Scaphiopus couchi, less than 10% of the ponds produced metamorphs, largely because of early desiccation (Newman, 1987). It seems therefore that early breeding is of sufficient selective advantage every third year on average, to maintain this trait in this fringe population of *Salamandra* population on Mt. Carmel.

ACKNOWLEDGEMENTS

The meteorological data were kindly supplied by the Israel Meteorological Service at Beit Dagan. This research was partially supported during the past 2 years by a Fund for the Promotion of Research at the Technion. The skillfull technical assistance of Mira Rosenberg in histology and photography is gratefully acknowledged.

REFERENCES

Anderson, J.D. (1967). A comparison of the life histories of coastal and montane populations of *Ambystoma macrodactylum* in California. *Am. Midl. Nat.* **77**, 323-355.

Beneski, J.T., Zalisko, E.J. and Larsen, J.H. (1986). Demography and migratory patterns of the eastern long-toed salamander, *Ambystoma macrodactylum columbianum*. *Copeia* **1986**, 398-408.

Degani, G., Goldenberg, S., and Warburg, M.R. (1980). Cannibalistic phenomena in *Salamandra salamandra* larvae in certain water bodies and under experimental conditions. *Hydrobiologia*, **75**, 123-128.

Degani, G., and Mendelssohn, H. (1982). Seasonal activity of *Salamandra salamandra* (L.) (Amphibia: Urodela: Salamandridae) in the headwaters of the Jordan river. *Israel J.Zool.* **31**, 77-85.

Degani, G., and Warburg, M.R. (1978) . Population structure and seasonal activity of the adult *Salamandra salamandra* (L.) (Amphibia, Urodela, Salamandridae) in Israel. *J. Herpet.* **12**, 437-444.

Joly, J. (1968). Donees ecologiques sur la salamandre tachetee *Salamandra salamandra* (L.). *Ann. Sci. Nat. Zool. Biol. Anim. 12 ser.* **10**, 301-366.

Klewen, R. (1985). Untersuchungen zur Okologie und Populationsbiologie des Feuersalamanders (*Salamandra salamandra terrestris* Lacepede 1788) an einer isolierten Population im Kreise Paderborn. *Abh. Westfal. Mus. Naturk.* **47**, 1-51.

Kusano, T., Kusano, H. and Miyashita, K. (1985). Size-related cannibalism among larval *Hynobius nebulosus*. *Copeia* **1985**, 472-476.

Lannoo, M.J., and Bachmann, M. D. (1984). Aspects of cannibalistic morphs in a population of *Ambystoma t. tigrinum* larvae. *Am. Midl. Nat.* **112**, 103-109.

Newman, R.A. (1987). Effects of density and predation on *Scaphiopus couchi* tadpoles in desert ponds. *Oecologia* **71**, 301-307.

Newman, R.A. (1989). Developmental plasticity of *Scaphiopus couchi* tadpoles in an unpredictable environment. *Ecology* **70**, 1775-1787.

Rose, F.L., and Armentrout, D. (1976). Adaptive strategies of *Ambystoma tigrinum* Green inhabiting the Llano Estacado of West Texas. *J. Anim. Ecol.* **45**, 713-729.

Semlitsch, R.D. (1985). Analysis of climatic factors influencing migrations of the salamander *Ambystoma talpoideum*. *Copeia* **1985**, 477-48.

Semlitsch, R.D. (1987). Relationship of pond drying to the reproductive success of the salamander *Ambystoma talpoideum*. *Copeia* **1987**, 61-69.

Semlitsch, R.D., Scott, D.E. and Pechmann, J.H.K. (1988). Time and size at metamorphosis related to adult fitness in *Ambystoma talpoideum*. *Ecology* **69**, 184-192.

Shoop, C.R. (1974). Yearly variation in larval survival of *Ambystoma maculatum*. *Ecology* **55**, 440-444.

Tevis, L. (1966). Unsuccessful breeding by desert toads (*Bufo punctatus*) at the limit of their ecological tolerance. *Ecology* **47**, 766-775.

