarale di Brescia, ai margini della linea ferroviaria Brescia-Cremona. Gli esemplari di *Hierophis viridiflavus* si erano riuniti all'interno di un pozzetto per l'alloggio di una pompa idrica, profondo circa 150 cm e con una luce di 60x80 cm. La comunicazione con l'esterno, il giardino privato ed una striscia incolta posta a ridosso della massicciata ferroviaria, era resa possibile da fori nei mattoni perimetrali e concomitanti gallerie prodotte da ratti. Il proprietario del terreno ha richiesto l'allontanamento dei serpenti per effettuare una urgente manutenzione idraulica. Tutti gli esemplari catturati sono stati sessati, misurati (secondo Scali & Montonati, Mus. Reg. Sci nat. Torino, 2000, 429-434 e Springolo & Scali, SEH 1998, 413-417) e fotografati, quindi mantenuti in latenza controllata fino all'inizio di marzo 2006, quando sono stati liberati nel sito di ritrovamento. I dati dell'analisi biometrica sono stati analizzati mediante statistiche descrittive (Tab. 1) e test univariati non parametrici. Le analisi sono state realizzate attraverso il programma SPSS 14.0. per Windows.

In data 6.XII.2005 erano presenti nel pozzetto di Poncarale 36 esemplari di *Hierophis viridiflavus*; il 24.XII.2005 altri 6 esemplari hanno raggiunto il pozzetto, ma sono poi sfuggiti alla cattura. La statistica descrittiva delle misurazioni effettuate su tutti gli esemplari catturati è riportata in Tab. 1.

Si tratta di esemplari adulti con una prevalenza di femmine (N=20 55.56%) sui maschi (N=16 44.44%) e una relativa sex-ratio (M:F) di 0.8:1.

Come in altre popolazioni italiane (Capula et al., Mus.reg.Sci.nat. Torino, 2000, 435-438; Scali et al., 2002, Biota, 161-166), i maschi hanno il tronco e la coda più lunghi e sono più pesanti. Tra i maschi anche gli esemplari di maggiore taglia (massimo rilevato 1 M con lunghezza capo+tronco di 106 cm, coda di 36.40 cm e peso alla cattura di 247.93 g); i maschi più grandi risultano melanotici. Molto ridotta, rispetto ad altre località, la percentuale di esemplari con code mozze o con ferite (N=3 8.33%).

È stato impossibile verificare in modo continuativo le condizioni ambientali all'interno del pozzetto, dove alla cattura la T era di 12°C e l'umidità relativa del 78% e dove a fine gennaio 2006, con una T aria all'esterno di –8 °C, sul fondo si rilevava una T di circa 5 °C.

Lo svernamento alternativo degli esemplari di *Hierophis viridiflavus* catturati è avvenuto in due terrari posizionati in una cantina non riscaldata né illuminata, dove il range termico è stato di 6 - 15 °C e l'umidità di 68 – 76 %; l'acqua è sempre stata disponibile. È stato registrato al termine del periodo di stabulazione (10.III.2006) un calo ponderale in media del 15.76% in tutti gli esemplari (N=36, range 12.38-20.25).

La marcatura individuale di tutti gli esemplari, effettuata con fotografie digitali del capo (di lato a dx, superiormente e ventralmente) e dell'intero tronco (dorsalmente e ventralmente) e con *scale-clipping*, prima della liberazione nell'area circostante il sito di svernamento, dovrebbe

permettere osservazioni a lungo termine di questo gruppo di *Hierophis viridiflavus* e, grazie alla disponibilità del proprietario, che ha praticamente lasciato nelle condizioni iniziali il pozzetto, di verificare la loro fedeltà al sito di svernamento. Sono in corso indagini statistiche multivariate per confrontare i dati biometrici rilevati con quelli di altre popolazioni peninsulari della specie (Capula et al., Mus.reg.Sci.nat. Torino, 2000, 435-438; Scali et al., 2002, Biota, 161-166).

Tab. 1. Statistiche descrittive del gruppo svernante di *Hierophis viridiflavus* di Poncarale (Brescia) (misure espresse in cm – peso in g)

Femmine (N=**20**)	**Peso alla cattura**	**Lunghezza capo+tronco**	**Numero Ventrali**	**Lunghezza coda**	**Numero sottocaudali**
Media	119,17	78,24	204,45	24,57	94,2
Mediana	115,73	79,60	205	24,65	96
Varianza	857,88	50,78	38,05	7,67	92,80
Dev. st.	29,28	7,12	6,16	2,77	9,63
Errore st.	6,54	1,59	1,37	0,61	2,15
Min.	79,73	67,6	195	18,00	63
Max.	199,42	89,10	216	29,00	106
Maschi (N=**16**)	**Peso alla cattura**	**Lunghezza capo+tronco**	**Numero Ventrali**	**Lunghezza coda**	**Numero sottocaudali**
Media	147,45	82,75	198,12	28,15	97,75
Mediana	129,40	79,30	197,50	27,12	99,00
Varianza	2308,49	115,63	3,18	11,38	69,93
Dev. st.	48,04	10,75	1,78	3,37	8,36
Errore st.	12,01	2,68	0,44	0,84	2,09
Min.	98,90	70,60	196	22,30	72
Max.	247,93	106,00	202	36,40	110

Key words: Hierophis viridiflavus, *Brescia, analisi biometria.*

STATUS E DISTRIBUZIONE DI *EUROTESTUDO HERMANNI* IN MOLISE

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Eurotestudo hermanni (Gmelin) è una specie di interesse comunitario inserita negli allegati II e IV della Direttiva Habitat (92/43/CEE), recepita in Italia dal D.P.R. n. 357/1997 (modificato ed integrato dal D.P.R. n. 120/2003. In Italia è considerata specie in pericolo (Bulgarini et al., 1998, Libro Rosso degli Animali d'Italia, Vertebrati). Al fine di valutare lo status e la distribuzione della specie nella regione Molise, nel 2003 è stato avviato un censimento delle popolazioni nel territorio della provincia di Isernia. Per l'individuazione delle aree da censire sono stati presi in considerazione i principali requisiti ambientali della specie. Le ricerche sul campo sono state integrate utilizzando i dati bibliografici e quelli museologici. Per ogni sito studiato è stata redatta una scheda dati informatizzata con le coordinate U.T.M., le quote altitudinali, la classe CORINE per l'unità ambientale principale al III livello, il sesso e le caratteristiche morfologiche e cromatiche degli esemplari di *E. hermanni* eventualmente rinvenuti. Le informazioni raccolte sono state riportate su una carta dell'uso del suolo secondo la classificazione Corine Land Cover al III livello, utilizzando un software Geographic Information System. Su un totale di 28 siti esaminati, la specie è stata rinvenuta in sette aree con popolazioni riproduttivamente attive. Tutti gli esemplari osservati sono ascrivibli alla ssp. *hermanni* Gmelin, mentre non sono stati rinvenuti esemplari di specie alloctone (*Testudo graeca* Linnaeus, *T. marginata* Schoepff). Le presenze accertate di *E. hermanni* nel territorio della provincia di Isernia vanno ad ampliare l'areale noto di questa specie nell'Italia centro-meridionale (Fig.1). I risultati appaiono tanto più significativi se si considera che le popolazioni rinvenute si trovano tutte nel versante adriatico della penisola ed in ambienti non costieri.

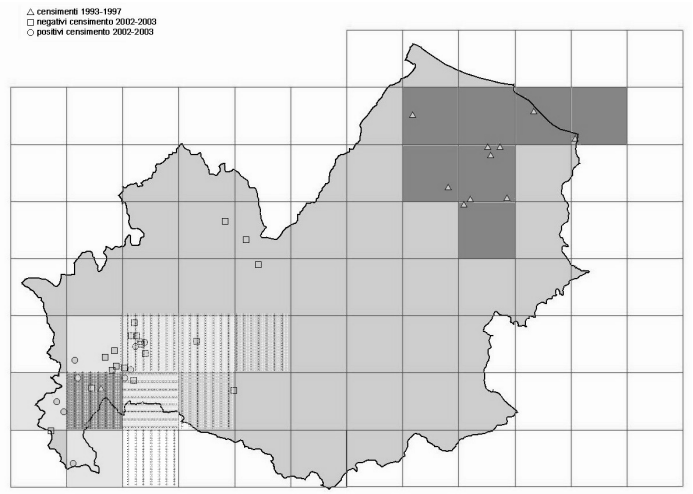

Fig.1. I quadranti con righe verticali indicano le nuove stazioni di *Eurotestudo hermanni hermanni* in Molise. Nei quadranti grigio scuro ed in quelli con righe orizzontali vengono riportate tutte le segnalazioni precedenti per la specie nella regione (Bruno e Guacci; 1993; Di Cerbo & Ferri, 1997).

Key words: Eurotestudo hermanni, *distribution, Molise, central Italy.*

STUDIO RADIOTELEMETRICO SU UNA POPOLAZIONE DI *TESTUDO HERMANNI* IN UN PSIC DELL'ITALIA MERIDIONALE

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Testudo hermanni (Gmelin, 1789) è specie di interesse comunitario (Dir. 92/43/CEE all. II e IV) e in particolare la sottospecie nominale, oggetto di questo studio, è in preoccupante regressione. Lo studio ha interessato una popolazione di testuggini presente all'interno del pSic "Duna e lago di Lesina-Focefortore" (cod. IT9110015). L'area di studio è caratterizzata da una struttura vegetazionale a mosaico, in cui si alternano gariga, macchia e bosco, che si sviluppa su un suolo composto in prevalenza da sabbie di origine marina e lacustre.
Gli individui sono stati catturati, misurati e marcati con radio trasmittenti incollate alla parte anteriore del carapace. Le localizzazioni sono avvenute a scadenza mensile o bisettimanale, in relazione anche ai periodi di attività delle testuggini, durante l'intero arco della giornata, per la durata di un anno (09-2004/09-2005). Per ogni fix sono state rilevate le temperature dell'aria e del suolo tramite un termoigrometro digitale.
Come stimatori dell' home range sono stati testati MPC e Kernell calcolati tramite l'estensione "Animal Movement" di Arcview®. L'home range annuale medio ottenuto è di circa un ettaro (MPC 95%=1.07 ha, SD=0,49; Kernell 95%=0,87 ha, SD=0,47). L'analisi della sovrapposizione degli home range sembra suggerire l'assenza di veri territori, ma una minor tolleranza tra maschi. Tutti gli individui hanno mostrato, oltre ad un periodo di latenza invernale, la tendenza all'inattività nel periodo estivo, in relazione alle alte temperature ambientali. I primi segni di attività sono stati registrati all'inizio di Aprile, mentre i siti di ibernazione sono stati raggiunti tra il 26/11 e il 20/12 con temperature del suolo tra 8,3° e 9,8°C.

Key words: *radiotracking, conservation, monitoring*

SALAMANDRINA PERSPICILLATA NELLE MARCHE: COROLOGIA, ECOLOGIA E ASPETTI DELLA CONSERVAZIONE

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Viene presentato un contributo relativo allo status attuale delle conoscenze su corologia ed ecologia di *Salamandrina* nelle Marche, apportando nuovi dati di presenza ed evidenziando le principali problematiche di conservazione. Alla luce del recente lavoro di Mattoccia et al. (2005, Zootaxa, 995: 1-19) le popolazioni marchigiane di salamandrina dagli occhiali sono ora ascrivibili a *Salamandrina perspicillata* (Savi, 1821).

Per aggiornare la distribuzione sul territorio marchigiano di *Salamandrina perspicillata*, alle banche-dati erpetologiche delle province di Pesaro-Urbino e Ancona ed alle segnalazioni bibliografiche ritenute attendibili, sono state aggiunte le nuove segnalazioni di presenza raccolte nel corso di ricerche di campo. I siti di riproduzione conosciuti (N=44) sono stati caratterizzati dal punto di vista ecologico (tipologia habitat, quota, esposizione, sintopia con altri Anfibi, fattori di disturbo). Per la rappresentazione cartografica dei dati è stato utilizzato come riferimento il reticolo formato dalle 130 maglie UTM di 10 km di lato, ricadenti nella Zona 33T, che interessano le Marche.

Salamandrina perspicillata risulta essere presente in 25 celle su 130 (pari al 19,2% del totale). La maggior parte delle segnalazioni si riferisce a siti compresi tra i 400 m (piano bioclimatico alto-collinare) e i 700 m (piano bioclimatico basso-montano), con massimi di 1100 m nel Parco naturale regionale Sasso Simone e Simoncello e 1390 m nel versante ascolano dei M.ti della Laga. La specie frequenta valli fresche, umide e ombrose, con copertura vegetale prevalente rappresentata da orno-ostrieti, faggete, querceti a Roverella, boschi ripariali ad *Alnus glutinosa*. I siti riproduttivi elettivi risultano essere i ruscelli a lento corso (33 siti su 44, pari al 75% del totale), vasche e fontanili abbandonati (7, 16%), mentre assai più rara è la riproduzione in forre e ambienti ipogei (3, 6.8%) e stagni (1, 2.2%).

L'attività riproduttiva ha inizio alla fine della stagione invernale: le femmine depongono le uova tra marzo (Parco naturale regionale Gola della Rossa e di Frasassi) e giugno (Monte Nerone), e le larve metamorfosano in 2-5 mesi a seconda delle condizioni microclimatiche e idrologiche locali.

Salamandrina risulta essere sintopica con *Rana italica* nella maggior parte dei siti e occasionalmente con *Salamandra salamandra*, *Triturus carnifex*, *Bombina pachypus* e *Rana dalmatina*.

I nuovi dati di presenza sul territorio regionale sono relativi alle stazioni di Cingoli e Sarnano nel Maceratese, ai siti di Acquasanta Terme (4 stazioni, tra 710 e 1390 m) e Montegallo (1 stazione) nell'ascolano. Per quanto riguarda le segnalazioni bibliografiche, non hanno a tutt'oggi trovato conferma i dati di Capula (1995, Rettili e Anfibi. Siti di Interesse Comunitario nei nuovi parchi nazionali dell'Appennino centrale; European Commission & Ministero dell'Ambiente) relativi ai siti riproduttivi di Bolognola (MC) e Montefortino (AP). Si tratta di dati che non sono stati presi in considerazione nell'Atlante degli Anfibi e dei Rettili d'Italia (Sindaco et al., 2006, Edizioni Polistampa).

I principali fattori negativi osservati (siccità estiva, alterazioni del sito riproduttivo, captazioni, operazioni selvicolturali, immissione di ittiofauna, attività sportive-turistiche) e la limitata distribuzione nei territori alto collinari e montani a cavallo tra Marche e Umbria, evidenziano

l'urgenza di approntare uno specifico piano di conservazione interregionale per l'endemita Appenninico.

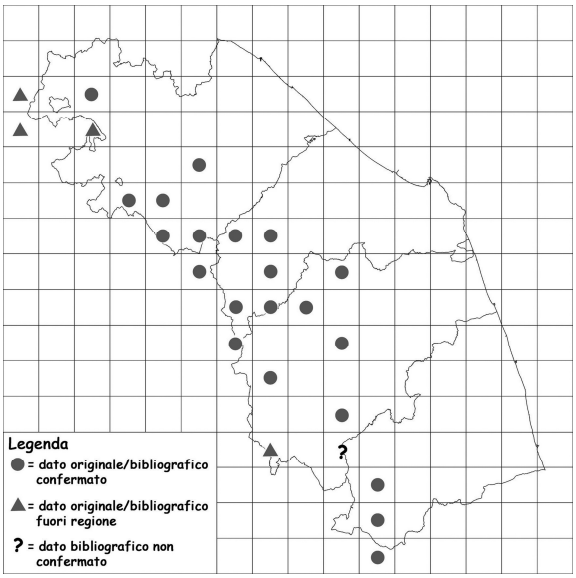

Fig. 1. Mappa di distribuzione di *Salamandrina perspicillata* nelle Marche (unità di rilevamento: celle UTM 10x10 km).

Key words: Salamandrina perspicillata, *Marche region, chorology, ecology*.

NOTES ON THE DISTRIBUTION AND ECOLOGY OF THE APENNINE YELLOW-BELLIED TOAD *BOMBINA PACHYPUS* IN CALABRIA AND LUCANIA

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Bombina pachypus (Bonaparte, 1838) is an endemic species of the Italian Apennine. The range of its distribution extends from Liguria to Aspromonte. The aim of this paper is to provide information about the distribution and the ecology of this species in Calabria and southern Lucania.

Data were collected from 1983 to 2006. Environmental and biological data were collected on field: altitude, aquatic environment, surrounding vegetation, coexistence with other Amphibians, reproductive status. Data were registered in the Herpetological Database of the Department of Ecology, University of Calabria (Rossi et al., 1991, S.It.E. Atti 12: 977-981). IGM maps scale 1 to 50.000 have been used to calculate terrestrial coordinates. Cartographical analysis was carried out employing the GIS vector cartographic software Map-Info®.

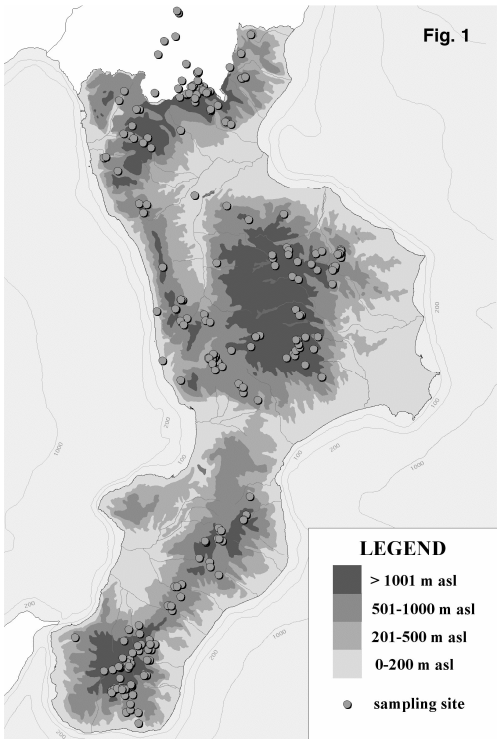
Distribution of *Bombina pachypus* along the study area is rather uniform (Fig. 1): we localized 297 localities where this species was found. Most records come from the main mountains of the study area. The altitudinal distribution of the species ranges from 157 ("Abbeveratoio del cibbione", San Marco Argentano) to 1930 metres a.s.l. (locality "Grande Porta", Terranova del Pollino), but it is most common from 400 to 1400 metres a.s.l.. The higher frequency of sampling sites of this species is located between 801 and 1000 metres a.s.l.. *Bombina pachypus* reproduces preferably in small water bodies such as temporary puddles and pools (Fig. 2). It is also frequent in man-made tanks and troughs, ponds and loops in streams.

In the study area the species is active from the end of February to early November. It shows a long reproductive cycle: Apennine yellow-bellied toads can mate several times due to the fact that males have a prolonged spermiation (Guarino et al., 1998, Ital. J. Zool. 65: 335-342). In Calabria and Lucania copulations start in May and finish in August; at the same time females deposit small clutches of eggs. Larvae are present in water from May to October: they have a rapid development and metamorphose from August to November. *Bombina pachypus* was often found in acquatic environments in coexistence with *Rana dalmatina, Triturus italicus, Bufo bufo* and *Rana italica*, less frequently with *Rana esculenta* and *Hyla intermedia*. The coexistence with the other Amphibian species of the study area is not significant.

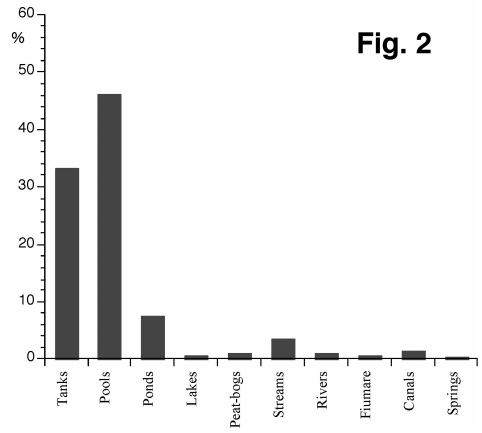
The Apennine distribution of *Bombina pachypus* is not uniform: most reports come from Calabria (Guarino et al., 2006, in: Atlante degli Anfibi e Rettili d'Italia, Edizioni Polistampa, Firenze: 272-277), where it seems to be a rather common species, especially in hilly and mountainous environments. Altitudinal and habitat preferences of this toad in the study area are similar to those known for other Italian regions (Caputo & Guarino, 1992, Atti soc. ital. Sc. nat. Mus. civ. St. nat. Milano, 132: 273-292; Mazzotti & Stagni, 1993, Gli Anfibi ed i Rettili dell'Emilia-Romagna, Mus. Civ. St. Nat. Ferrara: 50-51; Emanueli, 1994, in: Atlante degli Anfibi e dei Rettili della Liguria, Nuova LitoEffe, Castelvetro Piacentino: 50-51; Sarrocco & Bologna, 2000, in: Anfibi e Rettili del Lazio, Fratelli Palombi Editori, Roma: 48-49). The annual activity cycle of the species in Calabria and Lucania seems to be longer than in the rest of its range: probably it is due to the typical Mediterranean climate of the study area.

From a conservation point of view, the species appears to be not seriously endangered in the study area. *Bombina pachypus* is included, under the name *Bombina variegata,* in the Annex II of the Habitat Directive 92/43 CEE and it is considered in the category "Lower Risk" in the Red

Data Book of the Italian fauna (Bulgarini et al, 1998, Libro Rosso degli Animali d'Italia, Vertebrati). The principal threats to the survival of the species can be identified with the habitat alteration, the captation of water for irrigation and the extreme trampling due to the unlawful pasturage. The basic knowledge of the ecological preferences of the species represents the start point for carrying out of conservation measures.



Distribution of *Bombina pachypus* in Calabria and southern Lucania



Habitat preferences *Bombina pachypus* in Calabria and southern Lucania

Key-words: *Distribution, ecology,* Bombina pachypus*, Calabria, Lucania.*

INDAGINE PRELIMINARE SULLA POPOLAZIONE RIPRODUTTIVA DI ROSPO SMERALDINO *(BUFO VIRIDIS)* NELLA RISERVA NATURALE REGIONALE ORIENTATA DEI "LAGHI DI CONVERSANO" (PUGLIA, ITALIA)

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La Riserva naturale regionale orientata dei "Laghi di Conversano", nella quale è stata condotta la presente indagine, è proposto Sito d'Importanza Comunitaria in provincia di Bari (pSIC IT9120006): essa è costituita da un sistema di depressioni naturali contenenti acqua e rappresenta una delle aree più ricche di batracofauna dell'intera Provincia di Bari.
Lo scopo del presente lavoro è stato quello di investigare il possibile impatto da attraversamento stradale da parte della frazione riproduttiva delle popolazioni di rospo smeraldino in agro di Conversano. In particolare un'indagine conoscitiva preliminare era stata condotta già nel 2005, durante il periodo di trasmigrazione riproduttiva: la consistenza numerica degli esemplari ritrovati morti sulle strade nel periodo compreso tra il 14 febbraio e il 30 marzo 2005 era risultato di 2615 esemplari. La gran parte delle segnalazioni provenivano da due tratti di strada provinciale caratterizzate da un forte impatto dovuto al traffico veicolare. Individuati i siti riproduttivi e le strade maggiormente interessate al fenomeno migratorio, nel 2006 si è proceduto a standardizzare l'intervento di monitoraggio al fine di ottenere un modello di censimento raffrontabile con quello proposto dal "Progetto ROSPI" (Ferri, 2002, Atti Conv. Salvaguardia Anfibi: 53-62).
I conteggi sono stati effettuati a giorni alterni durante le ore serali nel periodo di trasmigrazione riproduttiva di *B. viridis* dal momento della prima osservazione utile lungo due tratti di strada provinciale, per un totale di 20 km a strada. In particolare la SP 65 "Conversano-Casamassima" viene attraversata dai rospi in migrazione per raggiungere i siti riproduttivi dei laghi di Sassano, di Chienna e di alcune vasche di depurazione presenti in zona; la SP 240-66 "Conversano-Mola" viene attraversata per raggiungere i laghi di Iavorra e, in misura minore, di Petrullo.
Inoltre si è proceduto a raccogliere dati morfometrici su campioni casuali di rospi vivi in trasmigrazione verso i due siti riproduttivi principali operando, nel contempo, un salvataggio manuale dei rospi grazie all'intervento di un gruppo di volontari del WWF Puglia.
L'analisi di questi dati, seppure basata esclusivamente sulla frazione riproduttiva della popolazione, potrà fornire preliminari indicazioni utili per valutare la struttura delle popolazioni di *Bufo viridis* e per poter programmare eventuali interventi di tutela mirati alla batracofauna migratrice in accordo con le Amministrazioni locali.
I conteggi complessivi sono riassunti in Tab. 1.
Come osservabile il numero totale degli individui morti conteggiati sul manto stradale è quasi doppio rispetto a quello dei vivi (1007 a dispetto di 525 esemplari vivi).
Considerando il totale degli esemplari (vivi e morti), il rapporto sessi maschi/femmine è uguale a 1,61. Si è anche stimata la numerosità effettiva (EPS) della popolazione attiva secondo la formula proposta da Giacoma (Giacoma, 1999, Riv. Idrobiol. 38: 251-265). I valori di EPS ottenuti per i rospi smeraldini che hanno attraversato la SP 65 è 205.20, mentre per la popolazione che ha attraversato la strada provinciale SP 240-66 è 166.27.

Tab. 1.

Anno 2006 (periodo 10 febbraio - 31 marzo)								
Fase di migrazione	Andata				Ritorno			
	♂ vivi	♂ morti	♀ vive	♀ morte	♂ vivi	♂ morti	♀ vive	♀ morte
SP 65	200	281	69	113	26	67	15	32
SP240-66	78	244	89	210	23	26	25	34
Totale	*278*	*525*	*158*	*323*	*49*	*93*	*40*	*66*

Key words: *green toad, spawning pond, migration.*

ANALISI BIOMETRICA DI UNA POPOLAZIONE DI *BUFO BUFO SPINOSUS* DEL LAGO D'IDRO (LOMBARDIA, ITALIA)

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Allo scopo di approfondire le conoscenze ecologiche sulla popolazione di Rospo comune del Lago d'Idro, dal 1998 al 2001, lungo la carreggiata che ne costeggia la sponda sinistra sono stati raccolti in modo random 113 maschi e 44 femmine adulti, uccisi dal traffico veicolare durante le prime fasi della stagione riproduttiva. Su di essi si è provveduto ad effettuare analisi morfometrica.

I campioni sono stati conservati in alcool etilico 70% o congelati a –20°. I parametri che sono stati sottoposti ad analisi includono Media, Mediana, Varianza, Deviazione Standard, Errore Standard, Minimo e Massimo su peso, lunghezza corpo, larghezza e lunghezza capo, occhio, omero, radio-ulna, femore, tibia. Le misurazioni sono state effettuate con una bilancia di precisione e un calibro (risoluzione 0,01mm, precisione 0,03 mm) digitali tenendo l'animale prono e considerando le zampe destre. Per verificare se e in che misura i metodi di conservazione dei rospi avessero influenzato significativamente sui dati si è ricorsi alla Principal Components Analysis (PCA) che ha permesso di semplificare la descrizione del sistema di variabili trasformando i dati in nuove variabili costituite da composizioni lineari delle variabili iniziali. Tutte le variabili sono state sottoposte alla tecnica multivariata PCA allo scopo di verificare un'eventuale differenza fra i campioni sui 4 anni di raccolta.

Sono stati applicati anche il test "t" di Student per verificare differenze significative tra le medie dei campioni e il test "U" di Mann-Whitney per verificare la divergenza fra le rispettive mediane.

Dai risultati della PCA si evince che i metodi di conservazione dei campioni non hanno influito sui parametri morfometrici. La stessa analisi evidenzia la possibilità di discriminare maschi e femmine in base alle caratteristiche morfometriche.

La percentuale più alta dei maschi risulta appartenere ad una classe di peso compresa fra 30 e 40 gr., seguita da quella 41-51 gr. Le femmine, invece, hanno maggiore distribuzione nella classe 79-99 e 100-120 gr. Per quanto riguarda la lunghezza del corpo, i maschi sono maggiormente distribuiti nelle classi 67-72 e 73-78 mm, mentre la percentuale più alta delle femmine appartiene alle classi 84-94 e 95-105 mm.

I dati sottoposti al test "t" di Student, al test "U" di Mann-Whitney per il peso e la lunghezza del corpo e al PCA per tutti i parametri, non indicano differenze fortemente significative nei diversi anni di campionamento. Né per i maschi, né per le femmine la PCA effettuata confrontando i dati biometrici di tutti gli esemplari del medesimo genere non ha rilevato differenze significative sui 4 anni di raccolta.

Per verificare la dipendenza reciproca tra alcune delle variabili è stata eseguita un'analisi di correlazione. Il Grafico 1 rappresenta le curve di regressione e i coefficienti di determinazione ricavati dai diagrammi di dispersione per l'analisi della lunghezza del corpo (SVL) in rapporto alla larghezza del capo (WHEAD). Ciascun punto rappresenta la misura della variabile per ogni esemplare. I risultati danno valori R^2 (parametro di correlazione R^2=1) pari a 0,2403 per i maschi e 0,0258 per le femmine, indicando che, particolarmente per le femmine, non sembra esserci buona corrispondenza tra il modello di crescita raffigurato e quello effettivo.

L'analisi biometrica conferma che *B. f. spinosus* (Daudin) mostra dimensioni corporee in media maggiori della forma tipica indicate da Ceccarelli M. (1996, Biologie et structure d'une popolation de crapaud commun (*Bufo bufo spinosus*) à Rampinga - Barbengo, Canton du Tessin

-. Université de Neuchatel: 1-89 +I-VI), Ceppi S. (1999, Biologie et structure d'une popolation de crapaud commun (*Bufo bufo spinosus*) à Rampinga - Barbengo, Canton du Tessin -. Université de Neuchatel: 1-69+I-IX) e Gaggini R. (1999. Structure et dynamique d'une popolation de crapaud commun (*Bufo bufo spinosus*). Université de Neuchatel:1-65).
Nessuna significativa differenza morfometrica, tenendo conto della disparità numerica dei campioni, è stata osservata rispetto a popolazioni lombarde già studiate da Chiappetti C. (1989. Il Rospo comune *Bufo bufo* (L.) in un'area settentrionale del Parco lombardo della Valle del Ticino: struttura della popolazione e biologia. Università Statale degli Studi di Milano), da Fantoni F. (1995. Aspetti della biologia ed ecologia di popolazioni di rospo comune (*Bufo bufo*) del lato sud-occidentale del Lago di Lecco - provincia di Lecco -. Problematiche di conservazione. Tesi di laurea Università Statale degli Studi di Milano) e da Giovine G. (1998. Il salvataggio delle popolazioni di Anfibi nei pressi dei Laghi di Endine e di Piangaiano (Valcavallina, Bergamo). In: Ferri V. (ed.), Il Progetto Rospi Lombardia. Regione Lombardia e Comunità Montana Alto Sebino).
I parametri morfometrici confermano i dati già riportati in letteratura per quanto attiene al dimorfismo sessuale. Nei maschi risultano significativamente inferiori le medie dei valori di peso, lunghezza corpo e larghezza capo.
I risultati dei test statistici, applicati per ciascun sesso, indicano che il traffico veicolare non opera alcuna selezione sugli esemplari.

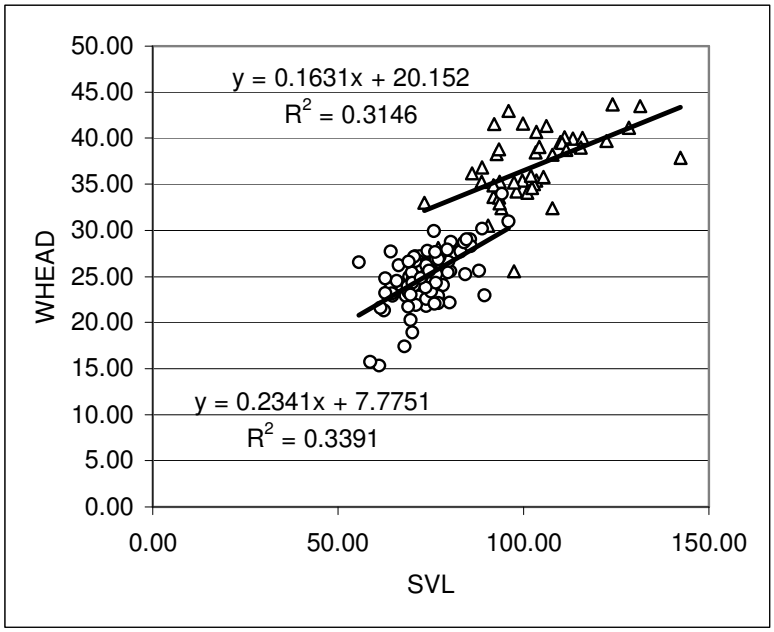

Fig. 1. Rette di regressione e coefficienti di determinazione in femmine (triangoli) e maschi (cerchi).

Key words: *Bufo bufo*, *morphometry*.

GLI ANFIBI E I RETTILI DELLA ZONA DI PROTEZIONE SPECIALE "LAGO TRASIMENO" (IT 5210070)

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Nell'ambito del progetto Life Natura "Ripristino habitat e conservazione Ardeidi sul Lago Trasimeno" LIFE 02NAT/IT/8556, è stato effettuato un monitoraggio su Anfibi e Rettili all'interno della Zona di Protezione Speciale "Lago Trasimeno" (IT5210070), istituita dal Ministero dell'Ambiente con D.M. 3 aprile 2000, ai sensi della Direttiva "Uccelli" 79/409/CEE.
La ZPS si estende per 14.607 ha, di cui circa 12.400 occupati dallo specchio lacustre. Tale complesso, posto tra 258 e 309 metri di quota, si articola tra i territori comunali di Castiglione del Lago, Tuoro sul Trasimeno, Passignano sul Trasimeno, Magione e Panicale in Provincia di Perugia (Velatta F., 2004. Gli uccelli del Trasimeno. Check-list 1987-2003. Provincia di Perugia.).
Tale area comprende interamente il Sito di Importanza Comunitaria "Lago Trasimeno" (IT5210018), istituito ai sensi della Direttiva "Habitat", 92/43/CEE; e l'omonimo Parco Regionale.
I dati emersi dal presente lavoro, utilizzati per redigere la check-list degli Anfibi e dei Rettili della ZPS "Lago Trasimeno", derivano da tre anni di monitoraggio (2002-2005) per un totale di 24 sopralluoghi ripartiti in 8 uscite anno tra marzo e ottobre e dati inediti validati forniti agli Autori relativi allo stesso periodo.
Sono state rilevate in totale 7 specie di Anfibi: *Triturus carnifex*, *Triturus vulgaris meridionalis*, *Hyla intermedia*, *Bufo bufo*, *Rana bergeri*, *Rana* klepton *hispanica*, *Rana dalmatina* e 9 specie di Rettili: *Testudo hermanni*, *Trachemys scripta*, *Lacerta bilineata*, *Podarcis muralis*, *Podarcis sicula Hierophis viridiflavus*, *Zamenis longissimus*, *Natrix natrix* e *Natrix tessellata* rispettivamente pari al 53,85% e 47,37% delle specie presenti in Umbria (Ragni *et alii*, in stampa. Anfibi e Rettili dell'Umbria. Distribuzione geografica ed ecologica. Petruzzi Editore.).
La ricerca bibliografica e i dati inediti raccolti hanno messo in evidenza la presenza, non più confermata, di *Emys orbicularis* ed *Elaphe quatuorlineata* (Orsomando E.& Catorci A., 1991.Carta della vegetazione del Comprensorio del Trasimeno. Associazione Comuni del Trasimeno. Università di Camerino, Dipartimento di Botanica ed Ecologia.).

Key words: *Amphibians, Reptiles, Trasimeno Lake*

L'ERPETOFAUNA DELLA SELVA DI CASTELFIDARDO E DELLA BASSA VALLE DEL FIUME MUSONE (MARCHE CENTRALI)

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Per migliorare le conoscenze sulla distribuzione di Anfibi e Rettili nella provincia di Ancona, in seguito all'avvio del "progetto atlante" (Fiacchini, 2003, Atlante degli Anfibi e dei Rettili della Provincia di Ancona; Nuove Ricerche Editore) sono state condotte alcune ricerche nei biotopi di interesse erpetologico nella bassa valle del fiume Musone (Marche centrali).
L'area oggetto di studio comprende 9 celle UTM di 5 km di lato: ricadono in queste unità di rilevamento l'area floristica protetta della Selva di Castelfidardo, l'ex cava di M.te San Pellegrino e la bassa valle del fiume Musone dalla confluenza con il torrente Fiumicello alla foce (I.G.M. Foglio 118 – III NE, "Loreto"). Le informazioni su Anfibi e Rettili sono state raccolte considerando sia la banca dati erpetologica provinciale, sia nuove segnalazioni scaturite da specifiche ricerche di campo attive dal 2004 con sopralluoghi mirati in ambienti ritenuti idonei: aree umide per gli Anfibi, fasce ecotonali e incolti per i Rettili.
Sono state rilevate 6 specie di Anfibi (*Triturus carnifex*, presente in 4 unità di rilevamento su 9, *Triturus vulgaris*, 4/9, *Bufo bufo*, 9/9, *Bufo viridis*, 5/9, *Hyla intermedia*, 7/9, *Rana bergeri – R.* kl. *hispanica*, 9/9) e 12 specie di Rettili (*Trachemys scripta*, presente in 1 unità di rilevamento su 9, *Testudo hermanni*, 4/9, *Caretta caretta*, 3/9, *Hemidactylus turcicus*, 3/9, *Anguis fragilis*, 2/9, *Lacerta bilineata*, 7/9, *Podarcis muralis*, 8/9, *Podarcis sicula*, 7/9, *Coronella austriaca*, 1/9, *Hierophis viridiflavus*, 8/9, *Natrix natrix*, 8/9, *Zamenis longissimus*, 6/9) (Tab. 1).
Nel complesso le 18 specie censite rappresentano poco più della metà dell'erpetofauna marchigiana (N=35) (il 40% degli Anfibi e il 60% dei Rettili delle Marche) e il 56% di quella provinciale (N=32) (il 46% degli Anfibi e il 63% dei Rettili della Provincia di Ancona).
La bassa valle del Musone, fortemente antropizzata e semplificata come la maggior parte delle pianure alluvionali marchigiane, presenta piccole "isole verdi", costituite da fasce di vegetazione ripariale, aree incolte, laghetti e pantani per la caccia agli anatidi, di notevole importanza per l'erpetofauna.
Per gli Anfibi i residui ambienti lentici rappresentano gli unici siti riproduttivi frequentati: da segnalare, in particolare, la discreta diffusione di *Triturus carnifex* e *T. vulgaris*, sintopici in tutte le stazioni osservate, di *Bufo viridis*, specie rara e scarsamente distribuita nelle Marche, e di *Hyla intermedia*. Tra i Rettili, oltre alla presenza occasionale di *Caretta caretta* (spiaggiamento), da segnalare *Coronella austriaca*, rinvenuta al margine di un boschetto nella campagna di Osimo. Gli esemplari di *Testudo hermanni*, osservati in condizioni di semicattività, sono ascrivibili alla sottospecie *boettgeri*.
I principali fattori negativi per l'erpetofauna della bassa valle del Musone sono rappresentati dal precoce prosciugamento degli specchi d'acqua, dall'uso massiccio di pesticidi, dalla scomparsa di aree umide e di incolti, e dalla frammentazione ambientale (elevato grado di infrastrutturazione).

Tab. 1. Anfibi e Rettili censiti nell'area oggetto di studio.

Specie	Distribuzione		
	N° celle (su 9)	%	Status (*)
Triturus carnifex	4	44,4	C
Triturus vulgaris	4	44,4	C
Bufo bufo	9	100	D
Bufo viridis	5	55,5	C
Hyla intermedia	7	77,7	D
Rana bergeri - R. kl *hispanica*	9	100	D
Trachemys scripta (**)	1	11,1	- - -
Testudo hermanni	4	44,4	C
Caretta caretta	3	33,3	L
Hemidactylus turcicus	3	33,3	L
Anguis fragilis	2	22,2	L
Lacerta bilineata	7	77,7	D
Podarcis muralis	8	88,8	D
Podarcis sicula	7	77,7	D
Coronella austriaca	1	11,1	L
Hierophis viridiflavus	8	88,8	D
Natrix natrix	8	88,8	D
Zamenis longissimus	6	66,6	C

Legenda:
* = L, specie "localizzata" (<35% delle unità di rilevamento); C, specie "comune" (36-70% delle unità di rilevamento); D, specie "diffusa" (>71% delle unità di rilevamento).
** = Non valutata poiché specie esotica non acclimatata.

Key words: *Musone river, Amphibians, Reptiles, chorology*.

L'ERPETOFAUNA NEI SITI DI IMPORTANZA COMUNITARIA (SIC) DELLA PROVINCIA DI LODI

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In Italia sono stati identificati oltre 2.400 siti di importanza comunitaria proposti (SICp), ai sensi della Direttiva comunitaria 92/43/CEE, meglio nota come "Direttiva Habitat", relativa alla conservazione degli habitat naturali e seminaturali e della flora e della fauna selvatiche, che insieme a zone di protezione speciale (ZPS) intendono costituire una rete ecologica su scala europea denominata NATURA 2000. Questa rete deve garantire il mantenimento, in un soddisfacente stato di conservazione, di tipi di habitat naturali e popolazioni di specie di particolare rilevanza nell'areale distributivo originario.
In Italia la direttiva è stata applicata attraverso il DPR 357/97 e successive modificazioni. La Provincia di Lodi ha aderito ad un programma di indagine degli aspetti faunistici e botanici avviando un monitoraggio sullo stato dell'erpetofauna negli 11 SIC presenti nel proprio territorio.
Sono stati indagati 11 siti distribuiti lungo l'asta fluviale dell'Adda e del Po, inclusi in prevalenza in Aziende Faunistico Venatorie; dieci pSIC erano ubicati all'interno del Parco Adda Sud e uno nella Riserva Naturale Orientata "Monticchie".
Il metodo di censimento utilizzato, Systematic Sampling Survey (SSS, Scott 1994), è una tecnica di indagine opportunistica il cui scopo è di individuare il maggior numero possibile di specie in un tempo prestabilito (Scott 1994, Razzetti & Msuya 2002). I SIC sono stati divisi in stazioni visitabili nel tempo di un'ora ciascuno, dal mese di aprile a luglio 2004. La raccolta dati è avvenuta in condizioni climatiche idonee per le specie considerate, durante uscite diurne e notturne, con riconoscimento a vista e al canto (anche con l'ausilio di un idrofono).
I Siti da monitorare presentavano notevoli differenze ecologiche e dimensionali (intervallo area = 6-552 ha), ma tutti caratterizzati dalla presenza di acque interne lentiche o lotiche. I dati raccolti con uno sforzo di campionamento pari a 169,5 ore hanno rilevato la presenza di sette specie di Anfibi e altrettante di Rettili (Tab. 1), rispetto alle nove specie di Anfibi e alle undici di Rettili segnalate per la provincia di Lodi da fonti bibliografiche (BERNINI et al. 2004, Atlante degli Anfibi e dei Rettili della Lombardia).
L'elevata frequenza di *Rana latastei*, specie endemica della pianura padana, testimonia sia l'idoneita' generale dei SIC per la specie, sia il successo di interventi di reintroduzione attuati nel periodo 1999-2000 nel territorio del Parco Adda sud, ed è elemento utile per la conferma del sito come SIC, in quanto specie inclusa nell'Allegato II della Direttiva Habitat. Analogamente, la scarsa frequenza di *Hyla intermedia* o *Bufo bufo,* specie ad ampia distribuzione regionale nazionale e un tempo presenti in zona potrebbe attestare condizioni di inidoneità parziale delle aree indagate
Per quanto concerne i Rettili si osserva un'ampia distribuzione di specie comuni come *Podarcis muralis, Natrix natrix* e *Lacerta bilineata* mentre appaiono molto localizzate specie come *Anguis fragilis* ed *Elaphe longissima*. Non sono state confermate o accertate la presenza di *Vipera aspis* (presente in aree non SIC presso Lodi) e *Coronella austriaca*, forse a causa dell'elusività di queste specie o alla loro estrema localizzazione. L'assenza di *Emys orbicularis*, segnalata nel recente passato riflette con tutta probabilità l'estinzione locale di questo rettile, come attestano anche altre indagini effettuate recentemente.

Tab. 1. Frequenza delle specie di Anfibi e Rettili nei SIC.

Specie	N.° SIC	Freq. (%)
Rana sk esculenta	11	100
Bufo viridis	10	90,9
Rana latastei	9	81.8
Hyla intermedia	6	54.45
Bufo bufo	5	45.45
Triturus carnifex	2	18.18
Triturus vulgaris	2	18.18

Specie	N.° SIC	Freq. (%)
Podarcis muralis	11	100
Natrix natrix	11	100
Lacerta bilineata	10	90.9
Hierophis viridiflavus	9	81.81
Natrix tessellata	5	45.45
Anguis fragilis	3	27.27
Elaphe longissima	1	9.09

Key words**:** *Anfibi, Rettili, Siti di Importanza Comunitaria*.

II - Aspetti morfologici e funzionali di Anfibi e Rettili

II - Morphological and functional aspects of Amphibians and Reptiles

(Convenor: Fabio M. Guarino, Benedetto Lanza, Gaetano Odierna)

MHC CLASS I VARIATION ASSOCIATES WITH PARASITE RESISTANCE AND LONGEVITY IN TROPICAL PYTHONS

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Using Restricted Fragment Length Polymorphism (RFLP) we identified 26 unique MHC genotypes in 104 water pythons. We observed a significant independent association between reduced blood parasite load (*Hepatozoon* sp.) and python body length/age, presence of a specific RFLP fragment (C-fragment) and the overall number of fragments. The parasite has a negative impact on several python life-history traits such as growth, nutritional status and longevity. Thus, the C-fragment could be considered a "good gene" (a fitness-enhancing genetic element). However, while the number of fragments affected parasite load, the association between level of parasitaemia and fragment number was not linear, and, hence, minimum parasite infection level was achieved at an intermediate number of fragments. Intermediate MHC fragment numbers were also observed among the largest/oldest pythons, suggesting that both a specific fragment and intermediate levels of MHC polymorphism enhanced python longevity. Thus, our results suggest python MHC is subject to both frequency dependent and balancing selection.

Key words: *Water pythons,* Hepatozoon *sp., MHC genotypes.*

MOLECULAR CLONING AND EVOLUTION OF METALLOTHIONEIN GENE IN SQUAMATES (REPTILIA, SQUAMATA)

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Metallothioneins (MTs) are low molecular mass cysteine-rich proteins, particularly effective in binding heavy metals such as zinc, copper and cadmium. MTs are thought to be involved in the homeostatic control of essential metals, in the defence from poisonous heavy metals and scavenging of superoxide radicals (Kägi and Schaffer, 1988, Biochemistry 27: 8509-8515). MTs are considered ubiquitous, as they are present in prokaryotes and plants, and in almost all animal phyla. In Vertebrates, MTs have been extensively studied in Mammals and, more recently, in teleosts (Scudiero et al, 2001, Gene 274: 199-208; Capasso et al, 2003, J Mol Evol, 57, S250-S257). Very little information are available on structure, function and evolution of MTs from birds, amphibians and reptiles. In the present work, we present the results of a study aimed at elucidating the pattern of MT evolution in Squamata.
We have examined ten species of squamates belonging to different Infraorders (Gekkota, Scincomorpha, Iguania, Diploglossa, Xenophidia) using RT-PCR to detect the presence of MT transcripts. MT specific primers were designed on the basis of the nucleotide sequence of the lizard *Podarcis sicula* MT (Riggio et al, 2003, Mol Reprod Dev 66: 374-382). The results obtained show the existence of a single MT isoform in each of the reptilian species examined. Reptilian MTs, together with the MT sequence available for the other classes of vertebrates, have been used to derive a gene phylogeny. A phylogenetic tree has been inferred using the Bayesian method implemented in the software Mr Bayes v. 3.1. The topology has been also assessed by the maximum parsimony method, using the softaware PAUP v. 4.0b. Both topologies show that reptilian MTs do not merge as an unique clade; in addition, reptile MT phylogeny seems to be inconsistent with the species phylogeny. These results prompted us to hypothesize that the identified MT might be considered a paralogous gene derived from a gene duplication event occurred before the diversification of the squamate species. Moreover, the alignment of the translated amino acid sequences allows us to identify in the position 63 a synapomorphic character useful to distinguish the various vertebrate clades. Tracing out the amino acid residue 63 on the species tree of vertebrates, we have been able to demonstrate that this residue is a distinctive feature of each group of vertebrates, with the exception of the squamates. In fact, in the Squamata order the amino acid 63 represents a synapomorphic character for each infraorder examined.
Recently, in a comparative study on MTs of different piscine and mammalian species, we showed that protein hydropathy (a quantity inversely proportional to flexibility) significantly correlates with the optimal temperature of the organisms (Scudiero et al, 2005, Gene 345: 21-26). Tracing of the hydropathy index on the species tree of vertebrates (Fig. 1) clearly shows that the MT hydropathy increases during vertebrates evolution reaching the maximum value in mammals.
This analysis suggests that MT hydropathy is a character displaying significant phylogenetic dependence but not associated to the thermal regime of species; consequently this trait does not represent an adaptation of vertebrates to organismal temperature. This result is strongly supported by the observation that hydropathy of avian MT is closer to that of other diapsid rather than to that of the other group of mammals.

This work is supported by the MIUR-PRIN Project n° 2004057282.

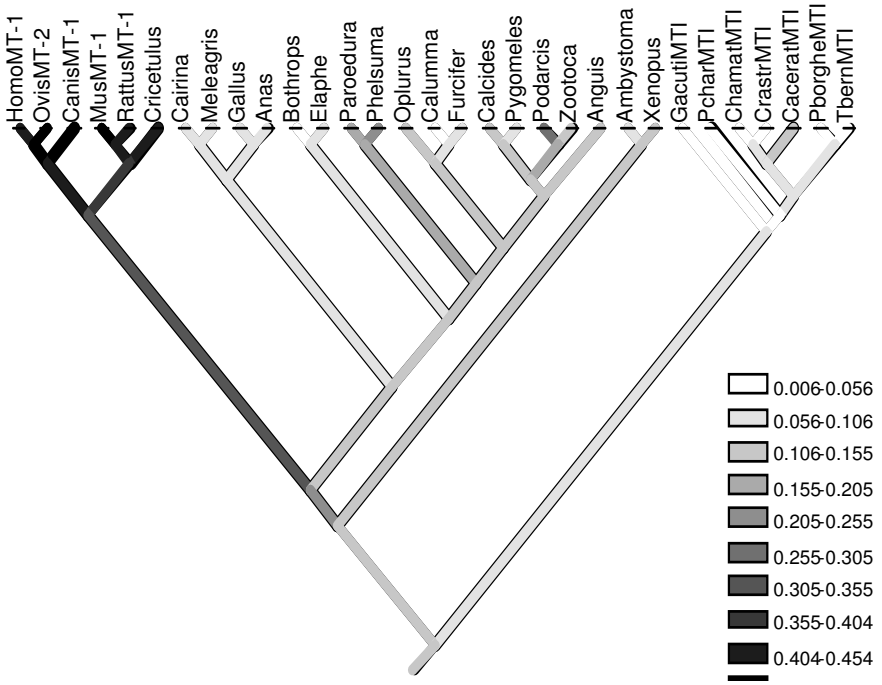

Fig. 1. Tracing of the hydropathy index on the species tree of vertebrates

Key words: *Metallothionein, Squamata, Evolution, Hydropathy.*

SEXUALLY DIMORPHIC GLANDS IN AMPHIBIANS

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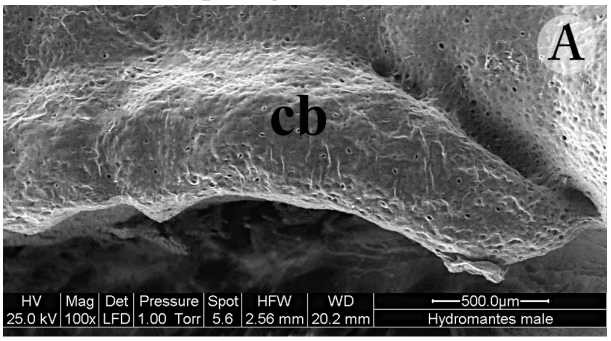
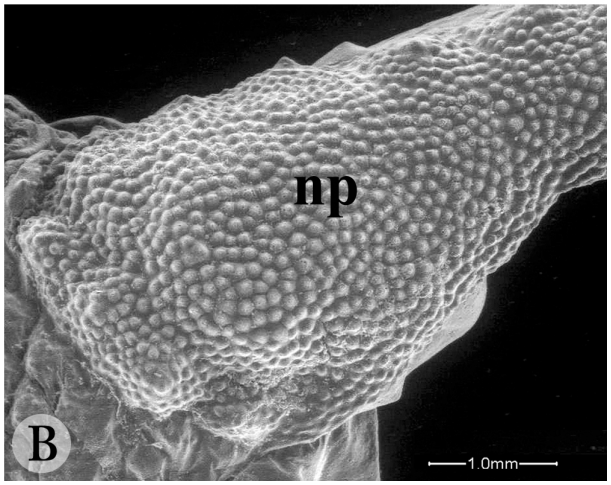
The intraspecific communication of amphibians involves not only visual and auditory cues, but also a variety of chemical signals. These latter, usually defined pheromones, are produced by specialized skin components, mostly dermal glands, and play a critical role in a variety of social activities, including courtship and mating behaviour.
The following sexually dimorphic glands (occurring only in males) were removed from the skin of some amphibians and performed according routine methods for observations under LM and SEM microscopies: nuptial pad glands of *Rana esculenta* and *Bufo bufo* (both species from the surroundings of Florence), specialized skin glands of the trunk of *R. dalmatina* (S. Donato in Collina, Florence, Tuscany) and *R. italica* (surroundings of Chiusi, Tuscany). Mental and vent glands of *Hydromantes italicus* (Scarperia, Tuscany), dorsal glands of *Triturus carnifex* (surroundings of Florence).
Our observations indicate that cutaneous glands producing courtship pheromones occur in many Anura and Urodela, although with different anatomical and morphological characteristics. As a rule, these glands lack in females and are hypertrophic in males during the breeding season. They are therefore defined sexually dimorphic skin glands (SDSG), or breeding glands, and their products regarded as chemical signals able to attract conspecifics and indicating status, sex and reproductive condition of the sender.
Sexually dimorphic glands in the urodeles: Emblematic examples of breeding glands in the salamanders are some cutaneous and cloacal glands occurring in the plethodontids, namely mental and vent glands, respectively. The first are a cluster of large, mucous glands that release their product on the male chin. During courtship the male delivers the mental gland secretion to the female, with the aid of sexually dimorphic premaxillary teeths. The vent glands occur inside the walls of the cloacal region and open externally, along the swollen cloacal border (cb, Fig. A). Their secretion acts as a chemical mark on the substrate to attract the female. A quite similar role is performed by the cloacal, dorsal glands of most salamandrids, namely of *Triturus*.





Sexually dimorphic glands in anurans: In many frogs and toads SDSG occur in form of keratinised patches on the thumbs and forearms and are specifically termed nuptial pads. In *Rana esculenta* and *Bufo bufo* (np, Fig. B) they are cutaneous specialisations including rows of glands (nuptial glands), embedded in the pad dermis. The pads are covered by a strongly keratinised epidermis, where high papillae alternate with gland pores. The

nuptial glands release their product onto the keratinised pads, which indicates an adhesive function of the secretion, which functions in promoting male's ability to retain the female during amplexus. Secretions of these glands may also prevent sexual interference by rival males. In other *Rana* species, as *R. dalmatina* and *R. italica* we observed peculiar clusters of "specialized" mucous glands dispersed in the male dorsal skin of the trunk. As in these species vocal sacs are absent, the pheromonal signals released from the above male glands may be vocal signal replacements and function as female attractants.
The skin plays a crucial role in the homeostasis of the Amphibia, performing a lot of functions in their biology. In particular, a wide array of unicellular and multicellular cutaneous components (including dermal glands) are engaged in the release of biochemical compounds relevant for survival strategies or communication (Duellman and Trueb, 1986, Biology of Amphibians. McGraw-Hill, New York; Houck & Sever, 1994, in: Amphibian Biology, Vol. 1. Heatwole, H., Barthalmus, G.T., Eds, New South Wales, Australia). A source of chemical cues is the secretory product from diffuse mucous glands, but also local gland clusters, frequently sexually dimorphic (e.g. these reported in this study), release pheromones. All these glands share morphological characteristics in both amphibian orders and pertain to the mucous gland line. As demonstrated by many ecological evidences, the SDSG have a highly critical function in promoting individual mating success and, in this connection, they shown a wide distribution in this class of vertebrates (Houck & Reagan, 1990, Anim. Behav. 39: 729-734; Houck & Verrell, 1993, Herpetologica 49:175-184).

Key words: *Amphibia, sexually dimorphic skin glands.*

A COMPARATIVE KARYOLOGYCAL STUDY OF *VIPERA* (*PELIAS*) *NIKOLSKII* (SERPENTES, VIPERIDAE) FROM FLOODED LANDS OF VOLGA AND DON BASIN RIVERS

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Vipera (*Pelias*) *nikolskii* (Vedmederja, Grubant et Rudaeva, 1986) inhabiting the forest-steppe and northern steppe zone of Eastern Europe is a species whose taxonomic status has been open to discussion for long. The usage of morphological methods only to classify the vipers of this group is insufficient and, as it is well known, other methods of analysis (including cytogenetic ones) are worthwhile employing in such cases. Therefore, it seems useful to study the karyotype of *V.* (*P.*) *nikolskii*.

Two males and two females of *V.* (*P.*) *nikolskii* were caught near t. Khvalynsk (the flooded-lands of small Volga tributaries) and near v. Novye Peski (Lysye Gory district, the flood-lands of the Medveditsa) in May, 2004 for karyological studies. Chromosomal preparations were made from peripheral blood cells using a modified technique (Ford & Hamerton, 1956, Stain Technol. 31: 247-251; Baker, Bull & Mengden, 1971, Experientia. 27: 1228-1229). The ready preparations were coloured with azur-eozine (Romanovski) and studied with the aid of a Zeiss microscope. Not less than 8-12 metaphases for each animal were analyzed. The chromosomal preparations of the vipers under study are kept at the Zoological Museum of Saratov State University.

The diploid set of *V.* (*P.*) *nikolskii* (Medveditsa study area) includes 36 chromosomes ($2n$=36, NF=50) with a pronounced division on macro- (1-8th pairs) and microchromsomes (9-18th pairs). The biggest chromosomes of the 1st and 3rd pairs are pronounced metacentrics. The chromosomes of the 4th pair with nearly equal arms should be classified as metacentrics as well. The chromosomes of the other pairs (2nd, 5th, 7th, and 8th), with the exception of the 6th subtelocentric pairs, are classified as submetacentric ones. The formula of macrochromosomes is: $2n$ = 4m + 8sm + 2st + m/st. The 4th female pair consist of Z-metacentric and W-subtelocentric chromosomes. The male chromosomes are also represented in the 4th pair (two metacentrics).

The karyotype of *V.* (*P.*) *nikolskii* (near t. Khvalynsk) is similar to that described above by all the indices analyzed. However, in this case the 6th, 7th, and 8th pairs of chromosomes are subtelocentric while only the 6th one is subtelocentric for the Medveditsa vipers; the chromosome formula is $2n$ = 4m + 4sm + 2st + 4sm/st + m/st.

