

WHO WAS THE FIRST TO OBSERVE PARENTAL CARE IN CROCODILES?

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ONE of the most interesting features of reproductive behaviour in crocodilians is the guarding of nests, eggs and hatchlings by parent females, including mouth transport performed by the latter to transport their young safely to water. Currently known from a considerable number of species representing all extant families (gharials being incapable of mouth transport due to the peculiar shape of their snout; see e.g. Magnusson et al., 1989; Trutnau, 1994), this particular aspect of behaviour had first been observed in southern African Nile Crocodiles (Pooley, 1974, 1977) - 'first' used here in the context of modern zoological literature only. It is true that some early authors (e.g. Bartram, 1792) had reported already on such behavioural traits almost 200 years previously; however, these reports were mostly regarded as myths, legends or even premeditated deceptions. It was primarily Neill (1971) who ultimately disregarded the observations of Bartram and other early writers, over three chapters in his influential monograph on crocodiles.

In 1777, one of us (WB) discovered another 200 year-old source describing the mouth transport behavior of *Alligator mississippiensis* in some detail (Böhme, 1977): the anonymous author of this work, entitled a 'Natural History of the best writers' wrote in one of its chapters, 'Das Krokodill' (see Fig. 1: 'Crocodyll'), 'Esquemeling assures in his "History of the Buccaneers of America" that the young are swallowed by their mothers when these become aware of a menace, and that he himself was eye-witness when they played around her mother, but that after he had thrown a stone among them, they crawled into their mother's mouth and appeared back only after some time'

(Anonymus, 1774; translation from German original: WB).

Following the recent rediscovery of Nile Crocodiles in the southern Sahara of Mauritania (Shine et al., 2000, see Fig. 2) we searched for all available records and other indications of the (former) existence of *Crocodylus niloticus* in the Sahara. The first report on surviving desert crocodiles was published by Duveyrier (1864), from the Tassili n'Ajjer, southern Algeria, and from Lake Mihero, Akkakus Mts. in southwesternmost Libya. Fresh crocodile tracks had been found at Lake Mihero by Erwin von

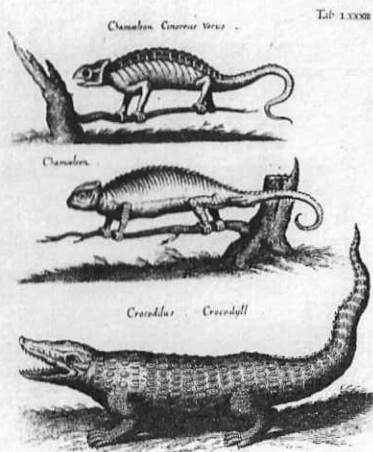


Fig. 1. Copperplate of the crocodile by Matthaeus von Merian (father of Sibylla von Merian), figured in 'Natural History of the best writers' (Anonymus, 1774).



Fig. 2. Subadult Nile Crocodile basking at a puddle in the desert near Ayoun el-Atrouss, SE Mauritania, documenting the survival of this species in the southern Sahara. In the foreground are 2 Laughing Doves (*Streptopelia senegalensis*).

Bary in October 1876 (de Bary, 1977). These discoveries were regarded as the most important and convincing evidence of the climatic history of the Sahara as a very young desert that had been a largely green and moist savanna only 10,000 years ago. The discovery of these relict crocodiles in the central Sahara (extirpated in Algeria in the 1920s: Joleaud, 1933; Lhote, 1961) further corroborated the authenticity of the famous rock engravings and paintings by the Neolithic inhabitants of this area, who had figured not only various large mammals (lions, giraffes, hippos etc.; see Coulson, 1999), but also crocodiles. The famous life-size crocodile of Wadi Mathendus (Fezzan, Libya: Fig. 3), described by Coulson (1999) as 'dramatic evidence of a wetter climate and the life that once basked on the banks of northern African rivers', is judged to be 9,000 years old; some of its grooves are more than 2 inches deep (Coulson, op. cit.). However, this author did not refer to a most important detail of this impressive rock picture, viz. a juvenile crocodile following the adult one (Fig. 3)! In contrast, the German naturalist Staudinger (1929) was already aware of the parent-offspring relationship of the two Wadi Mathendus crocodiles, but commented on them according to the extent of knowledge available at the time; observations on social