Travis, J. (1984). Anuran size at metamorphosis: Experimental test of a model based on intraspecific competition. *Ecology*, **65**, 1155-1160.

Warburg, M.R. (1986a). A relic population of *Salamandra salamandra* on Mt.Carmel: a ten-year study. *Herpetologica* **42**, 174-179.

Warburg, M.R. (1986b). Observations on a relic population of *Salamandra salamandra* on Mt.Carmel during eleven years. In *Studies in Herpetology*, 389-394. Z.Rocek (ed). Prague.

Warburg, M.R., Degani, G. and Warburg, I. (1978/79). Ovoviviparity in *Salamandra salamandra* (L.) (Amphibia, Urodela) from northern Israel. *Vie Milieu* **28/29**, 247-257.

Yom - Tov, Y. and Tchernov, E. (1988). *The Zoogeography of Israel* 560 pp. Kluwer.

Zakrzewski, M. (1970). Dates of appearance and development of larvae of the spotted salamander (*Salamandra salamandra* L.) in a natural habitat. *Acta Bio. Cracov ser. Zool.* **13**, 161-173.

SHORT NOTES

HERPETOLOGICAL JOURNAL Vol. 2, pp58-61 (1992)

NEW RECORDS OF MOROCCAN HERPETOFAUNA

JESUS MELLADO* AND JOSE A. MATEO**

* *Estación Experimental de Zonas Aridas, General Segura, 1., 04001 Almeria, Spain.*
** *Estación Biológica de Doñana, Avda Maria Luisa s/n., 41013 Sevilla, Spain.*

(Accepted 1.10.90)

Information concerning the distribution of Moroccan amphibians and reptiles was summarized by Bons (1967). Since this date numerous new data have been published describing increases in distribution ranges of many species. This new information has been compiled recently by Mellado and Dakki (1988), although new data is constantly being published (see Schouten and Thevenot, 1988; Destre *et al.*, 1989; Valverde, 1989a, b; Mellado and Olmedo, 1990).

This note presents more new data concerning herpetofaunal distribution in former Morocco (Western Sahara excluded) and describes (1) considerable increases in the distribution of some species, (2) new localities for some species, and (3) the confirmation of the existence of some species in previously poorly surveyed areas. These records have been selected from a considerable amount of new observations made by the authors since 1982, in addition to existing material deposited since 1952 in the collection at the Estacion Biologica de Doñana, Seville. The latter has been recently described by Ignacio de la Riva and the second author of this note (in preparation). In Table I appears a list of 45 new localities for 29 species of Moroccan herps, whose geographic situation is mapped (Fig. 1).