The karyotypes of *V.* (*P.*) *nikolskii* from the Volga valley and from the Medveditsa flooded-lands differed by the 7th and 8th pairs of macrochromosomes: they are subtelocentric and submetacentric, respectively. The differences in the macrochromosomal morphology of *V.* (*P.*) *nikolskii* suggest a pericentric inversion in these pair of chromosomes and, obviously, also suggest some important differences between these populations at a cytogenetic level. Further comparative analysis of two chromosomal sets of *V.* (*P.*) *nikolskii* from different parts of its habitat seems promising.

Key words: Vipera*, chromosome, morphology, Saratov region.*

DUPLICATION EVENTS AND THE EVOLUTION OF THE ASPARTIC PROTEINASE GENE FAMILIES WITH SPECIAL REFERENCE TO LIZARD NOTHEPSIN GENE

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Aspartic proteinases constitute a family of proteolytic enzymes active at acidic pH present in both the vegetal and animal kingdom. The various members of the family are endowed of distinctive hallmarks that allow assigning them to different groups. The nothepsin gene was identified for the first time in fish (Capasso et al, 1998, BBA 1387: 457-461; Riggio et al, 2000, Gene 260, 67-75); its coding sequence shares features common to cathepsin D and E, but the catalytic and functional characteristics of the enzyme are still unknown because the protein has never been isolated.

With the present work, we have attempted to ascertain the presence of the nothepsin gene in vertebrates other than fish by performing a search into the major databanks. The result unravel that most of the aspartic proteinase sequences retrieved from the data banks belong to mammals and only a few to non-mammalian species, with the reptiles not represented at all. For such a reason, by using RT-PCR and 5'-RACE approaches, we have cloned and sequenced in the lacertilian *Podarcis sicula* an aspartic proteinase form distinct from the cathepsin D previously described in the same organism (De Stasio et al, 1999, Mol Repr Dev 52: 126-134); sequence analysis has allowed establishing for the new lacertilian sequence features typical of nothepsin. No similar form is apparently present in other tetrapods. With the aid of Northern blot analyses, we have demonstrated that, at variance with fish (Riggio et al, 2002, Gene 295: 241-246), lizard nothepsin is constitutively expressed in all the tissues examined and seems to be insensitive to the estrogen action.

We have performed a phylogenetic analysis of the main aspartic proteinases subfamilies with the objective of obtaining a better understanding of the evolutionary relationships of nothepsin with other members of the family. The phylogenetic tree was inferred using the Bayesian method implemented in the software Mr Bayes v. 3.1. The obtained result shows that the phylogenetic history of aspartic proteinases is marked by numerous gene duplication events leading to the segregation of various groups of paralogs. The *P. sicula* nothepsin, together with the previously described piscine forms, are grouped in a clade resulting from the duplication of an ancestral gene that gave also origin to the cathepsin D clade. Other results, obtained by combining adaptive evolution and functional divergence analyses, show that the nothepsin clade is evolving under negative selection. In particular, nothepsin and cathepsin D are significantly divergent and display very different functional branch lengths, with the functional branch length of the nothepsin cluster being close to zero. This suggests that the nothepsin clade contains a larger amount of ancestral functions compared to the other clades. On the contrary, the long functional branch length of the cathepsin D clade suggests that this group has undergone extensive altered functional constraints. According to the neofunctionalization model, two genes produced by gene duplication should be stably maintained, with the nothepsin gene retaining the ancestral functions and the cathepsin gene being free to accumulate amino acid substitutions. Such a conclusion, however, is in conflict with the fact that the nothepsin gene is missing in a number of lineages.

Hence, we conclude that a pure neofunctionalization model is inadequate to explain the expression pattern of these two genes.
A more satisfactory model is given by subneofunctionalization (Fig. 1), according to which preservation of duplicate genes results from the combination of different evolutionary patterns of regulatory elements and partial functional relaxation caused by loss of ancestral functions of the enzyme. However, our data are better explained by combining this model with the hypothesis of metabolic cooperation of the two enzymes.

This work is partially supported by the MIUR PRIN project n° 2004051955.

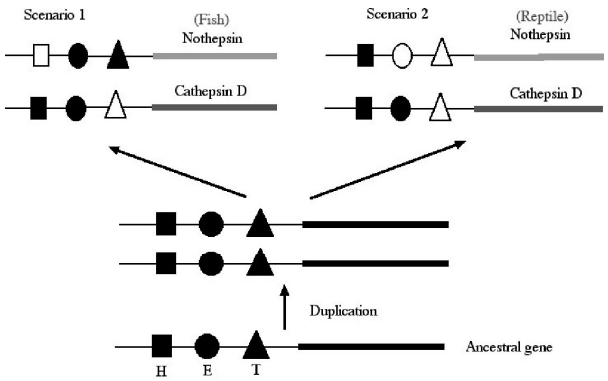

Fig.1 Pictorial model illustrating the evolutionary fate of duplicate genes encoding cathepsin D and nothepsin. Square, circle and triangle denote regulatory elements specific for housekeeping (H), estrogen induced (E) and tissue (T) specific expression. Solid symbols denote intact regulatory elements, open symbols denote null mutations.

Key words: *Nothepsin,* Podarcis sicula*, gene expression, gene preservation.*

CADMIUM CYTOXICITY IN *PODARCIS SICULA* LIVER

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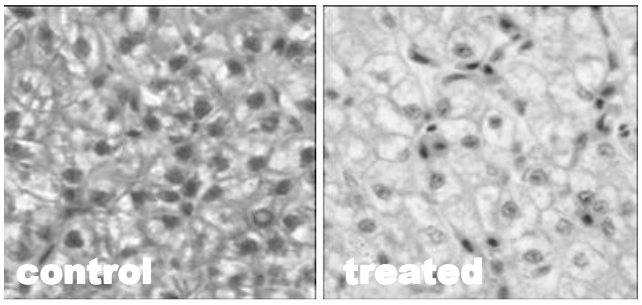
Cadmium (Cd) is a highly toxic metal, whose hazard to the cells is due to a high penetration and a low clearance rate (Schilderman et al 1997, Env Health Perspect 105:234-8). This metal enters through the respiratory and/or alimentary tracts, is distributed to the various organs via the blood stream (Leroyer et al 2001, Environ Res 87:147-59) and is accumulated by the detoxifying organs such as liver and kidney (Olsson et al 1996, Mar Environ Res 42:41-4).

In the present work we report the effects of cadmium in the liver of adult *Podarcis sicula* lizards exposed to three different experimental treatments. a) occasional: a single dosage of $CdCl_2$ (1 mg/kg BW) has been administered by food; b) chronic: several dosages of $CdCl_2$ (1 mg/kg BW) have been administered every other day, by food; c) acute: a single dosage of $CdCl_2$ (2 mg/Kg BW) has been administered intraperitoneally. Tissue samples, collected at regular time intervals up to a maximum of 120 days, have been processed for light microscopy and biochemical investigations. Sections have been stained for morphological investigations, and with PAS and lectins (DBA, LEA and WGA) to analyse glucid content; protein extracts have been electrophoresed, blotted and stained with PAS and lectins to investigate the presence of glycoconjugates and their nature.

Observations reveal that cadmium has induced significant alterations in hepatocytes, in the surrounding extracellular matrix and in the vascularization and that these effects apparently do not depend on the experimental treatment. At the cytological level, morphometric analyses demonstrate a clear swelling of cells and a decrease in their cytoplasm density (see figure). These effects could depend on a dilation of organelles (mitochondria, endoplasmic reticulum) (Thophon et al 2004, Env Toxicol 19:11-9) or on specific interferences of Cd with cell enzymatic activities (Carrettino et al 2004, Ecotox Env Saf 57:311-8).

Following Cd exposure significant molecular variations in glucid composition have also been observed. These are particularly evident at the level of the extracellular matrix and/or of the hepatic sinusoids. Staining with PAS reveals a significant increase in glycoconjugates, and in particular in those positive to the lectins WGA and DBA. This event is probably related to the appearance, in blots, in all treated samples, of a protein of 116 kDa, also positive to the two lectins. This observation agrees with literature reporting that following different toxicant, including Cd (Kaji et al 1995, Microvasc Res 49:268-76), glycosaminoglycans, and in particular dermatan sulphate (Aenson et al 1988, Gastroent 95:441-7), significantly increase in the extracellular matrix. These molecules condition the molecular organization of the hepatic extracellular matrix (Gressner 1994, Eur J Chem Clin Biochem 32:225-37) and also play an important role in the interaction occurring between cell surface receptors and growth factors (Pinzani et al 2001, Semin Liver Dis 21:397-416).



Finally, in liver of chronically exposed animals, from day 10 onward, a significant increase in vascularization is observed. This alteration is present until day 60; later the liver return to a condition that closely resembles that observed in untreated controls.

This work is supported by MIUR, PRIN project entitled 'Risposte molecolari di cellule embrionali, differenziate e tumorali ad intossicazione da cadmio'.

Key words: *cadmium, liver, glycoconjugates.*

CADMIUM EFFECTS ON GTH CELLS IN THE PITUITARY GLAND OF *PODARCIS SICULA*

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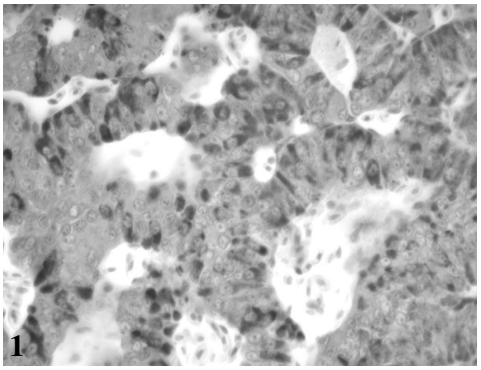
It is reported that cadmium exposure affects the activity of the endocrine system in mammals (Lafuente, Cano & Esquifino, 2003, Biometals 16:243-250). Little is known about the effect of cadmium on the adenohypophyseal cells in reptiles and particularly in snakes and lizards of which is note the utility as bioindicators. Scope of this work was to evaluate the possible morphological changes induced from cadmium on the gonadotropic cells in the lizard *Podarcis sicula.* Experiments were carried out on 25 adult females of *P. sicula*, in the period of November-February. Lizards were treated for four months with $CdCl_2$ at dose of 1mg/kg-BW in the drinking water. A separate group of lizards received cadmium–free water to use as control. At 10, 30, 60, 90 and 120 days groups of five animals were killed: after removal of the skullcap, the brains with the pituitary were fixed in Bouin's solution for 48 h and then decalcified for 25-30 days. Serial paraffin sections of 6μ were processed by Mallory stain and by the ABC immunohistochemical technique using the following antisera: anti-human FSH (Signet, 1:100) and anti-human LH (Signet, 1:100).
P. sicula pituitary gland is markedly extended in the cephalic-caudal direction in which the pars distalis (PD) is divided in a rostral pars distalis (RPD), a caudal pars distalis (CPD) and a medial pars distalis (MPD). The whole PD consisted of homogenous cellular cordons in a reticular stroma and appeared greatly vascularized. In all control specimens the gland appeared compact and lacking in dilated spaces: a basal lamina was observed all around the cellular cordons and it was clearly possible to distinguish the different adenohypophyseal cellular types.



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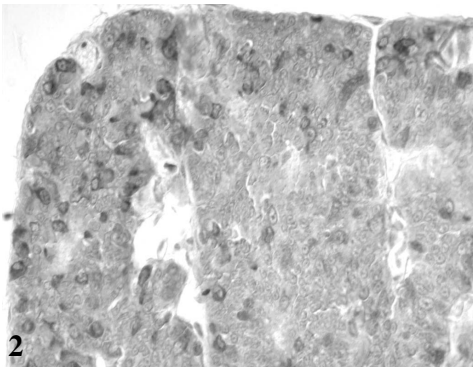

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At 10 days the presence of some dilated spaces between the cells were already evident; during the treatment these dilatations (Fig.1) increased and in the specimens at 90 and 120 days they appeared more extensive. In *P. sicula* pituitary the FSH and LH cells appeared as two distinct cellular populations: the first cells were more numerous, with a variable shape and mainly grouped in the CPD, the others indeed were rare, little and globular in shape. Both cellular types during the treatment increased in number and intensity to the immunoreaction. LH cells were just considerable increased at 10 days, with a maximum at 60 days of $CdCl_2$ exposition (Fig.2). A meaningful increase in number of FSH cells were indeed observed at 30 days (Fig.1). However it was revealed that both cells during the treatment, after a considerable increase (at 30-60 days) in

number and intensity of reaction, returned to normal values. These preliminary observations are indicative that in *P. sicula*, an oral chronic exposure to cadmium, provokes an alteration of the general morphology of the gland by the evidence of extensive dilatations between the adenohypophyseal cells. In addition both GTH cells during the treatment increase in number and in immunostaining intensity explicable by a possible inhibitory effect of cadmium on FSH and LH secretion as reported in the rat (Lafuente &Esquifino, 2002, BioMetals 15:183-187) and in the catfish (Jadhao, Paul & Rao, 1994, J.Neurosc. 6(10):2995-3005).

MIUR-PRIN2004 (cord. prof.ssa Filosa S.) grant provided the funding for this research.

Key words: *gonadotropic cells, cadmium exposure, reptile, immunohistochemical.*

COLOUR MORPHS AND IMMUNITY IN MALE WALL LIZARDS *(PODARCIS MURALIS)*

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Males of several species of lizards show discrete polymorphic color badges, each morph adopting an alternative mating strategies that involve different expression of aggressiveness or territoriality (Zamudio and Sinervo 2002, in Fox S.L. et al 2002, Johns Hopkins University Press, pp 83-106). In this study we investigated whether male color morphs of the wall lizard *Podarcis muralis* reliably signal T-cell mediated immune response, which reflects the ability of individuals to face diseases and parasite infestations, and is an important fitness trait that reliably predicts viability.

We collected 38 adult males from 4 sites near (Northern Italy, 45°11'N – 9°9'E), between 29 April and 2 June 2005. Body length (SVL) was measured and each male classified as white, yellow or red according to throat color. The variation of T-cell mediated immunity among color morphs was assessed by the delayed cutaneous hypersensitivity (DCH) test, which is based on a subcutaneous injection of phytohaemoagglutinin (PHA), a mitogen which causes local swelling and oedema (Goto et al. 1978, Poultry Sci. 57:246-250). T-cell response was assessed as the change of thickness of the right foot six hours after injection (Belliure et al 2004, J. Exp. Zool. 301A:411-418). The effect of male color on the response to PHA injection was assessed by a mixed model analysis of variance

The intensity of the T-cell mediated immune response was significantly related to male throat color ($F = 3.48$, df = 2,34, P = 0.042) but not by the collection site (Likelihood-ratio test = 1.79, df = 1, P = 0.15). The PHA swelling response was lower in yellow-throated males compared to both white- and red-throated males (yellow-white: P = 0.045; yellow-red: P = 0.014), and did not differ between red and white throated males (P = 0.26). Finally, the immune response increased according to male SVL ($F = 4.98$, df = 1.33, P = 0.033, estimate: 0.011 ± 0.005 SE). These results indicate that immune function is morph-specific in male wall lizards, suggesting that male color may advertise different male attributes and that immune response is a condition-dependent trait.

Key words: Podarcis muralis, *immunocompetence, colour polymorphism, PHA*

MALFORMATION OCCURRENCE IN TWO *TRITURUS* SPECIES (*T. CARNIFEX* AND *T. VULGARIS*) FROM THREE LOCALITIES IN CENTRAL ITALY: DESCRIPTION AND POSSIBLE CAUSES

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Several accounts of high rates of abnormalities in amphibians wild populations were collected in the last decades. Aim of this study is to describe and estimate the occurrence of malformations in two *Triturus* (*T. carnifex* and *T. vulgaris*) species. Hypotheses to explain possible causes of these deformities, relating them with human land-use and other environmental factors were also formulated.

Adult specimens were collected in three sites in Latium, Italy (authorization number DPN/2D/2003/2267) from April 2005 to April 2006. In particular, 1267 *T. carnifex* were caught in Monterano Regional Natural Reserve (Canale Monterano, Rome Province), 340 *T. carnifex* and 267 *T. vulgaris* in the Circeo National Park (Sabaudia, Latina Province) and 114 *T. carnifex* and 96 *T. vulgaris* in the Castelporziano Presidential Estate (Rome, Rome Province). All specimens were marked by digital photo of the belly pattern and toe-clipped, and all abnormalities were recorded. We focused on all external deformities, described according to the standardized technical terms.

Newts from the Circeo site showed the highest frequency of deformities (8.48% in *T. carnifex* and 5.62 in *T. vulgaris*). The malformation frequency of *T. carnifex* population in Monterano was 5.13%. Finally, the occurrence of abnormalities at Castelporziano site was 1.75% in *T. carnifex* and 1.04% in *T. vulgaris* (only two and one individual respectively). No significative differences in the occurrence of malformations between the two species were evidenced (Circeo: $\chi^2 = 1.83$; df = 1; $P > 0.05$ Chi-square Test; Castelporziano: $G = 0.19$; df = 1; $P > 0.05$ Log-Likelihood Ratio Test).

The observed abnormalities involved primarily autopodial bones (93.44% of deformed *T. carnifex* in Monterano, 95.45% of deformed *T. carnifex* and 73.33% *T. vulgaris* in Circeo site). Only in one case we observed supernumerary limb (*T. carnifex* in Monterano) (Fig.1).

Malformations involving other body structures (head, cloaca, trunk and tail) were observed with low frequency (between 1.5 and 7%) in both Monterano and Circeo populations.

Fig.1. Supernumerary limb in a *T. carnifex* specimen from Monterano.

Amphibian malformations have been the subject of some recent review papers and international workshops: the consensus developed is that the background rate of morphological abnormalities in wild population of amphibians is less than 2% (Gardiner & Hoppe, 1999, J. Exp. Zool. 284: 207-216; Ouellet, 2000, Sparling et al.: Ecotoxicology of Amphibian and Reptiles). In the Castelporziano populations the low rate of abnormalities is comprised in the natural range, but in the Circeo and Monterano sites, the studied species have a malformation incidence greater than the normal rate. This supports a causal relationship between environmental or anthropic causes and malformation occurrence. It was demonstrated that agricultural herbicides, insecticides, fungicides and fertilizers are often toxic also to non-target organisms, and can cause deformities and mortalities in amphibians (Diana & Beasley, 1998, *In*: Status and conservation of Midwestern Amphibians, Iowa Univ. Press). In particular, a relationship between the exposition to pesticide runoff and the observed deformities in the two newts species at Circeo site, surrounded by intensive agricultural fields, could be hypothesized. Regarding the Monterano site, during the embryonic and larval stages and the adult aquatic phase, newts are continuously exposed to low doses of *alfa* radiation from Radon decay. Radon-222 is exhaled by tuff rocks both in air and in the pond water inhabited by newts, and this radiation could be the cause of common deformities in this population. Because there are none data on effects of chronic irradiation on amphibians, further experimental evidence will be necessary to support this hypothesis.

Key words: *Amphibian deformities, central Italy, newts, pesticide runoff, Radon-222.*

HEPATIC PROFILE OF HEAT SHOCK PROTEINS IN A *TRITURUS CARNIFEX* POPULATION CONTINUOUSLY EXPOSED TO NATURAL RADON RADIATION

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The increased levels of heat shock proteins (Hsps) represent a cellular marker of environmental stress response in both mammals and fishes. These molecular chaperones defend protein structures by ensuring the homeostatic state. As far we know, some scarce information is available on their role in Amphibian. In this study the level of 27, 75 and 90 kDa Hsps in the liver of newt *Triturus carnifex* inhabiting a pond located in the Natural Regional Reserve "Monterano" (Rome Province, Latium, Italy) has been evaluated. This pond is characterized by the presence of low doses of natural Radon radiation. Individual of *Triturus carnifex* inhabiting ponds devoid of any Radon radiation (i.e., Castelporziano Presidential Estate, Rome Province; Circeo National Park, Sabaudia, Latina Province, Latium, Italy) were used as control.

Newt livers were lysed and 50 µg of solubilized proteins were resolved using SDS-PAGE. The proteins, transferred to nitrocellulose, were subjected to Western blot and then probed with either one of anti-p27, anti-p75, anti-p90 antibodies (raised against the C-terminal portion of mammalian Hsps) as well as either one of anti-phospho-p38, anti-p38, and anti-HIF-1 antibodies. Antibody reaction was visualised with chemiluminescence reagent for Western blot. All the used antibodies gave a positive reaction against newt liver proteins, in all considered populations, thus demonstrating an high degree of conservation of these proteins, at least on the epitopes considered. High levels of Hsp90 and 75 kDa were present in livers of females caught in Monterano, whereas the males of the same population presented an increase only of the 75 kDa protein with respect to the control populations. In mammals the increased level of 75 kDa protein is generally associated to the response against the temperature or the oxidative stresses. As the Monterano's individuals have been caught in the same temperature conditions (autumn) the presence of an oxidative stress in the area of Monterano was hypothesised. The activation of a kinase (i.e., the phosphorylation of p38/MAPK) involved in the transduction of oxidative stress signals as well as the presence of a protein described as oxygen sensor in mammals were studied in our samples to confirm this hypothesis. First of all the effect of an oxidative stress-inducing agent (H_2O_2) was checked in a liver-derived human cell line (HepG2). The results confirm that H_2O_2 elicits the increase of Hsp 75 kDa level paralleled by the increased phosphorylation of the p38/MAPK and the increased levels of HIF-1 in human cells. It is noteworthy that also in the newt Monterano population (both males and females) the increase of Hsp 75 kDa is paralleled by the p38/MAPK phosphorylation confirming that this population is exposed to the oxidative stress. In conclusion, our data indicate that Hsps represent an high conserved family of proteins that could be largely used as biomarkers to evaluate the maintenance of homeostasis also in Amphibian.

Moreover, the data indicate the presence of the oxidative stress in Monterano's population, this could be related to a low oxygen concentration in the pond water or to a reduced oxygen uptake from newt skin. Preliminary histological analysis indicate an increased thickness of newt skin supporting the idea of a lower oxygen availability in the liver of Monterano's newts with respect to other populations. Finally, in females, Hsp 90 kDa level is usually related to the activation of estrogen receptors, one of the first steps necessary to the onset reproductive cycle. An increase of

Hsp 90 was observed exclusively in Monterano population, during autumn, thus suggesting a earlier reproductive activity in these newts than in the other two populations.

Key words: *Hsps, newt, Radon, environmental stress.*

EFFETTI DELLE EMISSIONI NATURALI DI RADON SUL SISTEMA TEGUMENTARIO E SULLE GONADI DI UNA POPOLAZIONE DI *TRITURUS CARNIFEX* DELLA RISERVA NATURALE REGIONALE MONTERANO

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Il radon è un gas nobile radioattivo presente in natura, in tracce nel sottosuolo quasi ovunque. È facilmente riscontrabile all'interno di concrezioni ignee di natura tufacea, associate ad attività di eruzione e deposizione piroclastica o ad affioramenti rocciosi associati a movimenti della crosta terrestre per attività vulcanica. È noto che le emissioni naturali di radon possono causare danni irreparabili a vari tessuti ed organi in modo tale da comprometterne seriamente la funzione, portando talvolta a formazioni di varia natura, compresa quella tumorale.
Il principale obiettivo di questa ricerca è stato quello di verificare se, ed in che misura, gli effetti di emissioni naturali di radon fossero in grado di avere un effetto sullo stato di salute dell'ambiente e degli animali ivi presenti. A tale scopo, è stata presa in considerazione la possibilità di esaminare le potenzialità di rischio che tale elemento può generare, prendendo come oggetto di studio la specie *Triturus carnifex*, ed in particolare una popolazione presente all'interno delle pozze della Riserva di Canale Monterano (sita a circa 30km a nord di Roma), formatesi in seguito all'abbandono di una cava di tufo. All'interno di questa zona è stata rilevata la presenza di radon, sia nel suolo sia disciolto in acqua. L'indagine è stata eseguita su alcuni tessuti ed organi che esibiscono una buona sensibilità sia ad agenti radianti che a fattori chimico-fisici ambientali, come il tessuto epidermico, lo strato delle cellule pigmentarie, le ghiandole mucose e granulose del tegumento, lo strato dermico e l'apparato genitale (sia maschile che femminile).
Sono stati allestiti 2 lotti di controllo (8 tritoni provenienti da Castel Porziano e 15 dal Parco Nazionale del Circeo) ed 1 sperimentale (41 tritoni provenienti dalla Riserva di Canale Monterano). Prima della biopsia, tutti gli animali sono stati sacrificati per anestesia in eccesso con metan sulfonato di tricaina (MS 222) disciolto in acqua. Successivamente, previa fissazione in soluzione di Bouin, gli organi e i tessuti prelevati sono stati processati secondo la tecnica standard dell'inclusione in paraffina. Le sezioni sono state colorate con emallume-eosina. Le biopsie sono state effettuate su tegumento (sottogolare e dei fianchi) e gonadi maschili e femminili.

I risultati preliminari di questa indagine stanno a dimostrare che la popolazione di controllo dei tritoni crestati prelevati a Castel Porziano, mostra che per quanto riguarda tutte le strutture esaminate (tegumento e gonadi) non si riscontra alcuna anomalia e nulla che si discosti dal quadro morfo istologico normale classicamente noto per questi tessuti.
Per quanto riguarda la popolazione sperimentale dei tritoni prelevati alla Riserva di Canale Monteranno, per quanto attiene all'osservazione morfologica delle gonadi, nei maschi sono stati riscontrati dei testicoli soprannumerari, in numero variabile, fino ad 8. La percentuale di tali maschi ha rappresentato il 37% della popolazione sperimentale esaminata. L'analisi istologica dei tessuti esaminati, soprattutto a carico della pelle, ha manifestato una serie di modificazioni che possono essere così riassunte:

a – iperplasia a carico dello strato epidermico;
b – frammentazione o scomparsa dello strato dei cromatofori oppure addensamento delle cellule pigmentarie fino a costituire ammassi melanici anche di discrete dimensioni;

c – alterazione della morfologia e, in qualche caso, della struttura delle ghiandole mucose e granulose;
d – scomparsa di vaste zone dello strato ghiandolare, che risulta in questi casi sostituito o da epidermide iperplastica o da ammassi melanici;
e –presenti (anche se non frequenti) fenomeni di iperemia o vasodilatazione. Le modificazioni riscontrate e descritte, sono state osservane in misura all'incirca equivalente sia nei maschi che nelle femmine della Riserva di Monterano, per cui, almeno dai dati fino ad ora a disposizione, non sembra sussistere una risposta diversa tra i due sessi.

Per quanto riguarda lo studio e l'analisi delle gonadi (sia maschili che femminili), della stessa popolazione, non sono state rilevate anomalie osservabili istologicamente, né durante la spermatogenesi e neppure durante l'oogenesi. L'unico evento rilevato sporadicamente, riguarda, soprattutto nei testicoli, fenomeni di vasodilatazione.
Per quel che concerne la popolazione di controllo del Parco Nazionale del Circeo, era da attendersi un andamento morfo-istologico regolare nell'analisi dei tessuti esaminati, sovrapponibile a quello ottenuto nei campioni di controllo già descritti di Caste Porziano. I dati a disposizione, in realtà, risultano più facilmente confrontabili, anche se non del tutto sovrapponibili, a quelli riscontrati nella popolazione di Canale Monterano. A carico del tegumento, le anomalie, seppur più circoscritte, risultano circa della stessa natura, cioè iperplasia dell'epidermide, frammentazione dei cromatofori, assenza di qualche ghiandola, disorganizzazione dermica. Non si manifestano invece fenomeni iperemici, accumuli melanici frequenti e scomparsa totale delle ghiandole.
Nei 5 maschi esaminati, non sono stati riscontrati testicoli soprannumerari. Spermatogenesi ed oogenesi risultano parimenti nella norma.

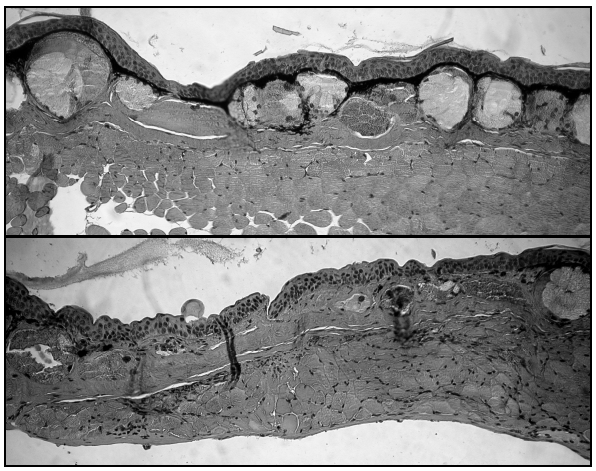

Fig. 1. Esempio di epidermide di un esemplare proveniente dalla stazione di controllo (in alto) e di un esemplare con tegumento quasi privo di ghiandole e cromatofori (in basso).

Key words: Triturus carnifex*, histology, tegument, gonad.*

DEVELOPMENT OF A MICRONUCLEUS ASSAY THAT USE *TRITURUS CARNIFEX* TO DETECT GENOTOXICITY OF WATER

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Micronuclei (MN) are acentric fragments which are not incorporated into daughter cells at the end of mitosis. The usefulness of the micronucleus test to detect chemical and physical agents with either clastogenic or aneugenic potential is well established (Heddle et al., 1983, Mutat. Res., 123:61-118)
In this study 44 animals have been analysed and in the same animal we have collected the first, second shed and blood from the tail. Fragments of the shed and drops of blood were fixed in methanol for 48 h, stained with DAPI.
The frequency of MN was evaluated by scoring the frequency of MN 1000/ cells for each animal under fluorescence microscopy.
The gills collected from larvae were fixed, in 20% acetic acid and stained with DAPI. From each animal 1000 cells were scored to assess the frequency of micronuclei.
The micronucleus test has been largely adopted in mammals, fishes and mussels, whereas few data are available on Urodela amphibians, and to our knowledge no information are available in *Triturus carnifex.*
The purpose of this study was the comparison of MN frequency between amphibians captured in two different sites: Riserva Naturale di Canale Monterano (Site1) and Parco Nazionale del Circeo (Site2). In particular, the Monterano puddle was characterized by the presence of dissolved ^{222}Rn .On the contrary, animals captured in San Felice Circeo Lake were exposed to chemical pollution as produced from human activity related to agriculture.
MN observed in shed skin displayed a MN frequency of 0,35/1000 cells for population of Site1, while the frequency of the MN observed in the population of Site 2 was 0,16 /1000 cells.
The frequency of MN in analysed in red blood cells ranged from 0 to 4/1000 cells and no different were observed from animals captured in Site 1 and Site 2.
This lack of differences could be ascribed to the very short penetrability of □-particle generated by ^{222}Rn which are stopped by few mm of animal tissue and are no able to reach either the erythropoietic organ.
On the contrary, the results obtained from gills show that the frequency of the MN were significantly higher than those in skin in fact in gills of larvae captured in Site 1 (n=12), the frequency was 9,06/1000 cells, significantly higher than the frequency observed in animals from Site 2 (n=11), that is 1,44 /1000 (Fig 1).
We believe that the developing of monitoring assay in such specie can be successfully exploited to assess the genotoxicity of water in the field.

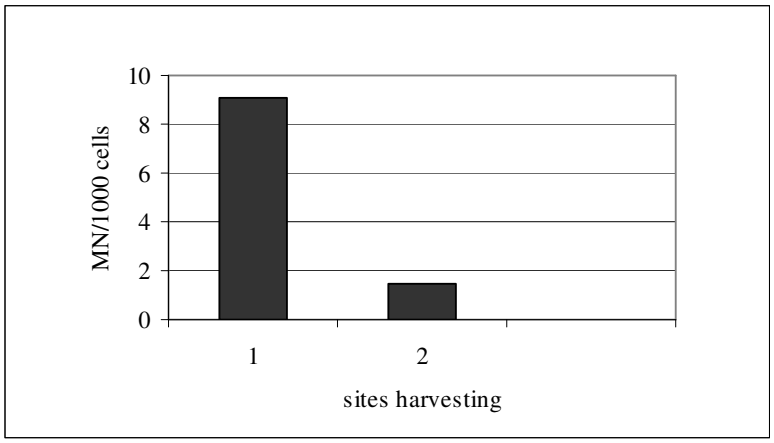

Fig 1. Frequency MN in gills larvae captured in either Site 1 (Riserva Naturale Canale Monterano) or Site 2 (Parco Nazionale del Circeo).

Key words: *Genotoxicity; DNA damage; micronucleus assay;* Triturus carnifex.

SOUND DISCRIMINATION AND ORIENTATION IN SMOOTH NEWTS (*LISSOTRITON VULGARIS*)

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Netws orientate using multiple cues (i.e. Diego-Rasilla & Luengo, 2002. J Ethol 20: 137-141) and at least one species may rely on advertisement calls of sympatric anurans to locate breeding sites (Diego-Rasilla & Luengo, 2004. Behav Ecol Sociobiol 55: 556-560). However not all the species use the same kind of breeding sites, so it would be a better strategy for a newt to follow preferentially the call of the species that share the same microhabitat for breeding. In this study we tested if the smooth newts (*Lissotriton vulgaris*) were able to discriminate the playbacks of the advertisement calls of two sympatric toads (*Bufo bufo* and *Pseudoepidalea viridis*) that breed in ponds with different features.
We collected adult newts of both sexes from the "Paludi di Arsago" Special Area of Conservation, Northern Italy. In a first experiment we tested 10 males and 10 females by presenting each one the playbacks of choruses of *B. bufo* and *P. viridis* in two separated trials. In a second experiment we tested other 11 males and 9 females by presenting them the two playbacks simultaneously. The two experiments were conducted in a circular arena in total darkness; order and direction of presentation of the *stimuli* were randomized appropriately to avoid any undesired effect. The experiments were performed on 15 April 2006. All the directional responses were analyzed using standard circular statistics (Batschelet, 1981. London, Academic Press).
In the first experiment neither order and direction of the *stimuli* had any significant effect on the orientation responses of the newts. Both sexes showed a significant phonotactic response, independently from the species presented, while in the second experiment newts preferentially orientated towards the playback of *B. bufo*. Our results demonstrated that smooth newts are capable of discrimination implying that they can effectively collect information from environmental sounds to orientate. Since *B. bufo* in northern Italy is more associated with smooth newts than *P. viridis*, the preference for its playback in the second experiment may suggest that newts can use heterospecific calls to select the best suitable breeding sites.

Key words. *Phonotaxis, newts, orientation.*

PRELIMINARY OBSERVATIONS ON TAIL AUTOTOMY IN SARDINIAN CAVE SALAMANDER (*SPELEOMANTES IMPERIALIS SARRABUSENSIS*)

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During a 2005 investigation conducted on the "Sette Fratelli" mountain (southern Sardinia, Italy), a population of *Speleomantes imperialis sarrabusensis* (Lanza B., Leo, Forti, Cimmaruta & Nascetti, 2000) was identified inhabiting some semi-natural caverns. These artificial caverns are utilized as water reservoirs fed from a spring. In order to numerically determine the make-up of the population, all of the animals present were removed from the caverns. A total of 52 live specimens were sexed (18♂♂, 18♀♀, 16 juveniles). Each animal was measured, weighed, sexed and photographed. After one hour, having verified that no additional specimens were present, the captured animals were returned to the sites along the walls of the caverns where they had been found. During the handling of the specimens the phenomenon of autotomy, or self amputation, was observed in two of the animals (one female and one juveniles). These two specimens, stressed by manipulation due to measuring, after twisting their bodies numerous times lost their tails using the hand of the operator as a fulcrum without loosing even a drop of blood (Fig. 1). The phenomenon of autotomy is well known in the family Plethodontidae (Wake & Dresner, 1967, J. Morph. 122, 265-306) but has never been reported or described in the European species. In depth studies are under way to verify the mechanism of autotomy in this genus. The two severed tails are being analyzed to determine at what point in the vertebral or intervertebral body the separation from the rest of the animal occurred.
Autotomy is considered to be a defense mechanism triggered by the sense of imminent predation.

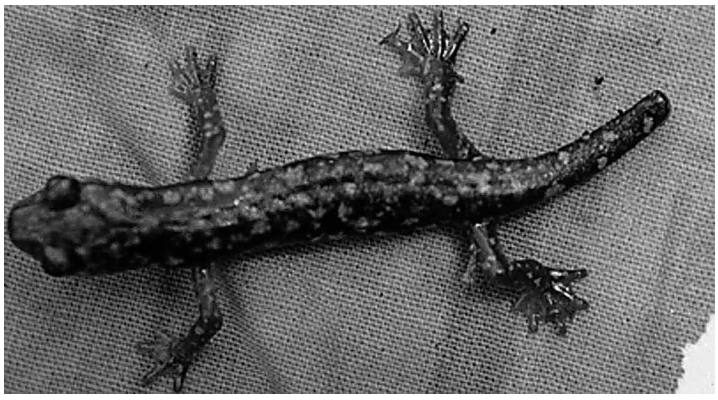

Fig. 1. Tail autotomy in cave salamandre

Key words: *Autotomy; Plethodontidae.*

SEXUAL DIMORPHISM IN *BOMBINA V. VARIEGATA*: A BIOMETRIC MULTIVARIATE APPROACH

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Sexual size dimorphism (SSD) in Yellow-bellied toad, *Bombina v. variegata,* (Linneaus, 1758) has been not much investigated. This morphometrical study is based on a biometric multivariate approach.

Two sets of specimens were measured and analysed: one was composed by 68 (31F; 37M) live adults, captured in 4 localities situated in Lombard Prealps, while the second set was formed by 75 (28F; 47M) adults yellow-bellied toads, collected in some regions of northern Italy (Lombardy, Trentino – Alto Adige, Veneto) and alcohol-preserved in the Natural History Museums of Milan and Turin. The set of parameters recorded for each sample was body length (SVL), head length (HL), head width (HW), internarial distance (IND), interorbital distance (IOD), orbit-nostril distance (OND), eye diameter (ED), femur length (FEL), tibia length (TIL), foot length (FOL). The biometrical measures were taken using a 0.1 mm precision callipers. The statistical analysis were performed on log-transformed data, using the software SPSS ver. 12.0 (SPSS, 2004).

A preliminary discriminant analysis was performed to assess the homogeneity of the whole sample. The mean measures of our preserved yellow-bellied toads resulted significantly lower than those of live specimens (males: Wilks' lambda = 0.428; χ^2 = 67.877; d.f. 4; $P < 0.001$; females: Wilks' lambda = 0.412; χ^2 = 49.176; d.f. 3; $P < 0.001$). Therefore we decided to perform separate analysis on them.

Museum sample: A discriminant analysis was applied to the set of 10 variables. The stepwise method selected two variables: FOL and SVL; with an F-to-remove greater than 5.2. In the jackknifed classification matrix, 74.7% of the animals were classified correctly. The differences among the sexes were highly significant (Wilk's lambda = 0.804; χ^2 = 15.685; d.f. 2; $P < 0.001$), with a canonical correlation value of 0.442. From the Canonical score of group means the group of females appears correlated to longer measures of body than males, while the males themselves are correlated to longer measures of the foot.

Live sample: The discriminant analysis was performed. The stepwise method run for four steps, selecting the following variables: SVL, TIL, IOD and HW. However, in this analysis, the percentage of cases correctly classified in the jackknifed matrix increased to 75.0%. Differences between males and females were, clearly, still highly significant (Wilk's lambda = 0.634; χ^2 = 29.203; d.f. 4; $p < 0.001$) with a canonical correlation value of 0.605. The Canonical score of group means for females was still correlated to longer measures of the body, and for males showed an association to wider heads (higher measures of HW and IOD) and longer legs (TIL).

Morphological studies on *B. variegata* have mainly regarded secondary sexual characters (SSC). While minor evidences of SSD had been found (Caldonazzi et al., 2000, Atti I Congresso Nazionale *S.H.I.*, Torino 1996, Mus. Reg. Sci. Nat. Torino: 373-375; Radojicic et al., 2002, Folia Zool. 51(2): 129-140). Through discriminant analysis, significant differences between sexes have been found in both samples; ratio between the body length and the foot length seems an important variable in sexual dimorphism of *B. Variegata.* The multivariate statistics, considering more variables at the same time, permit the best separation between males and females.

Key words: Bombina variegata*, sexual size dimorphism, biometric multivariate analysis.*

CHANGES IN GILL ULTRASTRUCTURE OF *BUFO BUFO* TADPOLES, INDUCED BY ENDOSULPHAN

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Endosulphan is an organic chlorate pesticide used widely on a large range of cultivations. However, its persistence in aquatic habitats and toxicity are dangerous to the many species of amphibians that use pools during their life cycle. This study determines the acute toxicity of Endosulphan on the larvae of Bufo bufo and the morphological alterations of the respiratory apparatus, which mediates osmotic exchanges with the external environment. Insufficient, in fact is the information of the true effects on the gills due to the pesticides (Venturino et al., 2003, Biomarkers, 8, 167-186).

The first stage of the research involved tests that were carried out exposing the Bufo bufo larvae at short intervals (4 days) to high concentrations (0.200 mg/l; 0.300 mg/l; 0.500 mg/l) in order to determine the Endosulphan concentration causing LC50 (defined as 50% mortality rate of the individuals treated). In the second series of experiments, after an acclimatization period of three days, 35 larvae were chosen which had completely operculate inner gills at the developmental stage 24-26 second Gosner (1960, Herpetological 16:183-190). The larvae were exposed for 96 hrs to a sublethal concentration of Endosulphan (0.200mg/l) in waters from 15 1iters. Similarly, aquariums were prepared with 35 control animals for the comparison between starting conditions and experimental conditions. The tests were conducted at a temperature of 20±2 °C, pH 7.2 and 12:12 cycle day/night. Each series of test was repeated 3 times. The samples were taken after 24, 48 and 96 hrs of exposure. A morphological and ultrastructural analysis of the gills was completed via M.O., S.E.M. and T.E.M.

Mortality occurs at the highest exposure concentration: in fact the lethality tests show a 96 h LC50 of 0.500 mg/l. Low mortality values (between 0% - 20%) are observed in the two other concentrations.

Morphological alterations are already visible in the first 24 hrs of exposure, particularly in the tuft gills (whose ultrastructure is shown in Fig. 1) responsible for the respiratory functions. Filters on the gills, however, appear to maintain control of the typical functions. After 96 hrs of treatment, the structural modifications became irreversible in conjunction with the alimentary section of the gill apparatus. In general, there is an inflammatory response with a great production of mucus that is evidence at an ultra structural level, an increased presence of the Golgi apparatus, lipid vesicles and lamellar bodies; there was also a noticeable increase in intracellular space accompanied by alterations in the epithelial organisation (Fig. 2). The capillaries showed an increase in the endothelium cell volume, as well as the degeneration of basal cells, mitochondria-rich cells, and the appearance of numerous cytoplasmic projections and connective tissue infiltrations. As a response to the defence mechanism against external stress an increase in macrophages and residual bodies were noted, indicating intracellular digestion.

In amphibian larvae, the morphology and physiology of the gills, where osmotic regulation takes place, showed various alterations in response to the toxic agents.

Currently there are very few studies and toxicology tests measuring the damage of Endosulphan and general organo-chlorate pesticides, in particular there is no available data regarding the morphological changes of the Amphibian's respiratory system.

The sensitivity of the Anura to LC50 at 96 hrs varied from 1.8 ug/l for Rana tigrina to 123 ug/l for Bufo melanosticus (Berrill et al., 1998, Environ. Toxicol. & Chem. 17, 1738-1744). Only one published study looking at the hylide, showed at a microscopic and ultrastructural level, changes in the gills due to toxicity from paraquat: the gills of Scinax nasica showed an increase in the total volume and many alterations to the organisation of the epithelium (Lajamanovich et al., 1998, Arch. Environ. Contam. Toxicol. 34, 364-369).

In this present study, ultrastructural modifications observed in the Bufo bufo gills that appear as an inflammatory response to lethal concentrations of Endosulphan, supported previous studies from Lajamanovich et al. (1998). We can hypothesize therefore that despite the defence mechanisms (mucus) adopted by the respiratory apparatus, the damage from the exposure becomes so great over time that the capacity to recuperate is lost.

Fig. 1. Control animal (gill tuft)

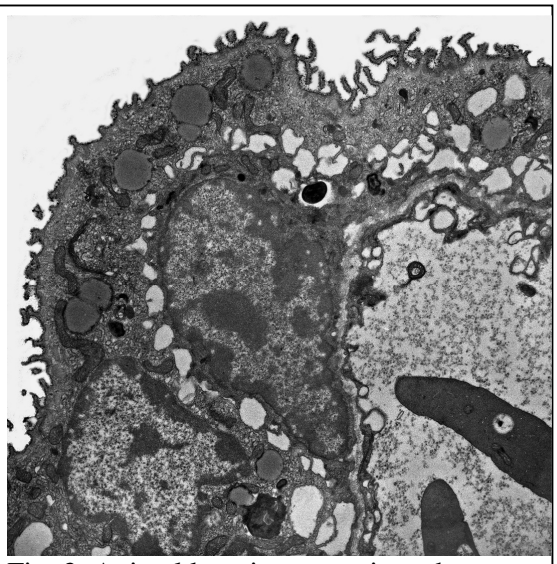

Fig. 2. Animal kept in contaminated water at 96h of exposition to 0.2 mg/l (gill tuft)

Key words: *endosulphan, gill, Anura, morphology.*

III - Tassonomia, filogenesi e paleontologia

III - Taxononomy, phylogeny and paleontology

(Convenor: Marco A. Bologna, Tassos Kotsakis, Mario García-París)

GREEN TOADS FROM MOST OF SICILY ARE AN OLD SISTER TAXON OF AFRICAN GREEN TOADS AND REPRESENT A NEW EUROPEAN VERTEBRATE SPECIES (*BUFO* N. SP.)

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Green toads of the *Bufo viridis* subgroup (Stöck et al., 2001, Zool. Abh. Mus. Tierkd. Dresden, 253-319) from most of Sicily (Southern Italy) and nearby islands (Ustica, Favignana) represent an old sister taxon (*Bufo* n.sp.) of African green toads (*B. boulengeri* Lataste, 1879). Mitochondrial d-loops of Sicilian *Bufo* n.sp. differ ~6% from that of all *B. boulengeri.* This African green toad ranges from Morocco to Egypt. Its mitochondrial haplotype group was also found on the islands of Lampedusa (Italy), Kerkennah and Djerba (Tunisia), all of which were connected to African mainland during Pleistocene sea level changes (Thiede, 1978, Nature, 276, 680-683; Giraudi, 2004, J. Quart. Sci., 537-547). Sicilian *Bufo* n.sp. d-loops differ by more than ~10% from those of neighboring green toads (*B. balearicus* Boettger, 1881). Although recently considered a "subspecies of uncertain validity" (Bologna & Giacoma, 2006, Atl. Ital. Amph. Rept., 306-311), *B. balearicus* is well differentiated from other members of the subgroup on the mitochondrial (Stöck et al. subm.) and nuclear level as well as from *B. viridis* (Laurenti, 1768), whose haplotype group (the same as at the *B. viridis* type locality, Vienna; Stöck et al. subm.) reached northeastern Italy (Padua, Trieste). *Bufo balearicus* occurs on some West-Mediterranean islands (Corsica, Sardinia, Mallorca, Menorca), and in central (Roma) and southern Italy (Apulia, Calabria). Detection of Calabrian *B. balearicus* haplotypes in northeastern Sicily suggests their recent invasion. It remains unknown whether both taxa (*B. balearicus, B.* n.sp.) occur in sympatry in northern Sicily as range maps suggest (Turrisi & Vaccaro, 1997, Boll. Acc. Gioenia Sci. Nat., 30, 5-88), and whether they would hybridize; their calls (Palermo) are similar to and typical of diploid members of this species complex (Castellano et al., 1998, J. Linn. Soc. 63: 257–281; Stöck, 1998, Amph.-Rept. 19: 29-42) but deserve further investigation. Breeding phenology (Lo Valvo & Giacalone, 2003, Ann. Mus. civ. St. nat. Ferrara, 6: 61-65) differs between Italian mainland (including Calabrian) and Sicilian populations (Sicilia et al. subm.). D-loop patterns are consistent with more conserved mtDNA markers (16S, cytochrome b) as well as complete mitochondrial genomes of one representative from each taxon (*B. boulengeri, B. balearicus*, *Bufo* n.sp.). Consistently, two nuclear markers (RAG-I, tropomyosine) link Sicilian *Bufo* n.sp. to north African *B. boulengeri* from which they have differentiated and also confirm the deeper split from *B. balearicus* (Calabria, Corsica, Sardinia, NE-Sicily). Although repeated polyploidization played an important evolutionary role in Asian taxa of the subgroup (Stöck et al., 2005, Genetica 124, 255-272) and few polyploid individuals occur in Mediterranean populations (Odierna et al., 2004, Chromos. Res. 12, 671-681), karyotype data confirm all three species to be diploid. Morphometry of *Bufo* n.sp. from Sicily (Lo Valvo & Giacalone subm.) shows them to be larger than those from the Apennine Peninsula (Castellano & Giacoma, 1998, J. Herp. 4, 540-550). Multivariate morphometric comparisons with *B. boulengeri* are in progress. Our phylogeographic findings agree with paleogeographic and fossil data (Bonfiglio et al., 2002, Geobios 35, M.S. 24, 29–39) which suggest a long Plio-Pleistocene isolation and subdivision of Sicily and episodic Pleistocene faunal exchange across the Strait of Messina. Coalescence

analysis is underway to better estimate divergence times, however, our data let us rule out human introduction of *Bufo* n.sp. from Africa and suggest a vicariant event of Messinian age (5.3 Mya). We will formally describe *Bufo* n.sp. in the near future. Our data have implications for other Sicilian vertebrates.

M.S. and N.B. thank Craig Moritz and David Wake (Berkeley). This work was funded by a research grant (DFG 493/1-1) to M.S. by the Deutsche Forschungsgemeinschaft (DFG) und C. Moritz' startup fund. A.S. and M.S. are grateful to many colleagues who helped in the field or provided samples.

Key words: *green toads*, Bufo viridis *subgroup, Mediterranean biogeography, Africa, Sicily.*

PHYLOGEOGRAPHY OF THE COMMON SPADEFOOT TOAD (*PELOBATES FUSCUS*) BASED ON CYT *b* MITOCHONDRIAL GENE

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The common spadefoot toad is a fossorial wide-ranging European amphibian species in which a cryptic speciation event has been recently described (Borkin LJ et al., 2001, Amphibia-Reptilia, 22: 387-396; Borkin LJ, *et* al., 2003, Russian J. Herpetol. 10: 115-122) suggesting the existence of two major genetic lineages within *P. fuscus*, a 'western-' and an 'eastern-lineage'.
P. fuscus populations were analysed from their entire distribution range, including populations from all over Italy to unveil traces of expansion and contraction events of species' ranges. 702 bp of the Cyt *b* gene were obtained from 156 specimens sampled from 61 populations. A NJ phylogentic tree and a haplotype network have been constructed. Afterwards this haplotype network has been converted into a nested clade design (Templeton AR, et al., 1987, Genetics, 117: 343-351) (Fig.1). Applying Nested Clade Phylogeographic Analysis (Templeton AR, 2004, Mol. Ecol. 13: 789-809) these data enabled the reconstruction of the colonisation history and phylogeny of the western, eastern and Italian lineages.

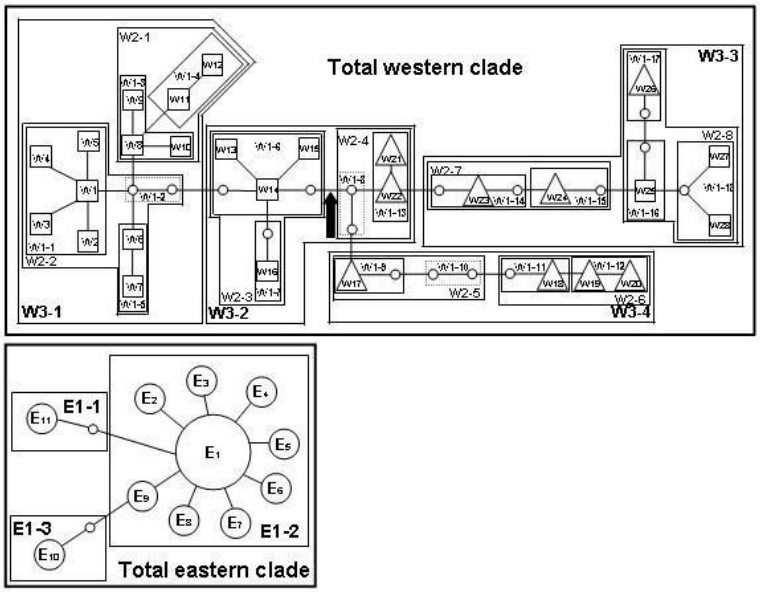

Fig. 1. Nested clade design of *P. fuscus* haplotypes based on 702 bp of the Cyt *b* gene; small open circles refer to hypothetical haplotypes (not found or extinct), squares to western haplotypes, triangles to Italian and circles to eastern ones; arrow marks the position of the root as inferred from the NJ tree

A total of 39 haplotypes, grouped in two distinct clusters (both in the NJ tree and in the MST) were identified, corresponding to the 'western' and 'eastern' lineages formerly suggested.
Among the 'western lineage', 13 haplotypes came from the Balkans, 9 from the Po Valley and only 6 being widespread from France to the Urals. Italian ones were unequivocally attributed to the 'western lineage', although they turned out to be exclusive of northern Italy.
The 'eastern lineage' shows much lower haplotype diversity with only one widespread haplotype being the likely ancestor to all the others.
Substitution rates and molecular TrN+I distance show that the level of divergence between these lineages is ca. three times lower than that between valid *Pelobates* species, even if the two separate clusters indicate a high level of differentiation among them.
Using the Afro-European vicariance of *P. cultripes* and *P. varaldii* (García-París M, et al., 2003, Mol. Phyl. Evol. 28: 12-23; Veith M, et al., submitted) and applying Bayesian dating a time frame for *P. fuscus* evolution was established, showing that divergence between these coevals' lineages arisen ca. 2.29 mya, after a Pliocene vicariance event. While range expansion of the 'western lineage' follow a complex scenario, the current range of the 'eastern lineage' could result from the survival of a small population in the south, followed by several events of colonisation giving rise to mostly local haplotypes having recently evolved.
A previously described pattern of unusual north-south descendance within the 'western lineage' (Eggert et al., 2006, Cons. Genet. in press) has been corroborated by our complete geographic sampling.
The raggedness of the mismatch distribution is indicative of several successive growth and decline events. This fits the hypothesis that the onset of Pliocene and Pleistocene climatic fluctuation was a key-event for speciation processes in *P. fuscus*.

Key words: Pelobates fuscus, *Cyt b, NCPA, cryptic speciation.*

A GENETIC PERSPECTIVE ON DIVERSITY WITHIN THE *TESTUDO GRAECA* COMPLEX

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Tortoises of the *Testudo graeca* complex inhabit a patchy range that covers part of three continents (Africa, Europe, Asia). It extends approximately 6500 km in west-east direction from the Moroccan Atlantic coast to eastern Iran and about 1600 km in north-south direction from the Danube Delta to the Libyan Cyrenaica Peninsula. Recent years have seen a rapid increase of recognized taxa. Based on morphological investigations, it was suggested that this group consists of as many as 20 distinct species and is paraphyletic with respect to *T. kleinmanni* sensu lato and *T. marginata*. Based on samples from representative localities of the entire range, we sequenced an mtDNA fragment comprising the mitochondrial cytochrome *b* and adjacent tRNA genes and conducted nuclear genomic fingerprinting with ISSR PCR. The *T. graeca* complex is monophyletic and sister to a taxon consisting of *T. kleinmanni* sensu lato and *T. marginata*. The *T. graeca* complex comprises six well-supported mtDNA clades (A-F). Highest diversity occurs in the Caucasian Region, where four clades occur in close neighborhood, suggesting this region as radiation center, like the fossil record. Clade A corresponds to haplotypes from the East Caucasus. It is the sister group of another clade (B) from North Africa and West Mediterranean islands. Clade C includes haplotypes from western Asia Minor, the southeastern Balkans and the western and central Caucasus Region. Its sister group is a fourth, widely distributed clade (D) from southern and eastern Asia Minor and the Levantine Region (Near East). Two further clades are distributed in Iran (E, northwestern and central Iran; F, eastern Iran). Distinctness of these six clades and sister group relationships of (A + B) and (C + D) are well-supported; however, phylogeny of the resulting four clades (A + B), (C + D), E and F is badly resolved. While all traditionally recognized *Testudo* species are highly distinct using mtDNA sequences and ISSR fingerprints, we detected within the *T. graeca* complex no nuclear genomic differentiation paralleling mtDNA clades. We conclude that all studied populations of the *T. graeca* complex are conspecific under the Biological Species Concept. There is major incongruence between mtDNA clades and morphologically defined taxa. This implies that pronounced morphological plasticity, resulting in phenotypes shaped by environmental pressure, masks genetic and taxonomic differentiation.

Key words: *Testudinidae*; Testudo; Testudo graeca; *molecular phylogenetics; mitochondrial DNA; ISSR; nuclear genomic fingerprinting; phylogeography.*

DEVELOPMENTAL GEOMETRIC MORPHOMETRICS FOR *GAVIALIS-TOMISTOMA* DEBATE: A THIRD APPROACH

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Phylogenetic relationships of *Gavialis gangeticus* and *Tomistoma schlegelii* are still under the conflict between molecular and paleontological/morphological approaches (Brochu, 2003: Annu. Rev. Earth Planet. Sci. 2003, 31: 357–397). The former proposes a close relationship between *Gavialis* and *Tomistoma* with a splitting time for *Gavialis* in the Late Tertiary, while the latter places *Gavialis* out of Brevirostres and *Tomistoma* close to *Crocodylus* with a divergence time for *Gavialis*, calibrated upon the fossil record, in the Late Cretaceous. This incongruence is hardly reconcilable; no geometric morphometrics works exist for Crocodylia neither a developmental morphological study for *Gavialis-Tomistoma* debate.
We collected 90 landmarks of left unilateral configurations for a total amount of 110 specimens belonging to *C. niloticus* (36), *C. porosus* (37), *T. schlegelii* (18) and *G. gangeticus* (19) comprehending relatively complete post-hatching ontogenetic series for all species.
All analyses were performed in Morpheus, Statistica, SMATR and SPSS softwares. We computed a Generalized Procrustes Analysis (GPA) both for all shape (109 individuals due to a damaging on the rostrum for one *T. schlegelii*) and only for neurocranial shape (41 landmarks) to investigate the relative influence of an highly plastic and adaptive region of the crocodylian skull: the rostrum. All set of successive analyses were performed on both shape residuals (with and without the rostrum). As first, Principal Component Analysis on Procrustes residuals was performed. Successively Manova, Mancova and Reduced Major Axis analysis between first PCscores and logCS were computed. All shape: PCA analysis revealed that the first PC axis explain 76.7% of total variance. MANOVA revealed significant differences between groups for PCscores (Wilk's λ: 0.026; F=356.973; d.f.= 10, 96; P= 2.86e-071). For the first PCscores both Tukey and Games-Howell test were significative for all pairs. With the inclusion of CS as a covariate, MANCOVA revealed a significant differences between all couples as well significant effect between group*CS for first four PC scores (general model: Wilk's λ: 0.042; F=217,527; d.f.= 10, 96; P=2.552e-061). To test that more analytically a rma analysis of ontogenetic trajectories between logCS and first PCscores (explaining 76.7% of total variance) where performed: the main results concern a significant difference in slope between groups (p=0.0000, except for *C.niloticus* and *C.porosus*) and a significant elevation shift between groups (ANCOVA: F=2162.917 d.f.= 3; P= 0.000).
Only neurocranium: PCA analysis revealed that the first three PC axes explain 79.7% of total variance. MANOVA revealed significant differences between groups for PCscores (Wilk's λ: 0.00037547; F=130.23; d.f.= 30, 285.39; P=3.78e-148). Tukey's and Sheffe's test were significative for all couples except for the *C.niloticus-C.porosus*. With the inclusion of CS as a covariate, MANCOVA revealed a significant differences between all couples as well significant effect between CS and first four PC scores (general model: Wilk's λ: 0.042; F=217.527; d.f.= 10, 96; P=2.552e-061). To test that more analytically a rma analysis of ontogenetic trajectories between logCS and first PCscores (explaining 56% of total variance) where performed: the main results concern a significant elevation shift between groups (ANCOVA: F=764.097; df..=3;

P=0.000) and the posthoc result indicating *Gavialis* trajectory strongly differing from all other species(F=16.290; d.f.=3;P=0.000). In Fig. 1 are showed the two plots referred to the all shape analysis and to the analysis performed on neurocranium together with rma regression lines and statistics (first PCscores vs. logcs).
These results clearly show that the phenotypic plasticity of the rostrum plays a major role in the morphological signal in crocodiles. In fact neurocranial morphology suggests very different growth trajectories for *Gavialis*, a result congruent with that of morphological discrete analysis.