Fig. 3. The famous rock engraving of the two crocodiles from Wadi Mathendus, Fezzan, Libya. Photograph by Hemmo Nickel, drawing (bottom) by Ursula Bott.

behaviour and parental care having apparently been ignored, and evidence of the archosaurian relationships with birds not yet having emerged. In consequence, it may be assumed that he would have been unable to explain or make sense of the depiction of a juvenile crocodile following an adult one because, as was the belief at that time, all reptiles were simply egg-layers that having deposited their eggs in the ground, showed no further interest in them.

In the light of our current knowledge, indicated by several forgotten literature references from about 200 years ago, we may, however, assume that even the Neolithic inhabitants of the Sahara may have been already aware of special relationships between crocodiles and their young. The Wadi Mathendus rock picture shows that crocodilian parental care was obviously known to humans at least 10,000 years ago.

REFERENCES

- Anonymus (1774). *Naturgeschichte aus den besten Schriftstellern mit Merianischen und neuen Kupfern*. 6. Abschnitt: *Naturgeschichte der Frösche und anderer vierfüßigen Thiere ohne Haare, welche Eyer legen*. Heilbronn: Eckebrechtische Handlung.
- Bartram, W. (1792). *Travels through East and West Florida*. Philadelphia: James and Johnson.
- Bary, E. de (ed., 1977). *Erwin von Bary - Sahara-Tagebuch 1876-1877*. Heusenstamm: Orion-Heimreiter-Verlag. 337 pp.
- Böhme, W. (1977). Zur Entdeckerpriorität des Maultransports bei Krokodilen. *Salamandra* **13** (3/4), 185-186.
- Coulson, D. (1999). Ancient art of the Sahara. *National Geographic* **195**, (6): 101-119.
- Duveyrier, H. (1864). *Les Touaregs du Nord*. Paris.
- Joleaud, L. (1933). Études de Géographie zoologique de la Berberie. *Bulletin de Zoologie de France*, Paris **58**, 397-404.
- Lhote, H. (1961). Le crocodile du Tassili. - *Bulletin de Liaison Saharienne* **43**, 268-285.
- Magnusson, W.E., Vliet, K.A., Pooley, A.C. & R. Whitaker (1989). *Reproduction*. In *Crocodiles and alligator*, pp. 118-135. Ross, C.A. (Ed.). MacMahons Point: Weldon Owen Pty Ltd. 240 pp.
- Neill, W.T. (1971). *The last of the ruling reptiles. Alligators, crocodiles and their kin*. New York: Columbia University Press.
- Pooley, A.C. (1974). How does a baby crocodile get to water? *African Wildlife* **28** (4), 8-11.
- Pooley, A.C. (1977). Nest opening response of the Nile crocodile, *Crocodylus niloticus*. *Journal of Zoology* **182**, 17-26. London
- Shine, T., Böhme, W., Nickel, H., Thies, D.F. & T. Wilms (2000). Observations of relict populations of the Nile crocodile, *Crocodylus niloticus* (Laurenti, 1768) in southeastern Mauritania. *Oryx*, submitted.
- Staudinger, P. (1929). Krokodile in der Inner-Sahara und Mauritanien. - *Sitzungsberichte der Gesellschaft naturforschender Freunde zu Berlin* **1929**, 141-142.
- Trutnau, L. (1994). *Krokodile*. Westarp Wissenschaften Magdeburg. 270 pp.
- Magnusson, W.E., Vliet, K.A., Pooley, A.C. & R. Whitaker (1989). *Reproduction*. In *Crocodiles and alligator*, pp. 118-135. Ross, C.A. (Ed.). MacMahons Point: Weldon Owen Pty Ltd. 240 pp.
- Neill, W.T. (1971). *The last of the ruling reptiles. Alligators, crocodiles and their kin*. New York: Columbia University Press.
- Pooley, A.C. (1974). How does a baby crocodile get to water? *African Wildlife* **28** (4), 8-11.
- Pooley, A.C. (1977). Nest opening response of the Nile crocodile, *Crocodylus niloticus*. *Journal of Zoology* **182**, 17-26. London
- Shine, T., Böhme, W., Nickel, H., Thies, D.F. & T. Wilms (2000). Observations of relict populations of the Nile crocodile, *Crocodylus niloticus* (Laurenti, 1768) in southeastern Mauritania. *Oryx*, submitted.
- Staudinger, P. (1929). Krokodile in der Inner-Sahara und Mauritanien. - *Sitzungsberichte der Gesellschaft naturforschender Freunde zu Berlin* **1929**, 141-142.
- Trutnau, L. (1994). *Krokodile*. Westarp Wissenschaften Magdeburg. 270 pp.