Species	Date	Location	Code	Observers
Pleurodeles waltl (Salamandridae)	240486	Puente fomento (Chechaouen)	1	JAM*
" "	050686	Talamagait	5	JAM
Salamandra salamandra (Salamandridae)	170587	Djebel Bouhalla (Chechaouen)	2	Cl&LLJ*
Alytes obstetricans (Discoglossidae)	210582	Djebel Tazekka (Taza)	15	JM&GO
Discoglossus pictus (Discoglossidae)	001186	Ouled berrehil (Taroudant)	29	JM&LJ
" "	110587	Cascade de Ouzoud (Azilal)	18	JAM&IR*
" "	080587	Agoudal	19	JAM&IR*
Bufo bufo (Bufonidae)	090587	El Ksiba	17	JAM&IR*
" "	010687	Taforaet	9	JM
Blanus cinereus (Amphisbaenidae)	280382	Bab Bou Idir (Taza)	14	GO&JM
Trogonophis wiegmanni (Trogonophidae)	000062	Sidi Ifni	31	RT*
Gekonia chazaliae (Gekkonidae)	090566	Inezzgane	30	EK*
Hemidactylus turcicus (Gekkonidae)	150778	Peñon de Alhucemas	4	AJ
Ptyodactylus oudrii (Gekkonidae)	080587	Tizi tirherhouzine (Agoudal)	20	JAM&IR*
Quedenfeldtia trachyblepharus (Gekkonidae)	080587	Tizi Tirherhouzine (Agoudal)	20	JAM&IR*
Saurodactylus mauritanicus (Gekkonidae)	010789	Souk el Had (Mrirt)	16	JAM&JM
" "	040686	Talamagait	5	FFP&JAM*
" "	000489	Torres de Alcalá	3	JAM
Stenodactylus petriei (Gekkonidae)	250389	Erg Chebbi (Merzouga)	24	MG
Tarentola annularis (Gekkonidae)	051165	Mulekta (Zag)	33	JAV*
Tropiocolotes tripolitanus (Gekkonidae)	000066	Inezzgane	30	EK*
Uromastix acanthinurus (Agamidae)	310161	Zaîo	7	AP*
" "	070586	Mechra Hommadi	8	LLJ&JAM*
Chalcides mauritanicus (Scincidae)	000061	Beni Enzar	6	AP*
Sphenops boulengeri (Scincidae)	000461	Figuig	25	AP*
" "	030587	Erg Chebbi (Merzouga)	24	JAM&IR*
" "	160388	Tamgrout	26	LJ&JM
Mesalina rubropunctata (Lacertidae)	220786	Ouarzazate	27	AM*
" "	160487	Erg Chebbi (Merzouga)	24	JM
" "	230388	Erfoud	22	LJ&JM
Podarcis perspicillata (Lacertidae)	070587	Oued Todra (Tinerhir)	21	JAM&IR*
Ophisops occidentalis (Lacertidae)	060687	Oued Betoun (El Ateuf)	12	IR*
" "	190487	Ain Beni Mathar	11	JM
Psammodromus algirus (Lacertidae)	030587	Rissani	23	JAM&IR
" "	190263	Sidi Ifni	31	RT
Psammodromus blanci (Lacertidae)	060489	Col de Jerada (Jerada)	10	LJ&JM
Ophisaurus koellikeri (Anguidae)	120582	Debdou	13	GO&JM
Varanus griseus (Varanidae)	040587	Erg Chebbi (Merzouga)	24	IR&JAM
" "	140486	Tamgrout	26	JM
" "	000084	Tan Tan	32	LLJ&JAM
Eryx jaculus (Boidae)	000852	Zaîo	7	AP*
Boaedon fuliginosum (Colubridae)	000070	Aoulouz	28	JU&MU
Psammophis sibilans (Colubridae)	260490	Ouarzazate	27	LLJ&JAM
Bitis arietans (Viperidae)	000070	Aoulouz	28	JU&MU
" "	000085	Ouled Berehil (Taroudant)	29	JU&MU

TABLE 1 (previous page). List of new localities of Moroccan amphibian and reptile species. Indicated are the dates of observation or capture, the name of the location, the coding assigned to these locations in Fig. 1., and the observers' initials. The initials JM and JAM refer to the authors, and the remaining to those named in the acknowledgements. Species are named according to Mellado and Dakki (1988). Observations marked * denote specimens preserved in the collection of the Estación Biológica de Doñana, Seville.