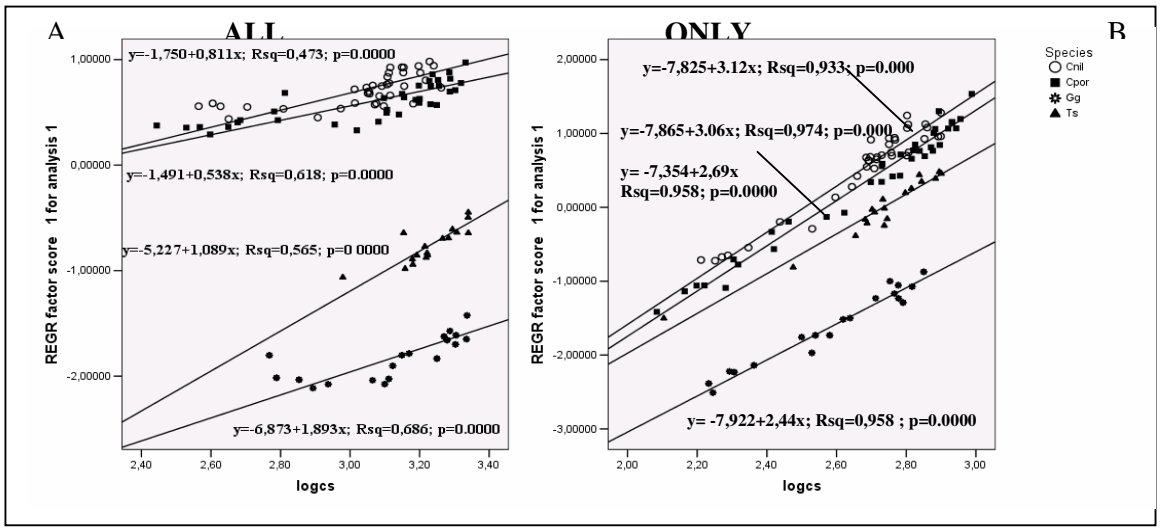

Fig.1.

Key words: Crocodylus, Gavialis, Tomistoma*, Generalized Procrustes Analysis, rostrum.*

FOSSIL SEA TURTLES FROM ITALY

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Extant sea turtles are grouped in two families, Cheloniidae and Dermochelyidae, the former represented by five genera and the latter by a single species. The fossil record testifies for a surprisingly long evolutionary history (oldest fossils date to Late Jurassic of Europe) and for an unexpected paleodiversity of sea turtle. The contribution of the Italian remains to the evolutionary history of sea turtles is rather limited: fossils of sea turtles are known in about twenty Italian localities, for a total of 25 taxon/locality data (Late Cretaceous to Holocene in age). Cheloniids are represented by 21 taxon/locality data and dermochelyids by 2 (two more data are referred to undetermined families).
Remarkable specimens have been referred to *Protosphargis veronensis* Capellini, 1884 (from the Late Cretaceous of Sant'Anna d'Alfaedo in Valpolicella; Verona Province) and to *Psephophorus polygonus* Meyer, 1847 (from the Miocene of Melpignano; Lecce Province). The former, represented by several carapacial and plastral fragments characterized by being extremely reduced, is considered a large-sized cheloniid of still unresolved phylogenetic position.
The latter is a dermochelyid present in several European localities (Late Eocene to Late Miocene in age) but the Italian remains from the Pietra Leccese sediments represent the best preserved and most informative specimens of *Psephophorus polygonus* so far known. *P. polygonus* is probably the sister taxon of the extant leatherback turtle, *Dermochelys coriacea*. Curiously, the post-Neogene findings of leatherback turtles are very scarce, limited to two poor remains coming from the Pliocene of USA.
Among modern sea turtles, *Caretta caretta* is the only one that is known in the Italian fossil record (three archeological sites in Sicily and dated to the Holocene).
Several fossil species of sea turtles have been erected in the past (mainly in the XIX century) on the basis of the Italian remains but nearly all are today considered as unidentified members of the family Cheloniidae: of the 14 chelonioid fossil species that have been described, only one taxon, *Protosphargis veronensis*, is considered valid at present.

Key words: *paleontology, sea turtle, Chelonioidea,* Caretta, Protosphargis, Psephophorus.

MOLECULAR DISSECTION OF GAMETOGENESIS IN THE HYBRIDOGENETIC *RANA ESCULENTA* COMPLEX

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The *Rana esculenta* complex includes the hemiclonally-reproducing hybrid *R. esculenta* which arises by natural hybridization between *R. ridibunda* and *R. lessonae*. In the germ line of the hybrids, a mechanism of premeiotic exclusion of one genome, followed by endoreduplication of the remaining chromosome set, provides functional gametes. The hybrid survival is ensured by crossing with the parental species whose genome was eliminated. Such a reproductive mode is known as hybridogenesis (Graf & Polls Pelaz, 1989, NY State Mus. Bull., 466: 289-302). In spite of the molecular mechanisms of hybridogenesis is still unknown, cytogenetic studies and morphological inspections demonstrated the presence of alterations in the gametogenesis of the hybridogenetic frogs (Bucci *et al*., 1990, J. Exp. Zool., 255: 37-56; Ogielska, 1994, Zool. Pol., 39: 461-474). In addition, a delay in sexual maturation was observed in *R. esculenta* when compared to parental species (Ogielska & Wagner, 1993, Zool. Jb. Physiol., 97: 349-368).
We suppose that the molecular analysis of the gametogenesis process of both parental species and hybrids, can contribute to decode the cellular and molecular events regulating hybridogenesis. To this aim, we have focused our interest on highly conserved genes coding for post-transcriptional regulators, that play a key role in germ cell specification and differentiation, in both Vertebrates and invertebrates. We isolated cDNAs of representative members of *Y-box*, *Vasa*, *Pumilio* and *Daz* gene families (*RlYb*, *RlV1g*, *RlPl10, RlPum1*, *RlPum2* and *RlDAZ*) from *Rana lessonae* (Boag et al., 2005, Development, 132: 4975-86; Xu et al., 2005, Dev. Dyn, 233: 872-82; Moore et al., 2003, PNAS, 100: 538-543; Tung et al., 2006, Dev. Genes Evol., 216: 158-168). Specifically, *RlYb* shows similarity with *Y-box* genes, *RlV1g* and *RlPl10* are homologous to the DEAD box helicase *vasa* and *Pl10* genes, *RlPum1*, *RlPum2* represent the *Rana* orthologues of the two vertebrate's *pumilio* genes and *RlDAZ* belongs to the *Deleted of Azoospermia* gene family.
The expression pattern of these genes investigated by RT-PCR on both somatic and gonadal tissues shows that *RlV1g* and *RlYb* are expressed only in gonadal tissues, while *RlPl10, RlPum1* and *RlPum2* are expressed in both somatic tissues and gonads.
Their spatial expression analysis by in situ hybridization carried out on adult gonads of *R. ridibunda, R. lessonae and R. esculenta*, shows that they are expressed at early stages of gametogenesis, with distinct profiles. In adult testes they are expressed in spermatogonia and groups of spermatocytes at different phases of cell cycle. It is worth noting that, during oogenesis, the hybridization signal of *RlYB*, *RlV1g*, *RlPl10, RPum1* and *RPum2* is widely distributed in the cytoplasm of early oocytes. Conversely, *RlDAZ* transcripts are localized at the vegetal pole, resembling the asymmetric distribution observed for other germ line determinants (Houston et al., 1998, Development, 125: 171-180).
No difference in the expression patterns of the analyzed genes is detected between *R. ridibunda, R. lessonae* and *R. esculenta*, suggesting that the gametogenesis, during the adult life, follows similar genetic pathways of differentiation in the two parental species as well as and hybridogenetic hybrids.

Key words: *Hybridogenesis,* Rana esculenta *complex, germ line, post-transcriptional control.*

PRELIMINARY DATA ON THE MORPHOLOGY AND SEXUAL DIMORPHISM IN *HYLA SARDA* (AMPHIBIA: ANURA)

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The Sardinian tree frog is an endemic species of the Tyrrhenian islands (Sindaco et al., eds, 2006, Atlante degli Anfibi e Rettili d'Italia – Atlas of Italian Amphibians and Reptiles, SHI & Polistampa), occurring only in Corsica, Sardinia and on Elba and Capraia islands (Tuscan Archipelago). The present work reports preliminary data on the morphometry and sexual dimorphism of *Hyla sarda*.

A total of 133 specimens (83 ♂♂ and 50 ♀♀) were analysed [Sardinia (40 ♂♂ and 27 ♀♀), Corsica (21 ♂♂ and 17 ♀♀) and, Elba and Capraia islands (22 ♂♂ and 6 ♀♀)]. For each specimen the following characters have been studied: SUL (snout-urostyle length), HL (head length), HW (head width), HUL (humerus length), RL (radius length), FL (femur length) and TBL (tibia length). The Regression Residuals of the variables on SUL have been calculated to obtain size-corrected variables; these have then been analysed using a Discriminant and a Canonical Analysis. A series of Factorial AN(C)OVA (with SUL eventually used as covariate) has been carried out in order to evaluate which characters are different among the populations, if sexual dimorphism is present and, in case, how it varies among the populations. Morphology of the hind leg has been also analysed with a *t*-test.

Multivariate analysis has pointed out that there are little differences among the 6 groups (3 populations x 2 sexes). The percentages of correct classification show that these differences are mainly due to a certain degree of sexual dimorphism: the total rises up from 38% (considering the 6 samples) to 53% joining the sexes, but keeping the localities separated; it reaches 70% joining the populations, but keeping the sexes separated. The plot of the Canonical Analysis (Fig. 1) shows that there are no significant differences among the populations, nor between the sexes.

Factorial ANOVA analysis conducted on SUL has shown that sexes differ significantly ($F_{1,127}$=19.19; P=0.00002), with females that are longer than males. Significant differences have been found between: Sardinian ♂♂ - Sardinian ♀♀, Sardinian ♂♂ - Corsican ♀♀, Tuscan ♂♂ - Sardinian ♀♀ and Tuscan ♂♂ - Corsican ♀♀ (Scheffe Test P<0.01). The three populations do not show any significant difference regarding SUL, nor does the sexual dimorphism seems to vary among the populations. Factorial ANCOVAs carried out on the other variables, using SUL as covariate, have underlined that just RL ($F_{1,126}$=4.49; P=0.04) and TBL ($F_{1,126}$=4.44; P=0.04) are significantly different between sexes. The following couples showed significant differences: Sardinian ♂♂ - Sardinian ♀♀, Sardinian ♂♂ - Corsican ♀♀, Corsican ♂♂ - Sardinian ♀♀, Tuscan ♂♂ - Sardinian ♀♀ and Tuscan ♂♂ - Corsican ♀♀ (Scheffe Test P<0.01) for RL; Sardinian ♂♂ - Sardinian ♀♀, Sardinian ♂♂ - Corsican ♀♀, Sardinian ♂♂ - Tuscan ♀♀, Corsican ♂♂ - Sardinian ♀♀, Tuscan ♂♂ - Sardinian ♀♀, Corsican ♂♂ - Corsican ♀♀, Tuscan ♂♂ - Corsican ♀♀ and Tuscan ♂♂ - Tuscan ♀♀ (Scheffe Test P<0.01) for TBL. No one of the variables differs among populations, nor does the detected sexual dimorphism vary from population to population. Finally, the *t*-test shows that, in both sexes, no significative differences exists between femur and tibia, which average size is then more or less of the same.

Thus our results indicate that no significant morphological differences have been found between the different *Hyla sarda* populations. A certain (even if low) degree of sexual dimorphism has, on the contrary, been detected at least by the AN(C)OVAs; it is mainly due to SUL (female are longer than males) and also to RL and TBL which differ between sexes. However the latter three variables do not differ among populations.

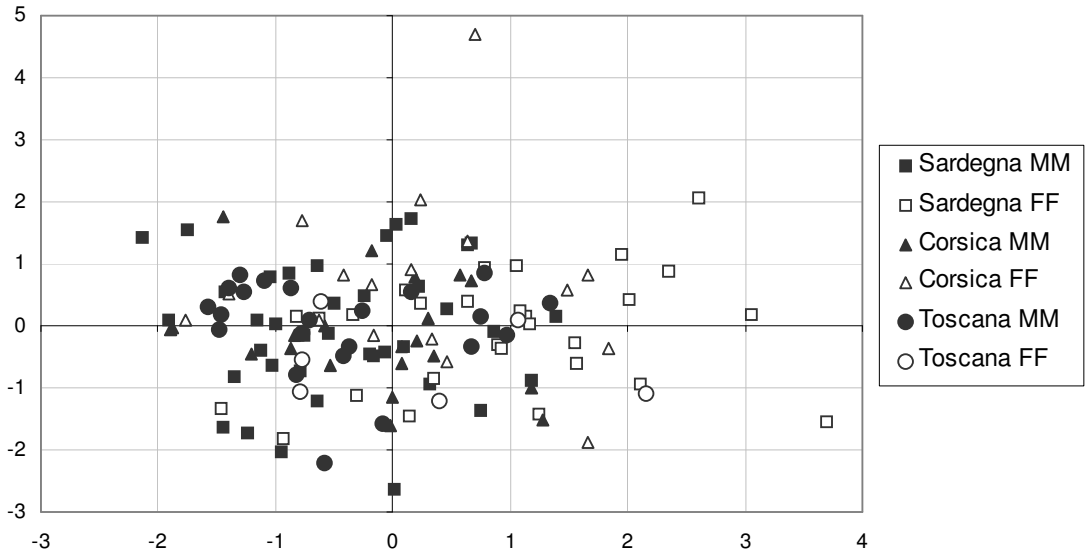

Fig. 1. Graph of the Canonical Analysis

Key words: *Sardinian tree frog; morphometry, sexual dimorphism.*

PRELIMINARY DATA ON MORPHOLOGICAL DIFFERENCES BETWEEN *HYLA SARDA* AND *HYLA MERIDIONALIS* (AMPHIBIA: ANURA)

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Four species of tree frogs are found in Italy: *Hyla intermedia*, *Hyla sarda*, *Hyla meridionalis* and *Hyla arborea* (Sindaco *et al*., eds, 2006, Atlante degli Anfibi e Rettili d'Italia – Atlas of Italian Amphibians and Reptiles, SHI & Polistampa). This paper reports preliminary findings on morphometrics of the Sardinian tree frog *Hyla sarda* and the stripeless tree frog *Hyla meridionalis* and in particular on their sexual dimorphism and interspecific differentiation.

A total of 216 specimens have been measured: 133 (82 ♂♂ and 51 ♀♀) of *Hyla sarda* from Corsica, Sardinia, Elba and Capraia Islands, and 83 (46 ♂♂ and 37 ♀♀) of *Hyla meridionalis* from Liguria. Each of the following characters has been measured: SUL (snout-urostyle length), HL (head length), HW (head width), HUL (humerus length), RL (radius length), FL (femur length) e TBL (tibia length). Regression residuals of the morphometric characters have been calculated on SUL to obtain size-adjusted variables (Carr 1996, Herpetologica 52: 56-65) and then analysed with a Discriminant and a Canonical analyses. AN(C)OVAs (with SUL eventually used as a covariate) have then been calculated to evaluate which characters are different between the species; the analyses have been conducted not separating the sexes, because the sexual dimorphism is of little relevance (see "results" and Bruschi & Corti, present abstract book).

Previous studies (Bruschi & Corti, present abstract book) have shown that in *H. sarda* just SUL, RL e TBL are sexually dimorphic. AN(C)OVAs led on *H. meridionalis* have pointed out that, apart SUL which was statistically larger in females, only TBL was dimorphic ($F_{1,81}$= 10.36; P=0.001). On the whole, sexual dimorphism appears of little relevance, so the AN(C)OVAs between the species have been calculated not separating the sexes. All the variables except FL have resulted significantly different: SUL ($F_{1,214}$=257.14; P<0.0001), HL ($F_{1,213}$=5.77; P=0.02), HW ($F_{1,213}$=15.11; P=0.0001), HUL ($F_{1,213}$=233.60; P<0.0001), RL ($F_{1,213}$=74.48; P<0.0001), TBL ($F_{1,213}$=19.07; P<0.0001).

Multivariate analysis have pointed out that there were moderate shape differences between the two species and confirmed that sexual dimorphism is less important, at least in this context (see Fig. 1, which graphically shows the results of the Canonical Analysis). The total correct classification obtained by Discriminant Analysis was 55% considering the four groups (2 species x 2 sexes), achieved 67% joining the two species and keeping the two sexes separated, but raised up to 78% joining the two sexes and keeping the two species separated.

The present results show that in both *H. sarda* and *H. meridionalis* sexual dimorphism was moderate and, apart from body length, limited to the proportions of hind legs. The reduced differentiation in overall shape morphology observed between the sexes is of interest in the study of mating behaviour and sexual selection and should be studied also in other species of tree frogs.

Even if AN(C)OVAs have underlined that the morphology is quite different for several of the studied characters, multivariate analyses achieved low discrimination between the two species on

the basis of their overall body shape. Thus, in the two *Hyla* species shape appears more conservative in respect to other characters, for example mating call, which is strongly divergent.

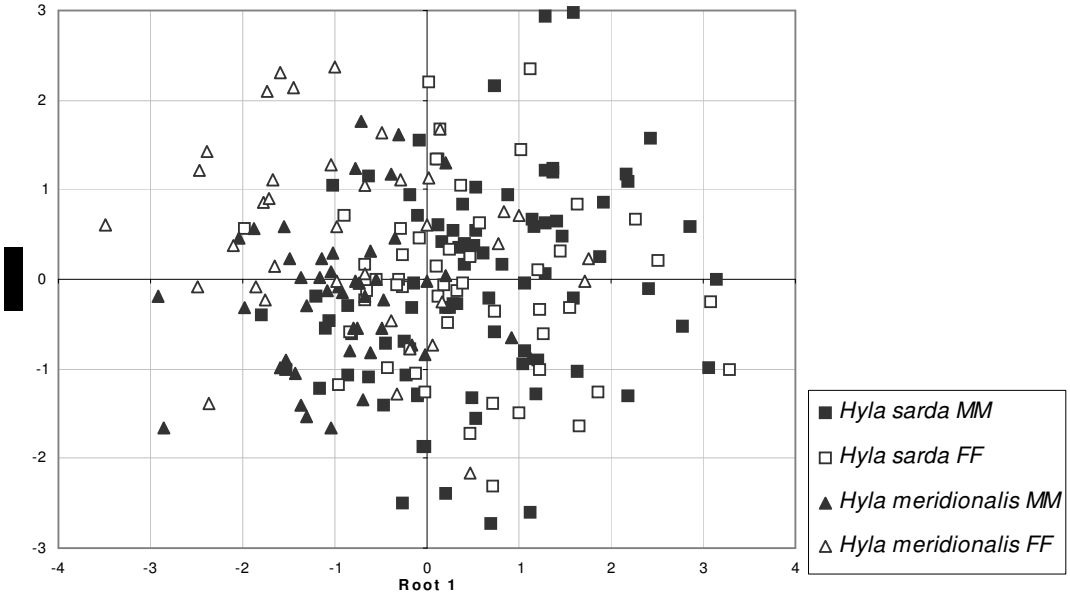

Fig. 1. Graph which shows the results of the Canonical Analysis.

Key words: *Sardinian tree frog; stripeless tree frog; sexual dimorphism; interspecific differentiation.*

EOCENE *NEOCHELYS* (PODOCNEMIDAE, PLEURODIRA, TESTUDINATA) OF ITALY AND THEIR PALAEOBIOGEOGRAPHY

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Remains of pleurodiran fresh water turtles, a group now living in Southern continents, have been discovered long time ago in Veneto: Zigno (1889, Mem. R. Ist. Veneto Sci. Lett. Arti, 23: 119-129; Mem. R. Ist. Veneto Sci. Lett. Arti, 23: 135-145) described *"Emys" capellinii* and *"Emys" nicolisi* from Purga di Bolca (Verona - boundary latest Ypresian/earliest Lutetian, MP 10 or MP 11) and Avesa (Verona - Early Lutetian, ?MP 12) on two carapaces respectively. This material and some new discovered fossils have been reexamined by some paleontologists (Bergounioux, 1954, Mem. Ist. Geol. Min. Univ. Padova, 18: 1-118; Broin, 1977, Mém. Mus. Nat. Hist. Nat. Paris, s. C, 38: 1-366; 2003; Kotsakis, 1978, Mus. Civ. St. Nat.Verona, 5: 211-219; Broin, 2003, Cienc. Terra, 15: 117-132) and assigned to the genus *Neochelys* Bergounioux, 1954. All but one the carapaces or plastrons of turtles are collected in Monte Bolca and clearly belong to the same species, *Neochelys capellinii* (Zigno, 1889). The comparison with the other species belonging to the genus (*Neochelys* sp. from Silveirinha, *Neochelys* sp. from Dormaal, *N. eocaenicus* (de Stefano 1902), *N. salmanticensis* (Jimenez Fuentes 1968), ?*N. arribasi* (Jimenez Fuentes 1975), *N. arenarum* Broin 1977, *N. zamorensis* Jimenez Fuentes, 1992, *N. franzeni* Schleich 1993,) and with *Papoulemys laurenti* Tong, 1998 (= *N. laurenti* after Broin, 2003, op.cit.) confirmed very close relationships with *N. eocaenicus*. The specimen discovered in Avesa (unfortanately lacking the anterior lobe of plastron), considered dubitatively as synonym of *N. capellinii* by some authors (Kotsakis, 1978, op.cit.; Broin, 1988, Stud. Palaeocheloniologica, 2: 103-142), is characterized by features (ratio marginal 1/nuchal, oval shape of plastron, very short anal notch depth of the plastron) differing from *N. capellinii*. For this reason we agree with Broin (1977, op.cit.) to assign this fossil to a distinct species, *N. nicolisi* (Zigno, 1890), but as *nomen dubium.* However, the affinities of the Avesa's *Neochelys* are undoubdetly very close to *N. capellinii*.

The genus *Neochelys* belongs to the family Podocnemidae whose members are now living in South America and Madagascar. Nevertheless, many members of this family have been discovered in Africa, India and Europe in sites of Early Cenozoic age. In the last continent four genera have been described from Palaeogene strata: *Palaeaspis*, *Neochelys*, *Papoulemys* and the living Madagascan genus *Erynmnochelys* (Broin, 1977 op.cit., 1988 op.cit.; Tong, 1998, Oryctos, 1: 43-53; Righi & Delifino, 2003, Abstr. Conv. "Giornate di Paleontologia 2003", Alessandria, 44). *Neochelys*, the commonest among these genera, appears in Portugal, France and Belgium during earliest Ypresian (MP 7), and somewhat later in Spain (MP 8 or 9); it is reported also from Early Lutetian (MP 11) of Germany. In France is present till Early Bartonian (MP 15) whilst in Spain survives till the closing of Priabonian (MP 20) or the beginning of the Oligocene (Broin, 2003, op.cit.). The genus clearly immigrated from Africa during the Paleocene/Eocene boundary and rapidly colonized Western Europe. In Late Eocene its area of distribution is restricted to the southern part of Western Europe, as a result of the climatic deterioration after the end of Middle Eocene. In Italy *Neochelys* is present in an insular area of a Tethysian archipelago. Very probably its ancestor is *N. eocaenicus*, known in France since Middle/Late Ypresian (MP 8/MP 9). The last appearance of this species is reported in sites of Middle Lutetian (MP 12/MP 13) age. The colonization of the Bolca archipelago from the European mainland must be occurred through a salt water barrier. A similar hypothesis of dispersion has been proposed for the crocodiles of Bolca (Kotsakis *et al.*, 2004, Palaeogeogr.

Palaeoclim. Palaeoecol., 210: 67-86). Life in marine environment is accepted for Bothremydidae, sister group of Podocnemoidae (Broin, 1988, op.cit.). Land connections must be excluded because no terrestrial mammals are known among the fossil tetrapods (several species of non-marine crocodiles and turtles) collected in Monte Bolca.

Key words: *Podocnemidae*, *Eocene, Italy, Palaeobiogeography.*

ON THE EXTINCTION OF *MAUREMYS* IN THE CENTRAL MEDITERRANEAN AREA

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Terrapins of genus *Mauremys* are represented in the north Mediterranean area by three species: *M. leprosa* (Iberia and south-west France), *M. rivulata* (Balkans and Mediterranean Anatolia), and *M. caspica* (continental Anatolia and west Asia). Italy and nearly all France represent a gap in the current European range of this genus. However, fossils remains indicate that this genus inhabited the central Mediterranean area at least from Late Miocene to Late Pleistocene. France has nearly no post Neogene *Mauremys* remains being the sole exception represented by four fragments coming from a Holocene site in Gard department in France. On the contrary, the Italian Peninsula hosted *Mauremys* at least from the Late Miocene to the Middle Pleistocene, and in Sardinia it was still present in the Late Pleistocene. Fossils are widely distributed on the peninsula and, on the basis of the presently known localities (see localities in Fig. 1) it seems that only the central and southern regions of the peninsula were inhabited during the Pleistocene. *Mauremys* probably went extinct in the Italian region because it has been less warm that the neighbouring peninsulas and separated from them by biogeographic barriers that prevented recolonization. Both *Emys* and *Mauremys* were present in the Italian peninsula as well as in Sardinia and, actually, they were sintopic at some sites like San Giovanni in Sinis or Cava Pirro and Cava Dell'Erba. Even if *Mauremys* is considered to be less sensitive to environmental factors than *Emys* and, where sintopic the former is often more common than the latter, *Mauremys* died out in the central Mediterranean sector before the end of the Pleistocene while *Emys* survived. A comparison of the present ranges of these two species clearly betrays the marked thermophily of *Mauremys*. The last glacial stages of the Late Pleistocene seem to be therefore responsible for the Pleistocene extinction of *Mauremys* in the central Mediterranean area.

Fig. 1. Geographic distribution of the *Mauremys* fossil record in Italy and Malta: 1) cf. *Mauremys* sp.; Santa Vittoria d'Alba (CN); Late Miocene. 2) *Mauremys* sp.; Pian Calcinaio, Scansano (GR); Late Miocene. 3) *Mauremys* sp. or Geoemydinei indet.; Fornace R.D.B., Villafranca d'Asti (AT); Middle Pliocene. 4) *Mauremys* sp.; Torre Picchio, Montecastrilli (TR). 5) *Mauremys portisii*; Valleandona (AT); Late Pliocene. 6) *Mauremys gaudryi etrusca*; Colombaiolo, San Giovanni (AR); Late Pliocene-Early Pleistocene. 7) *Mauremys gaudryi etrusca*; Restoni, Figline (AR). 8) *Mauremys* sp.; Cava Pirro/Dell'Erba, Apricena (FG); Early Pleistocene. 9) *Mauremys* sp.; Grotta del Monte delle Gioie, Ponte Salario (RM); Middle Pleistocene. 10) *Mauremys leprosa*; Zebbug Cavern, Malta; Pleistocene. 11) *Mauremys* sp.; San Giovanni in Sinis (OR); Late Pleistocene.

Key words: *paleontology,* Mauremys, Emys, *fossil record, Pleistocene glaciation*.

CARATTERIZZAZIONE E DISCRIMINAZIONE BIOMETRICA TRA LUCERTOLA CAMPESTRE *PODARCIS SICULA* E LUCERTOLA DI WAGLER *PODARCIS WAGLERIANA*

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La Lucertola campestre e la Lucertola di Wagler sono le sole specie del genere *Podarcis* in Sicilia (isole minori escluse). Spesso sintopici, i due lacertidi differiscono per alcuni aspetti di nicchia ecologica. E' stata realizzata un'analisi biometrica per caratterizzare ed evidenziare le differenze fra i due *taxa*.

Per raggiungere lo scopo sono state catturate 192 Lucertole campestri (114MM e 78FF) e 76 Lucertole di Wagler (51MM e 25FF) in varie località siciliane.

Su ogni individuo è stato rilevato il sesso e, con un calibro digitale di precisione, le misure di 14 variabili corporee relative al capo, al tronco ed agli arti. Per le analisi biometriche sono state adottate statistiche univariate e multivariate.

Il confronto fra i dati biometrici indica, per tutte le variabili, maggiori dimensioni medie in *P. sicula* (Rafinesque, 1810) rispetto a *P. wagleriana* (Gistel, 1868), per entrambi i sessi. L'analisi della varianza a due vie mostra differenze significative sia fra i due *taxa* sia fra i due sessi ($F=21.7$; $df=14.252$; $P<0.001$). L'analisi discriminante ha permesso l'individuazione di due funzioni discriminanti statisticamente significative (Λ di Wilks=0.49; $F_{(45,\ 743)}=29.0$; $P<0.001$), che insieme riclassificano correttamente il 95.5% degli individui esaminati.

Il piano fattoriale formato dalle due funzioni discriminanti mostra la netta distinzione tra i clusters relativi ai due *taxa* e ai due sessi. Mentre il primo asse, corrispondente alla prima funzione discriminante, separa sul piano fattoriale le due specie sulla base delle dimensioni, il secondo asse, corrispondente alla seconda funzione discriminante, mostra valori di correlazione elevati con le variabili legate alla lunghezza di alcune dita e degli arti.

E' probabile pertanto che la differenza nei rapporti di lunghezza riscontrata negli arti sia uno dei fattori che influenzano le abitudini e gli habitat frequentati dalle due specie, ciò potrebbe spiegare, ad esempio, la predilezione per gli ambienti prativi di *Podarcis wagleriana* e la sua scarsa predisposizione alle superfici subverticali come scarpate, pietraie, muretti a secco e ruderi, abitati in genere da *Podarcis sicula*. Queste differenze limitano la competizione interspecifica soprattutto in aree in cui le due specie vivono in sintopia.

Key words: Podarcis sicula, Podarcis wagleriana, *biometria, Sicilia*.

GEOGRAPHIC VARIATION AND DISTRIBUTION OF *ZAMENIS LONGISSIMUS* AND *Z. LINEATUS* (REPTILIA: COLUBRIDAE) IN ITALY

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In Italy *Zamenis longissimus* (Laurenti) and *Z. lineatus* (Camerano) seem to be vicariant species. *Zamenis longissimus* is said to inhabit northern and central Italy and also Sardinia, where it was probably introduced by humans (Razzetti & Zanghellini, 2006, *Zamenis longissimus* / *Zamenis lineatus*. In: Atlante degli Anfibi e dei Rettili d'Italia/Atlas of Italian Amphibians and Reptiles**.** Societas Herpetologica Italica, Edizioni Polistampa); *Zamenis lineatus* is endemic to southern Italian Peninsula and Sicily (Lenk & Wüster, 1999, Herpetol. J., 9: 153-162). The two species are anatomically and ecologically similar (Capula *et al*., Amphibia-Reptilia, in press) and are recognizable using some morphological and molecular characters (see Lenk et al., 2001, Amphibia-Reptilia, 22: 329-339).

To assess the pattern of geographic variation in *Zamenis longissimus* and *Z. lineatus*, geometric morphometrics of the dermal skull was investigated in several populations. Sixteen samples of *Zamenis longissimus* (from central and northern Italy, Switzerland, Croatia, Greece, Turkey) and four samples of *Z. lineatus* (from southern Italy: Campania, Basilicata, Calabria, Sicily) were analyzed. Geometric morphometric analyses were run on a total of 128 specimens (*Zamenis longissimus*, n = 91; *Z. lineatus,* n = 37) preserved in the collections of some Italian zoological museums (Florence, Rome, Palermo). Each animal was placed under a binocular microscope provided with a digital camera connected to a PC. Thirty-five X-Y coordinates were recorded on digital images of the half configuration of the dorsal dermal scudes of the skull through TpsDigit (Rohlf, 2004, TpsDig 1.4, Dept. of Ecology and Evolution, State Univ. of New York Stony Brook). Configurations of landmarks were rotated, translated and superimposed through the program TpsRelw (Rohlf, 2003, TpsRelw 1.35, Dept. of Ecology and Evolution, State Univ. of New York Stony Brook). Partial Warps and centroid sizes were extracted through TpsRelw and then analyzed through ANOVA and MANOVA in order to summarize and visualize patterns of variation. Based on the geographic origin of the studied individuals, the distribution of both species in Italy was also analyzed and discussed.

A. Interspecific variation. Based on shape variation expressed by CVA of partial warp scores, the two species are clearly recognizable and multivariate discrimination is highly significant (Wilks' lambda = 0.028; F = 12.21; P< 0.00001). Shape differences between species are mostly related to the variation of specific osteoderms. Transformation grids (Bookstein, 1991, Morphometric tools for landmark data. Cambridge Univ. Press), produced through TpsRegr on CV scores (Rohlf, 2004, TpsRegr. Dept. of Ecology and Evolution, State Univ. of New York Stony Brook), indicate that major differences are in the shape of the Internasal, the Supraocular, the Prefrontal and the Frontal (Fig. 1). In particular, the shape of the frontal and parietal osteoderms appears to be highly diagnostic between the two species. The shape of the skull of *Z. lineatus* is at one extreme of variation, with a rostral and nasal region narrower with respect to the central portion of the skull, while *Z. longissimus* is at the other extreme, showing wider rostral and nasal regions**.**

B. Intraspecific variation. In *Zamenis lineatus* both the analysis of relative warps 1 and 2 (accounting for 33.53% and 15.35% of variance respectively) and the Canonical Variates

Analysis on partial warps scores (Wilks' lambda: 0.00123, F (38.4)= 2.839518, P< 0.1591) indicate that the samples are very similar to each other and there is very low variation. On the other hand *Zamenis longissimus* is characterized by higher interpopulation variability, as shown by CVA on the first 42 relative warp scores (Wilks' lambda= 0.00004 F (252.74.4)= 1.324262, P< 0.0769).

C. Distribution. Our results indicate that the distribution of both species in Italy should be revised. Contrary to the opinion by Lenk & Wüster (1999), *Zamenis longissimus* does occur in Campania. According to our results, this region of southern Italy is inhabited by both *Z. lineatus* and *Z. longissimus*. Thus Campania can be considered as a parapatric contact area. This is probably true also for Puglia, where we recorded the occurrence of *Zamenis longissimus* for the first time. Based on these data, it can be noted that (i) the Italian range of *Zamenis longissimus* appears to be wider than that known up to now, and (ii) *Z. lineatus* and *Z. longissimus* co-occur sympatrically in some areas of southern Italy.

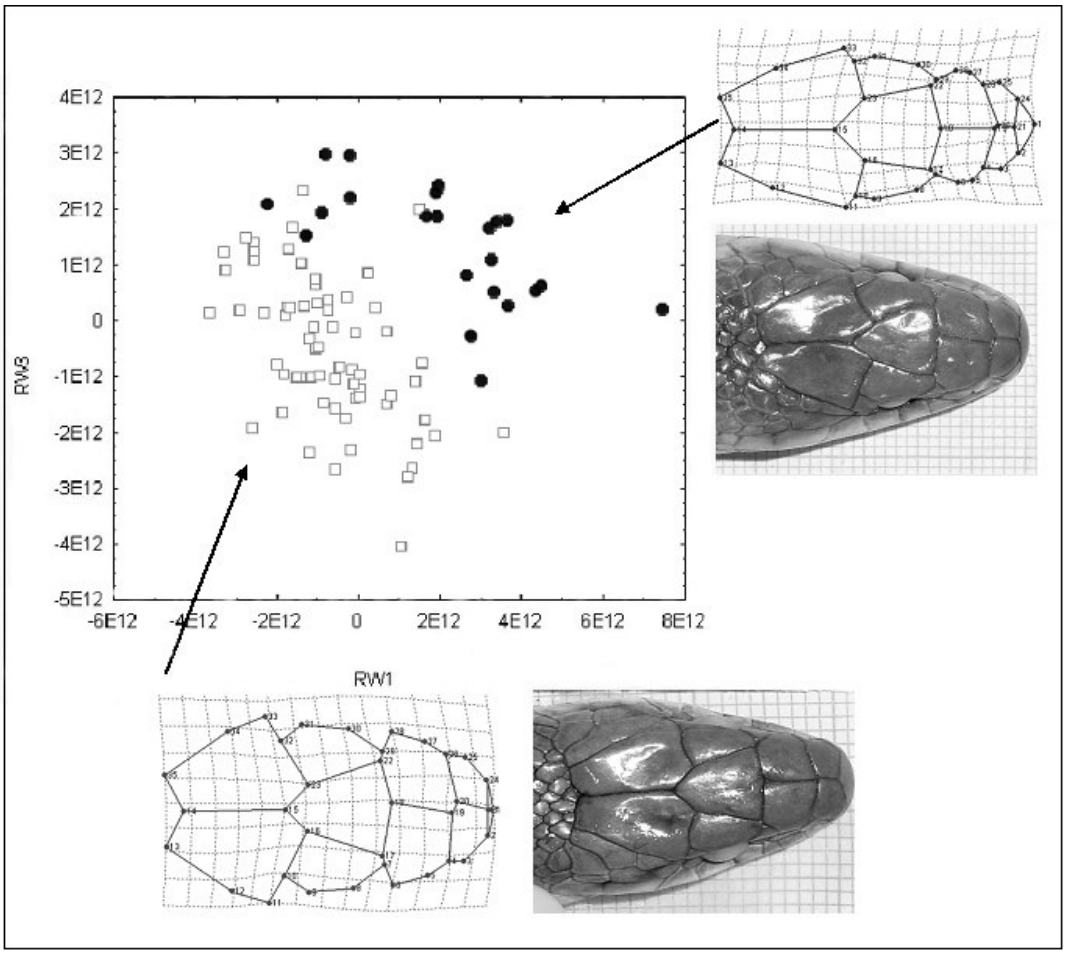

Fig. 1. Distribution of Relative Warps 1 and 2 in samples of *Z. lineatus* (black circles) and *Z. longissimus* (open squares). Deformation grids related to the extremes of variation along CV1 and CV2 are shown upper right (*Z. lineatus*) and bottom (*Z. longissimus*).

Key words: Zamenis longissimus, Z. lineatus, *geographic variation, skull shape, distribution, Italy.*

IV - Ecologia e conservazione di Rettili

IV - Ecology and conservation of Reptiles

(Convenor: Claudia Corti, Thomas Madsen, Valentin Perez Mellado)

GENETIC RESTORATION OF AN INBRED POPULATION OF ADDERS (*VIPERA BERUS*)

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The negative effect of inbreeding is well documented in captive animals. However, there is surprisingly little evidence that genetic factors cause a decline of wild populations. From the point of view of conservation strategies, it is not only the effect of genetic factors on population decline that need to be considered, but also whether introduction of novel genes can prevent or reverse such a decline. Due to their comparatively low mobility many reptile populations may be subject to relatively low levels of genetic variability. Anthropogenic activities such as agriculture or other types of "development" may often result in habitat fragmentation which may restrict or even prevent migration between populations. Depending on their population number, some of these isolated populations may then exhibit too low genetic variability which in turn may result in inbreeding depression. An example of the latter is a small isolated adder (*Vipera berus*) population that I have been studying since 1981. This population declined dramatically around 35 years ago and has since then suffered from severe inbreeding depression, with a high proportion of malformed or stillborn offspring. By introducing 20 new males collected from two different large adder populations the population decline towards extinction was halted and since 1996 both the population number and genetic variability has increased dramatically.

Key words: Vipera berus; *inbreeding; genetic variability.*

HABITAT SELECTION IN A SNAKE GUILD OVER TEN YEARS

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A study on the habitat selection in a snake guild was conducted in a natural reserve of the Parco Lombardo della Valle del Ticino, called "La Fagiana". The research was carried on from 1996 to 2005 and all the data were gathered to investigate the habitat features affecting snake distribution in the study area.

The snakes were searched, captured and individually marked along and nearby a standard path about 16 km long. Five species were found in the area (n_{tot}=563): *Natrix natrix* (*n*=252), *N. tessellata* (*n*=58), *Hierophis viridiflavus* (*n*=170), *Zamenis longissimus* (*n*=72), and *Vipera aspis* (*n*=12). The real study area was defined as the standard path plus a buffer 150m wide. A 100m square grid (no. of cells=281) was overlapped to the area map and the habitat of each cell was characterised as follows, using a GIS software: surface covered by each vegetation type, ecotone and stream length. Habitat preferences were analysed with a logistic regression, using the presence of snakes as the dependent variable and habitat descriptors as the covariates.

The forward stepwise likelihood ratio logistic regression analyses were significant for all the species; the results, including extracted variables and coefficients, are reported in the following table.

Species	Variable	B	SE	Change in –2LL if term is removed	df	P	Exp (B)
N. natrix	Ecotones	0.003	0.001	14.081	1	0.001	1.003
N. tessellata	Mature wood	0.0002	7.45E-05	6.486	1	0.01	1.000
	Ecotones	0.003	0.001	3.988	1	0.05	1.003
H. viridiflavus	Mature wood	0.0002	5.40E-05	18.261	1	0.001	1.000
	Scrub	0.0001	6.36E-05	4.616	1	0.05	1.000
	Stream	-0.014	0.005	8.729	1	0.01	0.986
	Ecotones	0.003	0.001	8.686	1	0.01	1.003
Z. longissimus	Mature wood	0.0001	5.24E-05	5.481	1	0.05	1.000
V. aspis	Stream	-0.022	0.013	5.517	1	0.019	0.978

The classification was correct in 80.4% of cases for *N. natrix,* in 95.0% of cases for *N. tessellata*, in 86.5% for *H. viridiflavus*, in 89.0% for *Z. longissimus*, and in 96.4% for *V. aspis*.

The results showed a clear preference of snakes for natural woods and scrub, with extended ecotones. *Natrix natrix* is a generalist species and it is present over the whole area; it seems not to be affected by vegetation type, but only by ecotone length. The terrestrial habitat of *N. tessellata*, a mainly aquatic snake, is characterized by mature deciduous woods with long ecotones.

Hierophis viridiflavus prefers dry areas with a rich and varied vegetation, often fragmented by ecotones. The presence of *Zamenis longissimus* is mainly affected by mature deciduous woods, being a forest, tree-dweller species. *V. aspis* presence is not correlated to any vegetation type, and this species only seems to prefer dry and sunny areas.

In conclusion, the study confirms the importance of a well preserved and varied habitat for the maintenance of a well-structured snake guild. The presence of different habitats and of forbidden

areas to tourists allow a high diversity in the snake guild and the survivorship of large populations even in an area subject to intensive recreational activities.

Key words: *Valle del Ticino;* Natrix, Hierophis, Zamenis, Vipera.

DIET SPECTRUM, PREY ENERGETICS, AND BODY SIZE IN THE EUROPEAN WHIP SNAKE, *HIEROPHIS VIRIDIFLAVUS*

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Feeding rates in the European whip snake have been widely documented (among several: Rugiero and Luiselli, 1995, Amphibia-Reptilia 16, 407-411; Capula et al., 1997, Herpetozoa 10, 65-79). Nevertheless, data on energetic of food intake and on prey quality and their relationship to body size and growth trajectories are still no investigated, and are argument of the present research.

Prey spectrum was investigated on stomach contents of 23 adult males and six adult females, faecal remains of 17 males and 13 females (study collections, and field research) coming from several Italian localities and additional 53 items from France (see Tab. 1). Samples of 10 crickets (considered all together, due to individual low body mass [less than 0.35 g each]), 10 immature house mice (*Mus domesticus*) and 10 adult lizards (6 males, 4 females *P. sicula*) were sacrificed, dehydrated, centrifuged, a standard unit was extracted from homogenised sample, and total proteins, lipids, ashes, and Kcal were calculated.

Monthly distribution of the recorded predation activity ranged from April to October in males, from April to September in females. Males fed upon insects from April, mainly upon passerine birds, reptiles (lacertid and scincid lizards) and anurans from May up to October, while seemed to prey upon mammals mainly in spring (May-June), more rarely in autumn. Females start their feeding activity in April, preying upon reptiles (lacertid and scincid lizards) and adult anurans, up to the end of June. No data were available for the summer period, almost surely due to the extreme rarity of museum specimens and field observations. Insular whip snakes prey also frequently on amphibians (Zuffi, 2001, Herpetol. J. 11: 123-125), while continental snakes and those of large islands (Sicily, Sardinia, Corsica) strongly reduced to feed on amphibians. Stomach contents (taxon per stomach) are not differently distributed (Kruskall-Wallis test = 2.059, P = 0.151), as well as those found in intestine (Kruskall-Wallis test = 2.399, P= 0.121). Comparisons between exothermic vs endothermic (amphibians-reptiles vs birds-mammals) preys of central Italy (Tuscany-Latium) and small insular (Giglio-Pianosa-Capraia-Montecristo) areas was highly significant (χ^2 = 17.76, df = 3, P< 0.001). Despite crickets and lizards are significantly lighter than mice (Tab. 1), lizards are much richer in proteins (Mann-Whitney U = 2, P = 0.0001), mice are richer in lipids (Mann-Whitney U = 12, P = 0.004) and slightly more caloric than lizards (Mann-Whitney U = 24, P = 0.049). Considering males and females lizards, it emerges that proteins are equally distributed in both sexes (Mann-Whitney U test = -1.706, P = 0.114), while lipids are more concentrated in females (Mann-Whitney U test = -2.558, P = 0.011), which are also more caloric (Student t test = -4.192, P = 0.003). Kcal titolation in females lizards do not differ also when compared to mice (Student t = -0.693, P = 0.501).

Hierophis viridiflavus is markedly characterised by different body sizes, depending on considered localities, where continental areas host larger snakes than in small insular habitats (Zuffi, 2001, Herpetol. J. 11: 123-125; Fornasiero, 2004, unpubl. Thesis, Univ. Pisa; Zuffi et al., 2005, Herpetologia Petropolitana, SEH, 113-114). In Tuscany a sample of continental males averaged 998.91 ± 101.72 mm svl (n = 43), while females averaged 851.33 ± 94.53 mm svl (n = 12); on the Montecristo island, males averaged 726.44 ± 68.71 mm svl (n = 50) and females

averaged 694.77 ± 58.51 mm svl (n = 30) (Fornasiero et al, submitted, Revue Ecologie). Considering that *Hierophis viridiflavus* in captivity feeds on average each 5 days and that average activity period in the field ranges from 8 to 9 months, we can hypothesise that an average snake could feed for about 6 times/month with a possible minimum 48 feeding bouts per year. The categories we selected (e.g. insects, reptiles, mammals) correspond to 72.75% of total prey spectrum in Central Italy (insects, 18.2%; reptiles,45.45%; mammals, 4.37%), and to about 76% in insular habitats (insects, 24.14%; reptiles, 34.5%; mammals, 17.3%). The estimated energetic income is 14311 Kcal for any individual Central Italy Whip snake, while it is about 15207 Kcal for any individual insular Italy Whip snake.
Main difference in prey type and composition seemed relatively different moving from a coastal or an insular area to an inner area (cf. Rugiero and Luiselli, 1995, Amphibia-Reptilia 16, 407-411; Zuffi, 2001, Herpetol. J. 11: 123-125), indicating how habitat, climate and prey composition could be markedly different, and that Whip snake adapt accordingly. Possible interpretation of estimated energetic could be due to a relatively larger composition of insects and reptiles, organisms very energetic. Because lizards are more proteinic and less fatty than mammals and absolutely lighter than small mammals, average small body size of insular snakes could be easily explained from an energetic point of view, also considering that insects are not a feasible compound of this species diet.

Tab. 1. Bioenergetic components of standard prey items (average ± 1 SD; sample size = 10 each category).

	Prey type	Percentage of each prey type (n)
net weight (g)	cricket	3.69
	lizard	7.22 ± 2.35
	mouse	18.15 ±2.15
umidity	cricket	68.24
	lizard	71.29 ± 3.56
	mouse	70.13 ± 1.54
proteins	cricket	64.69
	lizard	74.34 ± 4.91
	mouse	63.24 ± 3.40
lipids	cricket	21.15
	lizard	10.40 ± 7.07
	mouse	19.18 ± 4.23
ashes	cricket	5.31
	lizard	15.97 ± 2.19
	mouse	11.37 ± 0.83
kcal	cricket	449.0
	lizard	390.97 ± 48.91
	mouse	425.62 ± 25.92

Key-words: *feeding energetic*, Hierophis viridiflavus, *body size, Mediterranean area*.

MEDITERRANEAN REPTILES: STATE OF KNOWLEDGE, HOT SPOTS, AREAS OF ENDEMISM, CONSERVATION.

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The Mediterranean Province is part of the "Arid-Mediterranean-Asiatic sub region" (*sensu* Ščerbak, 1982) and hosts the richest and most differentiated reptile fauna of the Palaearctic. The Mediterranean herpetofauna is strictly related to that of the Atlantic archipelagos of the Canaries and Madeira (the Azores do not host a native herpetofauna) and of the transition zone of the Middle East mountains lying between eastern Anatolia and the Kopet Dag.

More than 70,000 records of reptiles (exclusive of snakes) derived from more than 800 publications, together with unpublished observations coming from the study of museum collections of the western Palaearctic have been put into electronic maps. Species have been assigned to the main biogeographic regions of the western Palaearctic through computerised elaborations. Richness at species level and above species level (using both genera and species groups, provided their monophyly, so as to remedy the controversial definition of "genus") has been calculated for squares of "1° latitude x 1° longitude" width, by means of GIS elaborations.

Out of about 490 W-Palaearctic reptiles species (excluding snakes), 180 (36 %) have a mainly Mediterranean distribution: 133 species are basically Mediterranean, 17 Macaronesian; about 30 species widespread in the transition zone of the western Asian mountains show clear Mediterranean affinities. The areas with the highest biodiversity (*hot spots*) are highlighted in Fig. 1. The main areas of endemism of the species with mainly Mediterranean distribution (Fig. 2) are the following (from W to E):

Macaronesian (Canary and Madeira islands), characterised by the endemic genus *Gallotia,* by different *Tarentola* species of the subgenus *Makariogecko*, as well as by numerous endemic species belonging to the genus *Chalcides,* by *Tarentola (T.) angustimentalis* and by *Lacerta (Teira) dugesii*.

Maghrebian (most of Morocco, N Algeria, N Tunisia, NW Libya); endemic genera: *Trogonophis, Quedenfeldtia, Saurodactylus*; endemic species: *Blanus mettetali, B. tingitanus,* eleven species of *Chalcides*, *Novoeumeces algeriensis,* six *Acanthodactylus* species (belonging to the *erythrurus* and *pardalis* goups), *"Lacerta" andreanskyi, Lacerta (Teira) perspicillata, Lacerta (Timon) pater, Ophisops occidentalis, Podarcis vaucheri, Psammodromus blanci, P. microdactylus.*

Iberian (Iberian Peninsula and possibly S France); endemic are the subgenus *Iberolacerta* of the genus *Lacerta* (except of *L. horvathi*)*, Algyroides marchi, Lacerta* (s.s.) *schreiberi*, some species of the genus *Podarcis, Psammodromus hispanicus, Chalcides bedriagai, Blanus cinereus*. Three insular endemics: *Podarcis atrata, P. lilfordi, P. pityusensis*.

Sardinian-Corsican archipelago; *Algyroides fitzingeri, Lacerta (Archaeolacerta) bedriagae, Podarcis tiliguerta.*

Italian (excluding Corsica and Sardinia): three Sicilian insular endemics only: *Podarcis filfolensis, P. wagleriana, P. raffonei*; no peninsular endemics.

Balcanian (Balcan Peninsula and the Aegean islands, excluding the islands close to the Anatolian coasts): *Testudo marginata, Algyroides nigropunctatus, Podarcis erhardii*. There are three main areas of endemism: the Eastern Adriatic coast (*'Lacerta' oxycephala, 'L.' mosorensis* and *P. melisellensis*), the Peloponnesus and some Ionian islands (*Anguis cephallonicus,*

Algyroides moreoticus, 'Lacerta' graeca, Podarcis peloponnesiaca); the Aegean Island endemics (*Podarcis milensis, P. gaigeae*).
Anatolian: *Lacerta* (*Parvilacerta*) *parva, Lacerta* (i.s.) *danfordi, L.* (s.s.) *pamphylica, Ablepharus chernovi*.
NE Mediterranean: *Testudo kleinmanni, Acanthodactylus pardalis* (s.s.).
Levantine (from SE Mediterranean Anatolia to Sinai): *Cyrtopodion amictopholis, Ablepharus rueppelli, Chalcides guentheri, Ophiomorus latastii, Lacerta* (i.s.) *kulzeri, L.* (*Parvilacerta*) *fraasi*.
Among the endemics of the *Mediterranean – Iranian – Eurosiberian* transition zone have Mediterranean affinities *Ablepharus bivittatus*, *Ophiomorus persicus*, *Lacerta* (s.s.) *strigata*, *L.* (*Timon*) *princeps*, as well as most of the *Lacerta* (*Darevskia*) species (16) that can be grouped as follows: 1) species of the Great Caucasus (with one species in Crimea): *alpina, brauneri, caucasica, daghestanica, lindholmi, saxicola*; 2) species of the Small Caucasus and of the eastern Anatolia, eastern coasts of the Black Sea and neighbouring areas: *clarkorum, derjugini, mixta, nairensis, parvula, raddei, valentini*; all parthenogenetic species are found in this area; 3) species distributed in the northern mountain chains from the Alborz Mts. to the Kopet Dag: *chlorogaster, defilippii, steineri*. The biogeographic affinity results uncertain for *Cyrtopodion heterocercum* and *C. spinicauda* (related probably to *C. kotschyi*), endemic of the Alborz Mts. and Kopet Dag respectively.
From the conservation point of view, about 59 species (33%) can be defined "stenoendemic" (=strictly endemic) (*Area of occurrency* ≤ 5 squares) and 30 (17%) endemic (6-10 squares). Among these, several species result to be threatened, due to habitat modification, especially the coastal habitats (urbanisation of marine coasts, intensive agriculture, overgrazing). At the present any species is considered globally extinct, although for some species, like *Chalcides ebneri*, *Acanthodactylus ahmaddisi, A. spinicauda, Psammodromus microdactylus*, records are lacking in the last decades.

Fig. 1. Distribution and species richness of reptiles with Mediterranean affinities, showing 5 equal intervals between 1 and 22 species.

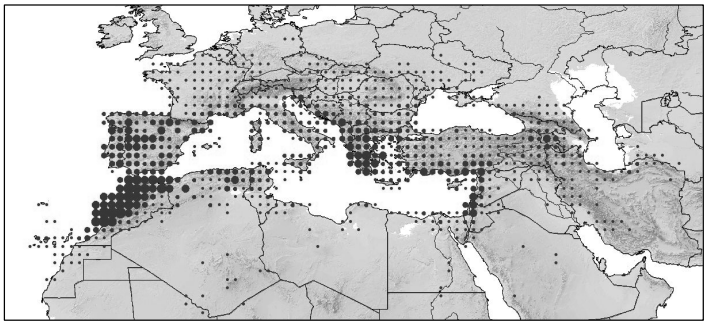
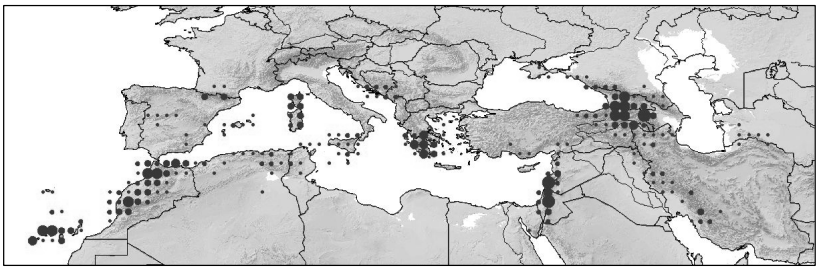


Fig. 2. Distribution and richness of stenoendemic species (< 5 squares 1x1 degree) with Mediterranean affinities (1 to 7 species).



Key words: *Mediterranean, Reptiles, biodiversity, endemism, conservation*

FEEDING HABITS OF THE GRASS SNAKE *(NATRIX NATRIX)* IN NORTH OF LOWER-VOLGA REGION (RUSSIAN FEDERATION)

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The Grass snake (*Natrix natrix* (Linnaeus, 1758)) like many other Colubridae has a wide range of prey types which may vary significantly depending on the availability of its preferred feed. It should be noted that the seasonal variability of the qualitative feeding composition and the daily food allowance of *N. natrix* are still not taken up. Snake diet was studied in 1975–1984 and 2002–2003 by means of analysis of stomach and intestine content: snakes were caught, marked and forced to regurgitate their ingested food; specimens found already dead in the field were also dissected. In total, 142 snakes were analysed. Data were processed statistically (STATISTICA 5.0 package).

N. natrix was found to usually prey upon medium-sized (55–80 mm in length, 25–40 g in weight) frogs. Such frogs are the most frequent prey of *N. natrix* with a body weight of 100 g and more. In May-June their food breadth was the most diversified in comparison with the successive months. The years 1975 and 1979 were those experiencing a high and long flood level in the island under survey, and a high concentration of mice on spots was noted. Nonetheless, in July and August *Rana ridibunda* was still the primary prey of the Grass snakes.

The daily food allowance of *N. natrix* varied widely: the maximum weight of food in the stomach of a *N. natrix* (a body weight 329.4 g) caught on 12 July, 1983 was 72.8 g. Its stomach contained: 2 *R. ridibunda* (69.8 g) and 4 tadpoles (3 g). In other cases the stomach content did not exceed 40 or 50 g. 30.6% of the snakes examined had only one *R. ridibunda* with a body weight from 25.3 to 41.1 g. In August 47.5% of the snakes had the stomach empty. Grass snakes utilized the maximum amount of biomass in June-July, which correlates well with their growth dynamics (Samarina, 1970, Rus. J. Ecology. 1(4): 89-90). In August the intensity of their feeding rates reduced noticeably.

Overall, Amphibians were the primary food (74.6% in number, 86.0% in weight) and mice were the secondary prey type. Other prey types (nestlings, fries, insects) were present in very restricted quantities, especially by weight (< 2%). *R. ridibunda* predominated among amphibians, *R. arvalis* and *Bufo viridis* being subdominant food items. However, Grass snakes can easily switch to more available and abundant feed as it was in 1975 and 1979 when a high abundance of mice was observed on non-flooded sites.

Key words: *Serpentes, food allowance, Anura, Mammalia, Saratov region*.

