

Studies on the *Acanthodactylus* of Tunisia IV. Geographic Distribution and Habitats

Charles P. Blanc

Laboratoire de Zoogéographie, Université Paul Valéry, 34032 Montpellier Cedex France

ABSTRACT—Extensive field investigations have determined the geographic distribution of four species of *Acanthodactylus* in Tunisia: *A. inornatus*, *A. pardalis*, *A. boskianus* and *A. savignyi blanci*. Important changes of the ranges, in comparison to those given in the literature, are available for the last three species. The ranges of these species are here related to bioclimatic zones and habitats.

* * *

INTRODUCTION

This study forms part of a series of investigations (Blanc, 1979) of the four species of the genus *Acanthodactylus* Wiegmann, 1834, now known from Tunisia: *A. inornatus* Gray, 1845, *A. pardalis* (Lichtenstein, 1823), *A. boskianus* (Audoin, 1829) and *A. savignyi blanci* (Audoin, 1829). Its aim is a synthesis of field observations covering the regional distribution and the zones occupied broadly and narrowly by each of these species.

The literature reports regarding the distributional pattern of these forms (see Blanc, 1935 and Bons, 1968 for earlier references) always deal with geographic information on regions more or less close to the site of collection or observation. Two difficulties occur. The first is toponymic: certain geographical terms, such as Bled Cegui, are difficult to localize because they are used so widely. The second is of a systematic nature: earlier authors confused some of the species (Blanc, 1979). Furthermore, the information on habitats is limited.

DISTRIBUTION OF *ACANTHODACTYLUS*

A. Geographic range.

The study was done from 1974 to 1978, in order to complete the distributional records reported in the literature. This allowed the development of a set of geographic maps for each species.

The range of *A. inornatus* (Fig. 1) was confirmed and extended into saharian Tunisia, while that of *A. boskianus* (Fig. 2) covers all of central Tunisia, including both high and low steppes. The distribution of *A. pardalis* (Fig. 3) appeared limited (on the basis of unambiguously determined specimens) to the region of the Chotts and with some uncertainty, to the south of the line running from Feriana to Kairouan to Sidi bou Ali; it has now been enlarged to the greater part of the country from the northern coast (Sidi Mecherig; El Haouaria) to the extreme south (Bordj Bourguiba). *A. savignyi blanci* (Fig. 4) was known only from the coasts of the Gulf of Tunis and of Hammamet and with some taxonomic question (*A. vulgaris* ?) from Kairouan and Sfax area. We encountered it close to the Kef town, near the Algerian frontier and on the hills of the region of Semmana and of Oum Djeddour.

A. pardalis, with its very great range, is in contrast to *A. inornatus* which is the most southern species in Tunisia, and *A. savignyi* which is the most northern one. The bioclimatological aspects of this distribution are next analyzed. The sympatries, in a portion at least of the geographic distribution, are numerous as indicated by the following scheme and a detailed study of their habitats will establish the actual interrelations between the sympatric populations.