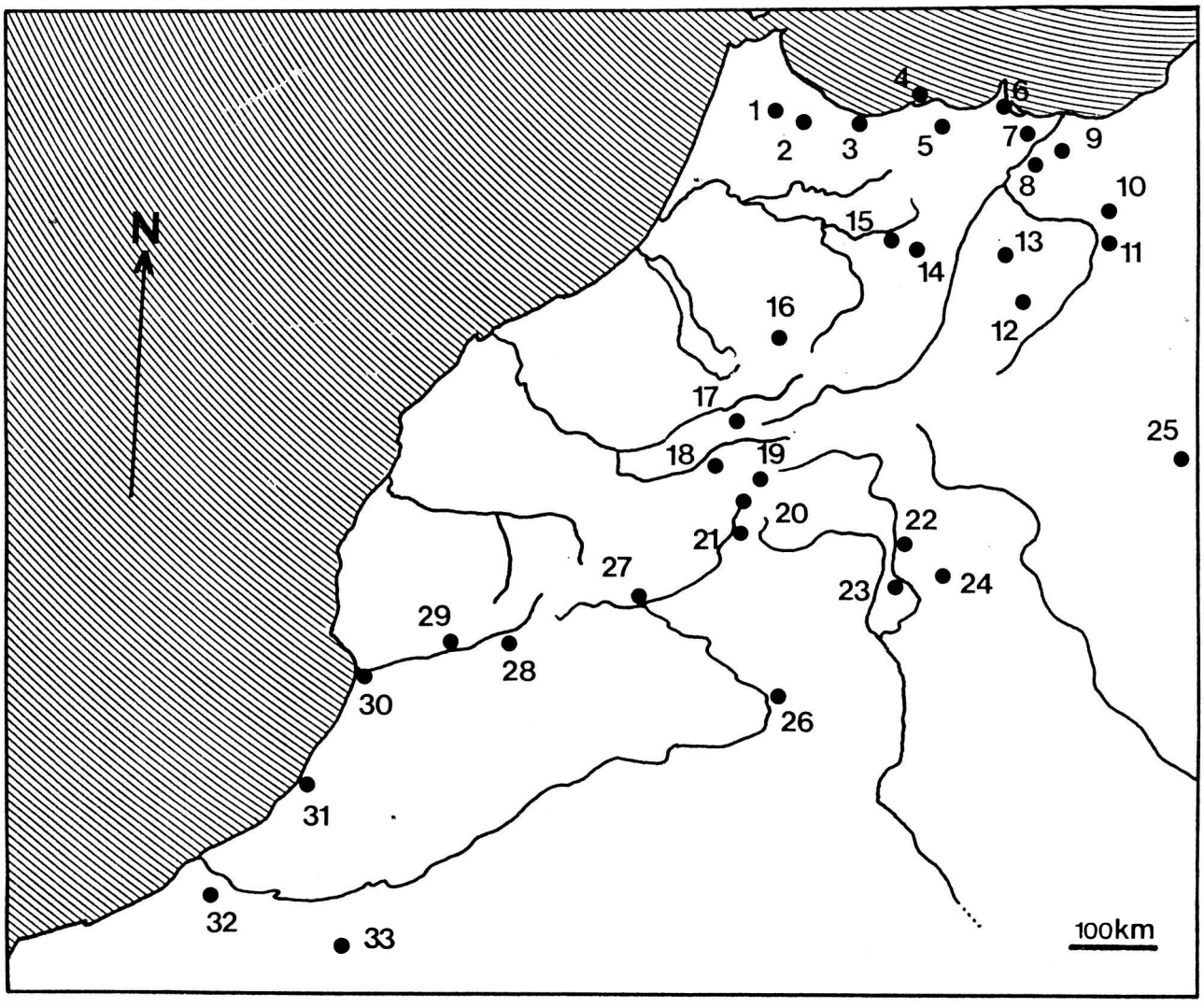

Fig. 1. Shows the geographical location of the sites appearing in Table 1.

These data reveal important increases in previously know distributions for nine species. Thus, amongst amphibians, *Pleurodeles waltl* expands its range to the east, now occupying the whole of the Rif mountains. *Discoglossus pictus* appears in the Souss Valley. *Bufo bufo* is detected in an isolated eastern locality (Djebel Beni Snassen) situated between the principal core areas of this species in Atlantic Morocco and Algeria (Doumergue, 1901; Pasteur and Bons, 1959). Amongst reptile species, *Saurodactylus mauritanicus* has a disjointed distribution with two core areas, one in the SW and the other in the NE of the country. These new data enlarge these existing areas to the north and the west respectively. *Mesalina rubropunctata* is expanding the northern limit of its known area. *Psammodromus algirus* is extending its distribution towards the south, both on the Atlantic coast (Sidi Ifni) and in the interior, penetrating the Sahara by means of the oases (Rissani). Particularly outstanding is the case of *Sphenops boulengeri*, whose range is expanding some 400 km to the west, reaching the upper Draa valley. *Ophisaurus koellikeri* appears in an isolated locality (Gada de Debdou), which now constitutes the eastern boundary of its range. Finally, *Eryx jaculus* now appears as far north as Morocco (where previously it was only known in Hauts Plateaux, Bons, 1967) as in the Oran region of Algeria (Doumergue, 1901).