THE OCCURRENCE OF *MABUYA BISTRATA* (SPIX, 1825)
(SAURIA: SCINCIDAE) IN FRENCH GUIANA

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IN some relatively recent papers (Gasc, 1976, 1981, 1990; Hoogmoed, 1973; Hoogmoed & Lessure, 1975; Hoogmoed, 1979), the scincid lizards of French Guiana were named as *Mabuya mabouia* (La Cépède, 1788). This species was considered to be the most common skink in Amazonia (Dunn, 1936), reaching Mexico and the Lesser Antilles (Peters & Donoso-Barros, 1970). Rebouças-Spieker (1981a) resurrected the name *M. bistrata* to designate the common skink of Amazonia and described a new species (1981b), *M. ficta* from Amazonia: she indicated that this new species is widespread through Amazonia and sympatric with *M. bistrata*. Subsequent authors (e.g. Hoogmoed & Gruber, 1983; Cunha et al., 1985; Nascimento, Avila-Pires & Cunha, 1988; Hoogmoed & Avila-Pires, 1990, 1991) adopted these new views and used the name *M. bistrata* to designate, for example, the skinks of French Guiana (Hoogmoed & Avila-Pires, 1990, 1991). Later, Avila-Pires (1995) indicated that in fact *M. ficta* is a junior synonym of *M. bistrata* (after seeing the lectotype specimen of *M. bistrata* RMNH 2512), so that the proper name to apply for the specimens previously called *M. bistrata* is *M. nigropunctata* (Spix, 1825). This situation partially explains the confusion still existing in French Guiana over the naming of these lizards; indeed, the name *M. bistrata* is still erroneously used for the Mabuyas of French Guiana (Born, 1996; Ringuet et al., 1998; Massary, 1999) and in other countries (e.g. Murphy, 1997 for Trinidad and Tobago; Gorzula & Señaris, 1999 for the Venezuelan Guayana) that are in fact *M. nigropunctata*.

Five specimens collected by JPG from areas in the southern French Guiana were recently studied. Moreover, during an ecological study led by JCDM at the Saint-Eugène field station (Courcibo River) of the Muséum national d'Histoire naturelle, Paris (MNHN), thirteen further specimens were collected and deposited at the MNHN; a further specimen was recently caught near the coast by MB, and was also deposited at the MNHN. This new material was compared with those specimens from French Guiana already available in the MNHN collections. After a thorough examination, it is clear that both *M. bistrata* and *M. nigropunctata* occur in French Guiana. We provide some characters based on the French Guianan specimens only, which allow separation of these two closely related species. In addition, the distribution map for both *M. nigropunctata* and *M. bistrata* in French Guiana is presented.

MATERIAL AND METHODS

The following characters were noted for all French Guianan Mabuyas available in the MNHN collection as well as the new material collected (for details, see Appendix 1): the snout-vent length as the linear distance from snout to cloacal vent; the number of supralabials; the number of infralabials; the number of scale rows around midbody; the number of lamellae occurring under the fourth toe; the number of supraciliaries; the contact between the parietals; the occurrence of keeled scales on the back. The specimens were also classified according to their colouration pattern.