INTERANNUAL VARIATION OF LIFE REPRODUCTIVE TRAITS IN THE EUROPEAN POND TURTLE, *EMYS ORBICULARIS,* FROM MEDITERRANEAN AREAS

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Despite the long effort provided by turtle ecologists in describing and determining the proximate ecological causes of reproductive traits in wild fresh water turtles (i.e. Iverson, 1992, Herpetol. Monog. 6: 25-42), no ecological study on more than one single population of *Emys orbicularis* in the whole distribution range has yet been carried out (i.e. Keller et al., 1998, Mertensiella 10: 147-158; Zuffi et al., 2004 Ital. J. Zool., Suppl. 2: 101-104). A medium term study on wild populations of coastal central Italy are here presented.

We considered 378 adult female *Emys orbicularis* (mean ± 1 SD, 135.64 ± 10.73 mm carapace length), captured during seven consecutive reproductive seasons (1996-2002) from San Rossore and Camp Darby areas (coastal Tuscany, "Parco Naturale Regionale Migliarino San Rossore Massaciuccoli"). They have been captured by hand, with floating traps, or fenced nets, measured and marked individually for future recognition (see Zuffi et al.,1999, J.Zool. Lnd. 247: 139-143).

The smallest adult females were found at 99-100 mm carapace length, but the first reproductive female had 119 mm carapace length. 120 adult females, at capture, were found not bearing eggs (not reproductive females, NRF) while 251 females were found with follicules larger than 12 mm diameter or with well developed eggs (positive to manual palpation, to ultrasonography or to x-ray procedure, reproductive females, RF; Zuffi et al, 2005, Herpetologia Petropolitana. Ananjeva N. & O. Tsinenko, Eds., Russian Journal of Herpetology [Suppl.]: 245-246). Carapace length was different throughout years (ANCOVA, $F = 3.802$; $df = 9$; $P < 0.001$; year as factor = 7.284; $df = 4$; $P<0.0001$), but independent of reproductive status ($F = 2.177$; $df = 1$, $P = 0.143$) and of cross relation year-status ($F = 0.519$; $df = 4$, $P = 0.722$). 1999 and 2000 females showed higher carapace length than other year RF.

In the whole sample, recorded clutches per year ranged from 14 (2001) to 61 (1997), and were significantly different among years (Kolmogorov –Smirnov, $Z = 16.852$; $P = 0.001$). Clutch size significantly varied from 5 eggs/clutch (year 2000) to 6 eggs/clutch (1997), in dependence on carapace length but not on year (ANCOVA, $F = 3.323$; $df = 3$; $P < 0.001$; year as factor = 2.192; $df = 1$; $P = 0.051$; carapace length = 16.646; $df = 1$; $P < 0.0001$). Significant differences in average clutch size were found between San Rossore (median = 6) and Camp Darby (median = 5) accordingly to larger body sizes of RF (Zuffi et al., 2004 Ital. J. Zool., Suppl. 2: 101-104).

Proportion of RF vs NRF was significantly higher (Kolmogorov –Smirnov, $Z = 13.518$; $P = 0.036$). Among all females captured more than once (n = 190), 158 produced one clutch/year and 32 out of them produced at least 2 clutches/year. NRF had shorter carapace length than RF, and were different between two considered areas (ANCOVA, $F = 27.212$; $df = 3$; $P < 0.001$; locality as factor = 54.417; $df = 1$, $P<0.0001$; status = 19.291; $df = 1$, $P < 0.0001$) suggesting different growth rate/age dependent rates. Using a PCA analysis on six biometrical variables (e.g.: carapace length and width, plastron length and width, carapace height and body mass), we found one component explaining more than 80% of total variance (Fig.1), significantly higher in 1999-2000 years (ANOVA, $F = 4.978$; $df = 6$; $P < 0.0001$, post hoc Bonferroni multiple test, with $P < 0.0001$ in 1999-2000 vs all other years).

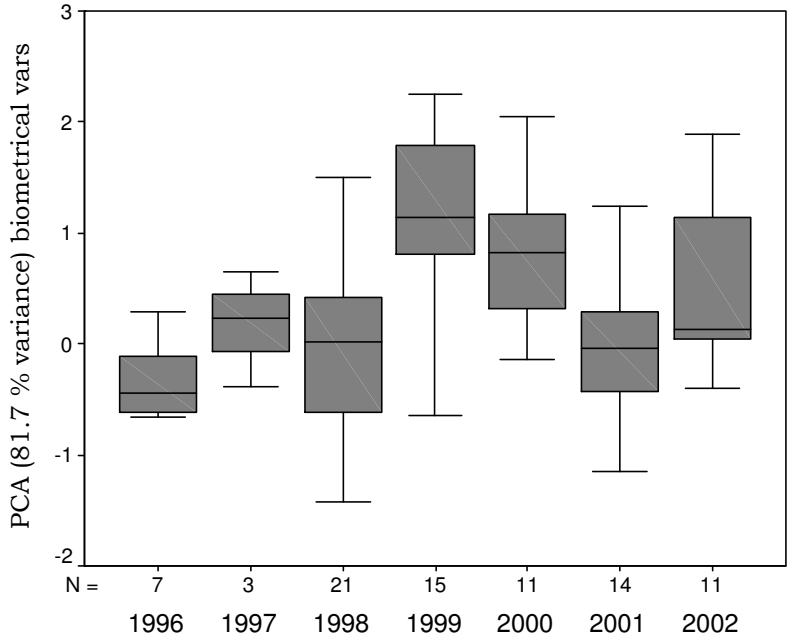

Fig. 1. Variation of overall body size of RF in Western Tuscany.

Relatively constant reproductive output (clutch size) slightly correlated to female body size, while double frequency of reproduction seemed a not constant pattern in all RF (Zuffi and Odetti, 1998, Ital. J. Zool. 65 (2): 187-189). Body size variation of adult RF (smaller RF did not reproduced) showed an inter-annual variation likely related to particularly negative years, as preliminarily found elsewhere (western Spain, C. Keller, pers. comm.), suggesting that environmental variables could play a determinant role in affecting reproductive strategies (see Iverson, 1992, Herpetol. Monog. 6: 25-42).

Key words: *clutch size, clutch frequency, annual reproduction variation*, Emys orbicularis, *phenotypic plasticity.*

POPULATION ECOLOGY AND STATUS OF *LIOLAEMUS MULTIMACULATUS* (SAURIA, TROPIDURIDAE) IN COASTAL DUNES OF ARGENTINA: A PRELIMINARY STUDY

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The small lizard *Liolaemus multimaculatus* is an endemic threatened species of the coastal dunes of the Buenos Aires and Río Negro Provinces of Argentina. The aim of this work is to describe and to analyze the population size, habitat use, sex ratio and age structure of a population of *L. multimaculatus*.

Between 2005 and 2006 (January and February) we made samplings every day in the "Mar Chiquita Natural Reserve". We applied a systematic line-transect design. We recorded age class, sex, habitat and microhabitat type, precise location and perpendicular distance of detection from the line transect of 262 individuals.

A large percentage of individuals was found in the fore- and second dunes (39% and 59%, respectively). With respect to the microhabitat, 96% of the individuals were detected in dune grasslands of *Spartina ciliata* (Graminea). This result suggests a pronounced preference by this species for this microhabitat type, probably due to the substratum type, because this species has the capacity to burrow inside the sand in order to escape predators. Both sex ratio and age class data were too few to make robust statistical analysis. In order to estimate the population density we applied the "Distance Sampling" model. The population density value estimated was 4.26 individuals per hectare (SD= 0.66; n=63; N=68).

Further works is needed in order to determine and evaluate population structure, home-range, survival and their implications on the population status.

Key words: *sand dunes lizard, protected areas, demography, conservation degree.*

ESCAPE DISTANCE IN RELATION TO SUBSTRATUM TYPE, SEX, REPRODUCTIVE STATUS AND TAIL CONDITION IN TWO LACERTIDS WITH CONTRASTED HABITS: *ZOOTOCA VIVIPARA* AND *IBEROLACERTA HORVATHI*

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Antipredatory behavior is essential in those animal species which are basal or intermediate in a trophic chain. Lizards are among the most widely predated organisms in the temperate zone ecosystems, being preyed upon by a variety of predators including e.g. birds of prey, carnivore mammals, snakes, etc. In this paper we analyse the correlates of escape distance in two sympatric lacertid lizards with contrasted life-history traits, i.e. the ground-dwelling common lizard (*Zootoca vivipara*) and the rupicolous Horvath's rock lizard (*Iberolacerta horvathi*).
Lizards were studied during the summer 1996 at a mountainous area in north-eastern Italy (Tarvisio Forest, province of Udine). Lizards were approached to quantify their escape distance (precision ± 5 cm), then were captured and marked.
We also recorded on capture their species, SVL, age (adults or subadults), sex, habitat of capture, microhabitat type, tail condition (whether whole, broken or regenerated), reproductive status (pregnant or not, if females), and time of day.
Data were processed by a Statistica version 6.4 PC package, with all tests being two-tailed and alpha set at 5%. We used parametric tests, given that all the variables were normally distributed or were log-transformed to achieve normality. We used several one-way ANOVA sets to establish eventual differences between groups, i.e. between species, sexes, etc.
In both species, males escaped at significantly higher distances than females (see Tab. 1) (*Z. vivipara*: $F_{2, 84} = 7.80$; $P < 0.001$; *I. horvathi*: $F_{2, 78} = 3.24$; $P < 0.05$), and there was no differences in either species as for the reproductive status effects on escape distance of females (*Z. vivipara*: $t_{27} = -1.55$; $P = 0.13$; *I. horvathi*: $t_{30} = 1.39$; $P = 0.17$). There was a significant effect of tail status on *Z. vivipara* escape distance with specimens with broken tails escaping at a shorter distance than intact tail individuals (146.4±55.5 vs 90.32±38.7; $t_{85} = 5.16$; $P < 0.001$), but not the same in *I. horvathi* ($t_{78} = 1.36$; $P = 0.18$). Substratum type had a significant effect on escape distance in both species (*Z. vivipara*: $F_{5,75} = 3.67$; $P < 0.005$; *I. horvathi*: $F_{3,77} = 5.72$; $P < 0.001$).
Our study highlighted noteworthy similarities between species as for their escaping response to an approaching potential predator. Indeed, the two sexes showed an escaping strategy clearly different with males escaping at a longer distance than females. The juveniles showed an intermediate response between males and females, but this was likely dependent on the fact that our variable included the two sexes pooled. However this scenario appear to be complicated by the substratum type and the tail status but not by the reproductive status (in females).

Tab. 1. Summary of the means (and dispersion measures) of the escape distances (cm) in the two study species at the study area.

Z. vivipara	N	Mean	Std. Dev.
Males	39	153.49	57.6
Females	29	104.35	45.8
Juveniles	13	136.54	60.9
I. horvathi			
Males	40	175.05	75.3
Females	32	138.44	57.4
Juveniles	9	191.22	90.0

Key words: *antipredatory behaviour, approach distance, lizards, Italy*

MICROHABITAT CHOICES OF *ARCHAEOLACERTA BEDRIAGAE*: LOCAL PREFERENCES AND ADAPTATIONS

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Archaeolacerta bedriagae is a rock lizard confined to large rocky outcrops of Sardinia and Corsica. This species shows some specialized characters probably associated with rock-dwelling, climbing vertical surfaces and hiding in small refuges (Arnold, 1998, Bull. Nat. Hist. Mus. Lond. 64: 63-89). In spite of the possible correlation between some morpho-functional traits and the peculiar autoecology of this species, only few papers examined in detail the habitat use of *A. bedriagae* (e.g. Vanhooydonck et al., 2000, Funct. Ecol. 14: 358-368).
In this research the micro-habitat choices made by 224 individuals of six populations (two from Corsica and four from Sardinia) inhabiting insular, coastal and mountain sites were examined. The values of the following 15 environmental variables regarding the First Sight Point of specimens (FSP) and the circular surface (Ø=1m) surrounding the FSP were measured: *height of FSP from the ground level (HFG), inclination of the FSP (INCL), exposure of the FSP (EXP), distance of FSP from the nearest plant (DFP), distance of FSP from the nearest hold (DFH), percentage of rock coverage in the surface surrounding the FSP (%ROCK), percentage of ground coverage in the surface surrounding the FSP (%GROUND), percentage of grass coverage in the surface surrounding the FSP (%GRASS), percentage of shrubs coverage in the surface surrounding the FSP (%SHRUB), percentage of trees coverage in the surface surrounding the FSP (%TREE), maximum vegetation height (MVH), number of very small holds (size<3cm) in the surface surrounding the FSP (NXSH), number of small holds (size<20cm) in the surface surrounding the FSP (NSH), number of medium holds (20cm<size<50cm) in the surface surrounding the FSP (NMH), number of large holds (size>50cm) in the surface surrounding the FSP (NLH).* The same measurements were also recorded on 175 descriptive points, selected at regular intervals along random linear transects throughout the same sites where the previous 224 observation points were recorded, in order to investigate micro-habitat availability in the studied sites. The presence of autocorrelation among these variables was tested (Spearman correlation test: $P<0.003$) and, in order to minimize the effect of autocorrelation, five variables (HFG, DFP, %ROCK, MVH, NXSH) were excluded from the following analyses.
Some differences between the Corsican and Sardinian descriptive points are statistically significative (Mann-Whitney U Test: $P<0.005$), in particular as concerns DFH ($U=2068.50$; $Z=4.36860$; $P=0.000013$), %GRASS ($U=2598.00$; $Z=-3.25486$; $P=0.001135$) and NSH ($U=2031.00$; $Z=-5.37006$; $P=0.000000$). On the contrary, the observation points of both islands are pretty similar, and only one variable (NLH) resulted significantly different ($U=3345.50$; $Z=3.55341$; $P=0.000380$). Six of the ten used variables appear significantly different between the observation points and the descriptive points. In particular, values of INCL and NLH are higher in the observation points than in the descriptive points (respectively: $U=15455.00$; $Z=3.71673$; $P=0.000202$, and $U=13716.00$; $Z=5.88406$; $P=0.000000$). On the contrary, values of DFH, %GROUND, %GRASS and NSH are lower in the observation points than in the descriptive points (respectively: $U=15952.00$; $Z=-3.15435$; $P=0.001609$ - $U=16884.50$; $Z=-5.55281$; $P=0.000000$ - $U=15890.00$; $Z=-4.55477$; $P=0.000005$ - $U=15935.00$; $Z=-4.38747$; $P=0.000011$).
According to these results, though Sardinian and Corsican sites are quite different one another, lizards select micro-habitats rather similar in both islands showing specific preferences throughout its range, independently from differences among sites and habitat availability. Within generically rocky sites, *A. bedriagae* specifically selects distinct points particularly steep and

close to potential holds, with scarce ground and grass, a low number of small refuges and numerous large crevices.

Key words: *rock lizard, Sardinia, Corsica, microhabitat choices.*

IL RUOLO DEI SEGNALI VISIVI NELLA DISCRIMINAZIONE DELLE RISORSE ALIMENTARI IN *TESTUDO HERMANNI*

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Molti rettili discriminano tra diverse fonti alimentari per mezzo di segnali chimici tramite gli organi olfattivi (Cooper e Pérez-Mellado 2001, Physiology & Behavior 74, pp 339-342), ma alcune specie usano anche stimoli visivi (Amo et al. 2004, in Animal Behaviour 67, pp 647-653). I Cheloni selezionano il cibo prevalentemente tramite stimoli olfattivi e, nonostante siano capaci di riconoscere distintamente i colori (Arnold e Neumeyer 1987, Vision Research 27, pp 1501-1511), non è noto in dettaglio quale sia il ruolo degli stimoli visivi nella ricerca del cibo in tali rettili. In questo studio abbiamo quindi indagato se la testuggine comune (*Testudo hermanni*) sia in grado di discriminare tra diverse risorse alimentari tramite l'impiego di stimoli visivi.
Nel giugno 2002 presso il Centro CARAPAX di Massa Marittima (GR) abbiamo effettuato una serie di esperimenti di scelta presentando a maschi e femmine di testuggine coppie di fiori con colori diversi. Abbiamo utilizzato fiori rossi, gialli (due tonalità), bianchi, azzurri e viola (3 tonalità) e tutte le possibili combinazioni sono state presentate a 40 individui (20 maschi e 20 femmine). L'esperimento è stato quindi ripetuto usando dischetti di carta rotondi, colorati secondo le tonalità dei fiori utilizzati nel primo esperimento. La scelta è stata valutata in base a quale fiore o dischetto era morso per primo; le differenze significative sono state analizzate tramite il test del χ^2.
Sia i maschi sia le femmine hanno mostrato una netta preferenza per i fiori di colore giallo e viola, mentre i fiori bianchi sono stati nettamente scartati. I test effettuati con dischi di carta colorata hanno confermato la preferenza per il colore viola , ma non quella per il giallo; contrariamente ai risultati con i fiori, il rosso è inoltre risultato significativamente preferito negli esperimenti con i dischetti di carta. I risultati di questo studio hanno confermato la spiccata capacità della specie di distinguere colori diversi e di preferire nettamente fiori dai colori vivaci come il giallo, il viola e il rosso. Le differenze riscontrate tra i due esperimenti dipendono probabilmente dalla presenza di segnali olfattivi nei test condotti utilizzando i fiori e indicano come la scelta alimentare in questa specie sia il risultato di un'interazione tra stimoli visivi e olfattivi.

Key words: *Preferenze alimentari, discriminazione dei colori,* Testudo hermanni.

WEIGHT VARIATION RELATED TO SEASON AND TO ACTIVITY IN *TESTUDO HERMANNI* (REPTILIA, TESTUDINIDAE)

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In ectothermic animals, activity rates undergo seasonal variations that affect their body weight, especially in Testudinata (Brisbin, 1972. Herpetologica, 28:70-75). From 1992 to 2005, a population of Hermann's Tortoise *Testudo hermanni* was monitored at the Mesola Wood (Po River Delta, Nothern Italy). Seasonal activity rates were described by Mazzotti & Vallini (1999, Atti I Congresso Nazionale Societas Herpetologica Italica, Museo Regionale Scienze naturali, Torino, 133-137); Mazzotti et al. (2002, Amphibia-Reptilia. 23: 305-312) and Mazzotti (2004, Italian Journal Zoology, Suppl. 1: 97-102). By means of monthly sampling, 224 males (average weight 797 g; SD = 228.2; range 41.1 – 1431 g) and 179 females (m = 1034 g; SD = 303.7; range 65.4 – 2389,0 g) were captured, for a total of 1730 and 1243 repeated captures. For each specimen, the carapace linear length we measured (males: mean = 157.5 mm, SD = 18.0, range 66.0 – 190.0; females: mean = 175 mm, SD = 24.1, range 67.0 – 229.0) and the cloacal temperature. Weight variations in males ranged from an average increase of 44.9 g to an average decrease of 107.5 g, whereas in females, the variation ranged from + 42.6 g to – 93.4 g. The minimum values corresponding to hibernation.

Seasonal patterns of weight differed with gender (Fig. 1). In March, weight increased both in males and in females; in April, males remained generally steady, while females showed a remarkable weight decrease, followed by a quick increase in May. This trend is especially clear in bigger specimens (males from 171 to 190 mm; females from 181 to 230 mm) rather than in small ones. Both sexes decreased in weight during April, due to a their high breeding activity. In May, egg maturation lead to a remarkable weight increase in females followed by a gradual decrease up to August, due to egg laying.

Important relationships have been reported among the different behavioural stages of tortoises, weight variations, and cloacal temperatures. The weight of active tortoises (moving, feeding, breeding, etc.) was above the average for 63 g in males and for 40 g in females, with average cloacal temperatures of 29.1 and 28.4 °C respectively. On the contrary, specimens that were inactive or resting underground had the average weight lower for 93 g in males and 75.5 g in females, with average cloacal temperatures of 21.3 °C and 21.8 °C respectively.

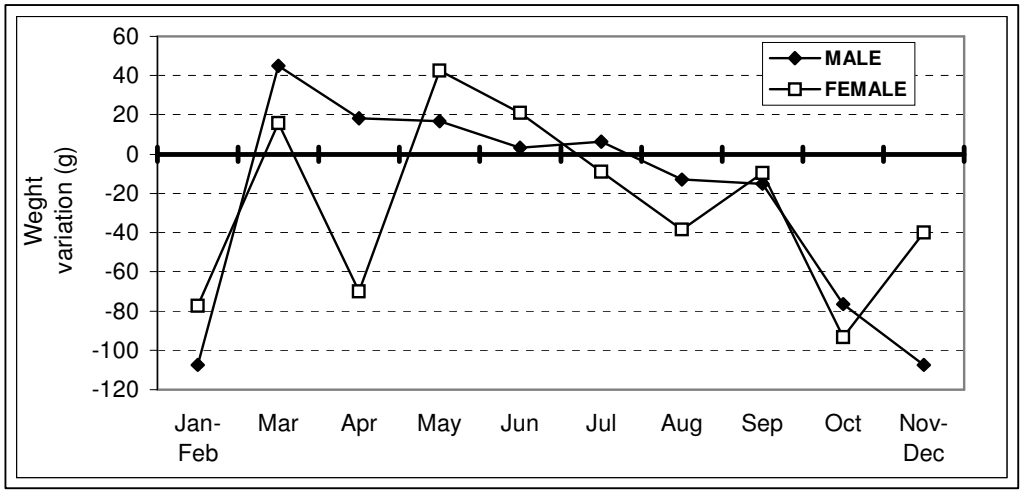

Fig. 1. Monthly pattern of weight variation from average values in male and female Hermann's Tortoises.

Key words: *weight seasonal variation, thermal relations,* Testudo hermanni.

PRELIMINARY DATA ON THE ECOLOGY OF *TESTUDO HERMANNI* OF ASINARA ISLAND (NW SARDINIA, ITALY)

Claudia CORTI[*,**,***], Lara BASSU[***], Carmen FRESI[***], Valeria NULCHIS[***], Maria Grazia SATTA[***], Antonio ADOLFI[****], Rossana BRIZZI[*], Miguel Angel CARRETERO[*****] & Marco A.L. ZUFFI[******]

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The Hermann's tortoise is distributed in the Mediterranean coastal regions from Spain (Catalonia) to Turkey, through the Italian Peninsula and the Balkans. In Italy *T. hermanni* is mainly distributed along the Tyrrhenian coastal zones and on the main islands of Sardinia and Sicily. The Hermann's tortoise is also present on some Sardinian satellite islands (Poggesi et al., 1995, Erpetologia delle isole circumsarde. Biogeographica, (N.S.) 18 [1994]: 583-618).

On Asinara Island (NW Sardinia) *T. hermanni* mainly inhabits areas characterized by high and low rocky Mediterranean maquis. Preliminary ecological observations seem to indicate that this population is active throughout the year with the exception of the coldest days from December to February. Seasons of major activity are spring and autumn, even if in spring the most different behavior is displayed. Winter activity is mainly devoted to basking while mating was observed in both spring and autumn. Despite the same behavior displayed by males and females in spring, in autumn males devote most of their activity moving around while females are resting. The latter aspect could be related to the mating activity observed in autumn when males are looking for females.

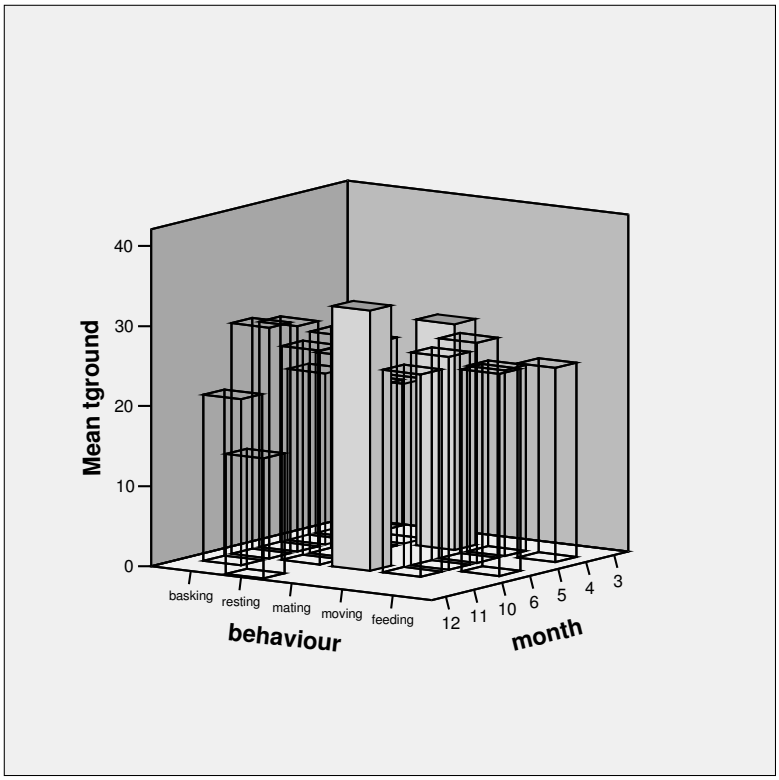

Fig.1. Different behavior displayed throughout the year.

Key words: *Hermann's tortoise, Asinara Island.*

DEMOGRAPHY OF A RESIDUAL POPULATION OF *TESTUDO HERMANNI* (REPTILIA, TESTUDINIDAE) AT BOSCO MESOLA (PO DELTA RIVER, NORTHERN ITALY)

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The population of *Testudo hermanni* in the reserve "Bosco Mesola" is a reside of the continuous range that in historic times covered all the coastal areas of the Northern Mediterranean. Presently this species is restricted to a few spots along the Adriatic coast, of which "Bosco Mesola" is the northernmost. As the Italian populations of *Testudo hermanni* represent 5-24% of the total, demographic data are very important for conservation strategies and to this aim, long term monitoring is necessary, according to recent studies on this or similar species (Hailey & Willemnsen, 2000, J. Zoology 251: 325-338; Diaz- Paniagua et al., 2001, Ecography 24: 707-721; Willemnsen & Hailey 2001, J. Zoology 255: 43-53; Hailey & Willemnsen, 2003, Biodiversity and Conservation, 12: 991-1011). The aim of this study, started in 1992 and still being continued, are to estimate the demographic parameters of this tortoise population, and to relate them to biology of this species and to the environmental variables (Mazzotti & Vallini, 2000, Atti I Cong. Naz. SHI, Museo reg. Sc. Nat. Torino, 133-137; Mazzotti et al., 2002, Amphibia–Reptilia, 23: 305-312; Mazzotti, 2004, Italian J. Zool., 71, suppl. 1: 97-102; Mirimin et al.,2004, Italian J. Zool., suppl. 2: 199-201).

The capture-mark-recapture methods proposed by Stubbs *et al.* (1984, Amphibia-Reptilia, 5: 57-68) were used, and the data collected from 1992 to 2004 were analyzed using MARK software (White & Burnham, 1999, Bird Study 46 (suppl.): 120-139; White & Cooch, 2003, http://www.cnr.colostate.edu/~g white/mark/mark.htm). We calculated the survival probability (Φ) and the capture probability (p) and we analyzed their variability in time and their association with sex and age.

The best fitting model, chosen using the Utilities-Capture-Recapture test (Utilities-Capture-Recapture, Choquet et al., 2003, Mimeographed document, CEFE/CNRS, Montpellier (ftp://ftp.cefe.cnrs-mop.fr/biom/Soft-CR/) estimated a survival rate equal to 0.99 (± 0.02 SE) for males and 0.94 (± 0.02 SE) for female, the difference between those values being not statistically significant ($z = 1.38$). A model with no difference between male and female assessed a survival rate of 0.96 (± 0.02). Because of the limited information about young specimens, it was impossible to investigate the relation between survival and age. The results of our study, compared with the literature on this or similar species, indicate that the natural reserve "Bosco Mesola" offers a stable habitat where *Testudo hermanni*, is free from the treats that commonly reduce its survival. In the highly fragmented landscape of NE Italy, this population constitutes a stock for future possible reintroductions in new protected areas.

Key words: *Survival rate, conservation, capture-mark-recapture,* Testudo hermanni.

PRELIMINARY DATA ON MORPHOLOGY AND ECOLOGY OF *TESTUDO GRAECA GRAECA* OF MAL DI VENTRE ISLAND (W SARDINIA, ITALY)

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Testudo graeca graeca is distributed in northern Africa and in south-western Europe, in the Iberian Peninsula, Balearic Islands and in some localities of southern France. Stable populations are known for western Sardinia and Mal di Ventre Island off the western Sardinian coast (Corti et al. 2004, 5° Congress, Societas Herptologica Italica, Calci Pisa, 29 Sept.-3 Oct.).

T. g. graeca inhabits coastal areas characterized by low 'maquis' vegetation up to mountain zones characterized by Mediterranean vegetation as well, uncultivated or with very low agricultural pressure.

The present work focuses on some morphological and ecological traits of the western Sardinian populations (Sinis area) and in particular on that of Mal di Ventre Island. The following morphological characters have been measured: carapace length, carapace width, plastron length, plastron width, carapace height, tail length. Each specimen has been weighed and marked before release. Mal di Ventre population, as already known in *Testudo* (Corti et al. 2005, Herpetologia Petropolitana, Ananjeva N. and Tsinenko O. (eds.), pp. 27–28) has shown that females are bigger than males (e.g. carapace length in FF range 125.8-146.6; MM range 90.9-110.7) and that individuals of both sexes of Mal di Ventre Island are bigger than those of the main island.

Preliminary ecological observations seem to indicate that the western Sardinian *T. g. graeca* is active throughout the year. Seasons of major activity are spring and fall. On Mal di Ventre Island in both seasons, autumn and winter, major activity seems to be devoted to basking, while on the Sinis area different activity behavioral patterns are displayed (e.g. feeding, courtship, mating) during these seasons.

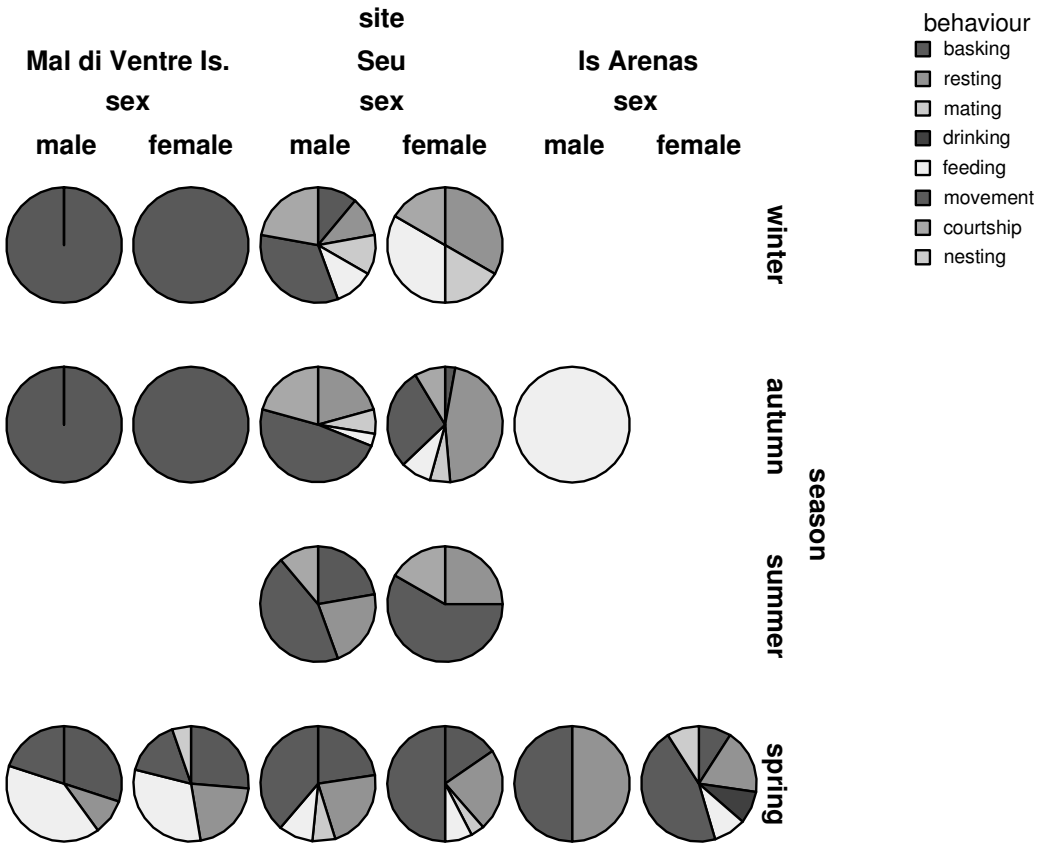

Fig.1. Percentage of the different behavior displayed.

Key words: Testudo graeca graeca, *Mal di Ventre*.

IL PROGETTO TESTUDINATI: LA CONOSCENZA E LA CONSERVAZIONE, PER UNO SVILUPPO ECOSOSTENIBILE DEL TERRITORIO

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Nel 2003 il Comune di Lesina (Fg) e il Centro Studi Naturalistici di Foggia hanno promosso il Progetto, tutt'ora in corso, sui Testudinati *Caretta caretta*, *Testudo hermanni*, *Emys orbicularis*, il quale ha ottenuto l'approvazione e il finanziamento dall'Unione Europea (fondo FESR), Regione Puglia e cofinanziamento del Comune di Lesina, tramite il P.O.R. Puglia 2000-2006 Misura 1.6.

Con questo progetto si è cercato di definire la consistenza delle colonie di testuggini nell'area d'intervento, rientrante nel P. N. del Gargano, acquisendo dati sulla consistenza numerica, sulla struttura e sulla dinamica delle popolazioni. Si è proceduto attraverso un campionamento secondo le indicazioni di Michael (1990) e Stubbs et al., (1984). Invece per la *Caretta caretta* si è monitorato il litorale al fine di permettere il salvataggio e il recupero di animali spiaggiati, provvedendo ad acquisirne i dati morfometrici, e all'individuazione e protezione dei siti di nidificazione nonché a fotografarli e a collocarli, temporaneamente i soggetti vivi, in due vasche predisposte.

Oggi l'ambiente è sottoposto a continui e profondi cambiamenti: lo sviluppo intensivo delle pratiche colturali, la cementificazione dei corpi idrici, la bonifica di molte zone umide minori, l'inquinamento dei corsi d'acqua, etc. Per i Testudinati, così come per le altre specie, si riscontra un vistoso calo della popolazione nonostante alcune norme legislative le tutelino. I principali obiettivi del Progetto sono stati: monitoraggio, conservazione e stabulazione temporanea della Tartaruga comune; monitoraggio in tutta l'area interessata dal progetto; informazione, sensibilizzazione e divulgazione dell'importanza della biodiversità, in particolare, di questa "fauna minore". Nel presente contributo si riportano alcuni dati preliminari relativi al periodo 2004-2005: per la Tartaruga comune durante le periodiche ispezioni del litorale sono stati segnalati 10 esemplari spiaggiati, purtroppo morti, e nessuna segnalazione inerente un'eventuale sito di nidificazione; per la Testuggine palustre sono state prese in considerazione 6 aree umide, dopo una prospezione dell'area oggetto d'intervento, e sono stati avvistati 10 individui catturandone quattro; invece la Testuggine comune si è rivelata la specie più frequente delle tre e la sua presenza è stata registrata in tutti i siti monitorati tranne uno. Sono stati catturati 54 individui e ricatturati 11.

Inoltre, questo è il primo Progetto sui Testudinati ad essere avviato nell'ambito della Provincia di Foggia e della Regione Puglia con l'utilizzo anche del radiotracking, in particolare per la Testuggine comune, al fine di colmare delle lacune relative ad aspetti biologici ed ecologici di questi animali conoscendone le loro abitudini, i loro comportamenti, per cui i risultati che ne emergeranno sono importanti anche dal punto di vista scientifico.
Le iniziative intraprese con questo Progetto vogliono essere il primo passo verso una maggiore consapevolezza da parte di tutta la comunità locale, e non solo, della necessità di una maggiore tutela e conservazione dell'ambiente in cui viviamo, ed in particolare della erpetofauna, affinché

la sua valorizzazione non prescinda da un'attenzione specifica della qualità ambientale e del paesaggio, individuando, inoltre, modelli partecipativi di gestione ecosostenibile del territorio.

Key words: Caretta caretta, Emys orbicularis, Testudo hermanni*, conservation*.

ESTIMATION OF SICILIAN POND TURTLE POPULATION IN THE NATURAL RESERVE "TORRE SALSA" (SOUTH-WESTERN SICILY)

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& Mario LO VALVO***

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Based on biomolecular and morphological investigations (Fritz et al., 2005, Zoologica Scripta 34: 351–371), pond turtle populations in Sicily have been recently assigned to a new species, *Emys trinacris*, endemic to the island. This paper provides a numerical estimation of Sicilian pond turtle population within the Protected Area "Torre Salsa" (Agrigento, Sicily).
For numerical estimation, the capture-mark-recapture method and Petersen-Lincoln algorythm (see Begon, 1979), modified on average estimations from Chapman (1951), were used. Specimens were caught by hand or using traps, and were all marked by notching a shell scute (Stubbs *et al*., 1984, Amphibia-Reptilia 5: 57-68). Sex was identified by their outer morphological features (sensu Lanza, 1983. Lavori Soc Ital. Biogeografia 8: 723-74), and/or based on biometric characters (Zuffi & Gariboldi in Llorente et al. (Eds). Scientia Herpetologica: 124-129).
Pond turtles were caught between March 2004 and October 2005. In total, 189 specimens were caught and marked: 79 males, 44 females, 39 sub adults and 27 young specimens born in the same year. The entire population, including adults and sub-adults, was estimated between 195 and 203 specimens, excluding juveniles born during the same year, which were caught but not considered in the estimation.
Based on the obtained results, and considering that specimens were caught during all months, it seems that the Sicilian pond turtle population found in the study area of the Natural Reserve "Torre Salsa" did not hibernate. Considering that this area is located just a few meters above sea level and at low latitude, extreme temperatures for this species are probably not reached for a long time. Moreover, it seems that this population is in better conservation conditions than the only population studied within the Natural Reserve "Lago Preola e Gorghi tondi" (Lo Valvo & D'Angelo, in press. Atti V Congresso SHI). Indeed, in addition to a larger number of specimens, average body size is bigger in both males and females (see D'Angelo et al., 2005. 4th International Symposium on *Emys orbicularis* web. Valencia, Spain; Fritz et al., in press. Amphibia-Reptilia). Considering that there is a positive correlation between the number of laid eggs, and the body size of females (Zuffi M., pers. comm.), a higher productivity is possible, as it is shown by the large number of young specimens caught, which were born during the same year (14.3% of the total number). The size of this population is small, when compared with the population sizes of European Pond Turtles (*Emys orbicularis*) in the Po River valley (northern Italy), where the lowest estimated density is approximately 100 specimens per hectare (Ficetola F., pers. comm.).

Key words: Emys trinacris*, Sicilian pond turtles, census.*

A REVISED SOUTHERN BOUNDARY OF *VIPERA* (*PELIAS*) *NIKOLSKII* HABITAT IN EUROPEAN RUSSIA

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Vipera (*Pelias*) *nikolskii* Vedmederya, Grubant et Rudaeva, 1986 is a widespread species of Viperidae dwelling in the forest-steppe and northern steppe zones of Eastern Europe. Some parts of its habitat were mapped on the basis of outdated literature data. In particular, this is true for the south-eastern part of the habitat, where until recently all the findings of light-coloured and dark-coloured vipers had not been distinguished; the zones of sympatry with *V.* (*P.*) *berus* have not been revealed reliably.

This situation suggested us to try creating an objective picture of the *V.* (*P.*) *nikolskii* distribution in European Russia. This has only become possible on the basis of accurate field surveys conducted in 1995-2005, and the analysis of collection materials from zoological museums in the Russian Federation.

Until recently the *V.* (*P.*) *nikolskii* habitat had been considered to be restricted to the forest-steppe and adjacent landscapes, and the southern habitat boundary to pass through the Volgograd, Saratov, and Samara regions (Bakiev, Bohme and Joger, 2005, Handbuch der Reptilien und Amphibien Europas: 293-309). However, actually the southern boundary goes somewhat north than was thought before. The existing evidences of the habitat expansion southward to Volgograd and even up to the Volga-Akhtuba flood-lands (Astrakhan region) are not confirmed by modern collections and observations (Tabachishin, Shlyakhtin and Zavialov, 2005, Modern problems of zoology and ecology: 288-289).

In the Rostov region the habitat of *V.* (*P.*) *nikolskii* is limited to the flooded lands of the Severski Donets and Derkul rivers (southward to 48°20' latitude North). Within the Voronezh region the southern boundary passes along ~49°45' latitude North (parts of the flood-lands of the Don, Khopyor rivers and their tributaries). Then the boundary goes north and encompasses the northern regions of the Volgograd Cis-Volga region; the habitat is limited south by the flood-lands of the rivers to 50°00' latitude North. In the Saratov region the habitat includes all the Cis-Volga region, then the southern boundary sharply rises north to the southern zone of the Saratov water storage basin along the flood-lands of the Volgograd water storage basin.

Thus, the southern boundary of the *V.* (*P.*) *nikolskii* habitat in European Russia begins from the RF frontier at 48°20' latitude North (somewhat northward of t. Donetsk Kamny district), goes north to the boundary between the Rostov and Voronezh regions and then east through the northern part of the Volgograd region (northward of v. Novogrigorievskaya, Ilovlino district and t. Petrov Val, Kamyshin district) to the place where the Volga river intersects the Saratov region boundary, then north along the Volga river valley (except the Saratov Trans-Volga region) to the southern zone of the Saratov water storage basin at 52°25' latitude North (Fig. 1).

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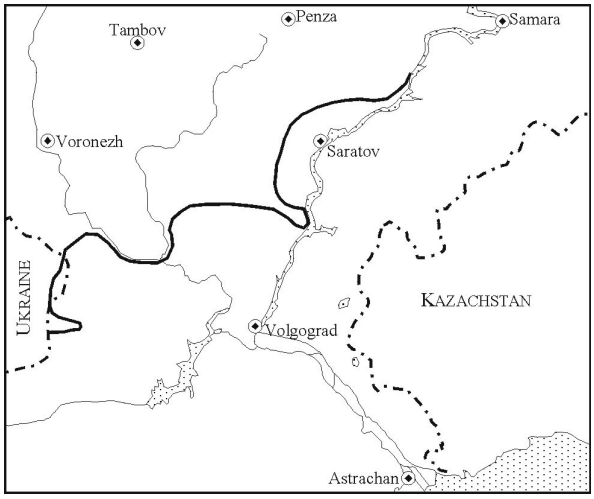

Fig. 1. Southern boundary of the *Vipera* (*Pelias*) *nikolskii* habitat in European Russia.

Key words: *Serpents, forest-steppe viper, biotopical distribution, habitat.*

VARIATION IN A MEDIUM TERM PERIOD OF A SNAKE COMMUNITY STRUCTURE IN THE PO PLAIN (NORTHERN ITALY)

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Medium to a long term studies on variation and composition of the biological structure of community and/or populations of snakes in relation to environmental changes are still very scarce (Fitch, 1998, A Kansas snake community: composition and changes over 50 years. Krieger Publishing Company; Jäggi & Baur, 1999, Amphibia-Reptilia 20: 25-34). We have studied patterns in species composition, sex ratio and body size of snakes from a Po Plain area in relation to increase of wood surface.

The present study has been carried out during 1988-1989 e 1999-2000 with three field day trips a week during the whole snake activity season (March–October). Snakes have been searched doing standard transects along ecotones. For each individual we reported species, sex, capture site and total length. The research has been carried out in "Boschi del Vignolo (province of Pavia), a 32ha area within the "Parco Lombardo della Valle del Ticino". In this area, starting from the 70ies, bushed and wooded areas have increased from about 32% to about 95%. At the beginning, the area was mostly characterised by marshy areas, grass and rice fields, uncultivated fields and by a small alder wood (about 10% of the whole area); nowadays, the hygrophilous forest and poplar woods cover almost all the area.

During the first period we captured 128 specimens of *Natrix natrix* (71 males, 57 females), 23 *Hierophis viridiflavus* (15 males, 8 females) and 20 *Zamenis longissimus* (15 males, 5 females). During the second period we captured 68 *N. natrix* (28 males, 40 females), 18 *H. viridiflavus* (13 males, 5 females), and 30 *Z. longissimus* (18 males, 12 females). The relative abundance of snakes observed between and the two study periods is highly significant (χ^2 = 11.18; df = 2; P= 0.004). We tested sex ratio in each species (between)? the two sampling periods. In *N. natrix* males decreased (1st period 55%; 2nd period 41%) while females resulted increased as a consequence (χ^2 = 6.61; df = 1; P = 0.018). In *H. viridiflavus* sex ratio has not changed significantly (1st period males as 65%; 2nd period males as 72%; χ^2 = 0.229; df = 1; P= 0.632). Furthermore, also in *Z. longissimus* sex ratio has not changed significantly (χ^2 = 1.11; df = 1; P = 0.293).

Using a general loglinear analysis, we obtained some differences also concerning class size composition within each sex in the considered species.

In *N. natrix* differences were highly significant (likelihood ratio = 98.925; df = 19; P < 0.001): 88.5% of males during first period had a total length (Ltot) ranging from 51 to 100cm, while the remnant individuals (11.5%) had Ltot < 50cm; during the second period, only 33% of adult males fell within this class, while other snakes (67%) showed Ltot < 50cm. In *Natrix natrix* 80.3% females in 1988-1989 had 51cm < Ltot < 100cm, while 19.7% had Ltot < 50cm; during 1999-2000 only 65% females had 51cm<Ltot<100cm while 35% had Ltot < 50cm.

In *H. viridiflavus* differences in size class composition were not significant (likelihood ratio = 31.678; df = 25; P = 0.168). In *H. viridiflavus* males we did not find any difference, even if during 1st period 46.6% of snakes had 101cm<Ltot<125cm, 33.3% had 126cm<Ltot<150cm, while the others were smaller in size; during 2nd period 33.3% of individuals had 101cm<Ltot<125cm, 33.3% had 126cm<Ltot<150cm, and the others were all smaller in size,

with the exception of 2 large snakes with Ltot>150cm. Also in females we did not record any significant difference and the largely representative class was 101cm<Ltot<125cm.
In *Z. longissimus* size class composition was highly different (likelihood ratio = 37.859; df = 25; P = 0.048). In males *Z. longissimus,* during 1st period, 46% individuals had 51cm<Ltot<100, while remnants were uniformly distributed among other size classes. During 2nd period, 58.8% males had 126<Ltot<150cm with two additional snakes of a much lager total length(Ltot>150cm), whilst the others were uniformly distributed among other size classes. The female sample for this species is limited in number, but it was clearly evident how in first (N = 5, 100% snakes) as well as in second period (N = 10, 83% snakes) the majority of females had Ltot<125cm.
It is furthermore necessary to underline that, till to the 1984, in this area *Vipera aspis* was present (Zuffi, 1988, Quad. Civ. Staz. Idrobiol. Milano 14: 7-65), and that such a species has never been found yet, nor during present study.
We are confident that the disappearance of the asp viper and the marked reduction in number of the grass snake could be put in relation to the decrease of most ecotonal habitats and of suitable basking places (see Jäggi & Baur, 1999, Amphibia-Reptilia 20: 25-34). Reduction of suitable basking sites could also have negatively affected, to a certain extent, the growth rate in many *Natrix natrix* specimens*;* on the other side, the increase of small ponds and dishes (as happened almost at the same time with the increase of wooded areas), may have favoured the size increase of female Grass snake. These ponds, seemed more favourable to the larval development of Amphibians, mostly predated upon grass snake newborns, and might then have been selected by female *N. natrix* to lay their eggs. On the contrary, the increase in number of large Aesculapian snakes could be related to the preference for humid woods, a typical habitat of this species. It appears that the increased number of *Z. longissimus* could has been favoured by the environmental changes occurred in the study area during the last 30 years. Lastly, the stable composition of size class in *H .viridiflavus* is in accordance with the high degree of phenotypic plasticity of this species.

Key words: Natrix; Hierophis; Zamenis *community structure, environmental changes.*

ANALISI DELLA COMUNITA' OFIDICA DI UNA RISERVA NATURALE URBANA E CONSIDERAZIONI SU *HIEROPHIS VIRIDIFLAVUS* QUALE SPECIE DOMINANTE NELLE AREE AD ELEVATO IMPATTO ANTROPICO

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Notevolmente esposti agli effetti della perdita e frammentazione dell'habitat, i serpenti possono costituire un eccellente elemento di valutazione dello stato di conservazione di un ecosistema. Durante uno studio preliminare sull'erpetofauna in cinque riserve naturali di Roma (Rugiero, 2004, Herpetozoa 16: 151-155) erano emersi indizi significativi relativi ad una forte rarefazione dell'ofidiofauna. Al fine di indagare su tali indicazioni è stata successivamente condotta, durante il biennio 2004 -2005, una ricerca di approfondimento sulla comunità ofidica della riserva naturale dell'Insugherata, che, fra le riserve esaminate, presenta alcune peculiarità di particolare interesse dal punto di vista ambientale. I risultati di tale ricerca costituiscono il presente contributo.

La Riserva naturale dell'Insugherata è un'area protetta di 697 ettari situata all' interno della città di Roma, fra la via Trionfale e la via Cassia. Si sviluppa lungo il bacino idrografico del Fosso dell'Acqua Traversa, e presenta un paesaggio alquanto mosso a valli e piccole alture in cui si alternano zone coltivate e numerose porzioni boschive residuali ad elevato grado di interconnessione reciproca. Questa ultima caratteristica contraddistingue l'Insugherata dalla maggior parte delle altre riserve naturali urbane di Roma, in cui si osserva, di norma, una maggiore frammentazione delle porzioni boschive. La ricerca è stata condotta in tre ambienti tipo, rappresentativi degli habitat principali della riserva, ed è stata effettuata dagli inizi di marzo alla fine di ottobre, così da comprendere interamente il periodo di attività dei serpenti. I campionamenti sono stati condotti camminando lentamente lungo gli ambienti in esame e procedendo alla registrazione di tutti i contatti relativi alle specie di ofidi presenti nell' area, vale a dire: (i) catture; (ii) ricatture; (iii) contatti extra marcatura-ricattura (esemplari sottrattisi alla cattura o alla ricattura sia fisica che visiva); (iv) esemplari morti; (v) esuvie. Nel caso degli esemplari morti si è proceduto ad un esame dell'esemplare atto a stabilire, qualora possibile, le cause della morte. Gli esemplari catturati sono stati marcati permanentemente mediante il taglio del margine di una o più squame ventrali, e temporaneamente mediante numeri dorsali per l'individuazione a distanza. Lo sforzo di campionamento è stato calcolato considerando un'opportuna unità di tempo, partendo dal presupposto della medesima velocità di avanzamento lungo i tre ambienti in esame. Al fine di comparare intraspecificamente le frequenze osservate tra gli ambienti, sono state calcolate le frequenze attese per ogni specie mediante un metodo derivato dalle procedure di Siegel (1992, J. Herpetol. 26: 32-37).

Cumulando i tre ambienti in esame sono state collezionate complessivamente 155 osservazioni di serpenti. *H. viridiflavus* è stato rinvenuto nettamente più di frequente delle altre specie, con 97 contatti complessivi ed una frequenza d'incontro di 0.475 esemplari per ora, seguito da *Vipera aspis*, con 25 (0.122 esemplari per ora), *Natrix natrix* con 24 (0.117) e *Zamenis (Elaphe) longissimus* con 9 (0.044). Queste quattro specie sono state trovate in tutti e tre gli ambienti esaminati. *H. viridiflavus* è stato incontrato più frequentemente degli altri serpenti anche considerando separatamente i tre ambienti, e ha evidenziato in modo affatto evidente, inoltre, un'assenza di selezione dell'habitat. Benché le altre tre specie abbiano mostrato una maggiore diversificazione nella presenza tra i diversi ambienti, se si considerano le frequenze osservate

rispetto a quelle attese sembra emergere anche da parte loro una tendenziale assenza di selezione dell' habitat. *Elaphe quatuorlineata*, specie per cui esistono segnalazioni estremamente sporadiche nella riserva, non è stato rinvenuto durante il biennio di campionamento; questo dato, confermato da quanto osservato anche in altre zone della riserva nel corso dell' indagine e dai risultati di Rugiero (2004), sembra dimostrare che all'Insugherata lo status di questo colubride, in netto declino nei dintorni di Roma e, in particolare all'interno della città, è attualmente critico. I risultati ottenuti riguardo a *V. aspis, Z. longissimus* e *N. natrix* denotano che la riserva naturale dell' Insugherata presenta un livello di conservazione ambientale particolarmente elevato rispetto a quanto si osserva nelle altre aree verdi situate dentro Roma, dove queste tre specie di serpenti risultano generalmente alquanto rare e localizzate, quando non assenti, con comunità ofidiche complessivamente più povere e più nettamente dominate dal biacco. Alla luce dei risultati ottenuti in questa riserva naturale e dei dati disponibili per altre riserve urbane romane si discutono, quindi, le implicazioni, per l'ofidiofauna, di dimensioni, isolamento e diversità ambientale delle aree verdi in territori ad elevato impatto antropico e forte frammentazione dell'habitat. *H. viridiflavus* è risultato significativamente più difficile da catturare delle altre tre specie: la sua percentuale di cattura (ricavata dalla somma di catture e ricatture rispetto al totale degli esemplari vivi rinvenuti) è stata, considerando cumulativamente i tre ambienti in esame, del 39.36 %, contro 87.50 %, 84.00 % e 77.27 % di *Z. longissimus, V. aspis* e *N. natrix*, rispettivamente. La minore catturabilità di *H. viridiflavus*, dovuta ad una maggiore abilità nell'individuazione a distanza di potenziali aggressori e ad una superiore velocità di fuga, può presumibilmente riflettere una minore vulnerabilità nei confronti di eventuali tentativi di uccisione da parte dell'uomo, non improbabili data la presenza, talora anche significativa, di persone all' interno della riserva. Gli indizi derivanti dal ritrovamento di esemplari morti suggeriscono la fondatezza di questa ipotesi. Vengono quindi considerate e discusse anche altre caratteristiche di *H. viridiflavus* che potrebbero spiegare, dal punto di vista ecologico, il suo notevole successo nelle aree a forte disturbo antropico.

Key words: Hierophis viridiflavus, Natrix natrix, Zamenis longissimus, Vipera aspis, Elaphe quatuorlineata, *comunità ofidiche, riserve naturali urbane, frammentazione dell'habitat, ecologia.*

ANFIBI E RETTILI DELLA ZONA DI PROTEZIONE SPECIALE "MONTE SAN VICINO – MONTE CANFAITO" (IT5330025 - MARCHE)

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Nell'ambito di ricerche faunistiche volte al miglioramento delle conoscenze circa la distribuzione di Anfibi e Rettili delle Marche, dal 2002 sono in corso dei sopralluoghi nella Zona di Protezione Speciale "M.te S. Vicino – M.te Canfaito". Nel 2004 il monitoraggio è stato coordinato dall'Università di Urbino all'interno del progetto "Rete Ecologica della Regione Marche".

L'area oggetto di studio, situata in Provincia di Macerata (codice sito Natura 2000: IT5330025; fogli IGM 117 III - 124 IV), si estende su di una superficie di 4707 Ha, con quote che vanno dai 490 m fino ai 1479 m del M.te San Vicino. L'area è stata suddivisa in 74 celle di 1 km di lato e il monitoraggio dell'erpetofauna, avviato nella primavera del 2002 mediante osservazione diretta, è avvenuto all'interno di 42 quadrati di studio aventi almeno il 60% della superficie compresa nel perimetro della ZPS. E' stata inoltre operata un'analisi critica delle segnalazioni bibliografiche.

Il monitoraggio dell'area, unitamente alla valutazione dei pochi dati bibliografici, ha permesso di stilare un primo elenco delle specie di Anfibi (N=12; *Salamandra salamandra*, *Salamandrina perspicillata*, *Triturus carnifex*, *T. italicus*, *T. vulgaris*, *Speleomantes italicus*, *Bombina pachypus*, *Bufo bufo*, *Hyla intermedia*, *Rana bergeri – R.* kl. *hispanica*, *R. dalmatina*, *R. italica*) e Rettili (N=11; *Anguis fragilis*, *Lacerta bilineata*, *Podarcis muralis*, *P. sicula*, *Chalcides chalcides*, *Coronella austriaca*, *Elaphe quatuorlineata*, *Hierophis viridiflavus*, *Natrix natrix*, *Zamenis longissimus*, *Vipera aspis*) segnalate per la ZPS (Tab. 1).

Quattro le specie di interesse comunitario la cui conservazione richiede la designazione di zone speciali di conservazione (Allegato II della Direttiva "Habitat" 92/43/CEE): *Salamandrina perspicillata* è stata segnalata in 1 unità di rilevamento sulle 42 complessivamente indagate (pari al 2.4%), *Triturus carnifex* è presente in 6 celle (14.3%), *Bombina pachypus* è stata rilevata in 1 quadrato (2.4%), *Elaphe quatuorlineata* in 3 (7.1%).

Il monitoraggio del sito ha permesso di acquisire maggiori informazioni circa la presenza e la distribuzione di Anfibi e Rettili, passando dalle 6 specie segnalate nel formulario standard del sito Natura 2000, alle 23 attualmente rilevate. Tre di queste (*Salamandra salamandra*, *Speleomantes italicus* e *Coronella austriaca*) non sono state osservate nel corso delle attività di campo e derivano da segnalazioni pregresse.

L'area riveste notevole interesse dal punto di vista erpetologico e sarà oggetto di ulteriori ricerche per meglio definire gli aspetti corologici, ecologici e conservazionistici di Anfibi e Rettili della ZPS.

Tab. 1. Anfibi e Rettili (N=23) della Z.P.S. "M.te S. Vicino – M.te Canfaito"

SPECIE	**PRESENZA**	**DIR. 92/43/CEE "HABITAT"**
Salamandra salamandra	$P_{(bib)}$	- - -
Salamandrina terdigitata	P	All. II – IV
Triturus carnifex	P	All. II – IV
Triturus italicus	P	All. IV
Triturus vulgaris	P	- - -
Speleomantes italicus	$P_{(bib)}$	All. IV
Bombina pachypus	P	All. II – IV
Bufo bufo	P	- - -
Hyla intermedia	P	All. IV
Rana bergeri – R. kl. *hispanica*	P	All. IV – V
Rana dalmatina	P	All. IV
Rana italica	P	All. IV
Anguis fragilis	P	- - -
Lacerta bilineata	P	All. IV
Podarcis muralis	P	All. IV
Podarcis sicula	P	All. IV
Chalcides chalcides	P	- - -
Coronella austriaca	$P_{(bib)}$	All. IV
Elaphe quatuorlineata	P	All. II – IV
Hierophis viridiflavus	P	All. IV
Natrix natrix	P	- - -
Zamenis longissimus	P	All. IV
Vipera aspis	P	- - -

Legenda
P = presenza accertata nel corso dei rilievi di campo (2002-2005)
$P_{(bib)}$ = dato bibliografico non confermato dai rilievi di campo

Key words: *Special Protection Area "Monte San Vicino – Monte Canfaito", herpetological check-list, Habitats Directive 92/43/EEC.*

V - Metodologie di raccolta e analisi dei dati

V - Sampling methodologies and data analysis

(Convenor: Sebastiano Salvidio, Alberto Venchi)

APPLICABILITÀ DELLA POPULATION VIABILITY ANALYSIS (PVA) AGLI ANFIBI: IL CASO DI *SALAMANDRA LANZAI*

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L'analisi della vitalità di una popolazione o PVA prevede la stima della sua probabilità di sopravvivenza nel tempo attraverso lo studio di fattori che la influenzano, fra cui (i) *fattori intrinseci,* quali tasso di mortalità e di natalità e la sex ratio e (ii) *fattori estrinseci,* come la disponibilità di risorse, l'interazione con altri organismi e il verificarsi di eventi catastrofici.