Expansions of lesser importance appear in a further six species. *Blanus cinereus* extends its area to the east. *Trogonophis wiegmanni* advances to the south along the Atlantic coast. *Geckonia chazaliae* now reaches the mouth of the river Souss. *Uromastix acanthinurus*, a typical desert species, now appears in semi-arid ecosystems in the NE, very close to the Mediterranean coast. *Chalcides mauritanicus*, a species previously only known in a single site in Morocco (Mellado, Caputo and Nascetti, 1987), reaches on the west the foothills of the Rif mountains. *Podarcis perspicillata* confirms its presence in the pre-desert zones on the southern slopes of the High Atlas.

Amongst the species with few recorded localities in the study area, new data for a further eleven species are presented (note however that some of the species considered in the above paragraphs, e.g., *Chalcides mauritanicus*, are also found in few localities). Amphibians include *Salamandra salamandra* (five

localities previously recorded; Pasteur and Bons, 1959) and *Alytes obstetricans* (previously only observed in the Rif mountains and since found by Libis, 1984, in Middle Atlas). Reptiles include *Hemidactylus turcicus*, before only cited in three places: Casablanca, Ouezanne (Pasteur and Bons, 1960) and *Lixus* (Stemmler and Hotz, 1972). *Stenodactylus petriei*, was only known from three localities: Meski, Bou Denib and to the north of Erfoud (Bons, 1967; Stemmler and Hotz, 1972). *Tarentola annularis* was present in a single place (close to Tarfaya; Joger, 1984). *Ophisops occidentalis* and *Psammodromus blanci*, each previously recorded in only two localities respectively (Bons, 1967). *Varanus griseus* was previously present in only six places (Bons, 1959). Amongst snakes, *Boaedon fuliginosum* only had three previous recordings (Bons, 1967). *Psammophis sibilans* has recently been discovered in a single Moroccan locality (Valverde, 1989a) whereas *Bitis arietans* had only two previously known locations (Bons, 1967).

Included finally are a group of localities confirming the presence of some species in previously poorly surveyed zones within their distribution ranges. Such is the case with *D. pictus*, *B. bufo*, *Quendenfeldtia trachyblepharus* and *Ptyodactylus oudrii* in the central High Atlas, with *Tropiocolotes tripolitanus* in the Souss valley and with *V. griseus* in the upper Draa valley.

ACKNOWLEDGEMENTS

We gratefully acknowledge the information provided by F. F. Parreño (FFP), M. Garcia (MG), C. Ibañez (CI), A. Jimenez (AJ), L. Jimenez (LJ), E. Kramer (EK), L. F. Lopez Jurado (LLJ), A. Manzanares (AM), G. Olmedo (GO), A. Pardo (AP), I. de la Riva (IR), R. Tapiador (RT), J. Ulpiano (JU), M. Ulpiano (MU) and J. A. Valverde (JAV). We also thank F. McHugh for his assistance in translating the manuscript. The name order of the authors was randomly decided by the toss of a coin.

REFERENCES

Bons, J. (1959). Les lacertiliens du Sud-ouest marocain. *Trav. Inst. scient. chérif. ser. Zool.* **18**, 1-130.

Bons, J. (1967). *Recherches sur la Biogeographie des Amphibiens et des Reptiles du Maroc.* Thése, Univerversité de Montpellier.

Destre, R., Roux, P., Geniez, P., Thevenot, M. and Bons, J. (1989). Nouvelles observations sur l'herpetofaune marocaine. *Bull. Soc. Fr*. **51**, 19-26 .

Doumergue, F. (1901). *Essai sur la faune erpetoloqique de l'Oranie.* Oran: Fouque.

Joger, U. (1986) . Taxonomische Revision der Gattung *Tarentola* (Reptilia: Gekkonidae). *Bonn. zool. Beitr.* **35**, 129-174.