Allo stato attuale esistono poche esperienze di applicazione di tale metodologia in campo erpetologico. Nel presente contributo è illustrata l'applicabilità della PVA su alcune fra le principali popolazioni italiane di *Salamandra lanzai*, urodelo endemico delle Alpi Cozie, al fine di comprendere quale impatto possono avere calamità naturali e attività antropiche su questa specie, caratterizzata da una peculiare ecologia. Per le analisi è stato utilizzato il programma VORTEX, adottando alcuni accorgimenti al fine di calibrare le caratteristiche del software alla biologia riproduttiva della specie. Si presentano di seguito i primi risultati ottenuti da un modello in cui sono stati esclusi alcuni parametri, quali depressione da inbreeding o la funzione che regola la densità dipendenza, in quanto sconosciuti.

Grazie alla disponibilità di dati demografici pregressi relativi a densità, struttura d'età, sex-ratio e fecondità, ottenuti sperimentalmente su una popolazione della Val Germanasca, è stato possibile stimare l'entità del danno provocato da un'ingente alluvione verificatasi nel 2000. Le stime hanno riportato una riduzione di circa il 50% della popolazione originaria, dovuta in parte alle cause naturali legate all'erosione della piena (a cui è stato assegnato arbitrariamente il 50% del danno complessivo) ed in parte a cause antropiche riconducibili al rimaneggiamento dell'alveo in seguito all'erosione (restante 50%). L'intervento antropico è stato considerato come causa principale della perdita della naturalità e della capacità portante (-20%), recuperabili solo sul lungo periodo. L'applicazione della PVA ha restituito una previsione di ripristino dei contingenti originari valutabile in poco più di un secolo, a condizione che nel frattempo non si verifichino ulteriori catastrofi. La stessa popolazione è risultata capace di stabilire un equilibrio con il susseguirsi di catastrofi naturali come quella analizzata, aventi un tempo di ritorno di 50 anni. Detta popolazione, peraltro, non risulta invece in grado di autosostenersi se alla catastrofe naturale seguono interventi antropici di sistemazione dell'alveo e delle sponde, che ne comportano la manipolazione e l'artificializzazione (Fig. 1). In questo caso la popolazione simulata declina tendendo all'estinzione. Il modello di base ottenuto per la popolazione della Val Germanasca è stato poi applicato a due popolazioni, rispettivamente della Valle Po e della Valle Pellice, adattando il valore di alcuni parametri biologici tipici. A tal proposito sono stati creati diversi scenari per simulare gli effetti delle condizioni di rischio a cui queste popolazioni sono realmente sottoposte. La sopravvivenza della popolazione della Valle Po risulta principalmente influenzata dall'impatto con gli autoveicoli: valori di mortalità suppletivi dell'ordine dello 0.5% (quantificabili in poche decine di esemplari l'anno) sono sufficienti ad innescare il processo di estinzione. Secondo l'esito di ancora preliminari, la popolazione della Valle Pellice risulterebbe inoltre compromessa dalla separazione degli esemplari in destra orografica da quelli in sinistra

orografica, avvenuta in seguito ai pesanti lavori di sistemazione idraulica realizzati in un ambiente incontaminato di alta quota.

L'approccio metodologico offerto dalla PVA consente di quantificare gli effetti di eventi naturali e di attività umane sulle popolazioni animali in termini di probabilità di estinzione. Fornendo una previsione sulla tendenza delle popolazioni nel tempo, la PVA si pone come utile strumento di valutazione nelle scelte di gestione e pianificazione territoriale. Il metodo applicato in questo lavoro, ancora perfezionabile, consente di stabilire i limiti di tolleranza rispetto a diverse forme di disturbo che possono interessare le popolazioni di *S. lanzai*, di cui tenere conto negli specifici programmi di conservazione.

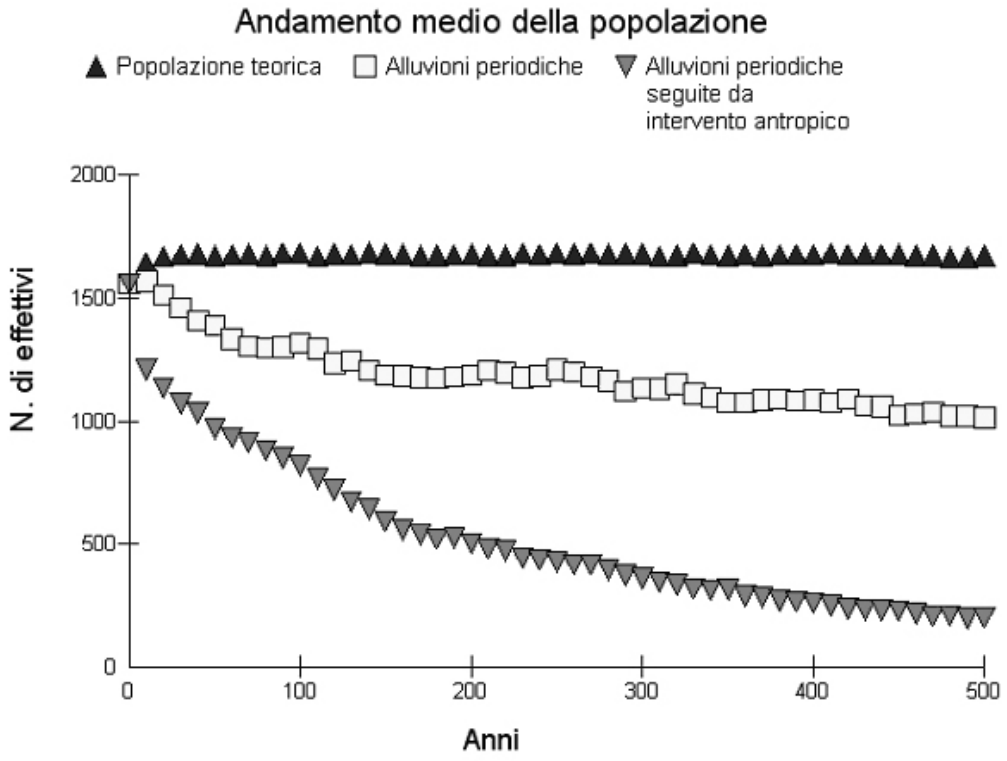

Fig.1. Andamento della popolazione della Val Germanasca in tre differenti condizioni simulate. La popolazione teorica rappresenta il modello di base sul quale sono state applicate le catastrofi derivate dalle alluvioni periodiche e dai successivi interventi antropici.

Key words: *Vortex, Amphibians, Conservation, Management.*

LOOKING FOR DISCONTINUITIES AND BREAKING POINTS IN THE RELATIONSHIPS BETWEEN SPECIES AND HABITAT

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Temporal trends, and the relationship between species distribution and habitat**,** are usually analysed via regression or generalized additive models (GAMs). Standard regression techniques and GAMs allow to test for linear or curvilinear relationships. However, not all the relationships are expected to be linear or curvilinear. For instance, theoretical models suggest the existence of thresholds in the response of species to environmental modifications. For example, species can undergo to decline when the percentage of suitable habitat falls under a given threshold value. Above this threshold, the species is apparently not affected by environmental alteration; below this threshold, species can abruptly disappear (Fahrig, 2002, Ecol. Appl. 12:346-353). Similarly, events occurring during temporal series can cause abrupt changes in the response variables. We applied Strucchange (Zeileis et al. 2003, Comput. Stat. Data An. 44:109-123), a recent a statistical tool developed for other disciplines, to the study of temporal trends and species habitat relationship in several species of amphibians and reptiles. We also compared the results of Strucchange with those of other techniques used to detect discontinuities. Strucchange detected a significant threshold pattern in the relationship between occurrence of *Triturus helveticus* in 371 ponds and the amount of forest cover (SupF = 29.603, P < 0.0001: Fig. 1), suggesting that above a given amount, increases of habitat availability do not increase species frequency. By contrast, in 77 streams monitored for *Salamandra salamandra*, Strucchange did not detect any threshold value (SupF = 8.32, P = 0.11, Fig. 1), and a nonlinear increase of the occurrence of *S. salamandra* in landscape having more suitable terrestrial habitat was the best model (F = 7.149, d.f. = 2.148, P = 0.009, delta AIC = 0.97, Fig. 1).

Strucchange can detect breaking points also in temporal series. A model allowing both abrupt thresholds and nonlinear variations was the better description of the temporal variation of nesting activity of *Eretmocheys imbricata* in a beach of Qatar; this model outperformed both classical linear models (delta AIC = 32) and GAMs (delta AIC = 12).

Strucchange always detected a significant threshold if the threshold was detected by other parametric and nonparametric tools, such as piecewise regression, AIC comparison among models and recoursive tree partitioning, suggesting that Strucchange is one of the most powerful tools available for this scope. Statistical models including discontinuities can outperform the linear and nonlinear ones, this suggest that the possibility of breaking points should be considered for a better understanding of processes influencing amphibians and reptiles; tools such as Strucchange allow for a rigorous testing and positioning of threshold values. Its availability as free software within the R environment (www.r-project.org) encourages a wider use of this method.

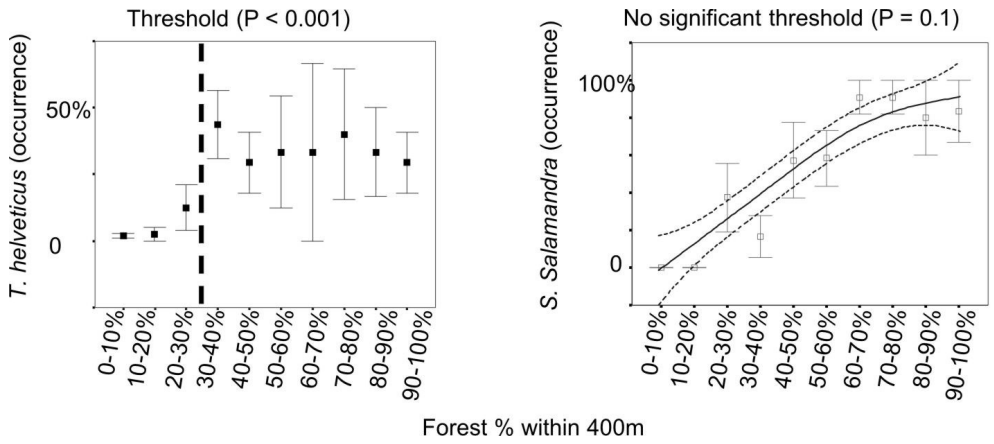

Fig. 1. Analysis of threshold in two species of urodele. For *T. helveticus*, the broken line is the position of the threshold; for *S. salamandra* it is showed the fitted GAM with 95% C.I.

Key words: *statistical methods, ecological threshold, habitat amount, temporal series.*

PHEROMONE TRAILING BEHAVIOUR IN MALES EUROPEAN WHIP SNAKE, *HIEROPHIS VIRIDIFLAVUS*: CHARACTERIZATION AND EFFECTS OF INSULARITY

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Chemical recognition of opposite sex is well documented in some snake species, but no European snake-as far we are aware-has been experimentally tested. We focused our interest on the European Whip snake (*Hierophis viridiflavus*) in order to test: i) male pheromone trailing behaviour; ii) any possible influence of geographical origin on the chemical recognition ability.
Wild males and females of European Whip snake have been collected from the Island of Montecristo (Tuscan Archipelago) and from a small area along the coast near Pisa (Western Tuscany). We built a standard Y-MAZE to present different sets of odours to different individual snakes. Individual odours have been collected using a standard lab filter paper rub on the dorsal-lateral surface of each snake. 12 males from Montecristo population have been tested in subsequent trials: 1) blank control; 2) same population female (SPF) *vs* blank; 3) same population male (SPM) *vs* blank; 4) SPF *vs* SPM; 5) opposite population female (OPF) *vs* blank; 6) opposite population male (OPM) *vs* blank;.7) SPF *vs* OPF; 8) SPM *vs* OPM. Each snake was never tested against the same odour. All trials were registered with a web cam placed near the maze.
When presented with the control maze (both arms blank), males whip snakes showed no preference for one arm over the other (2-tailed binomial test, with Exact test, P=1). In experiment 2 and 3 males responded significantly to same population snake trails (both P=0.006), while, in experiment 4, ten of 12 males followed the female trail (P=0.039). Male whip snakes from Montecristo island were able to discriminate blank from pheromones belonging to females and males of mainland population (experiments 5 and 6 respectively, both $P<0.006$); anyway, they did not show any preference for pheromone trails left by individuals of their own population when tested against males or females from mainland area (experiments 7 and 8, both $P>0.1$), even if careful observation of every single trial suggested that each snake spent more time exploring scent trails of opposite population specimens.
The ability of male Whip snakes to follow female pheromone trails most likely represents a mechanism to locate potential mates during the breeding season. Similarly, males might follow male pheromone trails in order to locate males that are near or are courting females, when a female trail is not directly present on the substrate: by initiating combat, the trailing male might be able to displace the other male and gain access to the local female. This seems particularly true if considering that, when both male and females trails were present, males Whip snakes followed the female one. Regarding the geographical origin, island males followed and recognized trails left by mainland ones when presented *vs* a blank arm of the maze, but they seemed not able to discriminate individuals of their own area with respect to individuals coming from a different area, suggesting the absence of an area effect on the production of skin pheromones in the Whip snake. Hence, the long lasting geographical isolation of insular animals (i.e. 18000 to 25000 years) presumably had no effect on the evolution of chemical signals in this species.

Key words: *Chemical recognition; Pheromones; European Whip snake; Y-Maze experiments; insular population.*

GROWTH OF *SALAMANDRINA PERSPICILLATA*: A STUDY OF FIVE-YEARS

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Salamandrina is an Italian endemic genus, only recently recognized as composed by two species: *perspicillata* (Savi, 1821) and *terdigitata* (Lacépède, 1788) (Mattoccia et al., 2005. Zootaxa, 995: 1-19; Nascetti et al., 2005. Rend. Fis. Accad. Lincei, (9) 16: 159-169). The biology of both species is poorly studied and only ecological and anatomical researches have been carried out so far (i.e., Vanni, 1981. Atti Soc. tosc. Sci. nat., Mem., 87: 135-159; Brizzi et al., 1989. Herpetologica, 45 (3): 310-322; Della Rocca et al., 2005. Herp. J., 15: 73-78). Little is known about their demography and growth and only a few studies exist on this topic. Our contribute is the first attempt to describe the growth in *S. perspicillata.* For years it was assumed that body size and age were strictly correlated in amphibians and reptiles because of their indeterminate growth. A review on this topic (Halliday & Verrell, 1985. J. Herp., 22(3): 253-265) evidenced that there is considerable variability in the degree of this correlation depending on the species and sex. An analysis on *S. perspicillata* growth was performed through a size-frequency method, based on a preliminary sheletochronological study on *S. perspicillata* assessing that there is significant correlation between age and body size (SVL) and that sexual maturity is reached after four years (Bovero et al., 2005. 66° Congr. Naz. Unione Zoologica Italiana, Riassunti: 142).

The studied population (on which ecological studies were carried out in the past - see Della Rocca et al, 2005. Herp. J., 15: 73-78), inhabiting a perennial stream in the Insugherata Regional Reserve (Rome province, Italy), was monitored for five reproductive seasons (2000-2004) with a daily sampling frequency. The sexes are indistinguishable morphologically (Brizzi et al., 1989), but only females are aquatic during the oviposition phase (Lanza, 1983. C.N.R. AQ/1/205, Verona; 196 pp). As a consequence, all specimens found in the water were considered adult females older than four years. Polymodal diagrams of the frequencies distribution, built using snout-vent lenght (SVL) of all captured specimens (dimensional range of 1 mm), were processed with FiSAT program (FAO-ICLARM Stock Assessment Tools). This program allows breaking up the length-frequency distribution in different Gaussian components using Bhattacharya's method (1967. Biometrics, 23: 115-135), which evaluate the population structure in terms of age classes or cohorts in which it is divided. We analysed the obtained population structures when the Gaussian curves presented a separation index (S.I.) > 2, as stated in previous studies (see Clark, 1981. Can. J. Fish. Aquat. Sci. 38: 297-307). The mean values of each component were used in order to describe the potential growth evaluating the parameters ($L\infty$, k, t_0) of von Bertallanfy's equation by ELEFAN-I (Electronic Length Frequency Analysis) method.

For the analysis we considered a total of 478 females of *S. perspicillata* (N_{2000}: 77; N_{2001}: 92; N_{2002}: 32; N_{2003}: 121; N_{2004}: 156). The average SVL of the studied population was 37.4 ± 3.1 mm (mean ± st. dev.) with a minimum and maximum SVL respectively of 28.9 and 46.0 mm. The average SVL in each year was: 3.82 ± 0.35 mm in 2000; 3.69 ± 0.32 mm in 2001; 3.70 ± 0.25 mm in 2002; 3.80 ± 0.25 mm in 2003; 3.70 ± 0.32 mm in 2004. In order to estimate the SVL of the first year age class, 16 neo-metamorphosed specimens were collected and measured (average SVL = 11.3 ± 0.6 mm). Our sample was representative of four age classes in 2000 and 2004, and three age classes in 2001-2003. The age classes obtained and correspondent average SVL are reported in table 1.

Tab. 1. Age classes of the *S. perspicillata* population in the five studied years. AC = Age classes; n = theoretics class population for each age class.

Year	2000			2001			2002			2003			2004		
AC	SVL	n	st.dev.	SVL	n	st.dev.	SVL	n	st.dev.	SVL	n	st.dev.	SVL	n	st.dev.
4	32.87	13	0.95	33.87	35	1.34	33.5	7	0.95	33.17	7	0.69	34.6	71	1.88
5	38.29	51	1.92	38.85	53	1.1	37.24	18	1.49	38.76	38	1.35	38.25	77	1.12
6	42.85	14	0.59	42.5	5	1.37	41.5	3	0.79	42.67	27	0.52	41.54	19	0.77
7	45.5	2	1.03	-	-	-	-	-	-	-	-	-	44.53	3	1.08

The growth curves obtained by ELEFAN-I are reported in Fig. 1. Seven age classes were estimated and the last four lines (4-7 age classes) intercepted the Length axis in correspondence of the mean values of each class. The k and L∞ values which described the growth curve were 0.32 year^{-1} and 51.6 mm respectively.

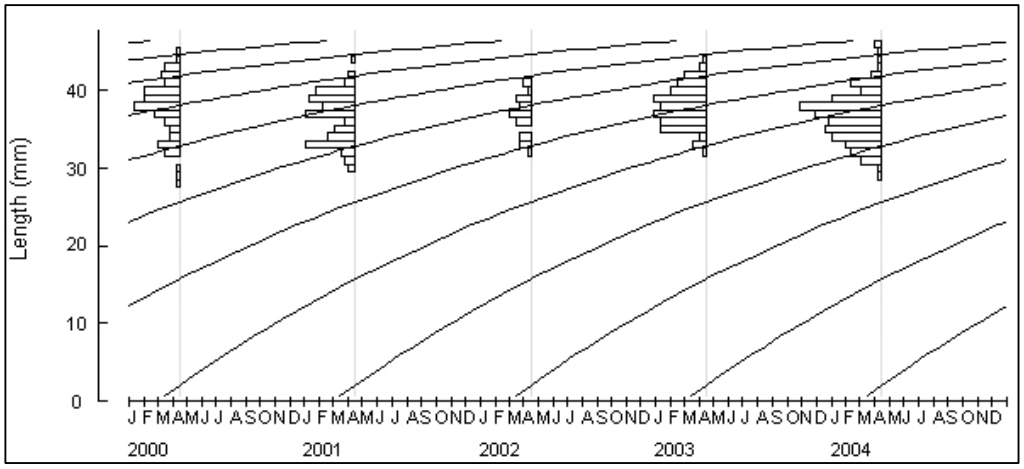

Fig. 1. Growth curves in the studied population of *Salamandrina perspicillata*. A single curve links two or more following yearly histograms.

This first attempt to describe the growth rate in *Salamandrina perspicillata*, based on the body size, revealed that the reproductive females are represented by four age classes, from the fourth year to the seventh. In our sample the age classes four and five (26.2% and 56.6% of the class population) were more conspicuous than the others and the class seven was represented by very few individuals (2.5 %). The average SVL through the studied seasons did not show any trend with an apparently random variation from a year to another and this indicated that in the studied population the recruitment of new reproductive females was balanced by the death or the end of reproductive activity of the older specimens. The k value, although there are no previous studies for comparison, seems to be characteristic of low growth rate species.

Key words: Salamandrina; *size-frequency method; sheletochronological study.*

AMPHIBIANS AND REPTILES IN ROME: IS THE URBANIZATION OF A BIG CITY COMPATIBLE WITH THE DISPERSION OF A SPECIES-RICH HERPETOFAUNA?

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Although Rome is one of the greenest European cities, it is largely affected by anthropogenic disturbance, leading many species to the edge of local extinction. As an answer to the environmental degradation and the constant decrease of biological and landscape diversities, the Municipality of Rome, together with the Biology Department of Roma Tre University, worked on the planning of an ecological network. This study is part of this wide project, the chosen model vertebrate groups being amphibians, reptiles, birds and mammals.
In the last decades, many studies have been conducted on amphibian and reptile species of Rome, allowing the creation of a geo-referenced database and the realization of two atlases at regional (Lazio) and city (inside the peripheral highway of Rome, G.R.A.) scale (Bologna et al., 2000. Fratelli Palombi Editori, Roma, 160 pp.; Bologna et al., 2003. Stilgrafica, Roma, 112 pp.). In the territory of the Municipality of Rome 11 amphibian and 16 reptile species are present, of which 9 and 15, respectively, within the G.R.A.
The aim of this study was to assess the suitability of urban green spaces for amphibians and reptiles and to highlight the degree of habitat fragmentation in terms of structure, connectivity and faunistic composition.
Since urban areas are considered to have the same basic ecological patterns and processes than other ecosystems, they were studied using existing ecological theories. The study zone is the entire Municipality of Rome, Lazio, with an area of 128.500 ha. Compared to the other European capitals, Rome has the largest network of protected natural areas, accounting for 31% of the total surface (Bologna et al., 2003). With the aim of reaching a greater level of detail, four sample zones were chosen inside the G.R.A., constituted by single green areas bounded by physical barriers (the matrix: major roads, highways and large waterways, buildings) to the migration of flora and fauna (Rudd et al., 2002, Restoration Ecology, 10: 368-375). Green spaces can be considered as patches that differ in appearance from the surrounding landscape matrix (urban in our study), resulting from the fragmentation of the original habitat. Different indexes (structural, connectivity, faunistic) were developed to assess the suitability of the patches (green spaces) for the herpetofauna in four sample zones chosen inside the G.R.A. Records on amphibian and reptile species distribution used for this study derived from a georeferenced herpetofaunistic database constituted by original samplings and previous faunistic researches. Seven amphibian and eleven reptile species were selected as target species, because of their high matrix unsuitability, on which analyses have been performed. Each target species was characterized in terms of its degree of ecological plasticity (euriecious vs. stenoecious) and an estimate of species-specific vagility capability was done dividing the species in three vagility categories: sedentary, medium dispersive and high dispersive. G.I.S. analyses were performed at first in defining the structural parameters of the green areas. The distribution data were used to estimate the species-rich areas for both amphibians and reptiles. Furthermore, the land use map and the species distribution layers were overlapped in order to get species- and classes-suitability maps, attributing a suitability score to each polygon (corresponding to the fourth level of Corine Land Cover categories) five level of increasing suitability (0-4). In order to estimate the potential species-specific connectivity of the study area a sequence buffer processes (the diameter of the buffer depending of the species-specific vagility capability) were performed on the polygons of

higher suitability (levels 3-4) containing known data of species presence: the polygons of high suitability covered by each new buffered area were selected and added to the previous set of polygons forming a new area of connected polygons that underwent to a new buffer process. When no high suitability polygons were covered by the last buffer area, the buffer process lasted individuating the area of potential dispersion for the selected species.
The species-richest areas fall in protected areas (regional and suburban parks) or urban artificial green spaces (i.e. Villa Doria Pamphilj, Villa Borghese) confirming the fundamental role of protected areas especially in urbanized contests in maintaining a high level of environmental complexity that allowed the presence of high diversified herpetofaunistic assemblages. Further, protected areas had the highest overall values determined by the different applied indexes. The analysis of connectivity highlighted a compromised situation for most species because of the very high fragmentation level characterizing almost all the green spaces within the G.R.A.

Key words: *ecological network, urban habitat, amphibians, reptiles, Rome*.

MODELLING THE POTENTIAL WESTERN RANGE OF THE MEADOW VIPER, *VIPERA URSINII*

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The possibility to predict the potential distribution of the species is very helpful to support the decision making process for biodiversity conservation, but is also a starting point for the formulation of biogeographical hypotheses. Several methods to elaborate models of environmental suitability using the relation between the species' sites of known presence and the environmental factors observed at those sites have been developed in the past (e.g. Guisan & Zimmermann, 2000, Ecol. Model. 135: 147–186; Raxworthy et al., 2003, Nature, 426: 837-841; Robertson et al., 2003, Ecol. Model. 164: 153–167).

In this paper we analyse the known locations of *Vipera ursinii* to assess its potential distribution. Geographic coordinates were assigned to all known sites of *Vipera ursinii* (264 localities): 43 in central Italy and 221 in south-eastern France. The data set was then divided in two random subsets, of which one (50% of the data) was used as training set to develop the models and the other (50% of the data) was kept for the validation process together with an equal number of points randomly generated within the study area.

Using DIVA-GIS (http://www.diva-gis.org/), the first subset was overlapped with the bioclimatic data of WorldClim (http://www.worldclim.org/) and used to define the bioclimatic envelope of the points. The bioclimatic envelope was then used to select suitable area within the study area following the BIOCLIM algorithm (Nix, 1986, in: Longmore, Austral. Gov. Publ. Serv.). Based on its original formulation, BIOCLIM uses 19 climatic variables derived from the monthly precipitation and mean, minimum, and maximum temperature. Version 1.4 of WorldClim provides interpolated climate surfaces for all of the 19 variables at a spatial resolution of 30 arcsec (about 1 km) for the 1950-2000 period. The resulting distribution model identifies five classes of environmental suitability: defining as excellent the pixels with values of the considered variables comprised between the 20^{th} and 50^{th} percentiles of the observation points, very high areas are between the 10^{th} and the 20^{th} percentiles, high between the 5^{th} and the 10^{th} percentiles, medium between the 2.5^{th} and the 5^{th} percentiles and low between 0 and the 2.5^{th} percentiles.

Models were first developed independently using the 19 variables. The 19 models obtained were validated assigning the predicted habitat suitability values to the tested subset and to the random points. The assigned values were compared producing a ROC (Fielding & Bell, 1997, Environ. Conserv. 24: 38–49) and deriving the relative AUC value (Faraggi & Reiser, 2001, Statist. Med. 21: 3093–3106), and also calculating the Kappa statistics (Cohen, 1960, Educ. Psychol. Meas., 1960: 37-46). The two variables which produced the models with the highest AUC and Kappa values were jointly used to elaborate the definitive map of potential distribution. This final model was also validated using the same procedure of the separated models.

The distribution of the Italian and French populations of *V. ursinii* appears to be mainly affected by the maximum temperature of warmest month (AUC = 0.942; Kappa = 0.821) and the

temperature annual range (AUC = 0.940; Kappa = 0.828) that, used together, produced a final model (Fig. 1) with very high levels of accuracy (AUC = 0.988; Kappa = 0.952).
The final model shows that, from the climatic point of view, the potential presence of *V. ursinii* is not limited to the few massifs of Central Apennines and French pre-Alps where the species has been observed. The model shows potentially suitable areas in some parts of the Northern and Southern Apennines, and on both the Northern and Southern slopes of the Central Alps. Apart from the unlikely possibility of the species being there and not having been observed, its absence in such areas should be explained with causes different from climatic variability. A potential factor for the presence/absence of this viper, not examined in this contribution, is the availability/density/distribution of its main prey, the non-flying orthopterans (Luiselli & Agrimi, 1992, Herpetol. J. 2: 37-42).

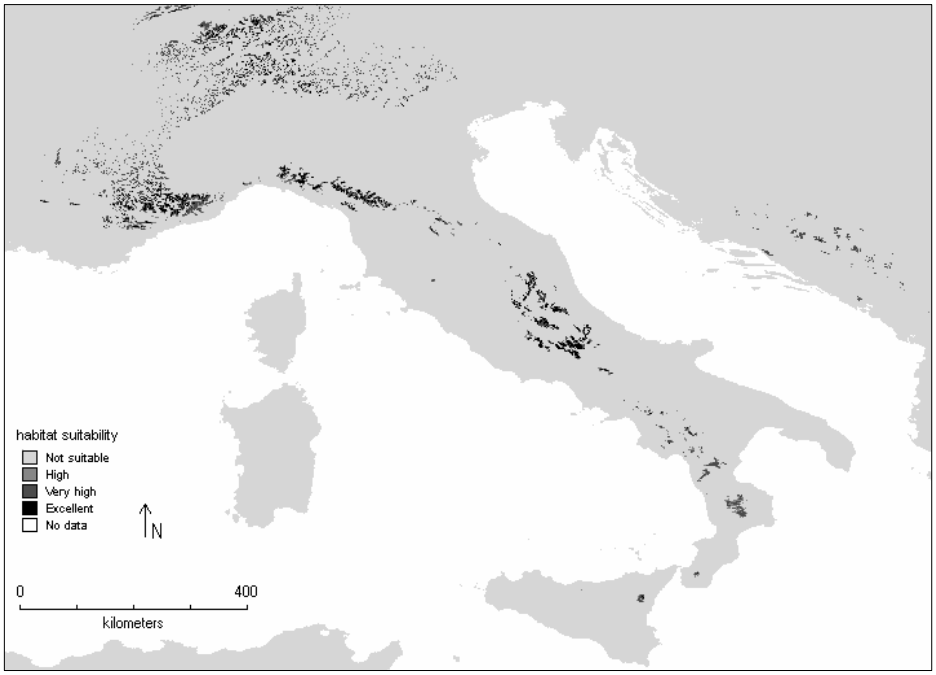

Fig. 1. Climatically suitable areas for the presence of *Vipera ursinii*.

Key words: *meadow viper, BIOCLIM, habitat suitability models, potential distribution.*

STABLE FEMALE, UNSTABLE MALE: ABOUT THE PLASTICITY OF THE TURTLE MODEL

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Several hypotheses have been postulated to explain the evident differences between male and female in all studied turtle and tortoise species. Habitat, diet, habitus of most studied taxa provided important correlations with the overall carapace shape or the head and/or skull shape (e.g. Claude et al., 2003, Biol. J. Linn. Soc. 79: 485–501). We selected two similar *Testudo* species (*T. graeca, T. hermanni*,), to verify if and how differences could be related to abiotic and/or biological features.

We used 18 standard measurements of shell (Zuffi et al., 1999, J. Zool. Lnd, 247: 139-143), fore and hind limbs, head and tail of 75 museum specimens (14 males 6 females *T. graeca*; 28 males 27 females *T. hermanni*); not normal data were log transformed prior to analyses. We tested firstly general differences between sexes for each species, then we analysed separately males of the two species, and females of the two species; ANCOVA procedure was then applied for all dependent variables, selecting sex or species as factor and alternative variables in turn (e.g. carapace length, carapace heigth) as covariate. A Principal Component Analysis (PCA) was finally used to reduce to a few variables the large amount of single factors.

Seven parameters out of 18 in *T. hermanni* (e.g. plastron length, carapace height) and two out of 18 in *T. graeca* (anal divergence, tail length) resulted as sexually dimorphic (Student t test, 34 to 51 df, P ranging from 0.004 to <0.0001 in *T. hermanni*; 9 and 14 df, P = 0.014 and 0.019 in *T. graeca*).

PCA selected two components, with most morphometric features of carapace (bridge length the most important) in the first component and anal divergence in the second component. Males are all placed in the upper position of the graph (Fig. 1, on the left *T. hermanni*, on the right *T. graeca*), with a larger anal divergence with respect to females. Females are placed in a similar manner in the lower central portion of the graph. It is relevant the contrasted pattern found in the two species. On average, males of both species show a more marked anal divergence than females; males of Hermann tortoise show lower carapace and plastron measures than females, while Moorish tortoise males have higher carapace measures than females.

It clearly emerges how Sexual Size Dimorphism is very evident in *T. hermanni* while is much less evident in *T. graeca*. Furthermore we found that the bridge length, a parameter never considered in literature (see Willemsen & Hailey, 2003, J. Zool. Lnd., 260: 353-365), plays a determinant role in separating sexes and species. A short bridge in male turtles favours a larger open space for leg movement, while a long bridge in females determines a narrower space. The larger space in males is well correlated to enhanced performance in courtship and in malemating combats (Zuffi unpubl.). Female tortoise morphology is somewhat a stable characteristic typical of an egg carrying organism: females produce clutches from one to two times per year, with eggs markedly constant in size (Optimal Egg Theory), during a long life span of at least 40-45 years, suggesting how a relatively similar morphology in female *Testudo* belonging to different species is not so improbable and may represent a suitable adaptive character. Males of *T. graeca* usually court females with strong hints with the gular shields on the posterior side of female carapace and with a pre-mount behaviour before actual copulation. *T. hermanni* bites frequently the hind legs of the females, then he mounts directly on female carapace, performing such an action for long time before copulation. We hypothesise that the observed differences of the overall body

size, particularly in males, and the known different reproductive strategies, in *T. graeca* and *T. hermanni*, represent a self explanatory frame, highlighting how an apparently stable figure (i.e. the turtle model), shows a wide range of possible adaptive patterns (e.g. larger males vs smaller males vs similar females), while many of them are likely still to be discovered.

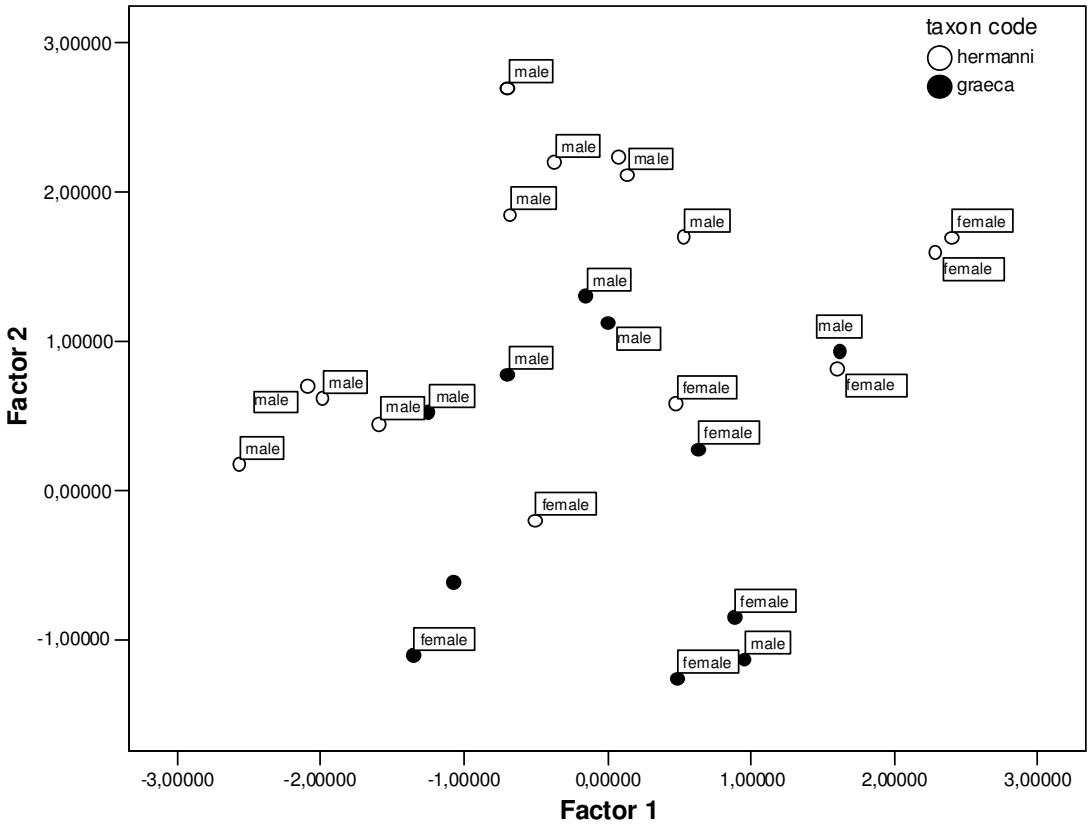

Fig. 1.

Key words: *biometry*, Testudo graeca, Testudo hermanni*, SSD, phenotypic plasticity*.

IS COLOUR PATTERN A VALID CHARACTER TO DISCRIMINATE BETWEEN *SALAMANDRINA PERSPICILLATA* POPULATIONS? A PRELIMINARY IMAGE ANALYSIS (AMPHIBIA, SALAMANDRIDAE)

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The genus *Salamandrina* (Fitzinger, 1826), which includes *S. perspicillata* (Savi, 1821) and *S. terdigitata*, is unique to peninsular Italy. Both species have an individual white/black/red ventral colour pattern that stills invariable troughout the salamanders' life. In order to understand whether individuals of the same population share any traits of their colour pattern, we analyzed 188 individuals from five populations: 33 from Rio Riazzo (RR), Alessandria, 32 from Valle Scupiccia (VS), Ancona, 35 from Casina Mainarde (CM), Frosinone, 53 from Acqua della Chiesa (AdC) and 35 from Ciccopano (CI), Latina. The latter two sites are in the Monti Lepini. Size and configuration of each individual was uniformed *via* geometric morphometric landmark and semi-landmark approach. Colours where uniformed into three pure colours (black, white and red). Standardized images where used to extract the common colours in the images of superimposed individuals from each population. Besides, a chi-square individual distances matrix was extracted from the pixel-by-pixel colour comparison of the standardized images and then a non-metric Multidimensional Scaling was applied.
The plot from the nmMDS does not reveal well separated clusters, but a) the close populations of AdC and CI have more similar ventral patterns; b) the RR population are less similar to the AdC and CI population, but c) are more similar to VS and CM populations. The comparison between the images of the superimposed individuals from the same population show that there are no areas of similar colour on the trunk, but the individuals of the same population share similar patterns on the head and cloacal regions, which are different amongst populations.
The head and cloacal colorations are conservative in all groups, showing differences among populations, whereas on the thorax there are no constant colour patterns. This preliminary investigation shows that the colour pattern analysis is a promising method to discriminate between *Salamandrina* populations, although at present, both the analytical and statistical approaches need to be widened and improved.

Key words: Salamandrina*, ventral colour pattern, image analysis.*

A NEW MEDITERRANEAN STATION OF *SPELEOMANTES STRINATII (AMPHIBIA, PLETHODONTIDAE),* FIRST DATA ON POPULATION STRUCTURE AND HABITAT CHARACTERIZATION

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The studied population of *Speleomantes strinatii* inhabits an artificial tunnel in a limestone quarry near Pietra Ligure (Liguria, NW Italy), characterised by a Mediterranean climate. Preliminary data on its ecology are showed to promote a conservation program supported by Savona Province, Pietra Ligure Municipality and Speleological Group "A. Issel".
Counts of *Speleomantes strinatii* were carried out in 18 occasions from June to September 2004. Temperature and Relative humidity were recorded during each visit in four points, starting from the entrance to the inner part of the tunnel. Sex, age class, length from the edge of the snout to the posterior end of the cloacae (SVL) and distance from the entrance were recorded for each specimen. A temporary removal experiment was conducted in July 2004 to estimate population size. Salamanders were captured in three occasions, and held in boxes, maintaining juveniles separated from adults. To estimate population abundance the generalised removal model of the software CAPTURE® (White et al., 1982, Los Alamos National Laboratory 8787 NERP) was used. The polymodal body-size distribution was analysed with FiSAT sofware (Gayanillo et al, 1995, FAO Computerized Information Series 8).

A total of 307 observations were made between June and September 2004. The highest number of salamanders for a one-day sampling was 37 (July 2004). A total of 60 different salamanders were collected during the removal experiment in the 2004: 21 juveniles, 10 sub-adults and 29 adults, with an equilibrated sex ratio. The population estimated size was 83 ± 16.9 specimens, with a constant capture probability of 0.346. The population structure seemed to correspond to three age classes. In fact, smaller specimens (19-39 mm) corresponded to juveniles while specimens longer than 55 mm were adults. Specimens with SVL in the range 43 - 55 mm, were probably sub-adults (i.e. large immature specimens).
Juveniles seemed to prefer the area in proximity of the entrance up to 10 m with 19 specimens observed in this region (95%). Eighty percent of the juveniles were found under stones on the cave floor. Adults were concentrated in the deepest part of the tunnel, with the 85% of them distant more than 10 m from the entrance. Adults were always observed on the cave walls. Two adults were found under rotten wood about 80 meters out the cavity in occasion of our last visit in September 2004.
Our preliminary study showed the presence of a *Speleomantes strinatii* population composed by 83 specimens, which were grouped into juveniles, sub adults and adults. This demographic structure is not different from others that have been observed in Apennine populations (Salvidio, 1993, Herpetological Journal, 3: 55-59; Salvidio et al., 1994, Amphibia-Reptilia, 15: 35-45). Apparently this cave salamander population is well adapted to both the Mediterranean climate and the artificial environment, as on average 26 specimens per visit were recorded. The abundance of juveniles was lower than adults in every sampling occasion and they were generally found near the entrance, as already reported in another artificial cavity (Salvidio & Pastorino, 2002, Amphibia-Reptilia, 23: 505-510). This first study is not certainly exhaustive, due to the short period considered. However, several conservation priorities were documented in consideration of the site fragility and its anthropic origin. Thus a conservation programme was elaborated in collaboration with the local

administration of Pietra Ligure, the Province of Savona and the Speleological Group "A. Issel".

Key words**:** Speleomantes strinatii*, population structure, conservation.*

ACCRESCIMENTO IN *SALAMANDRINA PERSPICILLATA*

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La biometria di *Salamandrina perspicillata* (Savi, 1821) (sub *Salamandrina terdigitata*) è stata studiata da vari autori. Tuttavia non esistono studi sulle modalità di accrescimento nello stadio adulto che, come nell'ontogenesi, può essere isometrico o allometrico. Questo studio intende analizzare le modalità di accrescimento in femmine adulte di *Salamandrina perspicillata*.
Sono state misurate con calibro manuale (precisione a 0.1 mm) la lunghezza muso cloaca (SVL), la lunghezza totale (TL) di 330 femmine adulte di *S. perspicillata* provenienti da 4 popolazioni laziali della catena dei Volsci (siglate con PER, FIC, ACQ, ANT) e da una popolazione toscana (STA). Per differenza è stata ottenuta la lunghezza della coda (LC). È stata poi calcolata la correlazione non parametrica appropriata tra TL e LC/SVL (correlazione Gamma nel caso di dati con molti valori identici (*ties*) oppure correlazione di Spearman quando non così) sia sommando tutti i dati che separatamente nelle 5 popolazioni. È stato poi applicato il test di Kruskall-Wallis per verificare se esistevano differenze significative tra le mediane dei gruppi analizzati.
La correlazione risulta significativa sia per i dati accorpati ($G=0.24$, $P<0.001$, $N=330$) che entro le diverse popolazioni (PER $G=0.22$, $P<0.001$, $N=150$; FIC $G=0.34$, $P<0.001$, $N=71$; ACQ $G=0.21$, $P=0.018$, $N=59$; ANT $r=0.46$, $P<0.01$, $N=30$; STA $r=0.45$, $P<0.05$, $N=20$). Il test di Kruskall-Wallis è risultato altamente significativo sia per SVL che per TL ($H_{4,330}=82.27$, $P<0.001$; $H_{4,330}=93.29$, $P<0.001$, rispettivamente).
L'allometrìa è il cambiamento della forma o delle proporzioni corporee con l'incremento di taglia mentre l'isometrìa è la costanza di tali paramenti con l'accrescimento (e.g. Alberch et al., 1979, Paleobiology, 5(3), 296-317). Nel nostro caso, in presenza di accrescimento isometrico, il rapporto LC/SVL, che ha una distribuzione differente rispetto alla TL, avrebbe dovuto rimanere sufficientemente costante così da non evidenziare alcuna significatività nella correlazione. Al contrario, la correlazione positivamente significativa suggerisce che con l'aumento della TL dell'adulto la parte del corpo che proporzionalmente aumenta di più è la coda. I valori biometrici sono stati misurati esclusivamente su femmine riproduttive (catturate in acqua durante la deposizione delle uova). La tendenza ad un accrescimento allometrico in *Salamandrina perspicillata* appare dunque fortemente supportata per le femmine adulte di questa specie. Inoltre essendo verificata per tutte le popolazioni esaminate una correlazione positivamente significativa tra TL e LC/SVL e risultando significativo anche il test K-W (le popolazioni hanno biometrie differenti), appare lecito asserire che l'accrescimento allometrico sia caratteristica indipendente dalle dimensioni assolute degli animali. Ovvero tale trend di crescita non si verificherebbe una volta raggiunte determinate dimensioni assolute ma apparirebbe delinearsi come caratteristica delle femmine adulte di ogni popolazione.

Key words: *Salamandrina, allometric growth*

VI - Ecologia e conservazione degli Anfibi

VI - Ecology and conservation of Amphibians

(Convenor: Giuseppe M. Carpaneto, Richard Griffiths)

ATTIVITÀ TERRESTRE DI *SALAMANDRINA PERSPICILLATA*: DISTRIBUZIONE SPAZIALE E TEMPORALE

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Le notizie sul comportamento di *Salamandrina* sono per lo più frutto di osservazioni sporadiche ed occasionali e niente si sa circa l'utilizzazione dello spazio. Qui si presentano i risultati di indagini condotte su *Salamandrina perspicillata* (Savi, 1821), con cadenza mensile fra ottobre 2003 e aprile 2005 nel sito di Ciccopano (Monti Lepini, Lazio), dove la specie ovidepone in autunno e in primavera (Angelini et al., 2001, Pianura 13: 105-108). Un'area di circa 32 x 28 metri attorno al sito di ovideposizione (una pozza di risorgiva di circa 25 litri di capacità) è stata ispezionata, secondo un percorso fisso, ogni 3 ore, a partire dalle 18:00 (ora solare) e fino alle 6:00 del giorno successivo. Di ciascun individuo incontrato durante il percorso, riconoscibile dalla fotografia ventrale, è stata rilevata la posizione tramite coordinate trigonometriche. Sono stati considerati soltanto gli individui attivi sul terreno scoperto.

Nel corso di 20 campionamenti notturni sono stati censiti 184 individui, dei quali 75 sono stati riavvistati fra 1 e 9 volte, per un totale di 338 contatti. L'attività sul terreno è stata registrata fra l'inizio di ottobre e l'inizio di aprile, con una pausa di circa due mesi fra dicembre e febbraio ed è approssimativamente coincisa con la stagione dell'ovideposizione. Il maggior numero di individui è stato registrato fra le 18:00 e le 24:00 (2003-2004: $\chi^2 = 59.2$; df = 4; $P < 0.001$; 2004-2005: $\chi^2 = 34.28$; df = 4; $P < 0.001$), quando, complessivamente, si è avuto più del 60% dei contatti. È stato applicato il test del χ^2 alle tabelle di contingenza "fascia oraria –notte di campionamento" (2003-2004: $\chi^2 = 65.5$; df = 24; $P < 0.001$; 2004-2005: $\chi^2 = 51.32$; df = 16; $P < 0.001$), e l'analisi dei contributi al χ^2 generale consente di mettere in evidenza che a) nelle fasce orarie in cui piove si osserva un minor numero di individui attivi, al contrario di quello che si osserva nelle fasce orarie immediatamente successive (senza pioggia); b) le salamandrine non sono attive con temperature inferiori a 4°C; c) l'attività comincia prima tanto più precoce è il tramonto, e viceversa. Gli individui si distribuiscono attorno al corpo d'acqua in modo non casuale (test di Rayleigh, Z = 202.26; $P < 0.001$); la loro attività, infatti, si svolge soprattutto in una zona in cui sono presenti alcune piccole cavità nel terreno roccioso (28, 9% dei contatti) e in prossimità della pozza riproduttiva (23.2% del totale dei contatti). La distanza dei singoli individui dalla pozza tende ad aumentare con l'avanzare della notte (ANOVA modello misto $F_{4,354.4} = 2.47$; $P < 0.05$; distanza media minima, alle 18:00, m 6.04; massima, alle 6:00, m 8.37) ed è complessivamente maggiore in primavera (m 7.4±0.3) che in autunno (m 6.4±0.2) (ANOVA modello misto $F_{1,296.8} = 3.99$, $P < 0.05$). 42 individui sono stati avvistati due volte nell'arco di una stessa notte. Al secondo avvistamento, questi si erano spostati ad una distanza media di m 1.8±0.5 (i = m 0 - 17) dal punto di cattura iniziale (il 59.5% si è spostato entro un metro). Considerando tutti gli individui catturati più di una volta nella stessa notte, nella stessa stagione riproduttiva e da un anno all'altro, la massima distanza fra i due punti di registrazione più lontani è in media 4,4±0,6 metri (n = 73; i = 0-21; un individuo è stato catturato nello stesso punto dopo 2 mesi). Ciascuno di 9 individui catturati almeno 2 volte sia nel 2003-2004 sia nel 2004-2005 ha mostrato home range nei due periodi ampiamente sovrapposti.

In conclusione, l'inizio della stagione autunnale di ovideposizione e della ripresa dell'attività su terreno scoperto dopo l'estate sono quasi coincidenti. L'attività giornaliera di questa popolazione si svolge principalmente nella prima parte della notte, come pure riportato per un'altra popolazione da Utzeri et al. (2004, Herp. Bull. 90: 27-31), ma risulta depressa dalla pioggia. La

ridotta estensione degli home range e la loro sostanziale sovrapposizione negli anni suggeriscono una marcata residenzialità.

Key words: Salamandrina*, land activity, home range.*

IL DOPPIO PERIODO DI OVIDEPOSIZIONE IN *SALAMANDRINA PERSPICILLATA*: CORRELATI ECOLOGICI

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Salamandrina perspicillata (Savi, 1821) ovidepone tipicamente in tardo inverno-primavera. Tuttavia, in alcuni siti dei Colli Albani e della Catena dei Volsci (Lazio), l'ovideposizione si verifica sia in primavera che in autunno. Al fine di comprendere i correlati ecologici di questa peculiarità, abbiamo effettuato il censimento e registrato le date di ovideposizione e la lunghezza muso-cloaca delle femmine di 9 siti dell'Italia centrale, indagati fra il 1996 e il 2005; abbiamo rilevato le dimensioni e l'idroperiodo di 100 potenziali siti riproduttivi dei Monti Lepini, 72 dei Monti Lucretili e 57 dei Colli Albani. Di 15 siti dei Monti Lepini abbiamo eseguito una analisi fisico-chimica dell'acqua e la valutazione dei BOD (Biological Oxygen Demand).

Popolazioni di salamandrina sono state registrate in 73 siti, in 18 dei quali l'ovideposizione avviene sia in autunno (settembre-dicembre) che in primavera (febbraio-maggio), dando origine a due distinte coorti larvali. Uno di questi ultimi siti è un torrente a debole scorrimento, mentre gli altri sono corpi d'acqua ferma. I siti in cui l'ovideposizione ha luogo sia in autunno che in primavera contengono significativamente meno acqua che quelli in cui l'ovideposizione è esclusivamente primaverile (m^3 0.8±0.3 versus m^3 3.2±0.7; $U_{44,17} = 216.5$; $P < 0.05$). Tra i siti con doppio periodo di ovideposizione, la proporzione di quelli temporanei è superiore a quella dei permanenti ma in modo non significativo ($\chi^2 = 3.62$; df = 1; P = 0,057). Un test ANOVA per misure ripetute rivela che il BOD dei siti a ovideposizione primaverile (N = 9) varia in modo differente da quello dei siti a doppia ovideposizione (N= 6): nei primi diminuisce da febbraio a maggio e ancora a dicembre, nei secondi a febbraio e a dicembre presenta valori simili tra loro e simili ai valori di febbraio dei siti a deposizione singola ($F_{2,22} = 12.41$; $P < 0.001$). Dalle indagini popolazionali è risultato che: (1) nei 3 siti con doppio periodo di deposizione si sono riprodotte femmine di dimensioni fra loro simili e maggiori rispetto a quelle dei siti ad ovideposizione primaverile (ANOVA $F_{8,2452} = 258.8$; $P < 0.001$; test post-hoc di Spjotvoll/Stoline: $\alpha = 0.05$); (2) le densità massime annuali delle femmine nei siti con doppio periodo di ovideposizione sono comprese fra 0,2 e 0,8 femmine/litro, mentre quelle dei siti con periodo singolo (primaverile) sono comprese fra 0.01 e 0.1; (3) le femmine hanno anticipato di anno in anno la data di deposizione; e (4) le femmine che hanno ovideposto in autunno non hanno ovideposto anche nella primavera successiva.

Il doppio periodo riproduttivo è statisticamente legato solo in modo marginalmente significativo ai siti temporanei e infatti non è esclusivo di questi. Nei siti di piccole dimensioni e ad alta densità di femmine, la diluizione dell'ovideposizione in due stagioni probabilmente diminuisce la competizione tra larve conspecifiche, aumentando il tasso di sopravvivenza sia delle larve primaverili che di quelle autunnali e aumentando il successo riproduttivo delle femmine. Poiché le femmine depongono sempre più precocemente di anno in anno, se in questi siti il BOD (indicatore del livello di produzione organica) in autunno ha livelli simili a quelli primaverili, le femmine più grandi (e più anziane), che hanno anticipato per più anni la data di ovideposizione, possono riprodursi con successo anche in autunno. Nei siti di dimensioni maggiori e a bassa

densità di femmine, nei quali non si verifichi affollamento larvale e/o la produzione organica autunnale sia bassa, l'ovideposizione autunnale non è favorita.

Key words: Salamandrina*, oviposition period, breeding density, B.O.D.*

PREDAZIONE DI UOVA DI *SALAMANDRINA PERSPICILLATA* DA PARTE DI IRUDINEI

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La mortalità degli stadi giovanili degli Anfibi è fortemente condizionata dalla predazione (e.g. Duellman & Trueb,1986, Biol. of Amph., McGraw-Hill Book Co., NY). Viene qui riportata per la prima volta la predazione su uova di *Salamandrina perspicillata* (Savi, 1821) da parte di sanguisughe.

Dal 2003 al 2006 è stata documentata regolarmente la predazione da parte di sanguisughe di grossa taglia su uova di salamandrina in un sito riproduttivo sui Monti Lepini (Lazio meridionale) costituito da un fontanile-abbeveratoio. In una singola data di campionamento nel maggio del 2004 venivano contate le sanguisughe presenti nel sito attraverso il metodo della rimozione ed un esemplare veniva portato in laboratorio per il riconoscimento a livello specifico. Inoltre, un ramo sommerso ricoperto di uova di salamandrina è stato posto in un box trasparente ed è stata effettuata la conta delle uova deposte e di quelle predate, chiaramente riconoscibili per i margini aperti e completamente sfrangiati. Dopo il conteggio il ramo veniva riposto nel sito.

Nel giorno del campionamento sono state contate 7 sanguisughe di cui 4 mentre si alimentavano delle uova di *Salamandrina*. La specie predatrice osservata è *Haemopis sanguisuga* (LINNAEUS, 1758) (Hirudinea, Haemopidae), che penetrando con il capo nell'involucro gelatinoso delle uova si nutriva di embrioni a vari stadi di sviluppo. Sul ramo prelevato dal sito, il 56% (54/94) delle uova ivi deposte è stato predato dalle sanguisughe. I dati di presenza nel sito acquatico indicano una densità di *H. sanguisuga* pari a circa 7 esemplari/m^2.

La predazione di Irudinei su uova di Anfibi, soprattutto Anuri, è stata ampiamente documentata. Sebbene *Haemopis sanguisuga* sia già nota come predatrice di uova di Anfibi (e.g. Laurila et al., 2002, Oecologia, 132:524-530; Hakansson & Loman, 2004, Ethology, 110:665-680), in letteratura non esistono casi analoghi di predazione su uova di Urodeli europei da parte di questa o di altre specie di sanguisughe. *H. sanguisuga* è segnalata in tutta l'Italia peninsulare, oltre che nelle maggiori isole (Minelli et al. 1995, cheklist delle specie della fauna italiana, vol. 20, Ed. Calderoni, BO) e, localmente, risulta piuttosto comune (Ferreri, 1995, Thal. Sal., 21: 29-49).

I dati di presenza e la percentuale di uova predate (56%), fanno ritenere che la specie, seppur poco comune nell'area, possa incidere sulla riproduzione di *Salamandrina*.

Gli Irudinei sono implicati in decrementi popolazionali di Anfibi a causa della loro predazione su larve, del loro ruolo di ectoparassiti o di vettori di endoparassiti del sangue (Merila & Sterner, 2002, Ann. Zool. Fen., 39:343-346; Kutschera, 2003, Int. Rev. Hydrob., 88:94-101), nonché per la loro predazione sulle uova (e.g. Miaud, 1993, J. Zool., 231: 575-582). Considerando inoltre che *Salamandrina* è un genere meritevole di tutela (e.g. Andreone & Luiselli, 2000, Biol. Cons., 96:197-208), riteniamo che il potenziale impatto della predazione sulle sue uova, sia da parte di sanguisughe che di altri predatori (Vignoli et al., 2000, III Congr. Naz. S.H.I., Pavia, riassunti: 29) possa assumere, ai fini conservazionistici, particolare rilievo e debba essere oggetto di monitoraggio.

Key words: Salamandrina, Haemopis sanguisuga*, eggs predation.*

IL RUOLO DELL'OLFATTO NELLA SCELTA DEL SITO RIPRODUTTIVO IN *SALAMANDRINA PERSPICILLATA*

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Salamandrina perspicillata (Savi, 1821) mostra un'alta fedeltà al sito riproduttivo. È stata testata la capacità di questi urodeli nel discriminare l'acqua del proprio sito riproduttivo rispetto a quella di altra provenienza.
Contemporaneamente, in box privi di illuminazione e poste al centro del sistema sperimentale, ad ognuna delle 58 femmine di *S. perspicillata* prelevate da 4 differenti siti riproduttivi, è stata data la possibilità di scegliere tra 4 contenitori equidistanti riempiti con: (*i*) acqua dal proprio sito riproduttivo (OWN), (*ii*) acqua del sito riproduttivo di un'altra popolazione (OTHER), acqua minerale imbottigliata di zone geologicamente analoghe (MIN), ed (*iv*) acqua distillata (DIST). Per uniformare la temperatura delle differenti acque, queste erano conservate in condizioni termostatate per 24 ore al buio prima dell'inizio dell'esperimento. Le salamandrine sono state riposte nei box e dopo 48 ore veniva conteggiato il numero di uova deposte in ognuno dei 4 contenitori.
51 salamandrine hanno deposto uova in uno o in più di uno dei 4 contenitori. La non omogeneità delle varianze del numero di uova deposte nei 4 gruppi (test di Levene, $F_{3,228}$=16.04, P<0.001) ha imposto l'uso di test non parametrici. Dopo avere verificato che la differenza nel numero di uova deposte tra i 4 tipi di acqua era altamente significativo (Kruskall-Wallis $H_{3,232}$= 47.45; P<0.001), si è proceduto con confronti multipli non parametrici per individuare quali gruppi avessero una tendenza centrale tra loro significativamente differente. È stata calcolata la differenza minima significativa per i 6 confronti possibili. Tra questi, il numero delle uova deposte in OWN risultava significativamente più alto rispetto a tutte le altre (P<0.001 in ogni confronto), mentre per gli altri confronti a coppia non esistevano differenze significative (P>0.1 per ogni confronto).
Salamandrina perspicillata è in grado di percepire il proprio odore e quello dei conspecifici (Romano & Ruggiero, 2006, VI Congr. Naz. S.H.I., Riassunti: hoc opus) inoltre presenta un'alta fedeltà al sito riproduttivo (Della Rocca et al., 2005. Herp. J., 15: 273-278). La capacità di riconoscere il proprio sito può offrire vantaggi (ad es. le uova non vengono deposte in invasi con idroperiodo insufficiente alla schiusa o alla metamorfosi delle larve) Si ritiene che la scelta preferenziale per l'acqua sia dovuta alla percezione dell'odore caratteristico del corpo d'acqua, capacità già evidenziata in altri urodeli da Joly & Miaud (1993, Ethol. Ecol. Evol., 5: 447-455). Differenze nella composizione chimica dell'acqua condizionanti la deposizione sono da escludere data la origine comune delle acque e la mancanza di differenze significative tra i gruppi OTHER, MIN e DIST o perlomeno tra quest'ultimo e gli altri. Il risultato ottenuto assume una particolare importanza conservazionistica. Infatti i biotopi acquatici, soprattutto se piccoli e pseudolentici (es. fontanili-abbeveratoi) costituiscono una porzione considerevole degli habitat riproduttivi di *Salamandrina* nell'Italia centrale, e loro eventuali alterazioni potrebbero condizionare il comportamento riproduttivo della popolazione in questione.

Key words: Salamandrina*, breeding site fidelity, olfactory orientation.*

CAPACITÀ DI DISCRIMINAZIONE OLFATTIVA NELLE FEMMINE DI *SALAMANDRINA PERSPICILLATA* A LIVELLO INTRASPECIFICO

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Gli Anfibi possiedono una notevole capacità di percepire gli odori. È stata testata la capacità di discriminazione intraspecifica su base odorosa in femmine di *Salamandrina perspicillata* (Savi, 1821).
Sono stati eseguiti contemporaneamente 4 test di "doppia scelta" ciascuno con 30 femmine di *Salamandrina perspicillata* provenienti dalla stessa popolazione. In ogni esperimento ciascun animale poteva scegliere tra due rifugi. La scelta possibile era tra: (A) due rifugi privi di odore, (B) un rifugio con il proprio odore e l'altro privo di odore, (C) un rifugio con l'odore di un conspecifico e l'altro privo di odore, (D) un rifugio con il proprio odore e l'altro con l'odore di un conspecifico. In ogni esperimento venivano effettuate 4 verifiche (una ogni ora). I rifugi, collocati in box (26x36x10 cm) di plastica chiusi erano costituiti da tubi di plastica (9 cm lungh., 3 cm diam.). I risultati sono stati testati con il Test dei segni usando i valori tabulati in Siegel & Castellan (1988, Nonpar. Stat. Behav. Sciences, McGraw-Hill, NY) e con il test esatto di Fisher.
Nei 4 test, le salamandrine che effettuavano una scelta tra i rifugi proposti oscillavano tra il 35% ed il 57% del totale. Nell'esperimento di controllo A la metà delle salamandrine sceglievano un rifugio, di queste, sette ne hanno scelto uno e otto l'altro (test dei segni, $P=0.50$). Il numero di animali che sceglieva di entrare in un rifugio negli esperimenti B, C e D non differiva significativamente da quello trovato nell'esperimento di controllo (test esatto di Fisher bilaterale, $P>0.1$ per tutti i tre confronti). Negli esperimenti B e C le salamandrine prediligevano come rifugio quello marcato dal proprio odore o quello marcato da un'altra femmina rispettivamente (test dei segni, $P<0.005$; $P<0.05$ rispettivamente). Infine, nell'esperimento D la tendenza a preferire il rifugio marcato da un conspecifico rispetto ad uno marcato dal proprio odore risulta significativa (test dei segni, $P<0.05$).
Salamandrina è in grado di discriminare l'odore proprio e di un conspecifico preferendoli ad un rifugio senza marcature odorose. Questa capacità di discriminazione olfattiva da parte delle femmine di *Salamandrina*, potrebbe giocare un ruolo nell'orientamento verso rifugi terrestri idonei dopo l'attività acquatica, come già dimostrato per altri Urodeli (cfr. Hayward et al., 2000, Herp. J., 10: 129-136). Inoltre, questa capacità potrebbe giocare un ruolo chiave nella individuazione e nel raggiungimento del sito riproduttivo da parte delle femmine più giovani che potrebbero seguire la traccia delle femmine con maggiore esperienza e conoscenza del territorio. Questa ultima considerazione troverebbe riscontro nel fatto che le femmine di maggiori dimensioni e dunque di maggiore età (Bovero et al., 2005, 66° Congr. Naz. U.Z.I., riassunti: 142) si recano al sito per la deposizione prima di quelle di dimensioni inferiori e dunque più giovani (cfr. Della Rocca et al., 2005, Herp J., 15: 273-278). Infine la percezione dell'odore di altre femmine, se percepibile anche su superfici e oggetti sommersi, potrebbe rappresentare un'attrattiva a deposizioni aggregate su substrati idonei.

Key words: Salamandrina*, intraspecific odor discrimination.*

STATUS AND CONSERVATION OF TWO POPULATIONS OF *SALAMANDRINA PERSPICILLATA* IN THE BOLOGNA PROVINCE

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The Centro Anfibi project, promoted by the district of Bologna and the municipality of Pianoro (BO), carried out in-depth population studies of *Salamandrina perspicillata* (Savi, 1821) on the hills of Bologna, in order to identify the causes of the disappearance of this species from some areas.

The study area consisted of two sites: (a) two artificial pools lined with a PVC tarpaulin, located along the stream Rio Cocco (which will later be referred to as RC), just outside the urban area of Bologna, at 150 m a.s.l; (b) a natural tract of the stream Rio della Fornace (which will later be referred to as RF) at 250 m a.s.l., within the SIC "Contrafforte Pliocenico" IT4050012. Both streams flow down northern hillsides characterized by rocky grounds and mesophilous scrubs (hilly and sub-montane middle-European vegetation zone). The surveys were carried out twice a week for two reproductive seasons (2004 and 2005). For each individual, photographs were made to the ventral pattern and the following measures were taken: weight (g), snout-vent length (mm) and tail length (mm).

The sampled females were: RC2004 = 229, RC2005 = 233, RF2004 = 234, RF2005 = 200, with a 30% (RF) and a 32% (RC) of re-captures from one year to the other, smaller than literature data (Angelini et al., 2001, Pianura 13 : 105-108). A high degree of fidelity to the same pool was observed in the two years. The egg-laying covered an average period of 56 ± 9 days at RC and 70 ± 0.7 at RF. In both areas, egg-laying took place exclusively in spring (from the end of March to the beginning of June), differently from the period observed in some populations from Central Italy, where it occurred in the autumnal and winter months (Corsetti, 1993, Quad. Mus. St. Nat. Patrica 4: 111-130). Hatching occurred after 46 ± 5 days on an average at RC (water T from 6.5°C to 14°C) and after 60 ± 5 days at RF (water T from 6°C to 11°C).

The use of Ford-Walford's equation (based on the variation of snout-vent lenght of the re-captured females) and of von Bertalanffy's function has allowed the elaboration of increase models and the estimation of increase coefficients for the individuals of the two populations (K = 0.74 at RF and K= 0.24 at RC); the highest value found at RF is probably due to the many resources available and to the absence of limitant factors, such as water contamination caused by the impurity of city sewages and the uncontrolled picking up of water, which instead have interested RC for many years.

At RC the averages of the snout-vent length (SVL) and total length (TL) have not changed significantly amongst the re-captured females of both years and those ones present only the second year (SVL $z = 0.45$; *ns* e TL $z = 0.90$; *ns*), on the contrary at RF these averages have significantly diminished in the individuals which were only present during the second year (SVL $z = 3.38$; $P < 0.01$ e TL $z = 3.10$; $P < 0.01$). Therefore at RC the females only present in 2005 are most probably adults which have not reproduced in 2004 while at RF we can presume that the majority of them are young individuals at their first egg-laying; this hypothesis could be verified with a third year of samplings which is currently in course.

The use of a PVC tarpaulin at RC was inevitable in order to guarantee the necessary conditions for egg-laying. In fact, the species disappeared from the near streams and is still reproducing (with a comparable consistence to that of the natural habitat RF) exclusively in the two waterproofed pools. At RF landslides of the stream banks and trampling caused by ungulates

turned out to be the main causes of eggs destruction and therefore the factors that mainly influenced the reproductive outcome of that population.

Key words: *artificial pools, biometric parameters, capture-marking-recapture.*

PREDAZIONE DI UOVA DI *SALAMANDRINA PERSPICILLATA* (AMPHIBIA, CAUDATA) DA PARTE DI GIRINI DI *RANA ITALICA* (AMPHIBIA, ANURA)

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Nel corso di ricerche sulla distribuzione dell'erpetofauna in provincia di Forlì-Cesena (Regione Emilia Romagna), sono stati localizzati diversi siti riproduttivi di salamandrina dagli occhiali, *Salamandrina perspicillata* (Savi, 1821) e sono state compiute osservazioni sulle relazioni trofiche fra le sue uova e le larve di due specie di Anuri conviventi.
Il Fosso del Volanello, situato nell'Appennino tosco-romagnolo (Comune di Bagno di Romagna, ca. 650 m s.l.m.), ospita una popolazione di salamandrina dagli occhiali (*Salamandrina perspicillata*) che si riproduce nelle pozze del torrente in sintopia con la rana appenninica, *Rana italica* Dubois, 1987, e il rospo comune, *Bufo bufo* (Linné, 1758).
Mediante sopralluoghi a cadenza irregolare sono stati raccolti dati riguardanti l'ecologia delle tre specie di anfibi.
In data 13.VI.2002 sono state osservate diverse ovature di salamandrina dagli occhiali aggredite da girini di *Rana italica e Bufo bufo* (leg. et det. P. Laghi & C. Pastorelli). I girini di *R. italica* si cibano dell'involucro gelatinoso delle uova e spesso anche del tuorlo, mentre i girini di *B. bufo* si limitano a "pascolare" sull'involucro stesso e non arrecano danni di nessun tipo agli embrioni. Allo stato attuale delle osservazioni si può quindi parlare di predatori solo in riferimento ai girini di *R. italica*, mentre i girini di *B. bufo* sembrano comportarsi da «pascolatori» (*grazers*). Dal momento che l'unico predatore finora conosciuto per le uova di salamandrina dagli occhiali è la larva del Tricottero *Plectrocnemia conspersa* (Curtis, 1834) (cfr. Vignoli et al., 2001, Pianura, 13: 176) la presente costituisce la prima segnalazione di un'interazione predatoria tra i girini di un anuro e le uova di *S. perspicillata*. Interazioni tra girini di rana appenninica e uova di salamandrina dagli occhiali sono state osservate anche in stazioni marchigiane da D. Fiacchini (comunicazione personale).

Key words**:** Salamandrina perspicillata, Rana italica, Bufo bufo, *predation.*

HABITAT FEATURES AND DISTRIBUTION OF THE FIRE SALAMANDER (*SALAMANDRA SALAMANDRA*): FROM STREAM QUALITY TO LANDSCAPE STRUCTURE

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Both aquatic and terrestrial habitats are needed for semiaquatic species, however they can have different importance for the survival of populations. Moreover, it is important to discriminate the role of composition and configuration of upland habitat and to evaluate the shape of the species-habitat relationships. We studied the fire salamander *Salamandra salamandra* (Linné, 1758) in 77 first order streams and surrounding landscapes in northern Italy. We considered streams at altitude between 200m and 600m, and far more than 2500m from the nearest monitored locality. For every site we monitored: (1) presence of larvae by using funnel traps and visual transects; (2) morphology, vegetation, chemical and physical features. Composition and configuration of landscape around streams were obtained on the basis of DUSAF land cover by using GIS ArcView 3.2. Data were analyzed by: (1) Pearson's correlation; (2) multiple logistic regression (3) linear regression models; (4) segmented regression and (5) analysis of structural changes. On the basis of the best AIC-ranked logistic model, *S. salamandra* was significantly associated with wood cover % in a buffer of 400m of radius ($X^2 = 30.62$; d.f. = 1; $P < 0.0001$) and streams with permanent water during spring ($X^2 = 10.73$; d.f. = 1; $P = 0.001$). After taking into account the effect of wood cover, none of the stream features measured had a significant influence, also because streams in non wooded landscapes had poor water quality. The effect of landscape composition was stronger than those of landscape configuration in determining the distribution of the fire salamander. After taking into account the effect of wood %, none of the measures of forest configuration (isolation, patchiness, area/perimeter ratio) had a significant effect. The analysis of the relationship between frequency of the fire salamander and forest cover did not detect any threshold pattern or plateau (analysis of structural changes: SupF=8.32; P=0.11), suggesting that increases in wood cover always result in an increase of the occurrence of the species.

Despite terrestrial and aquatic habitats are both crucial for population survival, our results show that a suitable terrestrial habitat can be more important than aquatic habitat for the presence of the species (Semlitsch & Bodie, 2003, Conserv. Biol. 17: 1219-1228), also because quality of breeding and post-breeding habitat are not independent, i.e. phosphates concentration was higher in landscapes with low wood cover ($r = -0.425$; $N = 74$; $P < 0.0001$).

Moreover, landscape composition resulted more important than landscape configuration because, after keeping equal wood cover, landscape configuration had not significant effect on distribution of species. This suggests that conservation efforts should focus on preservation and restoration of the amount of terrestrial habitat (Fharig, 2003, Ann. Rev. Ecol. Ev. Syst., 34: 487-515). We emphasise the critical importance of large amount of high quality, terrestrial habitat around streams for the conservation of semiaquatic herpetofauna.

Key words: *buffer zones, habitat conservation, salamanders, ecological thresholds.*

SEASONAL AQUATIC POPULATION-SIZE AND SEX-RATIO VARIATIONS IN SARDINIAN NEWT (*EUPROCTUS PLATYCEPHALUS*) FROM A POOL ON "SUPRAMONTE OF URZULEI"

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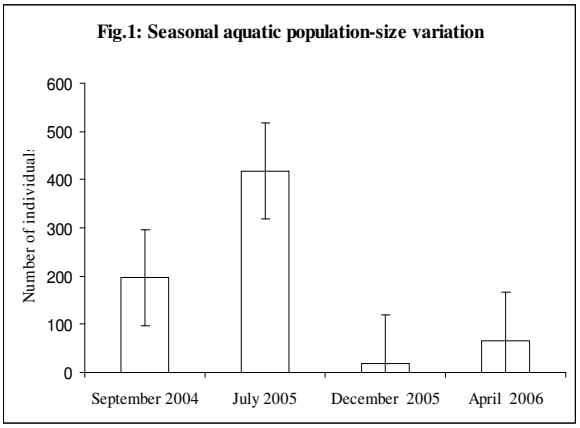
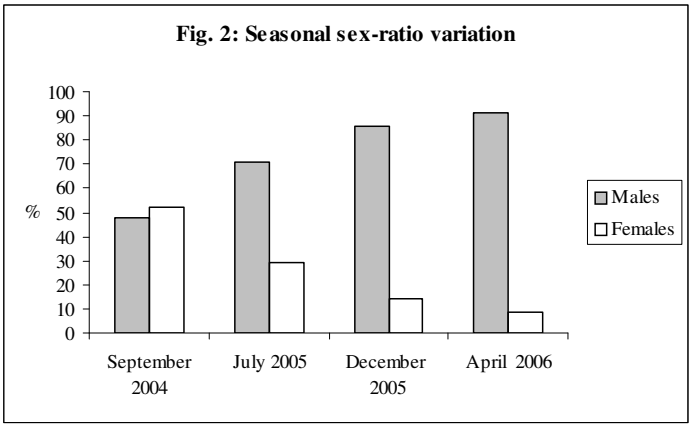
The phenology of the endemic and endangered Sardinian newt, *Euproctus platycephalus* (Gravenhorst, 1829) is still almost unknown. We investigated the seasonal variation in number and sex-ratio of the individuals collected in water, in order to better understand some natural history traits of a population living in a remote and wild area. Population structure end age of the same population were studied in 1994 and 1995 (Bovero et al., 1996, Atti I Congresso Nazionale S.H.I.; Bovero et al, 2003, Copeia:149-154). This population was found at a permanent pool under a water fall located into the Su Gorropu Gorges, a biotope included in the pSIC ITB022212 "Supramonte di Oliena, Orgosolo, Urzulei". We captured newts under the water by means of snorkeling tecnique. For each season (September 2004, July 2005, December 2005 and April 2006) we performed two capture sessions, in different days, with the same method and effort. We used digital photos of the gular pattern for individual recognition. All individuals were measured, weighted and sexed. Larvae were not considered. For each season we calculated the size of the aquatic population by means of Petersen's method (Bailey's modification).

We reported variations of both the aquatic population-size and sex ratio (Fig.1 and Fig. 2). Apparently, in winter there were few newts in water and their number increased in spring until the maximum population size in summer. The sex-ratio was unbalanced in favour of males in winter, spring and summer and was about 1:1 in autumn. A couple was observed in amplexus during December.

It is possible that the acquatic population size variations is due to a change in activity level during season: i.e. during winter the newts are in acquatic shelters where we are unable to see and capture them. Even if we found a couple in amplexus in December and observed the fecundation of the female, it is possible that winter time newts mobility can be reduced, in order to better react to the winter increase of water level and flow. Otherwise, it is possible that actually there are more newts in water during spring and summer months, whereas hibernation in terrestrial phase could occur in winter. Terrestrial phases are documented for the other species of the same genus, *E. montanus* (Alcher, 1978, Atlas prèliminaire des Rettiles et Amphibiens de France. Soc. herpet. Fr. Montpellier) and for *Calotriton asper* that lives in similar habitats (Montori, 1990, Annales des Sciences Naturelles, Zoologie, Paris 11: 209-211). Moreover Bovero et al., (2003) reported the absolute lack in the water of two and free years old metamorphosed individuals for the population of Su Gorropu.

It is difficult to understand what are the reasons below the seasonal variation of the sex-ratio. The relative high number of females observed in September is one of the many aspects still requiring future studies. The maximum population-size observed during these investigations (418 individuals) is similar to maximum population-size (318) reported in Bovero et al. (2003) and this suggest a quite population stability in the last decade.





Key words: *Sardinian newt,* "*Supramonte di Oliena", phenology.*

MONITORAGGIO DI UNA POPOLAZIONE DI *SPELEOMANTES ITALICUS* IN UNA CAVITÁ IPOGEA DELL'UMBRIA

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Tra maggio 2005 ed aprile 2006 sono stati effettuati 12 sopralluoghi con cadenza mensile, con l'obiettivo di condurre un monitoraggio su una popolazione di geotritone italiano, *Speleomantes italicus* (Dunn, 1923), localizzata in una cavità ipogea sul massiccio del Monte Tezio in Umbria; l'area di studio risulta geograficamente isolata dalla dorsale appenninica umbro-marchigiana.
La cavità è formata da brevi fessure di probabile origine tettonica e si sviluppa per circa 10 metri con un dislivello massimo pari a 3 metri. Tale cavità è posta a circa 900 m s.l.m. sul versante sud occidentale caratterizzato da praterie di origine secondaria con substrato calcareo affiorante.
L'area di studio è stata suddivisa in quattro settori per ognuno dei quali sono state rilevate la temperatura, l'umidità relativa e la posizione di tutti gli individui osservati.
Tutti gli adulti esaminati sono stati sessati e marcati mediante fotografia del *pattern* dorsale rilevando inoltre alcuni parametri biometrici (lunghezza totale, lunghezza muso-cloaca, larghezza testa, lunghezza testa, peso).
Sono stati osservati in totale 88 esemplari di cui 37 adulti (16 maschi e 21 femmine) 2 immaturi e 37 giovani; 12 individui non sono stati manipolati in quanto non raggiungibili, pertanto non è stato possibile determinarne il sesso e rilevarne i parametri biometrici.
Gli adulti sono stati osservati in tutti i mesi, ad eccezione di giugno, luglio, agosto 2005 e gennaio 2006, con un picco di presenze a ottobre 2005; i giovani sono stati osservati esclusivamente tra ottobre 2005 e aprile 2006, con un numero maggiore di presenze a febbraio 2006.
Circa il 95% degli adulti è stato rilevato all'interno della cavità con umidità relativa compresa tra 83% e 100% e una temperatura compresa tra 11.7°C e 18.2°C. Circa il 76% dei giovani è stato osservato all'interno della cavità con umidità relativa compresa tra 96,2% e 100% e una temperatura compresa tra 10.1°C e 18.2°C.

Key words: Speleomantes italicus*, ecology, Umbria.*

PRELIMINARY DATA ON THE TERRITORIAL BEHAVIOUR OF *SPELEOMANTES STRINATII*

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Territoriality has been demonstrated in several American Plethodontid salamanders (Mathis *et al*., 1995, Amphibian Biology, 2: 633-676), but has never been tested for in the European genus *Speleomantes*. This is the first experimental study on the territorial behaviour in Strinati's cave salamander *Speleomantes strinatii* (Aellen, 1958).

Tests were performed in August and September 2005 inside the Biospeleogical Station of Besolagno, an artificial cavity in Liguria (NW Italy). Only males were tested, because in Plethodontids agonistic behaviour varies with gender (Wilthenmuth, 1996 Animal Behaviour, 52: 841-850). Cave salamanders, captured in two different sites to avoid any association between related specimen, were caged in complete darkness and with relative humidity $\geq$ 90% inside fauna boxes lined with moist paper towels. They were fed weekly with live *Limonia nubeculosa* flies caught inside the cavity. At the end of the experiments, all cave salamanders were returned unharmed to their original sites.

Control tests: influence of captive and experimental conditions on behaviour. Twenty-four cave salamanders were transferred in the experimental boxes (dimensions: 24 x 16 x 3.5 cm, with a transparent lid to allow observation). The substrate was divided in two symmetric parts, on the left and right side. After 5 min of acclimatation under an opaque cover, the position of salamanders was checked after 1, 12, 24, 48 and 72 hours. The results of these tests demonstrated that cave salamanders occupied the substrate on the left or right side completely at random (binomial tests; $P > 0.15$ in all cases). Thus, captive and experimental conditions did not influence the substrate choice of cave salamanders.

Test 1: Recognition of a substrate marked by a conspecific. Twenty salamanders were introduced inside the experimental boxes with half of the substrate marked by a conspecific during three consecutive days, and the other half unmarked. The left or right position of the marked substrate was randomised. After 5 min of acclimatation under an opaque cover, salamander position was recorded after 1, 12, 24, 48 and 72 hours. Results indicate that salamanders occupied more often the marked substrate at all times and this tendency was statistically significant after 72 hours (binomial test; $P = 0.04$).

Test 2: behavioural interactions between two salamanders: "resident" and "intruder". Observations were conducted on 14 couples of salamanders having similar snout-vent length: SVL 62.5 ± 2,8 and SVL 60,0 ± 4.4, for residents and intruders respectively (Mann-Whitney test; $W = 232.5$; $P = 0.18$). Residents were maintained for three days in the test boxes, to allow them to mark the substrate and eventually to establish a territory. Then another salamander was introduced inside the box. To equalise treatments, both salamanders were manipulated and kept under an opaque cover for 5 min, before starting the experiment. In ten cases, the behaviour of both specimens was registered simultaneously by two observers for 15 min in dim light (about 110 lux). Observers focused on resident and intruder animals alternatively in successive trial. In four other cases, interactions were videotaped with a digital video camera (Canon MVX300) for 15 min, in dim light (about 750 lux) in absence of observers. Videotapings were projected on screen and analysed. Behaviours were classified as: exploratory, avoidance and sensitive (Wildemuth & Nishikawa, 1998, Animal Behaviour, 55: 1595-1606). During these encounters no

overtly aggressive behaviours (e.g. bites, chases or attacks) were observed. Overall, residents and intruders performed similar behaviours (i.e., "approach", "contact", "avoidance") with the exception of "look toward" that was performed more often by residents (Fisher exact test, P = 0.03) and "nose-tap" that was performed only by four intruders, although the observed difference was not significant (Fisher exact test; P = 0.10).
These are the first observations on the behaviour of European Plethodontids in controlled conditions. The data suggest that intraspecific chemical communication is present in *Speleomantes*, and that males are apparently able to recognise a substrate marked by a conspecific, and seem attracted by it. In the staged encounters however, overt aggressive behaviours were never performed; both residents and intruders displayed only exploratory, sensitive or avoidance behaviours. Although these results have to be considered as preliminary and in need of further confirmations with larger sample sizes, no evidence of territorial behaviour was observed in *S. strinatii*.

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Key words: *cave salamanders, social behaviour, Plethodontidae, nose-tap*.

PREDAZIONE SU *SPELEOMANTES ITALICUS* (AMPHIBIA, CAUDATA, PLETHODONTIDAE) DA PARTE DI *META MENARDI* (ARACHNIDA, ARANEAE, METIDAE)

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Il genere *Speleomantes* (Dubois, 1984) comprende 7 specie di geotritoni diffuse in Francia sud-orientale, Sardegna, Italia settentrionale e centrale. *Speleomantes italicus* (Dunn, 1923) è la specie che presenta l'areale più esteso, essendo diffuso nell'Appennino settentrionale e centrale, dalla provincia di Reggio Emilia (o forse Parma) fino a quella di Pescara. Predatori noti dei geotritoni sono i serpenti del genere *Natrix* Laurenti, 1768 [*N. natrix* (Linné, 1758), *N. tessellata* (Laurenti, 1768), *N. maura* (Linné, 1758) e *N. natrix cetti* Gené, 1839], l'Orbettino (*Anguis fragilis* Linné, 1758) e gli stessi conspecifici, dal momento che il cannibalismo e l'oofagia sono documentati all'interno del genere [cfr. Lanza, 1999, In: Handbuch der Reptilien und Amphibien Europas, AULA-Verlag, p. 122 e 182; Durand, 1970, Aqua Terra 7 (4): 42-48; Mutz, 1998, Salamandra 34 (2): 167-180].

A partire dal 1998 la popolazione di geotritone italiano che abita la «Grotta del Tritone» (43°53'52''N-11°58'06''E, 810 m s.l.m., comune di Bagno di Romagna, provincia di Forlì-Cesena) è stata oggetto di ricerche approfondite riguardanti diversi aspetti della biologia della specie [cfr. p.e. Pastorelli et al., 2001, Pianura 13: 347-351; Pastorelli et al., 2002, Biota 3 (1-2): 127-131].

Nella cavità oggetto di studio i geotritoni condividono il tratto della cavità prossimo all'apertura, con gli artropodi della cosiddetta «fauna parietale», tra i quali spiccano, per dimensione, gli aracnidi troglofili predatori del genere *Meta* C.L. Koch, 1836. Durante i sopralluoghi è stata osservata e fotografata per la prima volta la predazione di *S. italicus* da parte del ragno *Meta menardi* (Latreille, 1804); ad una prima osservazione effettuata in data 17.V.1999, se ne è aggiunta una seconda analoga, in data 22.X.2000 (leg. et det. P. Laghi & C. Pastorelli). In entrambi i casi il ragno adulto ha morso e avvolto in un involucro di seta un geotritone giovane (lunghezza circa 35 mm).

Key words**:** Speleomantes italicus, Meta menardi*, predation.*

STRUTTURA E DINAMICA DI POPOLAZIONI DI *BOMBINA PACHYPUS* NELL'APPENNINO ROMAGNOLO

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Lo scopo di questo studio è approfondire le conoscenze sulla biologia di popolazioni naturali di *Bombina pachypus* (Bonaparte, 1838) presenti in diversi ambienti (sorgenti, abbeveratoi, pozze di torrente), per meglio comprendere i fattori di minaccia che ne stanno determinando il declino e per valutare l'opportunità di eventuali azioni di conservazione.
Sono state prese in esame tre stazioni situate nell'Appennino romagnolo: 1) Sommorio, Casola Valsenio (RA), costituita da una sorgente con alcune piccole pozze create artificialmente nel 2001 in un'area boscosa a 500 m s.l.m.; 2) Monte Castellaccio, Casola Valsenio (RA), caratterizzata da due vasche in cemento per l'abbeverata degli ungulati selvatici, a 650 m s.l.m.; 3) Ca' di Veroli, Bagno di Romagna, (FC), formata da una pozza in alveo roccioso di torrente a 450 m s.l.m. Lo studio si è svolto negli anni 2004 e 2005, ma alcuni dati preliminari erano stati raccolti già dal 2001. Per le intere stagioni di attività (aprile-ottobre), gli esemplari sono stati catturati con cadenza mensile, fotografati per il riconoscimento dei *pattern* ventrali, pesati e misurati in lunghezza muso-cloaca (SVL).
Per la stima della dimensione numerica delle tre popolazioni è stata utilizzata la formula di Fisher-Ford applicata al metodo CMR. La struttura delle tre popolazioni è stata determinata utilizzando le lunghezze SVL e suddividendo gli animali nelle 9 classi dimensionali proposte da Plytycz & Bigaj per *Bombina variegata* (1993, Amphibia-Reptilia, 14: 35-44).
Utilizzando i dati relativi a tutte e tre le stazioni si è inoltre calcolata la relazione peso lunghezza espressa dall'equazione: $\ln(W) = b*\ln(L) + a$ (dove W è il peso in grammi; b è il coefficiente angolare della retta; L è la lunghezza muso-cloaca (SVL) in mm; a è il termine noto) suddividendo gli individui in maschi, femmine e giovani. L'analisi dell'accrescimento in lunghezza (SVL) degli esemplari è stata effettuata sui maschi di Sommorio utilizzando la funzione di Von Bertalanffy.
Nel 2004 a Sommorio sono stati catturati 40 esemplari: di questi 19 già marcati in anni precedenti, 13 non marcati e 8 neometamorfosati con *pattern* ventrali non ancora registrabili; l'anno successivo gli esemplari catturati sono stati 30, di cui 20 già marcati, 9 non marcati e 1 neometamorfosato.
A Monte Castellaccio nel 2004 sono stati catturati 16 esemplari di cui 4 già marcati; nel 2005 sono stati catturati 15 esemplari di cui 12 già marcati.
Infine a Ca' di Veroli nel 2004 sono stati catturati 16 esemplari di cui 4 già marcati; nel 2005, fra i 23 animali catturati, 10 erano già marcati e 13 erano neometamorfosati.
Dalle stime delle popolazioni (Fig. 1) si evidenzia come nelle annate 2004 e 2005 le tre popolazioni studiate non presentino significativi reclutamenti e mostrino una relativa stabilità. Calcolando il rapporto tra popolazione stimata e popolazione catturata, a Sommorio si cattura in media il 56.5% della popolazione, a Ca' di Veroli il 26% e a Monte Castellaccio l'87%. Il fatto che gli esemplari di Monte Castellaccio siano più facilmente ricatturabili potrebbe far ipotizzare un maggiore legame al sito riproduttivo (abbeveratoi); le altre due popolazioni, in particolare quella di Ca' di Veroli, potrebbero invece essere caratterizzate da una maggiore dispersione o da una maggiore contrazione del periodo riproduttivo.

Nel 2004 a Ca' di Veroli la popolazione era costituita principalmente da adulti, ma nell'anno successivo è stato rilevato un incremento di giovani. Nella stazione di Monte Castellaccio (dove la riproduzione è risultata scarsa in entrambe le annate) è stato rilevato uno scorrimento degli individui attraverso le classi dimensionali. Nella stazione di Sommorio, dal 2004 al 2005 la popolazione risulta distribuita su quasi tutte le classi dimensionali con prevalenza di individui adulti.
Nell'insieme dei tre siti la sex ratio risulta essere a favore dei maschi (media = 1.20:1): ciò è particolarmente evidente a Ca' di Veroli (media = 3.41:1). Diversa la situazione a Monte Castellaccio, dove la sex ratio è a favore delle femmine (media = 0.81:1) e a Sommorio, dove nel 2005 la sex ratio è a favore dei maschi (1.22:1) e nel 2004 delle femmine (0.81:1).
La relazione peso-lunghezza (SVL) dei maschi delle tre popolazioni è espressa dall'equazione ln(W) = 2.7614 * ln(L)-8.2059, quella delle femmine da ln(W) = 3.1714 * ln(L)-9.683, mentre quella dei giovani è ln(W) = 2.705 * ln(L)-8.1687. A parità di lunghezza le femmine pesano più dei maschi. La funzione di Von Bertalanffy mostra che l'accrescimento dei maschi di Sommorio è molto rapido nei primi anni di vita per poi assestarsi e tendere a una lunghezza asintotica media di 49.81 mm.

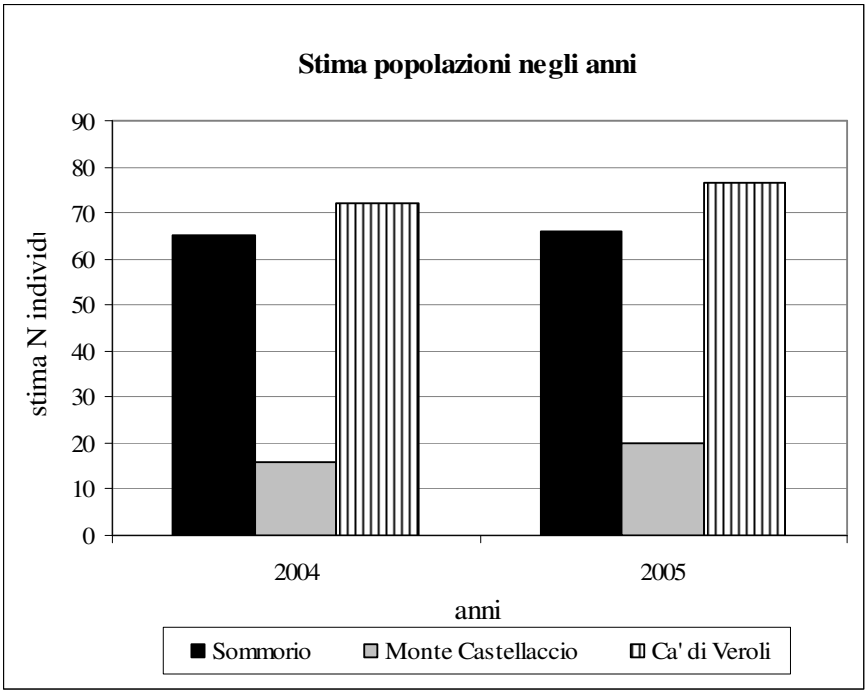

Fig. 1. Stima della dimensione numerica delle tre popolazioni di *B. pachypus* studiate.

Key words: *Amphibia, Apennine yellow-bellied toad, Population ecology, Romagna*.

VOLUNTEERING TO MONITOR AN ISOLATED POPULATION OF *PELOBATES FUSCUS* IN NW ITALY

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The common spadefoot toad, *Pelobates fuscus* (Laurenti, 1768) is a fossorial amphibian that inhabits many European plain areas. Two subspecies are currently recognised: *P. f. fuscus* and *P. f. insubricus* (Cornalia, 1873), the latter being historically distributed throughout the whole Po Plain (Andreone et al., 2004, Ital. J. Zool. 71 - Suppl. 1: 61-72) but currently restricted to few reconfirmed isolated populations.
Since three years a small population of *P. f. insubricus* close to Poirino (SIC "Stagni di Poirino Favari", Turin, NW Italy), has been monitored by a group of volunteers coordinated by the authors (see later). This area includes a pond of remarkable size that during the breeding period (from March to May) has been encircled by a drift fence (50 cm plastic sheet buried for 10 cm, to intercept the migrating individuals). The pitfalls were checked twice a day (morning and evening During 2004 and 2005 individuals have been photographed and identified one by one through dorsal pattern mapping. All the spadefoots were sexed, measured, weighed, and then released. Aim of this survey is to carry out an accurate analysis of the population size, by organizing an archive of this elusive toad and to study amphibian relative abundance in this area.
Results of *P. fuscus* migration obtained during 2004 and 2005 are given in Fig.1. Data referring to 2006 are not included since the breeding season, at present (April 2006) is still not finished.

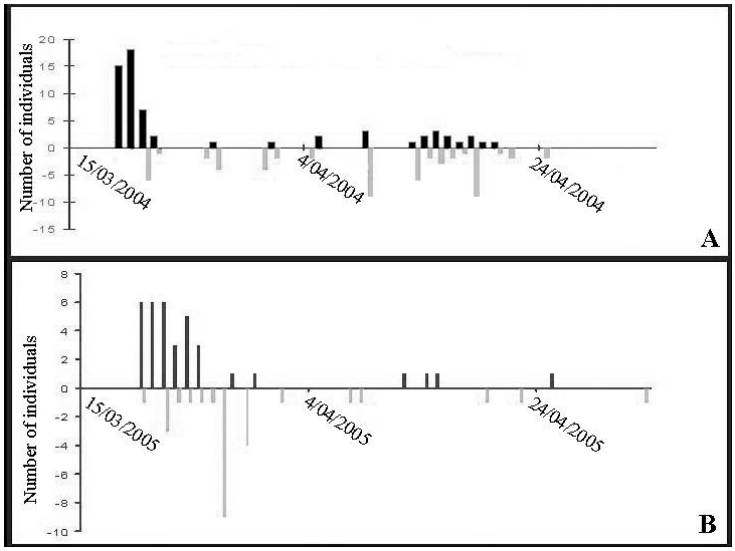

Fig. 1. Migration to (black bars) and from (grey bars) the breeding pond of *Pelobates fuscus* in 2004 (A) and in 2005 (B) at Cascina Bellezza (Poirino, Turin).

During 2004, over a period of 37 days, captures were 119, while in 2005 captures were 64 over 45 days. The population size was estimated (carried out with 2005 data) in 37 ± 1.85. These results suggest that the population is quite small. Data collected in 2005 show that males oversized females, with a sex ratio (male: female) of 1.31 (21 ♂♂ and 16 ♀♀), consistent with literature data (Andreone et al., 2004; Eggert & Guyetant, 2003, Can. J. Zool. 81: 46-51) while biometric data gave a SVL of 46.27 ± 3.57 mm in males (n = 21), and 53.99 ± 5.38 mm in females (n = 16), falling within the species' range.
In general migration takes place in March, in correspondence with first spring rainfalls, and is over at the end of May. Outputs of these monitoring show that *Rana* kl. *esculenta* turn out to be the most abundant species, while *R. latastei* the most uncommon. Other amphibians that inhabit and breed at this site are *R. dalmatina, Bufo bufo, B. viridis, Triturus carnifex, T. vulgaris* and *Hyla intermedia*. This area hosts all typical species of the Po plain and the occurrence of *P. fuscus* and *R. latastei* make this area one of the most important in the whole Italy.
From 2005 through pattern mapping was possible to verify if one specimen has been captured more than once. The application of this methodology is important because it is the first time that pattern mapping has been used with *P. fuscus*. This quick, easy and not invasive approach allows a one-by-one identification and the organization of a population archive. Preliminary results show such methodology is reliable also through years because a lot of individuals identified in 2004 were recognized also during the ongoing monitoring.

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Key words: *spadefoot toad, dorsal pattern, conservation, NW Italy.*

DIFFERENZE SESSUALI NELL'UTILIZZO SPAZIO-TEMPORALE DEL TERRITORIO IN UNA POPOLAZIONE DI *BUFO VIRIDIS* IN SICILIA

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Il comportamento di *Bufo viridis* Laurenti, 1768, in funzione del differente utilizzo del territorio in termini spazio-temporali da parte dei due sessi, è stato studiato in una popolazione che si riproduce in un abbeveratoio in disuso presso la Riserva Naturale Orientata "Capo Gallo" (Palermo, Sicilia).

Lo studio è stato condotto tra settembre 2002 e settembre 2004. Gli individui catturati sono stati marcati con microtrasmettitori passivi e le successive osservazioni sono state condotte, con cadenza almeno settimanale, per un totale di 115 giorni di campionamento. Le ricatture sono state effettuate lungo un transetto di 600 m, suddiviso in quattro settori di 150 m (denominati A, B, C e D, con il tratto settore A comprendente il sito riproduttivo e i tratti B, C e D a distanza crescente) al fine di valutare la distanza dal sito riproduttivo degli individui ricatturati.

Sono stati marcati in tutto 166 individui, 86 maschi e 80 femmine. Le ricatture sono state complessivamente 758, 546 per i maschi e 212 per le femmine. Il maggior numero di ritrovamenti è stato realizzato nel tratto settore comprendente il sito riproduttivo, sia per i maschi (497 ricatture, pari al 91%) sia per le femmine (128 ricatture, pari al 60.4%). Allontanandosi dal sito riproduttivo, il numero dei ritrovamenti tende a diminuire in modo drastico per i maschi (settore B = 33 ricatture, pari al 6%; settore C = 13 ricatture, pari al 2.4%; settore D = 3 ricatture, pari allo 0.6%) e in modo più graduale per le femmine (settore B = 43 ricatture, pari al 20.3%; settore C = 28 ricatture, pari al 13.2%; settore D = 13 ricatture, pari allo 6.1%).

L'analisi dei dati relativi ai singoli individui marcati evidenzia un'elevata numero di ricatture multiple dei maschi presso il sito riproduttivo; i 497 ritrovamenti sono infatti imputabili a 82 individui, ognuno ritrovato in media 6.1 volte. Tale valore è risultato molto più basso per le femmine (2.1 volte), evidenziando la tendenza dei maschi a frequentare il sito riproduttivo e le immediate adiacenze in modo più costante.

Le ricatture sono state ulteriormente analizzate in funzione del mese di ritrovamento, permettendo di ottenere una serie delle medie di ritrovamenti per ogni mese di campionamento e per ognuno dei quattro settori considerati. Alla matrice ottenuta è stato applicato l'indice di similarità di Bray-Curtis (1994, Clarke & Warwick; Plymouth Marine Laboratory), che restituisce una matrice della similarità percentuale di ogni coppia di dati della matrice d'origine. Essa è stata resa graficamente (Fig. 1) mediante l'analisi dei cluster per mezzo dell'algoritmo Average Linkage Cluster Analysis (1973, Anderberg; Academic Press).

L'analisi mette in evidenza come per i maschi esista un'elevatissima similarità spazio-temporale tra i dati relativi ai ritrovamenti nel settore A (comprendente il sito riproduttivo) e quelli relativi all'intero transetto (similarità = 93.9%). Per le femmine tale valore è notevolmente più basso (62.7%), mentre si riscontra un valore di similarità più elevato tra i due settori intermedi del transetto (73.0%).

In conclusione le analisi evidenziano un differente comportamento dei due sessi nei confronti dell'utilizzo spazio-temporale del territorio, con i maschi che tendono a concentrarsi e a rimanere a lungo nelle vicinanze del sito riproduttivo e le femmine che tendono, invece, a distribuirsi nel territorio in maniera più omogenea.

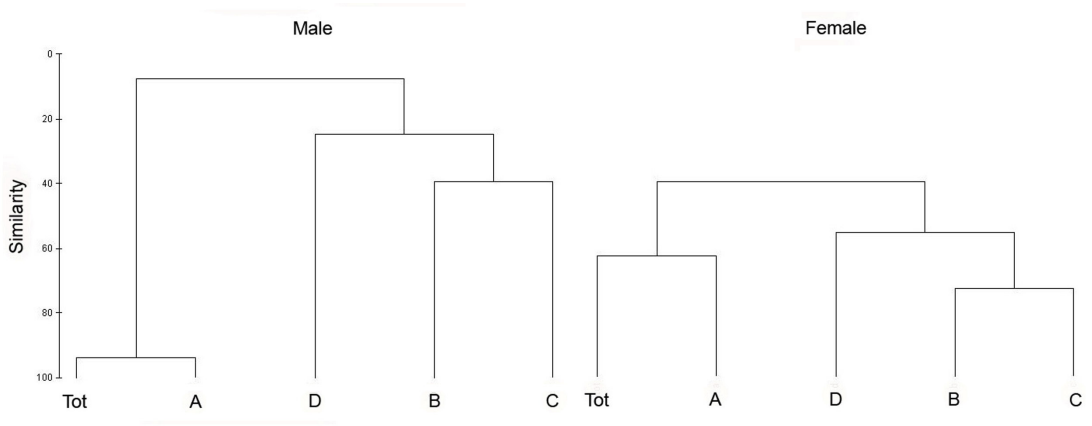

Fig. 1. Alberi gerarchici relativi alle similarità non normalizzate per i maschi (a sinistra) e per le femmine (a destra) relativi all'utilizzo spazio-temporale del territorio nei quattro settori considerati.

Key words: Bufo viridis*, Sicily, behavioural dimorphism, spatial usage.*

DINAMICA SPAZIALE E FEDELTA' TERRITORIALE AL SITO POST-RIPRODUTTIVO DEL ROSPO SMERALDINO (*BUFO VIRIDIS*)

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Molte specie di anfibi, trascorso il periodo nel sito di riproduzione, tornano a frequentare habitat terrestri per l'alimentazione e lo svernamento. (Semlitsch, 1998 Conservation Biology 12: 1113–1119; Sinsch, 1988, Oecologia 76: 390-398). Il presente contributo è finalizzato ad acquisire informazioni, attraverso il metodo CMR, sulla dinamica spaziale ed sulla fedeltà al sito post-riproduttivo in una popolazione siciliana di rospo smeraldino, *Bufo viridis* (Laurenti, 1768), il cui status tassonomico non è ancora chiaro.

La ricerca è stata condotta tra marzo 2004 e febbraio 2006 all'interno della Riserva naturale di Monte Pellegrino (Palermo). Con una fotocamera digitale sono stati fotoidentificati (attraverso il riconoscimento del pattern dorsale) sia gli individui in riproduzione, sia quelli incontrati di notte sul terreno. I primi sono stati fotografati, quasi giornalmente, nel Gorgo di Santa Rosalia, unico sito riproduttivo presente all'interno della riserva (cfr. Lo Valvo & Giacalone, 2005, Ann. Mus. civ. St. nat. Ferrara, 6: 61-65); i secondi, sono quelli incontrati di notte all'interno di un'area campione, utilizzata dai rospi al di fuori del periodo riproduttivo, lungo un itinerario di circa 8 km percorso quasi settimanalmente in automobile. Con l'ausilio di un GPS sono stati georeferenziati tutti i punti in cui i rospi venivano catturati.

In totale sono stati catturati e fotoidentificati 761 individui (271 maschi, 398 femmine e 92 indeterminati). Dal confronto dei pattern dorsali, sono state verificate 44 ricatture di cui 28 (27 femmine ed 1 maschio) relative ad individui ricatturati una sola volta, mentre 8 (7 femmine ed 1 maschio) ad individui ricatturati due volte. Il numero minimo di giorni trascorsi tra cattura e ricattura è risultato essere 7, mentre il numero massimo 517. Solamente due femmine sono state ricatturate, in amplesso ascellare, durante la stessa stagione riproduttiva, rispettivamente dopo 16 e 28 giorni. Le ricatture effettuate nell'area campione frequentata dai rospi dopo la riproduzione sono avvenute, durante lo stesso anno, ad una distanza media di 120 metri (n=13) dai punti di cattura, mentre sono avvenute ad una distanza media di 179 metri (n=22) tra i siti di ricattura dei due diversi anni. La distanza media percorsa dai rospi per raggiungere il sito riproduttivo dall'area campione postriproduttiva e viceversa è risultata di 1170 metri (min=391 m; max=1477 m).

Dai risultati ottenuti relativi al numero di rospi catturati e delle ricatture effettuate si può dedurre che la popolazione presente a Monte Pellegrino risulterebbe particolarmente numerosa. Il valore di sex-ratio calcolato nell'area campione, utilizzata dai rospi dopo la riproduzione, risulta sbilanciato in favore delle femmine (1:0.68), al contrario di quanto riscontrato nei siti riproduttivi da altri autori su altre popolazioni, che hanno ottenuto valori di sex-ratio variabili ma sempre in favore dei maschi (Giacoma et al., 2000, Atti I Congresso Nazionale SHI, Mus.reg.Sci.nat.Torino: 101-108). Dalle osservazioni effettuate si ritiene che questa differenza, più che ad un reale numero maggiore di femmine rispetto ai maschi, possa essere dovuta ad un differente utilizzo dello spazio da parte dei due sessi. Per quanto riguarda le ricatture, anche se in numero ancora basso rispetto alla dimensione della popolazione, i valori medi delle distanze misurate indicherebbero la fedeltà anche al sito post riproduttivo.

Key words: *Green toad,* Bufo viridis*, philopatry, Sicily.*

EFFECT OF MOONLIGHT ON THE REPRODUCTIVE MIGRATIONS OF A COMMON TOAD (*BUFO BUFO*) POPULATION

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The reproductive migrations of a common toad, *Bufo bufo* (Linné, 1758), population were analysed in order to evaluate the effects of moon phases, weather conditions and light intensity (determined by both moonlight and amount of clouds in the sky). Data were collected for 11 years (since 1995 to 2005), during the nocturnal displacements of toads towards wetlands near Mesenzana (Varese, Northern Italy)

The toads were collected along a barrier used to prevent road crossing. We recorded the number of toads migrating each year in each moon phase and in four increasing sky cover classes (clear, partially cloudy, cloudy, rainy) *a priori* defined. We used Chi-square test to investigate the influence of each factor on the migration by calculating the expected frequencies supposing that in absence of a precise choice the number of toads displacing should be the same in each conditions of moon phase or sky cover class. Loglinear analysis was used to investigate the correlation of moon phase and sky cover class with the different years of sampling and sex of individuals.

The results of the four statistical tests conducted (with the total number of toads for each year) are reported in Tab.1.

Tab.1. Statistical tests on the dataset presented in the paper

***Chi-square* tests**				**Loglinear analysis**			
Years	**Moon χ^2** (d.f. = 3)	**Sky cover χ^2** (d.f. = 3)	**LUX χ^2** (d.f. = 2)	**Partial associations**	**d.f.**	**Partial χ^2**	**P**
1995 N = 591	103,83	581,09	232,03	Year*Moon*Sky cover	90	12263,602	<0.001
1996 N = 835	641,58	595,73	574,09	Year*Moon*Sex	30	173,265	<0.001
1997 N = 807	205,11	16,77	75,75	Year*Sky cover*Sex	30	158,990	<0.001
1998 N = 1336	880,33	566,99	254,03	Moon*Sky cover*Sex	9	16,103	>0.05
1999 N = 2431	1626,04	217,07	920,35	Year*Moon	30	18008,779	<0.001
2000 N = 3878	490,64	648,24	333,76	Year*Sky cover	30	7547,807	<0.001
2001 N = 3387	2778,29	735,26	197,39	Moon*Sky cover	9	1860,344	<0.001
2002 N = 3237	867,53	474,19	229,64	Year*Sex	10	249,529	<0.001
2003 N = 4579	7060,07	262,71	2872,09	Moon*Sex	3	25,696	<0.001
2004 N = 3368	2142,69	548,20	318,23	Sky cover*Sex	3	196,490	<0.001
2005 N = 3072	1476,86	641,12	25,93	Year	10	8565,720	<0.001
				Moon	3	2753,151	<0.001
				Sky cover	3	7025,796	<0.001
				Sex	1	1206,570	<0.001

All Chi-square tests were significant at P<0.001 levels.

All one, two and three level interactions, except that among moon-sky cover and sex, resulted significant in loglinear analysis, showing that all variables are related. Since clouds emulate the light of new moon phase, we combined moon phase and weather conditions into a single variable, called LUX, reporting light intensity (low, medium, high). Chi-square test for this

variable was significant for all years (Tab.1).
Moonlight and sky cover seem to have an influence on toads displacements towards wetlands;. In particular toads migrate preferentially with new and waning moon, when the sky is cloudy or in rainy nights and tend to avoid crescent and full moon in clear or partially cloudy nights. This pattern suggests that toads displace with conditions that make them less visible and vulnerable to predation risk. Sex is the less significant variable in all interactions involving it, indicating that both males and females migrate with analogous conditions.
A similar pattern has been observed in an American snake, *Crotalus viridis*, whose adults feed on small mammals and hunt them in dark nights, avoiding full moon, when preys can detect them more easily. Young snakes, instead, are active in every moon phase because they feed on lizards, which are inactive by night (Clarke et al., 1996, J. Herp., 30: 192-197).

Key words: Bufo bufo*, night movements, lunar cycle, cloudiness.*

ANALISI DI CONTENUTI STOMACALI DI *BUFO BUFO:* CONSIDERAZIONI ECOLOGICHE E COMPORTAMENTALI

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Lo studio dell'alimentazione negli Anfibi, oltre a mostrare indicazioni sugli habitat frequentati, fornisce utili informazioni sulle strategie di predazione. In questo contributo vengono riportati i risultati ottenuti dall'analisi delle prede presenti in un campione di stomaci ed intestini di rospo comune (*Bufo bufo* Linné, 1758) provenienti da un'area della Sicilia. Gli stomaci e gli intestini sono stati estratti da individui ritrovati morti a causa del traffico automobilistico sulle strade nei pressi del Lago Scanzano, ricadente nel comune di Marineo (Palermo), durante le migrazioni dei rospi al sito di riproduzione negli inverni 2004-2005 e 2005-2006. Il contenuto estratto è stato analizzato con l'ausilio di un microscopio stereoscopico e di guide specialistiche per la determinazione dei diversi taxa e, quando possibile, si è giunti alla determinazione a livello specifico.

In totale sono stati analizzati 56 contenuti stomacali ed intestinali, dei quali 11 (19.6%) sono risultati completamente vuoti, 7 (13.5%) presentavano esclusivamente frammenti vegetali. Nei rimanenti 38 (66.9%) sono state identificate 210 prede di varie dimensioni, appartenenti a 46 taxa, inclusi nel phylum degli Anellidi (1.9%), dei Molluschi (5.7%) e degli Artropodi (92.4%). Tra questi ultimi i più predati sono risultati i Coleotteri (56.2%), in particolare Carabidi (22.9%) e Stafilinidi (14.3%), i Dermatteri (10.5%) ed i Lepidotteri (8.6%). La specie più predata è risultata lo Stafilinide *Ocypus olens* con 28 (13.3%) individui. Il numero medio di prede per stomaco è risultato 7.5 (min=1; max=23). Inoltre in 21 (37.5%) stomaci sono stati rinvenuti resti vegetali, probabilmente ingeriti in maniera accidentale durante la cattura delle prede, mentre in 16 (28.6%) sono stati trovati nematodi e/o cestodi.

I risultati ottenuti sulla composizione alimentare, insieme ai resti vegetali ritrovati, farebbero supporre una provenienza boschiva degli individui di rospo comune ritrovati morti, nonostante nel territorio circostante al Lago Scanzano siano presenti diversi tipi di ambienti. In questo habitat i rospi sembrano adottare una strategia di caccia basata sull'attesa della preda in movimento; Carabidi, Stafilinidi e Dermatteri, infatti, sono prede molto mobili e veloci, che potrebbero rivelare la propria presenza oltre che a vista anche sulla base del rumore prodotto dal loro movimento sulla lettiera del sottobosco. La dieta è risultata differente rispetto a quella riscontrata in altre popolazioni di rospo comune da Cornish et al. (1995, Herpetol J., 5: 236-238) e da Antonelli et al. (2001, Pianura 13: 353-356), essenzialmente mirmecofaga. Piuttosto che alla differenza di habitat, questa differenza potrebbe essere imputabile al periodo di indagine che nel nostro caso è coinciso con la stagione invernale, periodo in cui gli Imenotteri sono sicuramente meno frequenti ed abbondanti.

Key words: Bufo bufo*, common toad, diet, Sicily.*

BREEDING ACTIVITY OF *RANA TEMPORARIA* AT LOW ALTITUDE

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No long term studies are available on phenology and reproductive biology of the common frog (*Rana temporaria* Linnaeus, 1758) in low altitude lotic habitats of Italy. In the present paper, the seasonal activity of a common frog population was studied from a torrent at an altitude of about 450 m a.s.l.

The research was carried out at Albino (Bergamo province, Lombard Prealps), in 1995-2003 and 2006. The study area (about 3000 m^2) included a torrent with a main river-bed and a series of more o less connected pools (N=48). Environmental variables, location and number of *R. temporaria* clutches were annually recorded. Ninety six clutches were weighed. From each clutch, one sample of eggs was drawn and weighted. Then the number of eggs of each sample has been counted. The weight of one egg was calculated as the ratio of the weight of the sample to the number of eggs counted in that sample. The total number of eggs per clutch was estimated by means of the proportion formula: $N.eggs_{clutch} = (weight_{clutch} * n.\ eggs_{sample}) / weight_{sample}$. Statistical analyses were performed by software package SPSS rel. 12.0 (SPSS, 2004).

R. temporaria came near the aquatic site between February and April and the period of adults at ponds was variable, from 2 to 9.5 months. Reproductive activity was observed between March and April and lasted for 10-46 days (mean= 30.42, median= 33, S.D.= 12.87), time of tadpoles development was 3.5-6 months. The number of clutches layed per year varied from 24 to 107 (mean= 41.8, median= 35, S.D.= 26.61). Within 96 clutches examined, the number of eggs per clutch varied from 440 to 3130 (mean= 1305, median= 1259, S.D.= 563.8), weight from 121 to 680 gr (mean= 340.5, S.D.= 131.4). The number of eggs was highly correlated with the weight of clutches (Spearman corr. coeff.: r_S= 0.456, P<0.001) Weight of single eggs, with jelly capsule, varied from 0.08 gr to 0.67 gr (mean= 0.29, S.D.= 0.12). Annual count of clutches varied from 21 to 107 (mean= 41.9, median= 35, S.D= 26.6). During the whole study period, 19 out of 48 ponds (39.6%) were colonized for reproduction. No differences in the choice of reproductive sites were found among breeding seasons (Friedman Test: χ^2=11.862, df =8, P>0.05). Size and position of ponds, bottom composition, water turbulence, presence/absence of riparial and aquatic vegetation, exposure to the sun were considered as environmental variables. The surface of breeding sites ranged from 0.12 m^2 to 43.2 m^2 (mean= 5.22, median= 0.735, S.D.= 10.88), the depth from 6 to 200 cm (mean = 33.29, median = 10, S.D. = 48.3). The difference between ponds with or without egg masses were found for riparial and acquatic vegetation (Mann-Whitney U= 132.5, P<0.01 and U=167.5, P<0.01, respectively) and insolation (Mann-Whitney U= 178.5. P<0.05).

Rana temporaria is considered an explosive breeder. In this study, reproductive activity and attending of adults at the ponds were longer than those we have observed at higher altitude. Maximum size of clutches was 3130 eggs and 680 gr. It is known that size and number of eggs per clutch is influenced by feeding condition, age and size of female, and environmental factors (i.e. females tend to produce larger and heavier eggs, at high altitude). A variability of weight of single eggs was found because of different factors (degree of hydration, size and development stage), (Rolando et al., 1996 Acta Biol. 71: 191-196). Surface and depth of aquatic sites were not

limiting factors, likewise location (in the river-bed, connected or isolated ponds). However, females seem to prefer ponds well exposed to sun, with both riparial and aquatic vegetation.

Key words: Rana temporaria*, reproductive activity, low altitude.*

PRELIMINARY DATA ABOUT DIET AND DISTRIBUTION OF AN ALLOCHTHONOUS POPULATION OF *XENOPUS LAEVIS* IN SICILY

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The African clawed frog, *Xenopus laevis* (Daudin, 1802), is the most common anuran in laboratories and fish tanks. This fact favoured the production of several allochthonous stocks. This paper shows the preliminary data, gathered from a study still in progress, about the diet and the distribution of the only Italian population of this frog (Lillo *et al*., 2005, Herpetozoa 18: 63-64).