Libis, B. (1984). Nouvelle donnée sur la repartition au Maroc du Crapaud accoucheur *Alytes (obstetricans) maurus* Pasteur et Bons 1962. *Bull. Inst. Scient., Rabat.* **8**, 172.

Mellado, J., Caputo, V. and Nascetti, G. (1987). Sobre las poblaciones de *Chalcides* (Reptilia, Scincidae) del Nordeste de Marruecos. *Rev. Esp. Herpetol.* **2**, 183-186.

Mellado, J. and Dakki, M. (1988). Inventaire commenté des Amphibiens et Reptiles du Maroc. *Bull. Inst. Scient., Rabat,* **12**, 171-181.

Mellado, J. and Olmedo, G. (1990). El género *Acanthodactylus* en Marruecos: problemas de identificación en los grupos de especies *A. pardalis* y *A. scutellatus*. *Amphibia-Reptilia* **11**, 131-146.

Pasteur, G. and Bons, J. (1959). Les Batraciens du Maroc. *Trav. Inst. scient. chérif. sér. Zool.* **17**, 1-241.

Pasteur, G. and Bons, J. (1960). Catalogue des Reptiles actuels du Maroc. *Trav. Inst. scient. chérif. sér. Zool.* **21**, 1-134.

Schouten, J.R. and Thevenot, M. (1988). Amphibians and Reptiles of the Tarfaya region, Province of La'Youne, Morocco. In *Khnifiss Lagoon and its surrounding environment. Trav. Inst. Scient., Rabat* (Mém.hors série) 105-113.

Stemmler, 0. and Hotz, H. (1972). Bericht über eine herpetologische sammelreise nach Marokko im Juli 1969. *Verhandl. Naturf. Ges. Basel.* **83**, 125-160.

Valverde, J.A. (1989a). Notas sobre vertebrados. VI. *Psammophis sibilans teknae* (Colubridae, Serpentes) una nueva forma del Marruecos occidental. *Actas IX Bienal de la R.S.E.H.N.,* 207-213.

Valverde, J.A. (1989b). Notas sobre vertebrados. VII. Una nueva cobra del NW de Africa, *Naja haje legionis*, ssp. nov. (Elapidae, Serpentes). *Actas IX Bienal de la R.S.E.H.N.*, 214-230.

HERPETOLOGICAL JOURNAL, Vol. 2, pp 61-63 (1992)

MYCOPHAGY IN A FOSSORIAL MICROHYLID *COPIULA FISTULANS* IN NEW GUINEA

RUPERT STOCKS*

Department of Applied Physics, University of Technology, Lae, Papua New Guinea.

**Present address: 21 Church Road, Dartmouth, Devon, TQ6 9HQ, UK.*

(Accepted 31.8.90)

This work resulted from the observation of a captive *Copiula fistulans* (Menzies and Tyler) eating carrion. The diet of microhylids is generally unknown but frequently hypothesised to include small arthropods such as ants and termites (Emerson, 1985; Menzies, 1976; Zweifel and Tyler, 1982; Zweifel, 1972). Frogs usually only eat live moving prey, using the prey's movement as the stimulus to the feeding response (Ingle, 1971; Tyler, 1976). It therefore appeared that *C. fistulans* was using a stimulus other than movement and that its diet could be unusual. Examination of the stomach contents of other specimens revealed large quantities of non-animal matter.

Frogs were collected at various locations within 30 kilometres of Lae (Morobe Province, Papua New Guinea) and killed by freezing as soon as possible after capture (usually within 30 minutes, but occasionally up to two hours after capture) to halt digestion of stomach contents. Stomach contents were examined under a binocular microscope with an ocular micrometer. Relative masses of stomach contents were estimated visually, and arthropods were measured, counted and identified as far as possible.

Observations on captive frogs were made over a period of approximately one year, during which time the frogs were housed in a glass aquarium 70cm x 30cm x 40cm high furnished with soil and rocks and a bowl of water. Observations were made at night in a darkened