The data were collected in an agricultural pond (20x35m) near the "Lago Poma" (province of Palermo) at intervals of approximately two weeks (from March 4th to April 21st 2006). 59 specimens were collected by using a special home made net pulled on the bottom of the pond. The stomach contents, obtained by stomach flushing (Solé et al., 2005, Studies on Neotropical Fauna and Environment 40: 23-28) were preserved in 70% alcohol and then identified by using a stereoscopic binocular microscope. Spatial distribution data were collected by sampling ponds and streams around the first point of observation.

The frequencies of the prey in the total stomach contents showed that chironomid larvae were the most frequent prey type (67.8%), followed by Zygoptera larvae (55.93%), Ephemeroptera larvae (54.24%), Cladocera (45.76%), Copepoda (37.29%), and Anisoptera larvae (21.12%), while the presence of terrestrial arthropods was occasional (8.47%).
The presence of *Xenopus* eggs and tadpoles, respectively in 16.95% and 3.39% of stomachs, indicated a somewhat tendency towards cannibalism; the ingestion of sloughed skin was also frequent (20.34%).
Predation on Cladocera was more evident in fully-grown than in juvenile specimens (71.43% *vs.* 34.21%), whereas the opposite was true as for the ingestion of eggs (23.68% *vs.* 4.76%).
The evaluation of the weight fraction for each kind of prey (N = 31) on the total mass of stomach contents (to the exclusion of vegetal residuals, undetermined residuals and skin) shows a important variation of: Copepoda (0.27%), Cladocera (2.50%) and more than else chironomids, more frequent preys but with reduced weight fraction (4.78%). Odonata fraction is really higher with 79.90% (Zygoptera 44.35% and Anisoptera 30.55%) and Ephemeroptera with 13.19% in weight.
The weight fraction of preys, evaluated per each sampling day, shows for April 3rd the comparison of eggs in the stomach contents (20.56%), which decreases to 1.92% on April 21st at the same time of the reproduction. The increment of the fraction of total weight of Cladocera is remarkable on April 3rd (12.04%) and it decreases to 0.46% on April 21st.
The weight fraction over the total of stomach contents for each kind of prey confirms the previous results about predation frequencies of full-grown and juvenile specimens.
The data about the presence of *Xenopus* indicated an approximated distribution area of about 170 km^2, in a region that extends from “Valle dello Jato” (northern limit) to Camporeale (southern limit), including part of hydrographic bacin of Belice Destro River.
The largest part of this area is under agricultural activities and includes a number of agricultural ponds. These ponds cover a density of 6.4 per km^2 in the surveyed portion of Valle dello Jato.

Probably these ponds really work as *stepping stones* for the dispersion of this species which is rather unfitted to terrestrial life. (Fouquet & Measey, 2006, Animal Biology 56: 95-102).

Key words: *African clawed frog, stomach flushing, alien species.*

RISICOLTURA E RANE VERDI: POSSIBILI IMPATTI NEGATIVI

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Obbiettivo principale di questa ricerca è stato: valutare gli effetti della risicoltura sullo stato di salute delle popolazioni di *Rana esculenta* complex. A tale scopo abbiamo confrontato tre popolazioni che si riproducono in siti immersi nelle risaie della provincia di Vercelli e Novara con due popolazioni i cui siti in provincia di Cuneo sono costituiti da stagni in ambienti seminaturali.
Per ciascuna popolazione abbiamo effettuato due campionamenti serali nel periodo riproduttivo (maggio-giugno 2005), catturando tra i 20 e 40 esemplari per popolazione.
Di ciascun animale catturato abbiamo: 1) misurato la lunghezza corporea (SVL = snout vent length) con calibro digitale; 2) misurato il peso tramite bilancia digitale; 3) calcolato l'indice di condizione (CI) dividendo il valore del peso per il valore di SVL elevato al cubo; 4) determinato l'età e la maturità sessuale attraverso l'analisi scheletrocronologica eseguita su falange; 5) calcolato l'indice di accrescimento (GI) correggendo il valore di SVL per il valore di età di due anni attraverso la formula proposta da Lleonart et al. (2000, J. theor. Biol. 205: 85-93).
In totale, nelle popolazioni di risaia (che indicheremo con A = soggette ad un alto impatto antropico) sono stati catturati 34 maschi, 59 femmine e 15 immaturi, mentre nelle popolazioni di ambienti "seminaturali" (che indicheremo con B = basso impatto) sono stati catturati 26 maschi, 13 femmine e 3 immaturi. I dati relativi agli immaturi non sono stati analizzati.
Maschi e femmine delle popolazioni A sono risultati avere un peso, una SVL ed un CI significativamente più basso dei maschi e delle femmine delle popolazioni B (Tab. 1 e 2).

Tab. 1. Per i maschi delle due tipologie ambientali sono riportati il peso, la SVL, il CI ed il risultato del Test di Mann-Whitney. *** = $P < 0.001$

Tipologia ambientale	N	MASCHI PESO (g) (media ± dev. st.)	SVL (mm) (media ± dev. st.)	CI (mg/mm^3) (media ± dev. st.)
B	26	17.5 ± 7.9	56.26 ± 7.55	0.092 ± 0.009
A	34	6.8 ± 3.8	42.29 ± 6.65	0.083 ± 0.007
Mann-Whitney		U = 808.0***	U = 800.0***	U = 699.0***

Tab. 2. Per le femmine delle due tipologie ambientali sono riportati il peso, la SVL, il CI ed il risultato del Test di Mann-Whitney. *** = $P < 0.001$; ** $P < 0.01$

Tipologia ambientale	N	FEMMINE PESO (g) (media ± dev. st.)	SVL (mm) (media ± dev. st.)	CI (mg/mm^3) (media ± dev. st.)
B	13	20.1 ± 16.0	58.30 ± 12.07	0.086 ± 0.010
A	59	6.7 ± 3.7	42.67 ± 7.09	0.080 ± 0.005
Mann-Whitney		U = 693.5***	U = 689.0***	U = 596.0**

In totale, è stata determinata l'età di 26 maschi e 50 femmine delle popolazioni A e di 21 maschi e 8 femmine delle popolazioni B.
Le trasformate logaritmiche di età e SVL sono risultate associate in maniera positiva e altamente significativa nei maschi (N = 46, rho Spearman = 0.660, P < 0.001) mentre nelle femmine l'associazione positiva non è risultata significativa (N = 58, rho Spearman = 0.124, P = 0.353).
I maschi e le femmine dei siti A sono risultati avere in media età e tassi di accrescimento (GI) significativamente più bassi degli esemplari delle popolazioni B (Tab. 3 e 4). I maschi A sono inoltre risultati maturare ad un'età significativamente inferiore ad i maschi B mentre nelle femmine delle due tipologie ambientali non si è riscontrata una differenza significativa tra l'età di maturità sessuale (Tab. 3 e 4).
I nostri risultati sono tutti concordi nell'indicare uno stato di sofferenza delle popolazioni di risaia. Gli animali di questi ambienti tendono ad essere più magri e più piccoli degli esemplari di ambienti "seminaturali". Le minori dimensioni degli animali di risaia sembrano essere dovute sia ad una minore capacità di accrescimento che ad un'età media degli animali inferiore rispetto alle popolazioni soggette ad un minore impatto antropico. In conclusione, negli ambienti di risaia le rane verdi sembrano soffrire tassi di mortalità più severi e conseguentemente mostrano una struttura di età più giovane; inoltre esse sembrano non potersi accrescere ed accumulare riserve energetiche con la stessa efficienza che mostrano in ambienti meno antropizzati.

Tab. 3. Per i maschi delle due tipologie ambientali sono riportati l'età, l'età alla maturità sessuale e l'indice di accrescimento ed il risultato del Test di Mann-Whitney. *** = P < 0.001, ** P < 0.01

Tipologia ambientale	N	MASCHI		
		ETA' (anni) (media ± dev. st.)	MAT. (anni) (media ± dev. st.)	GI (mm) (media ± dev. st.)
B	21	3.9 ± 1.2	2.2 ± 0.4	46.4 ± 7.2
A	26	2.4 ± 0.8	1.8 ± 0.5	39.7 ± 5.6
Mann-Whitney		U = 466.0***	U = 367.5**	U = 413.0***

Tab. 4. Per le femmine delle due tipologie ambientali sono riportati l'età, l'età alla maturità sessuale e l'indice di accrescimento ed il risultato del Test di Mann-Whitney. ** P < 0.01, * = P < 0.05, NS = non significativo

Tipologia ambientale	N	FEMMINE		
		ETA' (anni) (media ± dev. st.)	MAT. (anni) (media ± dev. st.)	GI (mm) (media ± dev. st.)
B	8	3.1 ± 0.8	2.2 ± 0.5	50.8 ± 8.3
A	50	2.5 ± 0.7	2.0 ± 0.5	40.3 ± 7.2
Mann-Whitney		U = 287.0*	U = 250.0 NS	U = 329.0**

Key words: *water frogs, agriculture, rice fields, life histories.*

MARKETING AMBIENTALE E CONSERVAZIONE DELL'ERPETOFAUNA; OVVERO: COME QUADRUPLICARE LE POPOLAZIONI ITALIANE DI *HYLA ARBOREA*

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**Museo Civico di Storia Naturale di Trieste; **Tutori Stagni e Zone Umide Ass.S.C. Corpi Forestali del Friuli Venezia Giulia*

Già prima della rivalutazione tassonomica di *Hyla intermedia* (Boulenger, 1882), avvenuta all'inizio degli anni '90, appariva evidente il rapido declino delle raganelle in tutta la Venezia Giulia, ma ciò non accadeva per le popolazioni che si trovavano ad ovest dell'Isonzo. Ad est di tale fiume sparirono persino popolazioni campionate nelle indagini per la separazione tassonomica delle due specie. Dopo tale separazione emerse che *Hyla arborea* (Linné, 1758), era diventata una delle specie italiane più rare e minacciate, tanto da essere presente in soli 3 siti riproduttivi in Provincia di Trieste (Bressi & Dolce, 1992, Quad. Civ. Staz. Idrob. Mil. 19: 93-100) e 2 nel Tarvisiano (Bressi, 2006, in Sindaco, Doria, Razzetti, Bernini, S.H.I. Polistampa Firenze: 312-317).

Il Museo Civico di Storia Naturale di Trieste ha allora intrapreso una serie di operazioni volte allo scopo di scongiurare l'estinzione della specie dal territorio italiano (e dal margine sud-occidentale del suo areale). Gli sforzi si sono concretizzati lungo 3 contemporanee linee operative, distinte quanto complementari e interdipendenti. Si è iniziato con l'operare una certosina disamina della specie sul territorio per accertare ogni residua popolazione presente (censimenti diffusi e ripetuti), unitamente alle cause di scomparsa (raccolta estensiva e confronto di dati dai siti di estinzione). Secondariamente si è intrapresa la gestione diretta della specie, avviando ripristini e costruzioni di siti riproduttivi, stabulazione delle larve e programmi di reintroduzione. Contemporaneamente, la terza e decisiva iniziativa è stata quella del marketing ambientale mirato alla specie obbiettivo: attuando programmi multi-livello di divulgazione, sensibilizzazione, didattica e reclutamento.

Il marketing ambientale ha consentito di creare quel consenso che a sua volta ha portato all'ottenimento delle risorse umane necessarie ad amplificare e consolidare le altre 2 linee operative con un feed-back positivo di risultati. Dopo 10 anni gli esiti sono andati oltre ai nostri stessi obiettivi (che miravano ad un raddoppio delle popolazioni). Si sono avuti infatti: conservazione delle 3 popolazioni censite nel 1996, scoperta di altre 2 consistenti popolazioni in siti privati inaspettati, costruzione e reintroduzione in 3 siti, ripristino e reintroduzione in altri 6 biotopi, per un totale di 14 popolazioni distinte di *H. arborea* note oggi in Provincia di Trieste (forse le uniche in Italia, data la grave situazione in cui versa *H. arborea* del Tarvisiano) (Tab. 1). Il raggiungimento di tali obiettivi è stato possibile grazie a quasi un centinaio di operatori volontari coinvolti e alla comprensione delle istituzioni e della popolazione locale, sensibilizzati dal marketing ambientale mirato. Il tutto con un budget inferiore ai 10.000 €.

Tab. 1. Situazione dei siti riproduttivi di *Hyla arborea* in Provincia di Trieste dal 1976 (non esistono dati precedenti) ad oggi.

Situazione siti riproduttivi *Hyla arborea* in provincia di Trieste				
anno e denominazione sito				
1976	***1996***	***2006***	**problemi**	**lavori**
5			x, i	
6		6	i	R
7		7	s	R
		9	s	R, e
10		10	i	A, e
14,15			i	
		16	s	R, e
39			i	
18			x	
21	21	21		
23		23	s	R, e
46,47			s	
50			x, i	
63	63	63		
		82		C, e
Rosandra				
Noghere	Noghere	Noghere	x, i	M, A
		Carsiana	x	C, A, e
		O.P.P.	i	C, M, e
		Borgo Grotta		w
		Lazzaretto		w
14	3	14	**numero siti totali**	
R = ripristino del sito; **C** = costruzione di un nuovo sito; **M** = manutenzione e pulizia; **A** = eradicazione ittiofauna alloctona; s = sparizione; i = impaludamento; x = ittiofauna alloctona; e = reintroduzione; w = scoperta				

Key words: *marketing ambientale,* Hyla arborea*, conservazione, gestione, Trieste.*

RISULTATI PRELIMINARI DEL PROGETTO INTERREG III A ITALIA - AUSTRIA "SALVAGUARDIA DELL'ERPETOFAUNA NEL TERRITORIO DI ALPE -ADRIA"

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La parte italiana del Progetto "Salvaguardia dell'Erpetofauna nel territorio di Alpe-Adria" è stata coordinata dalla *Direzione Centrale delle Risorse Agricole, Naturali, Forestali e Montagna* attraverso l'*Ufficio Studi Faunistici* della Regione Autonoma Friuli Venezia Giulia, con la supervisione scientifica del *Museo Friulano di Storia Naturale* di Udine. Nel corso di questa iniziativa triennale sono stati sviluppati diversi studi ed operazioni mirate a costruire le basi strutturali per tutelare lo straordinario patrimonio erpetologico della Regione Friuli Venezia Giulia.

Il Progetto è stato sviluppato su un programma triennale di ricerca scientifica e monitoraggio che è stato oggetto di relazione annuale (Lapini et al., 2003. *Mus. Friul. di Stor. Nat.*, Rel. sul primo anno di attività, Reg. Friul. Ven. Giulia, UD; Lapini et al. 2004. *Mus. Friul. di Stor. Nat.*, Rel. sul secondo anno di attività, Reg. Friul. Ven. Giulia, UD; Lapini et al., 2005. *Mus. Friul. di Stor. Nat.*, Rel. sul terzo anno di attività, Reg. Friul. Ven. Giulia, UD).

Il percorso è stato realizzato mettendo anzitutto a fuoco gli elementi di fragilità delle comunità erpetologiche e le priorità di intervento. Ciò ha permesso di sviluppare le iniziative tenendo sempre presente una scala regionale del rischio biologico (Lapini et al., 2004. Op. cit.) capace di pesare necessità e priorità con criteri estremamente razionali.

I punti del programma sin qui sviluppato possono essere elencati come segue:

1. Individuazione delle priorità di conservazione della fauna erpetologica utilizzando i modelli proposti da Andreone & Luiselli (2000**,** *Biol. Cons.*, 96: 197-208.; 2001. *Biol. Cons.*, 97: 269).
2. Studio di alcune popolazioni di rane verdi quali possibili indicatori di qualità ambientale.
3. Creazione o ripristino di alcuni siti riproduttivi per anfibi.
4. Individuazione e mappatura dei più importanti corridoi di migrazione riproduttiva di anfibi ad elevato rischio di investimento stradale.
5. Interventi di Public Awareness rivolti a utenti di diverso ordine e grado d'istruzione.

La principale causa di rarefazione delle popolazioni di anfibi e rettili nella regione Friuli Venezia Giulia è riferibile ai condizionamenti ed alla pressione diretta e indiretta esercitata dall'uomo verso gli ambienti naturali più fragili (Cfr. la sintesi di Lapini et al., 1999**.** *Ed. Mus. Friul. St. Nat.*, Udine, 43: 1-149). Uno dei maggiori effetti di questo impatto si traduce nella frammentazione delle comunità di molte specie animali soprattutto per il continuo sviluppo delle infrastrutture umane. La crescita e diversificazione delle strutture di servizio e delle più svariate attività antropiche ha portato ad una graduale ma incessante compartimentazione dell'ambiente, con riflessi negativi sia sulla differenziazione genetica, sia sulla vitalità delle singole popolazioni. Il quadro complessivo, soprattutto in pianura, si è aggravato per gli effetti ambientali negativi provocati da bonifiche e riordini fondiari, attuati in buona parte della pianura

padano-veneta. Persino in montagna l'abbandono di tradizionali attività umane in equilibrio con l'ambiente naturale quali ad esempio l'alpeggio, ha provocato la graduale scomparsa degli abbeveratoi che nelle aree più carsificate garantivano la sopravvivenza di importanti comunità di anfibi (Cfr. ad es. Lapini L., 2006. 2. I libri del Parco. *Parco Nat. Dolomiti Friul. ed.*, Cimolais, PN).
Il Progetto Interreg di cui si è riferito costituisce la prima risposta che l'Amministrazione della Regione Friuli Venezia Giulia ha ritenuto di dare a questi problemi, con lo specifico obiettivo di proporre un approccio strutturale che vada oltre la gestione di sporadici interventi di emergenza. Ciò favorirà la pianificazione di iniziative più organiche sia a livello regionale, sia nazionale e internazionale, nel quadro normativo imposto dalla Direttiva Habitat 92/43 CEE e nell'ambito della rete Natura 2000.

Una delle pozze create a Palazzolo dello Stella (foto Sergio Cavan)

Key words: *Alpe-Adria, Progetto Interreg, comunità di Anfibi.*

UNA BANCA DATI SUI VERTEBRATI ENDEMICI ITALIANI: ANFIBI

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Nel 2006 l'APAT, Agenzia per la Protezione dell'Ambiente e per i Servizi Tecnici, ha avviato una linea di attività finalizzata a raccogliere informazioni sui Vertebrati endemici italiani, a livello di specie e sottospecie. L'attività s'inquadra nel ruolo svolto dall'APAT ai fini della diffusione delle informazioni in campo ambientale a supporto delle Amministrazioni Pubbliche centrali e locali.
Per la disponibilità di materiale bibliografico aggiornato, si è scelto di iniziare dalla classe Amphibia. E' stata quindi redatta la lista delle specie e sottospecie di Anfibi endemiche italiane, associandovi una banca dati dove, per ogni taxon, sono state riportate le informazioni relative alla tassonomia, alla biogeografia, all'ecologia e alla conservazione. L'associazione specie/sottospecie – habitat è avvenuta in base ad una valutazione di affinità tra caratteristiche dell'habitat e biologia della specie/sottospecie. Per gli habitat si è fatto riferimento alla lista CORINE biotopes (Agenzia Europea per l'Ambiente, 1991. CORINE biotopes. Commission of the European Communities), riadattata al contesto nazionale nell'ambito di un progetto interno all'APAT. La classificazione delle minacce e le azioni di intervento sono tratte da IUCN, The World Conservation Union, Species Survival Commission (IUCN, 2006- http://www.iucn.org/themes/ssc/; http://www.redlist.org).
Sono state identificate 29 entità tassonomiche (18 specie e 11 sottospecie) endemiche e subendemiche italiane. Tra queste, 1 (*Salamandra atra aurorae*) è in stato di conservazione critico (CR), 2 (*Euproctus platycephalus* e *Pelobates fuscus insubricus*) sono in pericolo (EN), 2 (*Salamandra lanzai* e *Speleomantes flavus*) sono vulnerabili (VU) e 19 sono a basso rischio (LR); le rimanenti 6 non hanno dati (IUCN, 2006) (Tab. 1). Il 48,2% ha un trend negativo mentre le rimanenti hanno popolazioni stabili (Global Amphibian Assessment, 2006 - http://www.globalamphibians.org).
Su 29 anfibi considerati, ben 28 risultano minacciati a causa della perdita e/o degrado degli habitat naturali; 18 subiscono negativamente gli effetti dello sviluppo di infrastrutture (residenziali o legate al tempo libero) mentre 15 sono minacciati per cause intrinseche: tasso di crescita delle popolazioni limitato o areali troppo ridotti. Altri fattori di minaccia rilevanti sono: l'inquinamento delle acque (14 taxa coinvolti), l'introduzione di specie aliene con un ruolo predatorio o competitivo verso gli anfibi (10 taxa) (Global Amphibian Assessment, 2006 - http://www.globalamphibians.org).
Le azioni di conservazione in atto riguardano soprattutto azioni politico-legislative che proteggono a livello internazionale 27 taxa su 29, 15 a livello nazionale e 10 a livello regionale; le azioni sugli habitat tutelano 25 taxa, con particolare riferimento alla gestione dei siti e l'istituzione di aree protette. Tra le azioni di conservazione non sono praticate, tranne poche eccezioni, quelle basate sulla comunicazione/educazione, sulla ricerca in senso lato e quelle agenti direttamente sulle specie (reintroduzioni, gestioni finalizzate al recupero ecc.). Infatti tra le azioni necessarie, la IUCN indica soprattutto la ricerca, con particolare riferimento alla valutazione delle entità delle popolazioni, le minacce, misure di conservazione e finalizzate alla conservazione degli habitat (Global Amphibian Assessment, 2006 - http://www.globalamphibians.org).
L'associazione taxon – habitat evidenzia che anfibi endemici sarebbero potenzialmente presenti, oltre che negli habitat acquatici in generale (laghi, fiumi, paludi, sorgenti, ecc.), nei boschi

alluviali umidi, nelle praterie umide, in alcune tipologie di coltivi (risaie e frutteti), ma anche in rupi, brecciai, cave e grotte. I meno adatti ad ospitare gli endemismi sarebbero gli habitat estremi come i ghiacciai e i campi di lava, gli habitat fortemente antropizzati e quelli marino-costieri.

Tab. 1. Anfibi endemici (E) e subendemici (S) italiani. Sono state considerate tutte le specie e sottospecie subendemiche aventi in Italia contingente maggiore del 50% del contingente globale (Categorie A, B e C1 di Sindaco et al., 2006; Societas Herpetologica Italica, Edioni Polistampa).

n.	Taxa		E/S	IUCN
1	*Euproctus platycephalus*	(Gravenhorst, 1829)	E	EN
2	*Salamandra atra aurorae*	Trevisan, 1982	E	CR
3	*Salamandra lanzai*	Nascetti, Andreoni, Capula e Bullini, 1988	S	VU
4	*Salamandra salamandra gigliolii*	Eiselt & Lanza, 1956	E	
5	*Salamandrina terdigitata*	(Lacépède, 1788)	E	LR
6	*Salamandrina perspicillata*	(Savi, 1821)	E	
7	*Mesotriton alpestris apuanus*	(Bonaparte, 1839)	S	
8	*Mesotriton alpestris inexpectatus*	Dubois & Breuil, 1983	E	
9	*Triturus carnifex*	(Laurenti, 1768)	S	LR
10	*Lissotriton italicus*	(Peracca, 1898)	E	LR
11	*Lissotriton vulgaris meridionalis*	(Boulenger, 1882)	S	LR
	Speleomantes ambrosii	Lanza, 1955	E	LR
12	*Speleomantes ambrosii ambrosii*	Lanza, 1956	E	LR
13	*Speleomantes ambrosii bianchii*	Lanza et al., 2005	E	LR
14	*Speleomantes flavus*	Stefani, 1969	E	VU
15	*Speleomantes genei*	Temminck & Schlegel, 1838	E	LR
	Speleomantes imperialis	Stefani, 1969	E	LR
16	*Speleomantes imperialis imperialis*	Stefani, 1969	E	LR
17	*Speleomantes imperialis sarrabusensis*	Lanza et al., 2001	E	LR
18	*Speleomantes italicus*	Dunn, 1923	E	LR
19	*Speleomantes strinatii*	(Aellen, 1958)	S	NT
20	*Speleomantes supramontis*	Lanza, Nascetti & Bullini, 1986	E	LR
21	*Bombina pachypus*	(Bonaparte, 1838)	E	LR
22	*Discoglossus sardus*	Tschudi, 1837	S	LR
23	*Discoglossus pictus pictus*	Otth, 1837	S	
24	*Pelobates fuscus insubricus*	Cornalia, 1873	E	EN
25	*Hyla intermedia*	Boulanger, 1882	S	
26	*Hyla sarda*	(De Betta, 1853)	S	LR
27	*Rana bergeri*	Gunther, 1985	S	LR
28	*Rana italica*	Dubois, 1987	E	LR
29	*Rana latastei*	Boulanger, 1879	S	LR

Key words: *Italian endemic amphibians; Data base.*

DIET AND TROPHIC NICHE OVERLAP OF TWO HYLID SPECIES IN A SUBTROPICAL WETLAND OF NE ARGENTINA

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Hyla nana and *Hyla sanborni* are two Hylids, recently recognized as two distinct species, similar in morphology, and frequently coexisting in the same reproductive sites. To determine whether food partitioning occurred during the reproductive phase, both numerical and volumetric analyses of the stomach contents were conducted on syntopic populations inhabiting a wetland system in the Corrientes Province, NE Argentina.

The fieldwork was carried out in the Ibera Lake, one of the most important waterbasins of the "Esteros del Iberá". This is a large wetland system situated in the Corrientes Province, NE Argentina (Ramsar site no. 1162). The study was carried out during the wet season (December to February). The climate is subtropical with a high relative humidity. Specimens came from 9 sampling sites, and sacrificed by immersion in an anesthetic solution (ethanol 10%) for 5 minutes (Peltzer and Lajmanovich, 2000, Bol. Asoc. Herpetol. Esp. 11:71-73). Food items were identified and photographed to measure prey volume approximating their shape to that of a cylinder or a prolate spheroid. The specific trophic strategies were assessed using the Costello's graphic techniques modified by Amundsen et al. (1996, J. Fish Biol. 48:607-614.). Prey niche breadth (standardized Levins' index B_A - Hurlbert, 1978,) and overlap (Schoener's index (C), 1969, Am. Nat. 103:277-313; Pianka's index (O), 1973, Ann. Rev. Ecol. Syst. 4:53-74) were also calculated. Factorial Analysis of the Correspondence (FAC) was applied to volumetric data in order to evaluate how the two species exploited the food resources. The average stomach content and food item volume were correlated to the size (SVL) of both species.

A total of 123 stomachs were analysed: 47 of *H. nana* and 76 of *H. sanborni*. In terms of prey volume, *H. nana* showed a preference towards larger food items than *H. sanborni* ($mean_{HN44}$=29.94mm^3, SD_{HN}=33.05; $mean_{HS111}$=16.44mm^3, SD_{HS}=43.41; df=153; t=-2.34; P<0.05; t-test). There was no difference between the two species in the mean stomach content volume of individuals, however the stomach contents of *H. nana* were slightly larger ($mean_{Hn=61}$= 42.5 mm^3, SD_{Hn}= 50.92; $mean_{Hs=31}$= 30.67 mm^3, SD_{Hs}= 44.59; df=90; t=2.09; P=0.43; t-test). The analysis of Costello graphics (based on numeric and volumetric data; Figure 1) showed that both species (and particularly *H. sanborni*) were characterised by a restricted niche breadth, being strong specialist predators of Diptera Nematocera. Spiders represented an additional main prey category for *H. nana*, but only a small fraction of the diet of *H. sanborni*. The relative contribution of Nematocera to the trophic spectrum was lower in *H. nana* than in *H. sanborni*. The remaining food categories occurred at low frequency in the stomachs of both species, representing small portions of the whole diet. The FAC applied to volumetric data of five comprehensive food categories (excluding prey with frequency of occurrence <5%), based on the first two factors (60% of the explained variance; Fig. 1), showed a different spatial arrangement of the two species due to the differential use of some food categories: *H. nana* plot distribution was influenced predominantly by Aranea and a various assemblage of winged insects (Ephemeroptera, Orthoptera, Isoptera, Trichoptera and Lepidoptera), whereas hemipterans represented a food category almost exclusive to *H. sanborni*. Diptera (Nematocera and Brachycera) were the main preys shared by the two species. Niche breadth (B_A) for both numerical and volumetric data was greater in *H. nana* than in *H. sanborni* (HN_{num}=0.11, HS_{num}=0.04; HN_{vol}=0.15, HS_{vol}=0.06). A diffuse overlap in the diet spectrum was observed (O_{num}=0.95 , O_{vol}=0.84; C_{num}=0.66, C_{vol}=0.51).

The diets of *Hyla nana* and *H. sanborni* were similar in composition. All the analyses showed a marked preference towards Diptera in both species, particularly in *H. sanborni*. *H. nana* exhibited higher prey diversity than *H. sanborni* but, fewer prey items per stomach. The food spectrum composition, evidenced by the FCA, indicated a preference towards preys of large average size (Aranea and Hexapoda assemblage) for *H. nana*, whereas the distribution of *H. sanborni* was clearly linked with the Diptera. According to Schoener's (1969, Am. Nat. 103:277-313) food size selection strategy model for a two syntopic predator species system, *Hyla nana*, the larger species, selected prey bigger in size, while *H. sanborni* ate a larger number of prey specimens. Despite a high degree of trophic niche overlap, *Hyla nana* and *H. sanborni* did not segregate spatially, hence the coexistence mechanism, at least during the reproductive period, should not be related to competition processes. However, overlap indices are not a direct measure of interspecific competition because they can be interpreted as evidence both in favour or against current competition (Colwell and Futuyma, 1971, Ecology 52:567-576).

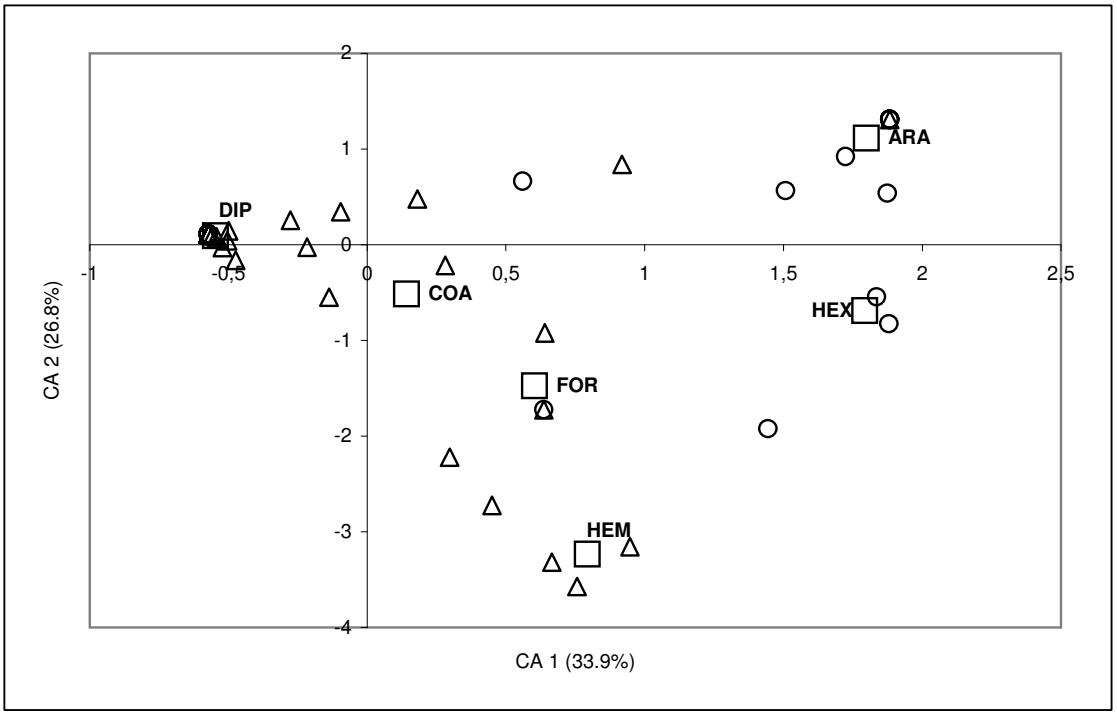

Fig. 1. CFA analysis on the first two factors ordinating the species on the basis of their trophic spectrum (volumetric data). Symbols: ARA=Araneae; COA=Collembola and Acarina; DIP = Diptera; FOR=Formicidae; HEX=Ephemeroptera, Orthoptera, Isoptera, Trichoptera and Lepidoptera; circles=*Hyla nana*; triangles=*Hyla sanborni*.

Key words: *Anura, Hylidae, Argentina, food partitiniong.*

VII - Erpetologia africana

VII - African herpetology

(Convenor: Godfrey C. Akani, Franco Andreone, Luca Luiselli)

A PILOT PROJECT BOOSTS THE AMPHIBIAN CONSERVATION IN MADAGASCAR

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As a general trait, very little is known about the decline of amphibians in mainland Africa and Madagascar, due to the lack of quantitative data. A recent workshop on the Global Amphibian Assessment held at the IUCN headquarters in Gland evaluated the status of the endemic species of amphibians of Madagascar. This led, among other things, to the publication of a paper, where the main problems affecting all the Malagasy species were highlighted (Andreone et al. 2005, Conserv. Biol. 19 (6): 1790-1802). As a conclusion, it was evident that many species are experiencing a critical conservation point, due to the increasing deforestation of remaining tropical forests, and habitat degradation. Furthermore, some species (e.g., *Mantella* spp., *Scaphiophryne* spp., *Dyscophus* spp.) are the object of a significant commercial trade for the terrarium market: due to their biological peculiarities and remarkable colouration, thousands of individuals of some of these frogs are exported for the pet trade each year. Of the 220 species evaluated, 9 turned to be Critically Endangered, 21 Endangered, and 25 Vulnerable. The identified critically endangered species were nine: *Mantella aurantiaca, M. cowani, M. expectata, M. milotympanum, M. viridis, Scaphiophryne gottlebei, Mantidactylus pauliani, Boophis williamsi,* and *Stumpffia helenae*.

This first data set (which has the potential to change in the future as a result of the discovery of new species and/or re-ranking of the threat status of other species) clearly pinpointed the species that major conservation actions should address. As a consequence, a research programme on some selected species was started. Within it two crucial steps were marked: (1) focus on those threatened species that are subject to the pet-trade, and (2) gather information on the remaining threatened species. The first phase dealt with some of the critically endangered species (*Mantella cowani, M. expectata, M. viridis,* and *Scaphiophryne gottlebei*), one endangered species interested by the pet trade and by incipient deforestation (*Mantella bernhardi*), and a vulnerable species currently listed in CITES I, the tomato frog *Dyscophus antongili.* The project study involved the collect of distributional and population data, natural history traits and age structure, and genetics (Andreone el al., 2006, Natura, in press).

This research work led to get some remarkable results in terms of biological conservation. For *M. cowani* new population nuclei were found, and a genetical analysis showed that saving a few big populations could lead to the conservation of most of its haplotypes (Chiari et al., 2005, Conserv. Gen. 6 (6): 1566-621). In *M. berhnardi* two conservation units were identified, thus stressing the value to be attributed in terms of local conservation (Vieites et al., Molec. Ecol. 15: 1617–1625). *M. expectata, M. viridis* and *S. gottlebei* are more widely distributed than formerly believed (Andreone et al., 2005. Froglog 72: 2). The tomato frog, *Dyscophus antongili,* is the only Malagasy frog included in CITES I: the present study confirmed the extension of the species much more southward than formerly known, close to a protected area, while the well-known Maroantsetra populations apparently showed indications of lowering. Further steps are therefore discussed at the light of these results, to be intended as part of a pilot study. An important keystone in this process is the realisation of a workshop that will be held in late 2006 at Antananarivo, during which the main conservation issues expected to be done in Madagascar will be discussed, searching for consensus among the most prominent amphibian specialists.

Such a workshop will be an ideal starting point to orient and boost the ongoing conservation on the Malagasy amphibians.

Key words: *Amphibians, Conservation, Madagascar.*

THE PLACE OF REPTILIAN TRADE IN THE BUSHMEAT CRISIS FROM THE FOREST MARKETS OF SOUTH-EASTERN NIGERIA

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Bushmeat represents a significant drain of African biodiversity resources (Bennett et al., 2002; FAO, 2004; Fa et al., 2005); at the same time, it is regarded as a relevant livelihood asset (FAO, 1997) and as an important component of the standard diet of 150 million people worldwide, representing one eighth of the world poorest (DFID, 2002). Traditional forest communities have been known to hunt a wide range of species (Ichikawa, 1993). These people tend to privilege ungulates and primates, but a number of secondary prey species also get caught, especially when larger prey is unavailable; in order of preference: rodents, turtles and tortoises, crocodiles, a number of carnivores (mongooses, civets, golden cat, leopard, etc), snakes, bats and invertebrates (snails, termites, caterpillars, beetles and mayflies, among others). In this paper we analyse the trends of bush-meat trade in southern Nigeria forest markets, with an emphasis on the relative role placed by reptiles in the current market trends.

Our study of Nigerian reptiles in bush-meat markets has lasted from 1994 to 2005, with a number of different projects conducted both as university-based academic research or as industry-linked applied research. During these studies a large number of forest plots was surveyed for short times, while some fewer plots were monitored for extensive periods (> 10 years), both using standardized methods (Andreone & Luiselli, 2000; Eniang & Luiselli, 2002) and *ad hoc* surveys. During our fieldwork, we systematically surveyed a number of large and small bushmeat markets, in order to maximize the number of specimens to analyse, and to investigate traditional uses of snake bushmeat. In this paper, we report market data concerning snake trading in Akwa-Ibom and Cross River States (respective capitals: Uyo and Calabar) during >50 independent visits conducted in the years 2003-2005. These market data were compared with field observations of the relative abundance of different reptile taxa in swamp rainforest, in mangroves, and in secondary savannah of the same study region, as reported in the literature (see Luiselli et al., 2005).

For every traded specimen, information was obtained from local traders and especially from those present at the time of capture, by collecting information about time of death, cause of death, and prior activities. When not mutilated, the specimens were bought, preserved in 70% ethanol, and kept in the collection at the Biodiversity Preservation Center (BPC) in Calabar or at the Rivers State University of Science and Technology in Port Harcourt. All statistical analyses were done with SPSS (version 8.0 for Windows) PC package, with alpha set at 5% and all tests being two-tailed.

A total of 13 different species of snakes, 5 of lizards, 3 of crocodiles and 7 of chelonians were regularly marketed in the forest markets in southern Nigeria. Although our data were collected

opportunistically, nonetheless the high number of specimens traded (x = 9.39 snakes × visit^{-1}) clearly suggests that human exploitation of reptiles was severe and it may represent a significant threat to local snake populations. In addition to direct consumption, some reptiles (particularly snakes and chameleons) were killed and traded for other reasons, i.e. fetish and traditional medicine. Direct observations showed that there was an obvious difference in the use made of snake species: venomous taxa were used in traditional rituals or as food when their body sizes were large (i.e., large *Bitis* vipers and the cobras *Naja* and *Dendroaspis*); non-venomous taxa were used as food, apart for pythons which were involved in a large variety of uses, including medicine. Table 1 below summarizes the main species targeted by bush-meat dealers, and their respective uses.

Tab. 1. Main species of Amphibians and Reptiles and their frequency of occurrence in the local markets. Symbols: AKS = all over Akwa-Ibom State; CRS = all over Cross River State.

Species	Location/Area	Uses	Occurrence at market
Crocodiles			
Osteolaemus tetraspis	AKS/CRS	Bushmeat	Common
Crocodylus cataphractus	Calabar	Fetish	Extremely rare
Crocodylus niloticus	Okwangwo	Bushmeat	Extremely rare
Chelonians			
Pelusios niger	AKS/CRS	Bushmeat/fetish	Common
Pelusios castaneus	AKS/CRS	Bushmeat/fetish	Common
Kinixys erosa	AKS/CRS	Bushmeat/fetish	Common
Kinxys homeana	AKS/CRS	Bushmeat/fetish	Common
Trionyx triunguis	AKS/CRS	Bushmeat/fetish	Rare
Lizards			
Rhampholeon spectrum	AKS/CRS	Fetish	Rare
Chamaeleo owenii	Eket	Fetish	Rare
Chamaeleo gracilis	Calabar	Fetish/medicine	Common
Chamaeleo cristatus	AKS/CRS	Fetish/medicine	Rare
Varanus niloticus ornatus	AKS/CRS	Bushmeat	Rare
Snakes			
Bitis gabonica	AKS/CRS	Fetish/Bushmeat	Common
Bitis nasicornis	Okwangwo	Fetish/Bushmeat	Common
Atheris squamiger	AKS/CRS	Fetish	Rare
Naja nigricollis	AKS/CRS	Fetish/Bushmeat	Common
Naja melanoleuca	AKS/CRS	Fetish/Bushmeat	Common
Dendroaspis jamesoni	AKS/CRS	Fetish/Bushmeat	Common
Pseudohaje goldii	Oban	Bushmeat	Rare
Psammophis phillipsii	AKS/CRS	Bushmeat	Common
Grayia smythii	AKS/CRS	Bushmeat	Common
Boiga (Toxicodryas) blandingii	AKS/CRS	Bushmeat	Common
Mehelya poensis	AKS/CRS	Bushmeat	Common
Python sebae	AKS/CRS	Bushmeat/Medicine	Rare
Python regius	Oban	Bushmeat/Medicine	Common
Calabaria reinhardtii	Oban	Fetish	Rare

Key words: *Nigerian reptiles, bush-meat markets.*

THE HERPETOFAUNA OF THE EASTERN SIDE OF THE LAKE TURKANA (NORTHERN KENYA)

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The region located in the eastern side of the Lake Turkana is one the least known from the herpetological point of view, in East Africa (cf. Spawls et al. 2001). Here are presented the results of 10 herpetological surveys carried out between 2001 and 2005 by the Pavia University (Italy) and the Brno university (Czech Republic), in collaboration with the National Museum of Nairobi (Kenya).

The study area is the region located in the eastern side of the Lake Turkana and its islets, eastwards to the village of North Horr, northwards to the border with Ethiopia and southwards to the Mt. Kulal. The area is characterised by extremely arid lowland habitats (from semidesert to arid savannah), except of the summit area of Mt. Kulal, covered by afromontane forest remnants and mesophilous vegetation formations. The research has been carried out by means of direct observations, both diurnal and nocturnal.

A total of 7 species of Amphibians and 49 of Reptiles (1 crocodile, 4 turtles, 23 lizards, and 21 snakes) listed in Table 1 have been found, many of which were not recorded for the area by Spawls et al. (2001) and other authors; it is remarkable that 16 (28.5 %) species, highlighted in bold in the table, have been observed exclusively on Mt. Kulal, which turns out to be very likely a relict range.

The herpetological community of the area is made of some groups of species clearly differentiated from the ecological and biogeographical point of view: **a)** species characteristic of more mesic habitats, with more or less wide distribution in East Africa, with isolated populations in Mt. Kulal or by some oases, due to the increasing desertification occurred at lower altitudes; **b)** species well adapted to arid habitats (widely distributed or mainly present in the Somali region), which reach in the area of Lake Turkana their range limit; **c)** species with Palaearctic range well adapted to arid habitats that have their southern distribution limit in the study area; **d)** endemic species: *Chamaeleo narrayioca*, recently described for the forest of Mt. Kulal (Necas et al., 2003), and *Pelusios broadleyi*, known so far only in a small water source, whose remains have been found in the lake side, as well as a Colubrid snake and a *Hemidactylus* gecko, whose description is ongoing at present; **e)** aquatic species living in the Lake Turkana or in permanent pools along *laggas* (temporary streams).

Tab. 1. Amphibians and Reptiles of the eastern side of the Lake Turkana on the base of original collections and observations of the authors (in bold the species only collected on Mt. Kulal).

	species	family			species	family	
1	*Bufo lughensis*	Bufonidae	b	**29**	*Echis pyramidum*	Viperidae	c
2	*Bufo turkanae*	Bufonidae	b	**30**	*Agama agama lionotus*	Agamidae	a
3	***Bufo cf. gutturalis***	Bufonidae	a	**31**	*Agama rueppelli*	Agamidae	b
4	*Ptychadena anchietae*	Ranidae	b	**32**	***Chamaeleo bitaeniatus***	Chamaeleonidae	a
5	*Ptychadena mascareniensis*	Ranidae	b	**33**	***Chamaeleo narrayioca***	Chamaeleonidae	d
6	*Ptychadena* cf. *taenioscelis*	Ranidae	b	**34**	*Hemidactylus brooki*	Gekkonidae	b
7	*Tomopterna cryptotis*	Ranidae	b	**35**	*Hemidactylus isolepis*	Gekkonidae	b
8	*Crocodilus niloticus*	Crocodylidae	e	**36**	*Hemidactylus macropholis*	Gekkonidae	b
9	*Eryx colubrinus*	Boidae	b	**37**	*Hemidactylus n. sp.*	Gekkonidae	d
10	*Colubridae n.gen. n.sp.*	Colubridae	d	**38**	*Hemidactylus platycephalus*	Gekkonidae	b
11	***Crotaphopeltis hotamboeia***	Colubridae	a	**39**	*Hemidactylus ruspolii*	Gekkonidae	b
12	***Dasypeltis scabra***	Colubridae	a	**40**	*Lygodactylus kenyensis*	Gekkonidae	a
13	***Dispholidus typus***	Colubridae	a	**41**	*Lygodactylus* cf. *somalicus*	Gekkonidae	a
14	***Lamprophis fuliginosus***	Colubridae	a	**42**	*Stenodactylus sthenodactylus*	Gekkonidae	c
15	***Lycophidion sp.***	Colubridae	a	**43**	***Gerrhosaurus flavigularis***	Gerrhosauridae	a
16	***Philothamus semivariegatus***	Colubridae	a	**44**	*Latastia longicaudata*	Lacertidae	a
17	*Platyceps brevis smithi*	Colubridae	b	**45**	*Pseuderemias smithi*	Lacertidae	b
18	*Platyceps florulentus florulentus*	Colubridae	b	**46**	*Afroablepharus sp.*	Scincidae	a
19	*Psammophis* cf. *punctulatus*	Colubridae	b	**47**	*Chalcides ocellatus bottegi*	Scincidae	c
20	***Psammophis biseriatus***	Colubridae	b	**48**	***Lygosoma afrum***	Scincidae	a
21	***Psammophis semivariegatus***	Colubridae	b	**49**	*Lygosoma sundevalli*	Scincidae	b
22	*Rhamphiophis rubropunctatus*	Colubridae	b	**50**	*Mabuya quinquetaeniata*	Scincidae	b
23	*Telescopus dhara*	Colubridae	b	**51**	*Mabuya striata*	Scincidae	a
24	***Apparalactus lunulatus***	Elapidae	a	**52**	*Mabuya varia*	Scincidae	a
25	***Naja haie***	Elapidae	a	**53**	*Pelomedusa subrufa*	Pelomedusidae	e
26	*Naja pallida*	Elapidae	a	**54**	*Pelusios broadley*	Pelomedusidae	e/d
27	*Leptotyphlops machrorhynchus*	Leptotyphlopidae	c	**55**	***Malacochersus tornieri***	Testudinidae	a
28	*Bitis arietans*	Viperidae	b	**56**	*Trionyx triunguis*	Trionychidae	e

Key words. *Kenya, East Africa, Lake Turkana, herpetofauna, Amphibians, Reptiles.*

ECOLOGICAL RELATIONSHIPS BETWEEN SYMPATRIC CHAMELEONS IN SOUTH-EASTERN NIGERIA AND WESTERN CAMEROON AS REVEALED BY MONTE CARLO SIMULATIONS AND NULL MODEL ANALYSES

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There is a considerable diversity of chameleon species in the hilly/mountainous areas placed between south-eastern Nigeria and Western Cameroon. Three to four species are relatively common in the lowland moist forests, and up to 6-7 sympatric species can be easily found in the montane forests of Western Cameroon. In this paper, we re-analyse (by null model analysis and Monte Carlo simulations of pseudo-communities) the data available on the niche relationships of montane chameleons in Western Cameroon, and compare these data to those collected by us or available in the literature on the chameleon communities from the lowland forests in south-eastern Nigeria.

Null model analysis of co-occurrence patterns is a powerful tool to individuate 'structure' in community ecology datasets. By means of this type of approach, we studied the community structure of chameleons in the rainforest regions of Nigeria and Cameroon. Our study is based exclusively on literature data as for Cameroon data, and from both literature and original data as for Nigeria data. Original data were collected between 2000 and 2005 in two lowland forest patches in south-eastern Nigeria (Rivers State and Cross River State). We performed Monte Carlo simulations (5000 iterations, with the sequential swap algorithm used) under several different model assumptions to derive patterns of co-occurrence among species. Both trophic and spatial segregation patterns were investigated. Trophic ecology datasets came from original studies, as well as from Akani et al. (2002) for Nigeria (lowland forest), and Hofer et al. (2003, montane forest) in Cameroon. Spatial ecology datasets came from original studies, as well as from multiple studies conducted in both Nigeria and Cameroon (details not shown for brevity). Two different scenarios, i.e. that of the lowland rainforest and that of the montane rainforest, were modelled. Four indices of co-occurrence patterns (C-ratio, number of checkerboard species pairs, number of species combinations, and V-score) were subjected to randomisation procedures. We defined 'standard' model assumptions those in which: (a) C-score simulations were done with fixed rows-fixed columns, (b) the number of checkerboard pairs with fixed rows-fixed columns, (c) the number of species combinations with fixed rows-fixed columns, and (d) the V-ratio with fixed rows-equiprobable columns. All other model combinations deviated from the standard model.

Comparisons of the various datasets after null model randomisations and analysis clearly revealed some patterns which remained masked during previous descriptive studies of single chameleon communities (e.g, Akani et al., 2002; Hofer et al., 2003):

(1) the chameleon communities were clearly not randomly organized, but followed precise deterministic patterns;
(2) these deterministic patterns varied remarkably if the chameleon communities were found in lowland rainforests (i.e. they were spatially distributed along a horizontal habitat axis) or in montane rainforests (i.e. they were spatially distributed along a vertical habitat axis);

(3) If the various species of chameleons were spatially distributed along a horizontal habitat axis, their communities were organized deterministically as for the trophic niche resource but not as for the spatial niche resource, that is: interspecific competition was likely for food, but very unlikely for space;
(4) If the various species of chameleons were spatially distributed along a vertical habitat axis, their communities were organized deterministically as for the spatial niche resource, but not for the trophic dimension (no data are available for Nigerian communities, but this latter pattern emerges after simulations on diet relationships of Cameroonian chameleons).

The species which appeared 'better modelled' for by the simulations were *Chamaeleo cristatus, Chamaeleo owenii,* and *Rhampholeon spectrum* as for the Nigerian study cases; and *Chamaeleo montium, Chamaeleo pfefferi, Chamaeleo quadricornis,* and *Rhampholeon spectrum* as for the Cameroonian study cases.

Overall, we conclude that the chameleon communities were not randomly organized, but followed precise deterministic patterns: chameleon communities in lowland rainforests were assembled deterministically as for the trophic niche resource but not as for the spatial niche resource, the opposite being true for chameleon communities in montane rainforests. These trends should be most probably detected also in many other lowland versus montane chameleon communities across Africa, and hence we strongly invoke further modelling studies to better clarify the aspects of community ecology of African tropical herpetofaunas which have remained undetected during usual 'descriptive' approaches.

Key words: *Chameleons, community structure, null models, Monte Carlo simulations, Cameroon, Nigeria, niche partitioning patterns, modelling*.

DISTRIBUTION OF *AUSTRALOLACERTA AUSTRALIS*: FROM KNOWN TO POTENTIAL RANGE THROUGH A BIOCLIMATIC ANALYSIS

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Australolacerta australis is a very poorly known species which was firstly discovered at the beginning of the 20th century (Hewitt, 1926, Ann. S. Afr. Mus. 20: 473-490) on the Cederberg Mountains (Western Cape, South Africa). The few faunistic researches carried out in the same area in the following years (e.g. Haacke, 1982, J. Herpetol. Assoc. Afr., 28: 19-21; Villiers, Baard & Branch, 1983, J. Herpetol Assoc. Afr., 29: 13-14), described *A. australis* as a rock dwelling lizard restricted to the Cederberg Mountains. The chance to model the habitat suitability of the species (e.g. Raxworthy et al., 2003, Nature, 426: 837-841; Robertson et al., 2003, Ecol. Model. 164: 153–167), in particular for elusive ones, allows to partially overcome the scarcity of faunistic data predicting the potential distribution on the base of the ecological features of the study area.

The eighteen geo-referred data relative to the specimen preserved in the herpetological collection of the Stellenbosch University were randomly separated in a training (70% of the data) and a test (30%) subsets. This separation was repeated to generate four training and four test random subsets. The training subsets were utilized to elaborate, by DIVA-GIS (http://www.diva-gis.org/), the 19 habitat suitability models (algorithm BIOCLIM [Nix, 1986, In: Longmore, Austral. Gov. Publ. Serv.]) deriving from the 19 climatic variables provided by the WorldClim databank (http://www.worldclim.org/) (see "Bombi et al., 2006, abstracts of 6th SHI Congress [on *Vipera ursinii*]" for the methodologies). The obtained models were validated assigning the predicted habitat suitability values to the test subsets and to the random points. The assigned values were compared producing a ROC (Fielding & Bell, 1997, Environ. Conserv. 24: 38–49), deriving the relative AUC value (Faraggi & Reiser, 2001, Statist. Med. 21: 3093–3106), and calculating the Kappa statistics (Cohen, 1960, Educ. Psychol. Meas., 1960: 37-46). The two variables which produced the models with the higher AUC and Kappa values were jointly used to elaborate the four definitive maps of potential distribution. These were finally summarized in a single mean map and validated using the same procedure of the separated models.

The distribution of the Southern Rock lizard appeared to be mainly affected by the "precipitation of coldest quarter" (see http://www.worldclim.org/ for datails) (AUC = 0.958; Kappa = 0.917) and the "mean temperature of wettest quarter" (see http://www.worldclim.org/ for datails) (AUC = 0.858; Kappa = 0.717). The final mean model (Fig. 1) (AUC = 0.929; Kappa = 0.857), obtained from the joined use of the two variables, shows that the distribution of the species is strictly related to the areas with elevation higher than 700 m a.s.l. and dominated by the Mountain Fynbos biome. Therefore, *A. australis* is potentially continuatively distributed along the Cape Fold Mountains, from Pakhuis Pass, near Clanwilliam in the north, to the Kwadousberg, near Worcester in the south, but could be also present on the Riviersonderendberge, near Riviersonderend. The modelling of potential distribution of such poorly known species can be also helpful in order to increase the efficiency of future faunistic researches aimed to define the real distribution, addressing the field efforts in the suitable areas for the species.

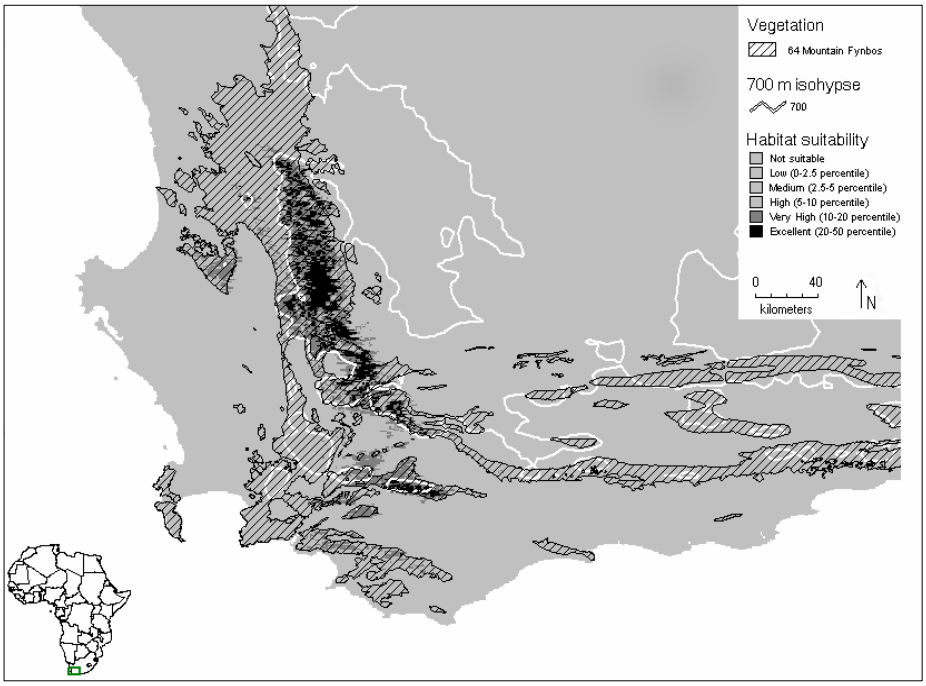

Fig. 1. Climatically suitable areas for the presence of *Australolacerta australis*.

Key words: *southern rock lizard, BIOCLIM, habitat suitability models, potential distribution.*

KARYOLOGICAL ANALYSIS ON FOUR TUNISIAN SPECIES OF ANURA (AMPHIBIA)

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In this paper we present the results of a chromosomal study carried out on several specimens of four out the five anuran species living in Tunisia: *Bufo mauritanicus, Bufo viridis, Rana saharica* and *Discoglossus pictus auritus*. We also extended our analysis to Moroccan specimens of *B. mauritanicus* and *D. p. scovazzi*. The obtained results were compared with literature data of their respective relatives.

Chromosomes were obtained from organs and/or blood cultures by means of the standard air drying method, and stained both with the standard method (5% Giemsa at pH 7), and using the following banding techniques: Ag-NOR banding (Howell & Black, 1980, Experientia 36: 1014-1015); chromomycin A_3 / methyl green staining (CMA_3) according to Sahar & Latt (1980, Chromosoma 79,1-28); Q-banding and DA/DAPI as suggested by Schmid (1978, Chromosoma 77: 83-103); C-banding according to Sumner (1972, Expl Cell Res 75: 304-306); sequential C- or *Alu* I banding +CMA_3+DAPI as reported by Odierna et al. (1999, It.J.Zool. 66:275-283).

Tunisian specimens of *R. saharica* displayed the basal *Rana* karyotype of 2n=26 biarmed chromosomes and NORs on the tenth/eleventh pair. However, they showed a distinctive C-banding pattern, constituted by very tiny, AT rich, centromeric C- bands. The extension of chromosome analysis to extra-Tunisian *R. saharica* populations, particularly those ascribed to *R. s. riodeoroi*, could show if this chromatinic character is distinctive for Tunisian populations or general propriety of the species. The Tunisian specimens of *D. p. auritus* had the typical *D. pictus* 2n=28 karyotype with the elements of 13th pair shaped as telocentric. In common with populations of other two subspecies, *pictus* and *scovazzi*, Tunisian populations of *auritus* also exhibited loci of NORs, heterochromatin location and composition, supporting genetic and molecular evidence of a close relationships between three subspecies (Vences & Glaw, 1996, Amphibia-Reptilia17:330-330), but recently questioned by Zangari et al. (2006, Biol J Linnean Soc, 87: 515-536). The two studied Tunisian *Bufo* species, showed the standard 2n= 22 *Bufo* karyotype, but displaying a different pattern both for localisation of NORs (on the sixth pair in *B. viridis* and the tenth chromosome pair in *B. mauritanicus*) and heterochromatin distribution and composition. Tunisian specimens of *B. viridis* displayed chromosome and chromatinic characters very similar to those found in other North African and Euro-Asian specimens (Odierna et al., 2004, Chromosome Res. 12: 671–681). Tunisian specimens of *B. mauritanicus* showed chromosome and chromatinic characters very similar to Algerian specimens studied by Schmid (1978, Chromosoma, 66: 361-388). However, the studied Moroccan specimens of this species differed in possessing chromosomes devoid of bright, Q-banding positive, paracentromeric bands. This difference in Q- banding phenotype between Moroccan and Algerian-Tunisian populations of *B. mauritanicus* urge for further investigations, also with different type of approach. In fact, interpopulational difference concerning heterochromatin composition and/or localization, found in some *Bufo* species, have been successively substantiated by molecular analysis (Stöck et al., 2005, Genetica, 124: 255-272), or have

constituted a character relevant for taxonomic and systematic inference (Miura,1995, Caryologia 48: 123-136).

Key words: *Tunisian herpetofauna, cytotaxonomy, heterochromatin heteromorphism, chromosome diversification.*

HABITAT SELECTION OF ANURANS IN SMALL PONDS AROUND THE VICTORIA LAKE, KENYA

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The shores of Lake Victoria (W Kenya) have been largely altered by human activities, mainly from subsistence agriculture. Just behind the coastal vegetation belt, consisting of papyrus and marsh grasses, cultivated fields extend over large areas. In the region of the Yala swamp, the original marshlands were reduced to favour plantations of vegetables for domestic consumption (cassaba, cabbage, seet potatoe, etc.). During a recent expedition to this area, an ecological survey on the amphibians was conducted in order to compare the species assemblage in natural and artificial ponds and to assess the factors influencing the species distribution.
Amphibians were studied during February and March 2004 at a seminatural area located between the eastern shore of Lake Victoria and a small satellite basin, Lake Sare (00°01'-00°03'S / 34°01'-34°03'E; Kisumu district, Kenya). Amphibians were sampled at 15 different (10 artificial and 5 natural) ponds that differed in terms of several factors: hydro-morphology (size, depth, bottom type, turbidity), vegetation (aquatic vegetation, surrounding vegetation, land use), and location (distance from lakes and from papyrus stands). The presence of amphibians within and around the ponds was assessed by visual encounter survey method (Heyer et al., 1994; Smithsonian Institution Press) during diurnal and nocturnal samplings. PCA and Cluster analysis were performed to detect similarities among ponds and to assess specific pond occupancy patterns.
The following species were collected in the study area: *Xenopus laevis*, *Phrynobatrachus* sp., *Ptychadena mascareniensis*, *Hemisus marmoratus*, *Hoplobatrachus occipitalis*, *Kassina senegalensis* and *Bufo* sp. Due to the exiguous number of records, *K. senegalensis* and *Bufo* sp. were excluded from the analysis. The species distribution among the sampled ponds is reported in Table 1.

Tab. 1: Pond occupancy by the studied species. A=artificial pond; N=natural pond.

Species	Ponds														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	A	A	A	A	A	A	N	N	N	A	A	N	A	A	N
Xenopus laevis	1	1	0	1	1	0	0	0	0	0	0	0	0	1	0
Phrynobatrachus sp.	1	1	0	0	0	1	0	1	0	0	1	1	0	1	1
Ptychadena mascareniensis	0	1	0	0	1	0	1	1	1	0	1	1	0	0	1
Hoplobatrachus occipitalis	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1
Hemisus marmoratus	0	0	0	0	0	0	0	1	1	0	0	1	0	0	1

The five amphibian species showed different patterns of occupancy in using the 15 ponds. *X. laevis* was found only in artificial ponds, whereas *Phrynobatrachus* and *Ptychadena* species were observed in both artificial and natural ponds. *H. marmoratus* and *H. occipitalis* showed an exclusive preference towards natural ponds. The PCA (68.21% of the explained variance on the first two factors) allowed to spatially arrange the amphibian species according to three main groups (Fig. 1): two groups were monospecific (i.e., *X. laevis* and *Phrynobatrachus* sp.) and another group consisted of the remaining three species, i.e. *P. mascareniensis*, *H. occipitalis* and *H. marmoratus*.

The artificial ponds were populated by a lower number of species than the natural ones ($mean_{art}$=1.3, $st.dev._{art}$=1.06; $mean_{nat}$=3, $st.dev._{nat}$=1; U=6.5, P<0.05; Mann-Whitney U-test). Based on hydro-morphological, vegetational and location parameters a UPGMA dendrogram was generated which showed two main clusters, consisting respectively of artificial and natural ponds. A further cluster analysis, based on data of amphibians pond occupancy, classified the ponds in the same groups generated by the previous analysis, thus evidencing a high relationship between the degree of human pond exploitation and the fauna composition.
The impact of human activities on small basins had a significant effect in terms of ponds morphology, vegetation into and surrounding the water bodies, and consequentely of amphibians composition. The artificial ponds and those modified for irriguous purposes showed a reduced species diversity and a clearly different species composition from natural ponds. Some species (i.e. *X. laevis*) could gain advantage from the changes made by humans, because of their euriecity and their capability to tolerate low oxygen levels and high organic load that are conditions often present in the ponds utilized for watering purpose.

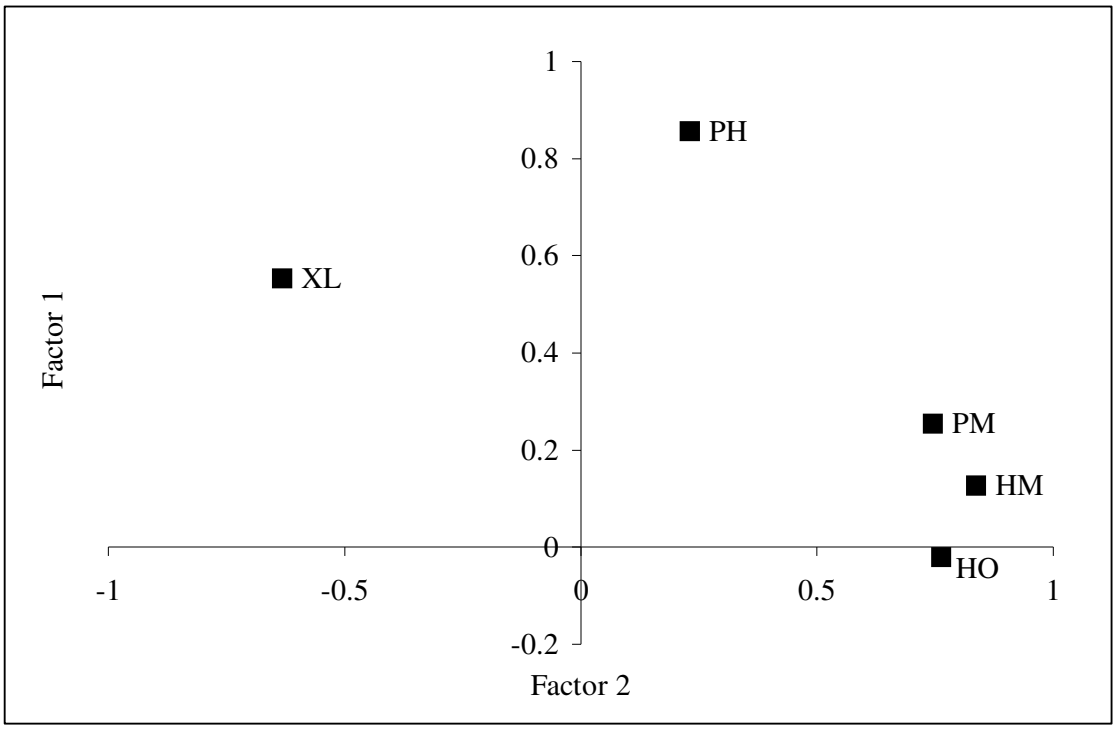

Fig. 1. PCA analysis on the first two factors ordinating the species on the basis of their pond occupancy pattern. Standardised Varimax rotated model was used. Symbols: HM = *Hemisus marmoratus*, HO = *Hoplobatrachus occipitalis*, PH = *Phrynobatrachus* sp., PM = *Ptychadena mascareniensis*, XL = *Xenopus laevis*.

Key words: *Amphibian assemblage, pond habitat, East Africa.*

MALAWI: A BRIEF OVERVIEW OF HERPETOLOGICAL STUDIES

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Malawi is an elongated country embedded in the Rift Valley in South-Eastern Africa. The total territorial area is about 120.000 square km of which nearly 20% is covered by Lake Malawi. The available data about the distribution of amphibians and reptiles are poor and quite outdated as referred mainly to works done in the Sixties (Stewart, 1967, Amphibians of Malawi; New York Press. Sweeney, 1961, Snakes of Malawi; Nyasaland Society). After the analysis of the available bibliography a brief overview of the effectuated herpetological studies in Malawi with a focus on conservation is provided.

The state of knowledge about the biology of Malawi's herpetofauna and its conservational status is reflected by consulting references that provide information concerning survey works with inedited data and available databases (IUCN 2004. IUCN 2004 Red List of Threatened Species. www.iucnredlist.org). Systematic and taxonomic works based about collections already available that time have been excluded. The search was mainly restricted to papers inherent only to Malawi (formerly Nyasaland) but without any restriction in time. This literature search produced 29 papers.

The beginning of the herpetological studies in Malawi was made by A. Günther in 1864 with a work on reptiles and fishes, which was followed after nearly two decades by two other works on amphibians and reptiles. In 1897 a complement of this pioneeristic works came from A. G. Boulenger with the publication of a list of presence of the Northern regions. The following history of herpetolological studies in Malawi is characterized by intermittence without the prevalence of one personality. In fact, during the period between the end of the 19th century and the first half of the 20th century, many English naturalists, among them A. C. Hoffman, H. H. Johnston, B. L. Mitchell and A. Loveridge, contributed to improve the biological knowledge of Malawi. The most productive of them was A. Loveridge, who in 1957 summarized the state of knowledge in his check list of amphibians and reptiles of East Africa. The Sixties were the most flowering period of the herpetological studies in Malawi with five published works. Actually, this decade is not only characterized by the highest number of publications, but even by the quality of important faunal works both of scientific and popular interest. Among the first category there are works of D. G. Broadley, R. A. Stevens and J. C. Poynton, while among the second there are the books about amphibians and snakes of Malawi, respectively by M. Stewart and by R. C. H. Sweeney. Recently, nice works focused on biology and conservation of high altitude herpetofauna providing new and detailed distribution data have been done by L. C. J. Mazibuko of the National Museum of Malawi. Today, of the nearly 240 amphibian and 400 reptiles species occurring on sub-equatorial Africa, about 80 amphibians (33%) and 140 reptiles (35%) are listed for Malawi. In fact, despite the relative small extension of the country the variety of habitat and climatic factors makes Malawi exceptional in terms of species richness (Seymour et al., 2001, Bio. Cons. 10: 2045-2076). Among the amphibians two species (2.5%) are strictly endemic: *Arthroleptis francei* and *Phrynobatracus stewarte*; other 11 (13.8%) are restricted to Malawi and neighbouring countries: *Afrana johnstoni*, *Arthroleptis reichei*; *Bufo nyikae, Hyperolius pictus*, *H. kachalolae*, *H. spinigularis*, *Nothophryne broadleyi, Phrynobatrakus ukingensis*, *Strongylopus merumontanus* and the caecilians *Boulengerula changamwensis* and *Scolecomorphus kirkii*. Similar the situation for the reptiles with 12 species

(8.6%) restricted to this area: *Bradypodion* (formerly *Chamaeleo*) *mlanjense*, *Chamaeleo goetzei nyikae*, *Rhampholeon chapmanorum*, *R. nchisiensis*, *Eumecia johnstoni*, *Trachylepis hildae*, *T. mlanjensis, Proscelotes (arnoldi) mlanjensis, Lygodactylus bonsi, L. rex, Cordylus nyikae* and *Platysaurus mitchelli*. On the basis of IUCN classification only four amphibian species (*Afrana johnstoni*, *Arthroleptis francei*, *Nothophryne broadleyi* and *Ptychadena broadleyi*) are listed as endangered, two (*Arthroleptis reichei* and *Bufo lonnbergi*) as near threatened, one (*Bufo nyikae*) as vulnerable and three (*Boulengerula changamwensis*, *Phrynobatrachus stewartae*, *P. ukingensis*) as data deficient. This leads to a total of seven threatened species (corresponding to 8.8% of the total). All the other species are listed as least concern, prevalently because of their general widespread distribution through Central and Southern Africa regions. The situation for the reptiles is quite different, with only one species (0.7% of the total) considered as near threatened: the Flap-shell turtle *Cycloderma frenatum*. Nevertheless, taking into account their restricted distribution, the above mentioned reptile species should be carefully re-considered.
The knowledge of amphibians and reptiles in Malawi is still rudimentary. Today, the high increase in human population and the consequent need for land for agricultural purposes related to deforestation and habitat fragmentation represent a serious hazard for the natural populations. As a result most of the terrestrial faunas are at present restricted in national parks and game reserves. This drastic habitat degradation makes it sure that our knowledge does no longer reflect, if it ever did, the actual situation of the natural communities. These considerations clearly highlighten the urgent need to gather new data on the distribution of amphibians and reptiles in Malawi.

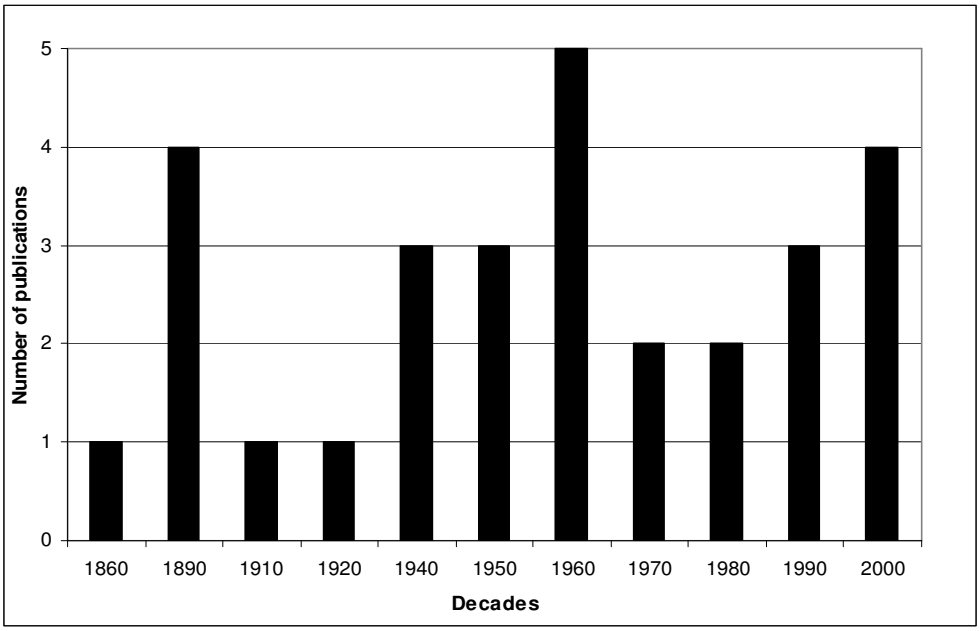

Fig.1. Number of herpetological publications concerning new distributional data in Malawi from 1864 to 1995. The missing decades have been left out due to lack of publications occurred.

Key words: *Malawi, taxonomy, conservation.*

THE SIGNIFICANCE OF SOLITARY INDIVIDUALS IN POPULATIONS OF THE GROUP-LIVING LIZARD, *CORDYLUS CATAPHRACTUS*

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There is strong evidence that heavy reliance on termites as a food source is central in the permanent group-living behaviour displayed by the armadillo lizard, Cordylus cataphractus. Effenberger (2004) established that individuals venture considerable distances away from the home crevice to forage at termite ports. Mouton et al. (2005) postulated that, over time, these excursions resulted in the evolution of heavy armour and tail-biting behaviour as protection against terrestrial predators encountered. The evolution of heavy armour, however, resulted in this species having low sprinting abilities. Because of the sluggish nature of the species, individuals are extremely vulnerable to birds of prey when basking at the crevice rock. Group-living apparently evolved to take advantage of predation reduction effects of living in groups ('many eyes' and 'dilution' effects). Group size will be dictated by termite availability, as well as physical attributes of the crevice rock, but to take full advantage of the predation reduction effects of group-living, large group sizes would be optimal. To be solitary, on the other hand, should represent the most disadvantageous situation for these lizards to be in.

The aim of this study was to investigate the significance of solitary individuals in populations of C. cataphractus. It is predicted that individuals will live solitary only for very short periods of time, in other words, that site fidelity will be much lower among solitary than among group-living individuals. The distinct male-plus sexual size dimorphism displayed by C. cataphractus led to the hypothesis that male-male competition will result in the competitive exclusion of certain males from groups. The predictions therefore are that the majority of solitary individuals will be adult males, that there would be more solitary males during the mating season than outside the mating season; and that solitary males would be smaller in body size, and possibly have more injuries or deformities than those occurring in groups.

In theory, solitary individuals may also represent group-living individuals that got lost during termite foraging excursions and that are only temporarily sheltering alone in unoccupied crevices. If this were true, one would expect more solitary individuals at times when other insect prey is scarce and reliance on termites is greater (December-May) than at times when prey is more abundant (June-November). If solitary individuals are due to foraging, then there should be equal numbers of male and female solitary individuals and these solitary individuals should not be morphologically different from those individuals that are found in groups.

The study was conducted in the Lambert's Bay/Graafwater area in the Western Cape Province, South Africa, between May and October 2002. A large area was searched and all C. cataphractus groups found, were recorded. Solitary individuals were, where possible, carefully removed from their shelters, using a small crowbar and a short noose. After they were sexed, measured, and marked with a unique paint code, they were released in their original shelters. In addition, 30 groups consisting of two or more individuals and of which it was possible to remove all group members from the crevice, were selected. All individuals in these groups, were sexed, measured and marked and returned to their original shelters. The study site was subsequently resurveyed at regular intervals to determine changes in the frequencies of solitary individuals and differences in site fidelity between solitary males and females and between solitary and group-living individuals. To compare solitary individuals and group-living individuals in terms of body size, and number of injuries or deformities, C. cataphractus material collected by Mouton et al. (1999)

and housed in the Ellerman Collection of the University of Stellenbosch, was included in the analysis.
It was found that solitary individuals were less loyal to their rock shelters than individuals living in groups, that solitary females apparently were less loyal than solitary males, that there was no difference in the frequency of solitary males in and outside the mating season, that solitary males were smaller in body size than group-living males, but that they did not have more scars or other deformities than the latter, that there was no difference in the frequency of solitary individuals during the wet and the dry seasons, and that there was also no difference in the frequencies of solitary males and solitary females recorded.
The observation that solitary individuals were less loyal to their shelters than individuals living in groups, supports the notion that to be solitary should be the most disadvantageous situation for a *C. cataphractus* individual to be in. Although the observation that solitary males are generally smaller in body size than those living in groups, and that solitary males tend to be more loyal to their shelters than solitary females, are indications that the competitive exclusion of certain males from groups may at least partly be responsible for the presence of solitary males. The fact that there were not more solitary males than females contradicts this observation.

Key words*: competitive exclusion,* Cordylus cataphractus*, foraging excursions, site-fidelity, solitary individuals.*

MODELLING OCCUPANCY RATES, DETECTION PROBABILITIES AND DENSITY OF *KINIXYS EROSA* AND *K. HOMEANA* (TESTUDINIDAE) ALONG LINE-TRANSECTS IN WEST AFRICA (GHANA, BENIN, AND NIGERIA)

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The hinge-back tortoises (*Kinixys erosa, K. homeana*) are increasingly threatened in West Africa due to forest habitat loss and the bush-meat trade. Their survival status has been up-listed by IUCN from DD to Vulnerable (2006), after the ending of a international project conducted under the financial support of *Conservation International*, *Turtle Conservation Fund*, *IUCN/SSC TFTSG*, and *Chelonian Research Foundation*. This project aimed at assessing the ecology and conservation of these species along a mega-transect in West Africa. Here we report some modelling data on the tortoise comparative occupancy rates and density in Ghana, Benin and Nigeria.

Surveys along several independent line-transects (each 5000 m long and 20 m wide) were done in Ghana, Benin, and Nigeria in the years 2003-2004-2005. All transects were done in appropriate forest habitat, during the wet season (activity peak for these tortoises), i.e. these estimates reflected conditions in which the density of tortoises is thought to be good. Modelling was done by the softwares PRESENCE (for detection probabilities and occupancy rates) and DISTANCE (spatial density). More details of the modelling methods are described in Luiselli (2006, 'Modelling site occupancy rates and density of sympatric Gaboon vipers and nose-horned vipers' *J. Trop. Ecol.*, in press).

Mean naïve estimates of presence were 0.123 (*K. homeana*) and 0.233 (*K. erosa*), with values higher in Nigeria than in Ghana and Benin; however, our modelling approach showed that occupancy estimates were slightly higher than naïve estimates in *K. homeana* (i.e., 0.234 (S.E. = 0.16)), as well as in *K. erosa* (0.268 (0.136)). Overall occupancy estimates of *K. homeana* in sites with 'high detection probability' was 0.44, but was 0.13 in sites with 'low detection probabilities'. For *K. erosa* the occupancy estimates were higher (i.e., 0.543 and 0.232), thus indicating that, under the same conditions, this species is more readily observed than *K. homeana*. AIC of the predefined model for *K. homeana* (with detection probabilities that are not time specific) was 138.61 (with K = 4, and –2log (likelihood) = 156.74); AIC of the predefined model for *K. erosa* was 152.81 (K = 4; -2log (likelihood) = 171.81). The 'best' three models with covariates that were fit to the data, ranked according to AIC, had virtually identical weight (i.e. 0.34, 0.29, 0.28) for *K. homeana,* as well as for *K. erosa* (i.e. 0.29, 0.22, 0.21), suggesting that all models provide a similar description of the data, where site covariates are much less important than sampling covariates in detecting a species' presence. Among the sampling covariates, the interval 'hrs 0801 to 1600' provides the best fit model, that is both tortoises were clearly best detected if searched along this time interval, especially during the wet season. Concerning density estimates there were remarkable differences among countries:

Ghana. Concerning *K. homeana,* we modelled its spatial density as follows: K = 2; AIC = 33.22; ESW/EDR = 3.31; D = 0.403; D (LCL) = 0.133; D (UCL) = 1.222; D (CV) = 0.535

where K is number of parameters, ESW/EDR is the effective strip width/detection radius, D is the density of individuals per hectare, D (LCL) and D (UCL) are respectively the lower and upper confidence limits of the density, and D (CV) is the density coefficient of variation. Concerning *K. erosa,* we modelled the spatial density of the tortoises as follows: K = 2; AIC = 104.64; ESW/EDR = 5.58; D = 0.627; D (LCL) = 0.364; D (UCL) = 1.079; D (CV) = 0.265.

Benin Republic. We modelled the spatial density of *K. homeana* as follows: K = 2; AIC = 58.79; ESW/EDR = 2.92; D = 0.914; D (LCL) = 0.478; D (UCL) = 1.745; D (CV) = 0.316. With regards to *K. erosa*, our modelling resulted in the following: K = 1; AIC = 34.25; ESW/EDR = 6.0; D = 0.250; D (LCL) = 0.109; D (UCL) = 0.573; D (CV) = 0.395.

Nigeria. Concerning *K. homeana,* we modelled the spatial density of the tortoises as follows:

K = 2; AIC = 55.68; ESW/EDR = 1.73; D = 1.480; D (LCL) = 0.899; D (UCL) = 2.436; D (CV) = 0.238. With regards to *K. erosa*, our modelling resulted in the following: K = 1; AIC = 41.42; ESW/EDR = 6.0; D = 0.204; D (LCL) = 0.103; D (UCL) = 0.402; D (CV) = 0.330. The same density estimates, for 38 independent transects surveyed in south-eastern Nigeria (i.e. east of the Niger River) (years 1999-2002) gave a modelled D = 1.402 for *K. homeana* and D = 0.707 for *K. erosa*. So, while the D-values were nearly identical as for *K. homeana*, it resulted that *K. erosa* was much rarer in Western Nigeria than in Eastern Nigeria (figure 1).

Overall, from these estimates it can be concluded that both *Kinixys* tortoises exhibit low population densities also in suitable habitats in Ghana and Benin, whereas Nigeria appeared to be a better area for these tortoises, despite huge development and deforestation which is currently vanishing large sectors of these tortoises' natural habitat.

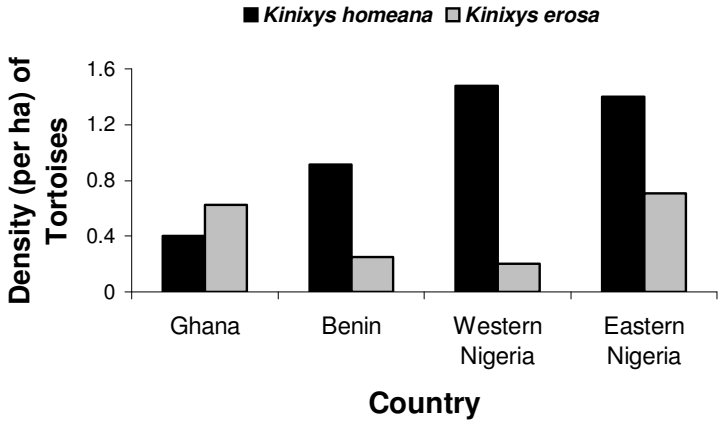

Fig. 1**.** Summary of the modelled density of tortoises country-by-country as estimated from standardized line-transect surveys.

Key words: Kinixys*, line-transect, density estimates, modelling occupancy rates, modelling detection probabilities, West Africa.*

MOLECULAR AND KARYOLOGICAL HOMOGENEITY IN *TRACHYLEPIS STRIATA* AND *TRACHYLEPIS WAHLBERGII* (SCINCIDAE, REPTILIA).

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This study provides a genetic characterisation of two African skink species, *Trachylepis striata* (Peters 1844) and *Trachylepis wahlbergii* (Peters 1869) by means of karyology and the analysis of the sequences of the 16S rRNA mitochondrial gene. These two taxa were considered subspecies until Broadley (2000, African J. Herp. 49: 87-110) suggested that they should be regarded as species because no evidence of a morphological cline occurs at their contact zone (Fig. 1a).

Chromosomes were obtained from one specimen of *T. striata* (Addis Ababa, Ethiopia) and one of *T. wahlbergii* (Solwezi, Northwestern Zambia); chromosomal metaphases were prepared by air drying following Castiglia (2004, African J. Herp. 53: 95-97).

The 16S rRNA gene sequences (480 bp) were obtained from the same two specimens used for karyotype analysis plus an additional specimen of *T. striata* from South Tanzania. All the published sequences of 16S rRNAs of the two species from different African countries were also included in the analysis. Phylogenetic trees were obtained with Neighbor-joining (NJ) and maximum parsimony (MP) analysis.

The two species have an identical karyotype, 2n = 32, NF = 64. The chromosomes can be divided into 10 pairs of macrochromosomes and 6 pairs of microchromosomes (Fig. 1b); however, the distinction between these two groups is not so evident. No differences have been found between the two species in the relative length of chromosomes and their centromeric index (not shown). This excludes the occurrence of pericentric inversions and/or centromeric shifts between the two species. However, *T. striata* shows a very different karyotype compared to the one previously described for the same species from Kenya by Dallai & Talluri (1969, Chromosoma 27: 86-94) that reported a 2n = 28 and NF = 56. It is not possible for the moment to establish whether it belongs to a chromosomal variant or it constitutes a misidentification of the specimen.

For the genetic analysis we used 7 specimens collected in 7 different localities. Results indicate that the two species are not distinguishable by 16S rRNA mitochondrial gene. As a matter of fact, the genetic distance within species is very close to that found among species (2.5%). This value is similar to the values of intraspecific divergence found in other *Trachylepis* species (Mausfeld et al. 2004, Bonn. Zool. Beitr. 52: 159-177).

Moreover, the phylograms obtained with NJ and MP fail to support any monophyletic assemblage suggesting that *T. striata* and *T. wahlbergii* have diverged very recently (Fig. 1c). To summarize, this work indicates that these two species share the same karyotype and do not reveal any differentiation in their 16S mtDNA gene. These results suggest that the specific rank of these two taxa should be revaluated.

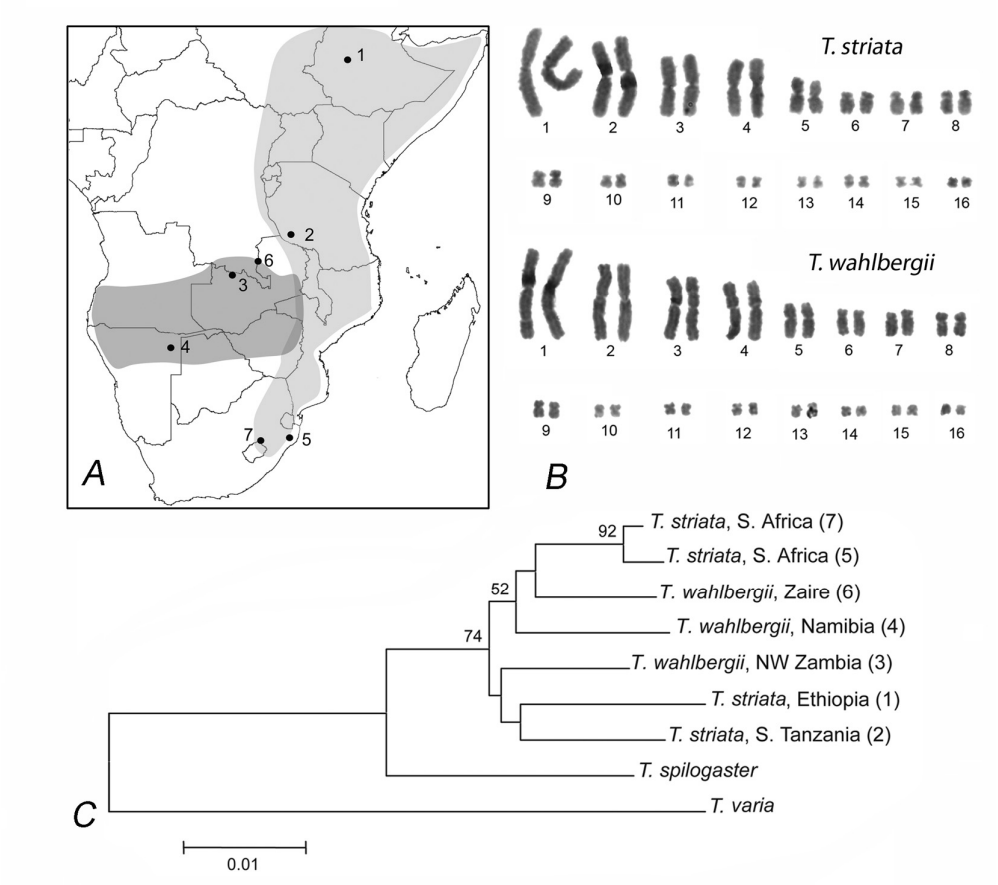

Fig. 1: A, approximative ranges of *T. striata* (light grey) and *T. wahlbergii* (dark grey) with sample sites; B, karyotype of *T. striata* (Ethiopia) and of *T. wahlbergii* (NW Zambia); C, NJ tree following the Jukes-Cantor distances using 422bp of the mitochondrial 16S rRNA gene (numbers indicate the localities as in the map).

Key words: *16S rRNA gene, chromosomal evolution,* Lygosominae, Mabuya, *mtDNA.*

DISCOVERY OF PARASITIC NEMATODES OF THE GENUS *TRICHINELLA* (*T. PAPUAE* AND *T. ZIMBABWENSIS*) INFECTING BOTH REPTILES AND MAMMALS AND THEIR ZOONOTIC POTENTIAL

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The detection of individual *Trichinella* species (*T. papuae* and *T. zimbabwensis*) infecting both mammals and reptiles has opened new scenarios in the epidemiology of this parasite group by increasing the food sources, which carry potentially infective stages. Our present knowledge suggests that most infections in reptiles are due to an improper management of farmed crocodiles. In Zimbabwe, of the 648 crocodiles (*Crocodylus niloticus*) examined in 1995, 166 (39.5%) were found to be infected, and of the 29 farms existing in Zimbabwe at that time, 18 (62.1%) were positive for *Trichinella*. A more recent survey performed in 2002 indicated that 11 (40.7%) of the 27 crocodile farms in Zimbabwe had infected animals. Epidemiological investigations suggested that a farm located near Victoria Falls was among the first to be infected, and if so, was the likely source of the infections observed throughout Zimbabwe. Transmission at the farm level occurs by feeding meat from slaughtered crocodiles to the other crocodiles, whereas the spread of infection between crocodile farms is probably related to the translocation of infected, bred crocodiles. This may explain also the presence of *T. zimbabwensis* on a crocodile farm at Lake Abaja in Ethiopia. However, natural infections have been identified in Nile crocodiles from Lake Cahora Bassa in Mozambique and in monitor lizards (*Varanus niloticus*) from Victoria Falls and Chiredzi in Zimbabwe. These data may suggest that epidemiological profiles observed in the dissemination of *Trichinella* between farmed pigs and local fauna may be mimicked in the transmission characteristics among reptiles and their surrounding fauna as well.

The origin of *T. papuae* in saltwater crocodiles (*Crocodylus porosus*) on a farm in Papua New Guinea is related to the practice of collecting and confining small, wild crocodiles, then feeding them market-bought, wild pig meat for several months prior to sending them for finishing at the crocodile farm. This mode of transmission has been confirmed by identical molecular markers found in both *T. papuae* from infected, wild pig meat purchased at the local market, and in *Trichinella* from farmed crocodiles. This finding clearly shows that *T. papuae* is capable of a transmission route from homoeothermic to poikilothermic animals. An human outbreak related to the consumption of meat from a monitor lizard (*Varanus nebulosus*) has been documented in Thailand. The meat of the Nile monitor is included in the diet of people consuming bushmeat, suggesting how this animal can represent a source of infection for humans if the meat is not properly cooked. The demand for the meat of crocodiles, caimans, and alligators in many areas of the world has increased dramatically. This has resulted in the development of national breeding programs in more than 30 countries in North and South America, Africa, Asia, and the Australian region, and produced an income of about US$60 million in 1998 for meat alone. As a result of this increased demand, the infection of reptiles with *Trichinella* species that are potentially infective for humans takes on great importance. Learning to control *Trichinella* infection in these hosts will help further advance their use as sources of food and other marketable products.

Phylogenetic studies using the variation in three genes (nuclear SSU rDNA and ITS2; mitochondrial LSU rDNA and COI DNA), suggest that the extant species of the genus *Trichinella* probably diversified only within the last 10-20 million years, which coincided with

the divergence of Suidae from the Tayassuidae in the Lower Miocene and *T. papuae* and *T. zimbabwensis* were only recently acquired by crocodilians and monitor lizards and are not relicts of an ancient coevolutionary association.

Key words: *parasite transmission*, Trichinella, *reptiles.*

VIII - Rettili marini

VIII - Sea Reptiles

(Convenor: Emilio Balletto, Cristina Giacoma)

BEACH FEATURES INFLUENCING NESTING ACTIVITY IN *ERETMOCHELYS IMBRICATA*

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In marine turtles, the decision of oviposition habitat is a key determinant of offspring success. However, environmental features of nesting areas are usually spatially autocorrelated. This limit the possibility to generalize the results to other areas (Lichstein et al. 2002 Ecol. Monogr. 72: 445-463). I investigated which environmental features influence nesting activity and nest distribution in *Eretmochelys imbricata*. Data were analysed by using Lag Spatially Autoregressive Regression (LagSAR), a tool allowing to keep into account spatial autocorrelation; this increases the possibility to generalize the results to other situations. I daily monitored a rookery of *E. imbricata* in Qatar, and I mapped the distribution of turtle nests and false crawls; I also measured several beach features (steepness, soil compactness, dune morphology, shrub density, presence of rocks, height above sea level). Beach features were summarized as three PCA scores explaining 86.3% of variation. Distribution of nests and false crawls was strongly spatially autocorrelated (Moran's I = 0.250; P = 0.003). In some areas, almost all the turtles that approached the beach excavated a nest, while in other areas nesting was very scarce but many false crawl were observed (Fig. 1). LagSAR showed that turtle activity was significantly related to beach features. Turtle activity was lower in the areas with steep coastline and high presence of rocks (Z = -3.726; P = 0.0002). Nest density was higher in beach areas with low slope and scarce rock abundance (Z = -2.584; P = 0.0098), soft soil, dune close to the shoreline and high abundance of shrubs (Z = -2.358; P = 0.018). Conversely, the density of false crawls was higher in areas with low rock abundance (Z = -2.362; P = 0.018) but hard soil, dune close to the shoreline, and low scrub abundance. (Z = 2.383; P = 0.017).

These observations are the first quantitative measures of beach features influencing nesting activity of *E. imbricata* in the Arabian Gulf. My results partially confirm those obtained for populations in the Atlantic ocean (Horrocks & Scott 1991 Mar. Ecol.-Prog. Ser. 69:1-8; Kamel & Mrosowsky 2005 Anim. Behav 70: 819-828). The strong exploitation of coastal areas in the Arabian Gulf makes these information of great relevance for the management and restoration of nesting areas for this critically endangered species.

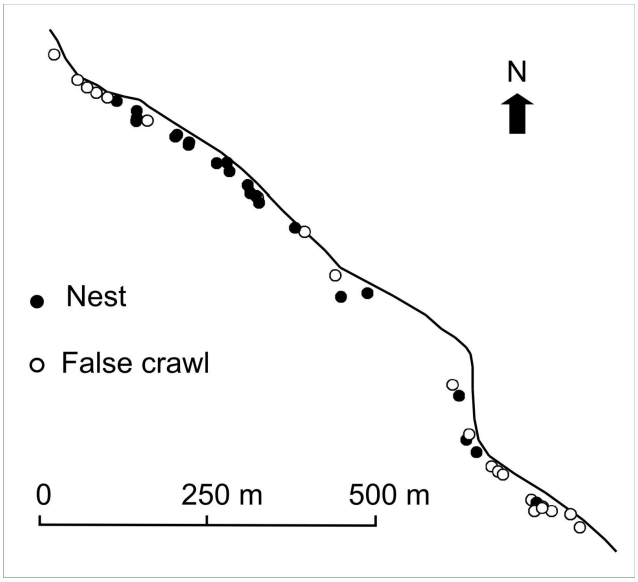

Fig. 1. Distribution of nests and false crawls of *E. imbricata* in a beach of Qatar.

Key words: *habitat management; nest site selection; nesting; vegetation; beach accessibility.*

DISTRIBUZIONE DI *CARETTA CARETTA* IN FUNZIONE DI PARAMETRI ECOLOGICI RILEVATI DA SATELLITE

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Allo scopo di verificare l'ipotesi di correlazione tra la presenza e distribuzione della tartaruga marina comune *Caretta caretta* e i parametri ambientali di temperatura superficiale dell'acqua e la concentrazione di clorofilla in superficie acquisibili da satellite, è stato condotto uno specifico programma di monitoraggio nelle acque circostanti l'isola di Lampedusa (Isole Pelagie, Sicilia) durante il 2004-2005.
I valori dei parametri ambientali acquisiti con sensore MODIS da satellite (satelliti TERRA ed ACQUA, risoluzione spaziale 1 km) sono stati calibrati in loco utilizzando la sonda Ocean Seven 316 ed hanno permesso la realizzazione di mappe di temperatura superficiale del mare e della concentrazione di clorofilla. Gli avvistamenti di tartarughe marine sono stati condotti secondo il metodo del transetto lineare. Le coordinate, registrate con sistema GPS, sono state utilizzate per elaborare la mappa di distribuzione della specie nell'area oggetto di studio. La raccolta dati in campo si concluderà nel 2006.
La conoscenza dell'habitat preferenziale delle specie marine in termini di parametri geofisici, la caratterizzazione biologica ed il comportamento dinamico degli oceani sono informazioni osservabili direttamente o indirettamente dai satelliti di telerilevamento attraverso le misurazioni di alcuni parametri ambientali quali la temperatura superficiale del mare (SST) e la concentrazione di clorofilla. La mappa di sintesi climatologica elaborata a scala locale identifica come una regione più calda l'area a sud dell'isola di Lampedusa, mentre l'analisi effettuata per la concentrazione di clorofilla ha evidenziato valori molto bassi (inferiori 0.4 mg/m^3) nell'area circostante l'isola. Verranno presentati i risultati di confronto tra i parametri ambientali indagati e la distribuzione spaziale di esemplari di *Caretta caretta.*
Il monitoraggio della presenza in mare di esemplari di tartaruga marina comune, condotto nell'ambito del progetto LIFE03 DEL.TA. NAT/IT/000163, è finalizzato anche alla verifica dei risultati ottenuti dall'applicazione delle azioni individuate nel "Piano d'Azione per la conservazione della tartaruga marina *Caretta caretta* nelle Isole Pelagie " (Balletto et al., 2003), e permetterà di effettuare una nuova oculata programmazione alla scadenza dei 5 anni di validità del Piano stesso.

Key words: Caretta caretta*, Isole Pelagie, distribuzione, rilevamenti satellitari.*

IMPATTO DELLA PESCA CON PALANGARO SU *CARETTA CARETTA*: ANALISI DATI DEL CENTRO DI LINOSA

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Le attività di pesca del pesce spada tradizionalmente legate all'impiego del palangaro hanno un impatto negativo sulle tartarughe presenti nelle acque dello stretto di Sicilia, dove sono state registrate probabilità di cattura che possono raggiungere valori di una tartaruga ogni 1000 ami. I dati raccolti dai centri di recupero costituiscono una banca dati importante per valutare l'entità delle catture accidentali ed il loro andamento annuale.
Nel 1994 l'associazione Hydrospera ha fondato un Centro Recupero Tartarughe Marine nell'isola di Linosa. L'attività del centro è poi continuata in collaborazione con il CTS - Dipartimento Conservazione Natura e il Dip. di Biologia Animale e dell'Uomo dell'Università di Torino nell'ambito del progetto LIFE *Caretta caretta* (1999NAT/IT/006271), DEL.TA (2000NAT/IT/00163) e TARTANET (2004 NAT/IT/000187), cofinanziati dalla Provincia di Agrigento e dalla Commissione Europea. Gli scopi del Centro Recupero consistono nel 1) fornire le cure veterinarie necessarie agli esemplari che vengono portati al centro; 2) coordinare le attività di sorveglianza alla vicina spiaggia Pozzolana di Ponente, dove le tartarughe depongono le uova; 3) svolgere attività di sensibilizzazione sulla conservazione delle tartarughe marine, educare turisti e pescatori ad adottare comportamenti che minimizzino le conseguenze negative delle loro attività a mare.

Il centro è dotato di 10 vasche interne di stabulazione da circa 1000 l ciascuna ed una vasca esterna per la riabilitazione da circa 15.000 l. L'equipe del Centro è composta da specialisti in biologia della tartaruga marina (due biologi ed un veterinario), ed è affiancata da volontari.

Durante i dodici anni di attività (1994-2005) il centro di Linosa ha ospitato e curato più di 600 tartarughe marine comuni (*Caretta caretta*), circa 50 per mese di attività di pesca di 1-5 pescherecci di piccole dimensioni. Oltre l'80% delle tartarughe giunte al centro ha abboccato ad un amo di palangaro, di queste il 6% presenta almeno un altro amo ingerito in precedenza. Circa il 90% delle tartarughe hanno una lunghezza curvilinea minima del carapace minore di 60 cm. Un dato importante emerso è che diminuiscono le dimensioni medie degli animali nel tempo. Occorre individuare le cause di questa diminuzione per verificare se si sta abbassando la longevità della popolazione o se è intervenuta una selettività diversa da introduzione di modifiche nelle modalità o negli attrezzi da pesca.

Key words: *conservazione, tartarughe marine, by-catch, Stretto di Sicilia.*

UNA BANCA DATI SULLE TARTARUGHE MARINE IN ITALIA

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All'interno del Progetto LIFE 04 NAT/IT/000187, denominato TARTANET – Un Network per la conservazione delle tartarughe marine in Italia, finanziato dalla Commissione Europea, è stata creata una banca dati nazionale per la tartaruga marina comune (*Caretta caretta*) di proprietà del Ministero dell'Ambiente e della Tutela del Territorio. Il software gestirà i dati sulle marcature, sui rilasci, sulle ricatture e sugli spiaggiamenti delle tartarughe marine.
Per la costituzione della banca dati nazionale, è stato coinvolto personale del CTS, dell'Università di Torino, dei partner e sostenitori di progetto, da anni impegnati nella studio e nella conservazione di questi rettili marini. In un primo momento verranno inseriti a livello centrale i dati pregressi raccolti prima dell'avvio del LIFE, tra cui quelli presi dal 1996 al 2002 dalla Guardia Costiera e dalla Castalia-Ecolmar per conto del Ministero, ma successivamente l'inserimento potrà essere effettuato direttamente dai vari operatori dei centri che saranno collegati in rete. Nella banca dati confluiranno le informazioni raccolte a livello nazionale dai vari operatori presenti sul territorio che aderiranno alla rete TARTANET e soprattutto dalla Guardia Costiera.
Il software risulta costituito da una serie di maschere di *data entry* di diversa tipologia (veterinaria, morfometria, ecc), che permettono l'inserimento dei dati; è inoltre possibile la sua consultazione (attraverso un sistema di filtri) e l'elaborazioni di alcuni dati (che saranno poi visualizzati sotto forma di tabelle o grafici).
La banca dati è accessibile sul portale "www.tartanet.it", cliccando su "banca dati".
Dall'*home page*, si accede alla funzione "inserimento dati" che immette in una prima maschera contenente dati preliminari (una sorta di registrazione con protocollo d'ingresso). Compilata questa maschera si può accedere alle diverse maschere di *data entry*: Scheda Cattura/Recupero; Scheda visita, analisi e interventi; Scheda *Follow Up*; Scheda dati biometrici; Scheda di nidificazione; Scheda di rilascio.
Con questo strumento a disposizione sarà possibile rafforzare la collaborazione tra i diversi Centri operanti sul territorio nazionale e raccogliere e rendere disponibili i dati scientifici sulle tartarughe marine (catture, nidificazioni, schiuse, spiaggiamenti, etc.) necessari a delineare idonee misure per la conservazione della specie.

Key words: *conservazione, distribuzione, spiaggiamenti, by-catch.*

MORPHOMETRIC DESCRIPTION OF NUCHAL AND CRANIAL MORPHOLOGY OF THE LOGGERHEAD HATCHLINGS IN ITALY

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The loggerhead turtle *Caretta caretta* (Linnaeus, 1758) is the only sea turtle species that nests on the Italian coasts. We report the first description of cranial morphology of loggerhead hatchlings from Italy.

We collected 32 natural dead-in-nest hatchlings at Linosa and Lampedusa in the nesting seasons 2002 and 2004. Both nuchal and cranial morphometric straigth-line measures were collected according to Kamezaki (2003, What is a loggerhead? The morphological perspective; Bolten & Witherington). Measures were taken with a digital calliper to an accuracy of 0.01 mm. 5 characters describing the nuchal morphology and 12 characters describing the skull morphology were measured. Cranial measurements has been taken whenever possible.

Average nuchal measurements results as follows: head width (HW) 13.26 mm (N=32; SD=1.11; min=11.16, max=15.57), head length (HL) 14.92 mm (N=32; SD=1.35; min=11.64, max=19.62), orbital diameter (OD) 7.42 mm (N=32; SD=0.69; min=6.21, max=9.07), rostrum length (RH) 3.65 mm (N=32; SD=0.35; min=2.91, max=4.56), upper jaw length (UJL) 6.02 mm (N=32; SD=0.79; min=4.50, max=7.20).

Average cranial measurements results as follows: height of premaxilla (HPM) 2.39 mm (N=19; SD=1.09; min=1.79, max=2.80), width of nasal opening (WN) 2.33 mm (N=17; SD=1.13; min=1.90, max=3.04), height of nasal opening (HN) 2.05 mm (N=17; SD=1.07; min=1.15, max=3.12), length of secondary palate (LSP) 8.63 mm (N=18; SD=1.94; min=3.41, max=4.78), height of cranium (HC) 8.63 mm (N=15; SD=4.35; min=7.56, max=10.50), cranial length from the anterior tip of premaxilla to the posterior tip of the condylus mandibularis of the quadrate (LC) 15.76 mm (N=13; SD=8.06; min=13.93, max=17.09), minimum distance between orbit and nasal opening (MDON) 1.72 mm (N=19; SD=0.80; min=1.17, max=2.36), orbital length (OH) 5.83 mm (N=16; SD=2.88; min=4.92, max=6.97), width of preorbital (WPO) 4.18 mm (N=15; SD=2.12; min=3.34, max=4.98), width of supraorbital (WSO) 5.20 mm (N=14; SD=2.68; min=3.98, max=6.28), width of zygomatic (WZ) 11.85 mm (N=10; SD=5.94; min=10.61, max=12.66), length of mandibular symphysis (LJA) 3.70 mm (N=18; SD=1.78; min=2.71, max=4.75).

Kamezaki (2003, What is a loggerhead? The morphological perspective; Bolten & Witherington) highlighted that only a few morphometric study are available for loggeheads and that just a few collections have good materials. With this study we increase the number of existing data in order to allow future morphometric examinations. Comparison with available data will be discussed.

Key words: *hatchlings, morphology, morphometry, geographic variability.*

LE ATTIVITA' DEL CENTRO DI RECUPERO TARTARUGHE MARINE DELL'ACQUARIO DI LIVORNO DAL 1990 AD OGGI

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Dal 1990 l'Acquario "D. Cestoni" di Livorno svolge una attività di recupero e riabilitazione di tartarughe marine rinvenute con varie modalità lungo il litorale toscano. Le attività vengono svolte operando all'interno del Centro Studi Cetacei ed in collaborazione con gli altri Acquari toscani e con il Servizio Veterinario dell'A.S.L. 6 di Livorno.
In questi sedici anni di attività gli interventi ed i recuperi di tartarughe marine sono stati numerosi: il tipo di intervento differisce in caso siano rinvenute tartarughe vive o morte. Gli esemplari morti vengono recuperati, misurati, utilizzati per prelievi di campioni e necroscopie e, se in buone condizioni, conservati a fini museali. Le tartarughe vive vengono ospedalizzate presso le vasche del Centro di Recupero in modo da poter valutare le loro condizioni fisiche ed effettuare interventi e terapie specifiche in presenza di eventuali patologie. Quando le condizioni dell'animale risultano ottimali viene effettuata la consueta marcatura e la successiva liberazione.
E' stata effettuata una analisi dei dati relativi a segnalazioni e ritrovamenti di tartarughe vive o morte che sono stati raccolti negli anni di attività a partire dal 1990 ad oggi (in totale 232).
In particolare sono stati analizzati i parametri biometrici, la distribuzione geografica e la stagionalità dei recuperi al fine di delineare un quadro generale delle specie presenti nel Mar Ligure e Tirreno Settentrionale. In particolare è stato evidenziato come la tartaruga comune (*Caretta caretta*) sia una presenza frequente nell'area, soprattutto nelle sue fasi giovanili, mentre altre specie debbano essere considerate occasionali; per la tartaruga comune è stato inoltre possibile determinare la stagionalità dei ritrovamenti e la loro distribuzione geografica anche in relazione alle varie classi dimensionali degli individui recuperati. In questo modo è stato infine possibile formulare delle ipotesi sul ruolo dell'area toscana nell'ambito del ciclo biologico di questa specie e sui movimenti presumibilmente effettuati dalle tartarughe comuni durante la loro vita.

Key words: *Centro di Recupero*, Caretta caretta, *litorale toscano.*

TARTARUGHE COMUNI (*CARETTA CARETTA*) ALL'OSPEDALE DELLE TARTARUGHE DELLA FONDAZIONE CETACEA DAL 1993 AL 2005: CASISTICA

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La regione del nord Adriatico pare rappresentare un'importante area di "svernamento" e di alimentazione per le tartaruga comune (*Caretta caretta*), soprattutto in fase giovanile e sub-adulta.
L'impatto antropico nella zona è comunque alto, a causa soprattutto dell'intensa attività di pesca e del traffico navale.
Per le attività rivolte alla salvaguardia delle Tartarughe marine, la Fondazione Cetacea è un punto di riferimento per l'area costiera dell'alto Adriatico, specificamente per le coste dell'Emilia-Romagna e delle Marche. Ha costruito negli anni un solido ed efficace rapporto con le autorità locali (Capitanerie di Porto e Uffici Cites), con cui collabora attivamente e per la quali rappresenta un punto esclusivo di riferimento. Essa gestisce da 12 anni un centro di recupero Tartarughe marine.
I dati degli esemplari ricoverati sono conservati in un archivio informatico.
Dal 1993 al 2005 930 esemplari di *Caretta caretta* sono stati recuperati sulle spiagge e nell'area di mare interessata. Di queste. 207 erano ancora in vita e sono state ospitate nel centro di recupero.
Ovviamente due sono le categorie di cause a cui far risalire il rinvenimento di un esemplare di tartaruga marina "in difficoltà": cause naturali e problemi invece legati alle attività antropiche. Nell'area il numero di esemplari rinvenuti spiaggiati rispetto a quelli raccolti con altre modalità (alla deriva, allamati, intrappolati in attrezzi da pesca…) è preponderante (63% del totale). Per questo motivo è spesso impossibile distinguere esattamente l'origine del problema.
Nel lavoro viene presentata una casistica della cause di ammissione al centro di recupero, distinguendo fra patologie "naturali" (micosi, esemplari cold stunned, altre patologie…) e problemi legati all'uomo (ferite da collisione, ingestione di ami, esemplari dichiaramene trovati in reti da pesca, o impigliati in altri attrezzi, lenze, etc.) con l'evidenza anche su casi particolarmente rilevanti.

Key words: Caretta caretta, *rescue center, human interaction.*

SPIAGGIAMENTI DI *CARETTA CARETTA* NELLA SARDEGNA MERIDIONALE

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Il Centro recupero Cetacei e Tartarughe marine "Laguna di Nora" svolge dal 1993 attività di rilevamento, cura e riabilitazione di esemplari di Cetacei e Tartarughe marine segnalati in Sardegna, lungo il tratto costiero ricompreso tra Arbatax e Oristano. I dati si riferiscono a 5 anni di rilevamenti di spiaggiamenti di Tartarughe marine, effettuati tra gennaio 2000 e dicembre 2005, nel tratto costiero ricompreso tra Arbatax e Oristano, nella Sardegna meridionale. Per ogni esemplare segnalato è stata registrata la localizzazione, le modalità del ritrovamento e i dati biometrici: lunghezza totale, lunghezza e larghezza curvilinea carapace, lunghezza e larghezza testa, peso. Si è proceduto poi all'inquadramento clinico del soggetto, attraverso il segnalamento, l'anamnesi e l'esame obiettivo generale.
Il rilevamento degli spiaggiamenti ha riguardato esclusivamente esemplari appartenenti alla specie *Caretta caretta* per un totale di 143 casi. Nessuno degli esemplari registrati presentava sistemi di marcatura. L'incidenza di individui ritrovati morti è stata pari al 24%, con 34 casi.
Degli esemplari di *Caretta caretta* censiti solo 13 casi, pari al 9%, provenienti da catture accidentali negli attrezzi da pesca che non hanno determinato lesioni, hanno consentito un rapido reinserimento in mare. Per 96 esemplari, pari al 67% dei casi di spiaggiamento rilevati, le condizioni cliniche presentate hanno richiesto l'ospedalizzazione presso il Centro di Recupero.
Le lesioni e le patologie riscontrate negli esemplari spiaggiati sono conseguenti ad ammagliamento nelle reti da pesca, ingestione di ami da palamito o di lenze, collisioni con natanti, abrasioni e infezioni cutanee superficiali da ferite accidentali o patologie dovute a corpi estranei occlusivi.
In particolare, nel campione in esame il 94% degli esemplari hanno presentato lesioni o patologie ascrivibili all'impatto con attrezzi da pesca. Nello specifico si è rilevata un'incidenza del 59% di patologie derivanti dall'ingestione di ami da palangaro, del 17% di lesioni alle pinne dovute a lenze o reti da pesca, del 18% di stato di ipotermia o anossico per apnee prolungate a causa di ammagliamento in reti da pesca. il 3% dei casi rilevati hanno presentato lesioni al carapace dovute all'impatto con eliche o scafi di natanti. Il rimanente 3% erano affette da lesioni oculari di varia natura.
Oltre che nell'attività di censimento e cura degli esemplari ritrovati, il Centro recupero Cetacei e Tartarughe marine Laguna di Nora è impegnato nella sensibilizzazione sui problemi legati alle specie marine protette. L'ubicazione del Centro recupero Laguna di Nora all'interno dell'omonimo Cea, dove si svolge attività di educazione ambientale rivolta alle scuole di ogni ordine e grado e al turismo stagionale, consente di svolgere in modo continuativo l'azione di sensibilizzazione e divulgazione sui problemi relativi alla conservazione dei Cetacei e delle Tartarughe marine. Il Cea Laguna di Nora è visitato ogni anno da circa 10000 visitatori.

Key words: Caretta caretta, *fisheries, by-catch, biological conservation.*

LOGGERHEAD TURTLE NESTING ON A BEACH COAST IN SOUTH-WESTERN SICILY

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The loggerhead turtle (*Caretta caretta)* nesting is a very unusual event along the Italian coasts, and regular nesting sites are even rarer. Along the Sicilian coasts, regular nesting sites are those in the islands of Lampedusa and Linosa, whereas single occasional nests have been identified during the last few years along the southern coast of Sicily. In summer 2005, two turtle night climbing up and one egg laying events were observed on a beach in southern Sicily, in the Giallonardo area (province of Agrigento, Sicily), while a second nest was identified when turtle hatchlings left it. Through measurement probes applied outside and inside one of the nests (30 and 50 cm depth), temperature values were recorded. Biometric data of hatchlings and eggs were collected through a digital calliper and electronic balance.

Turtle beach climbing up events took place during the night between 27 and 28 July 2005. Egg laying occurred during the second half of July at a distance of approximately 240 metres one from the other. The number of eggs in the two nests was 66 and 99, respectively, and reproduction success rate was 25.8% for the first nest. Eighty days after egg laying, much later that incubation time known for nests in Sicily, Lampedusa and Linosa, eggs from the second nest were moved - with the authorization of local competent authorities - to an incubator, where only one egg hatched. The average diameter of eggs in the two nests was 37.7 mm (n=3) and 35.3 mm (n=97), respectively, with 22.2 g (n=97) average weight. The average length of hatchlings was 40.2 mm (n=11), and 13.5 g (n=8) average weight. Average temperature rates in monitored nest were 24.8 °C and 24.4 °C, at 30 cm and 50 cm depth, respectively.

In 2005, known loggerhead turtle nesting sites on the coasts of Sicilian islands should only be three, one of which on the island of Linosa, and two on Giallonardo beach. These two nests – together with beach climbing up events - were close in time and space. This would show the high value of southern Sicilian beaches for reproduction and protection of this species. In the first nest, low productivity values measured may be due to constant presence of campers in the area, especially during the entire month of August, which caused missed hatching of 40 eggs (60.6%); for the second nest, the cause may be due to sudden temperature decrease, which lasted for approximately one week, and may have provoked embryo development slowdown and stop. Beach climbing up and egg laying occurred, in spite of the fact that human pressure is quite strong in this beach section, due to bathing use of the area during the day, and amateur fishing activities during the night. Due to the fact that the area is not protected at all, amateur fishermen usually reach their fishing sites driving on the beach with cars.

Key words: Caretta caretta, *loggerhead turtle, Sicily, reproduction.*

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