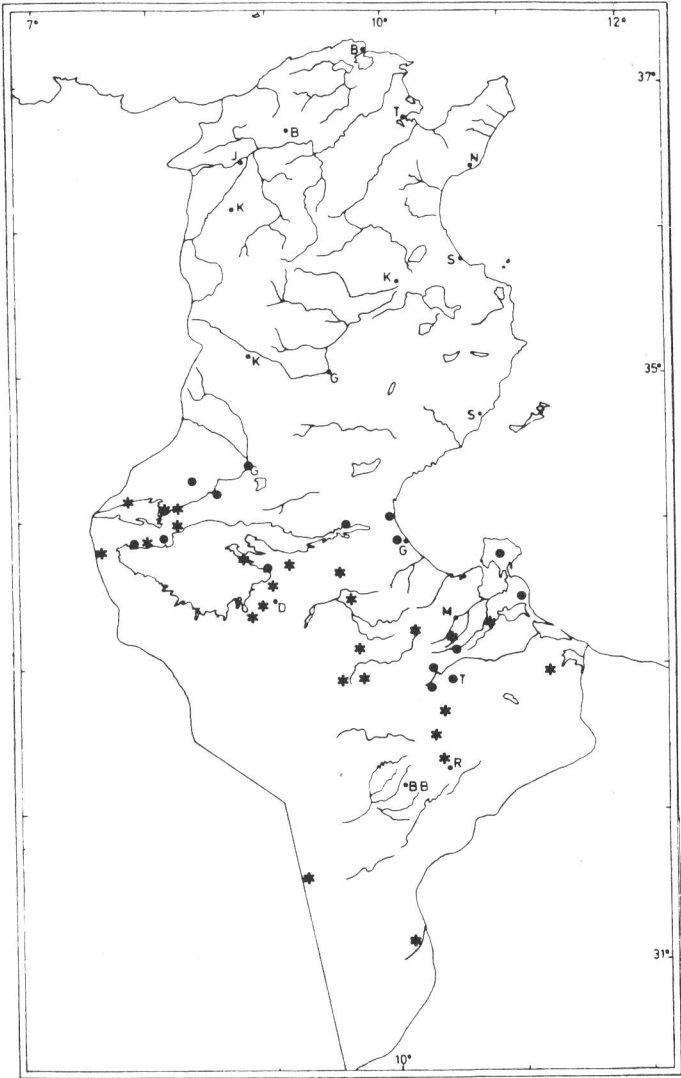
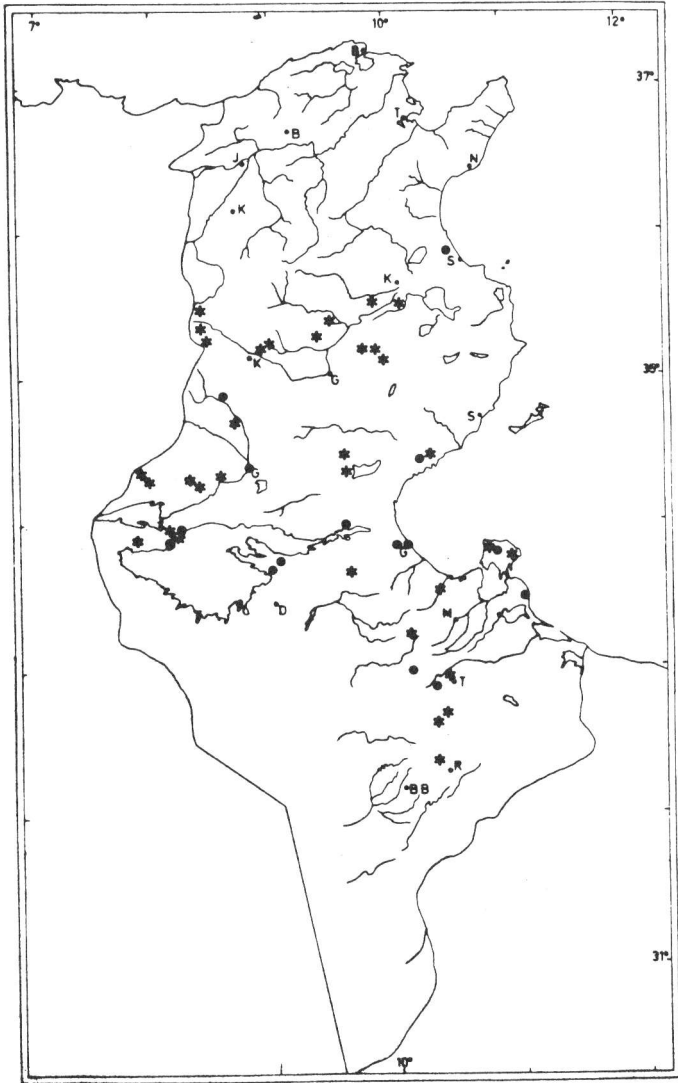
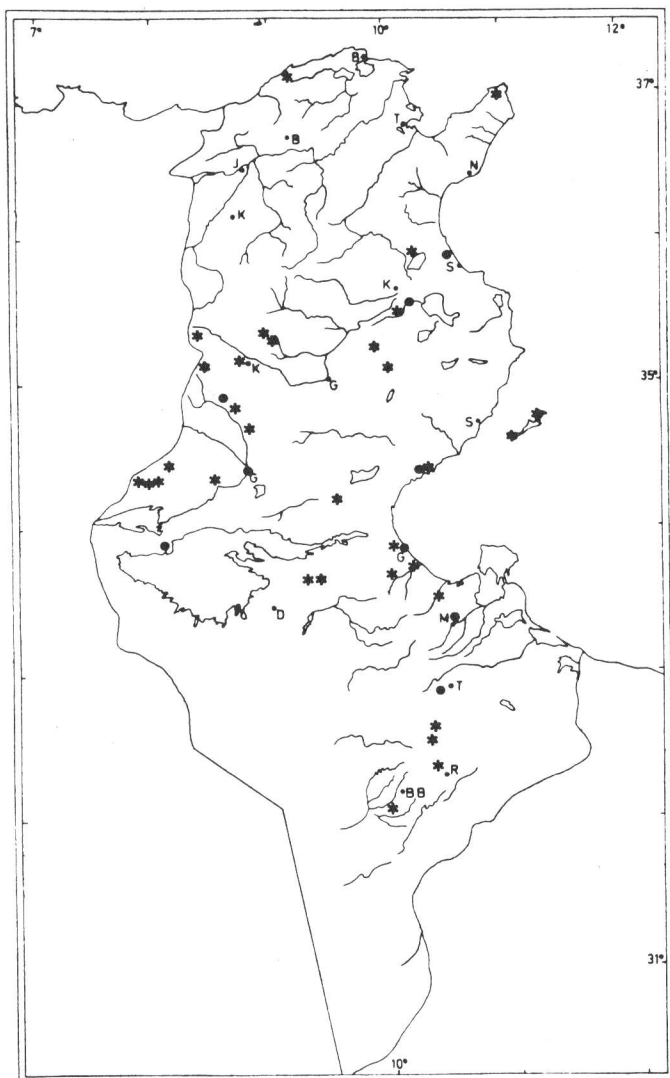
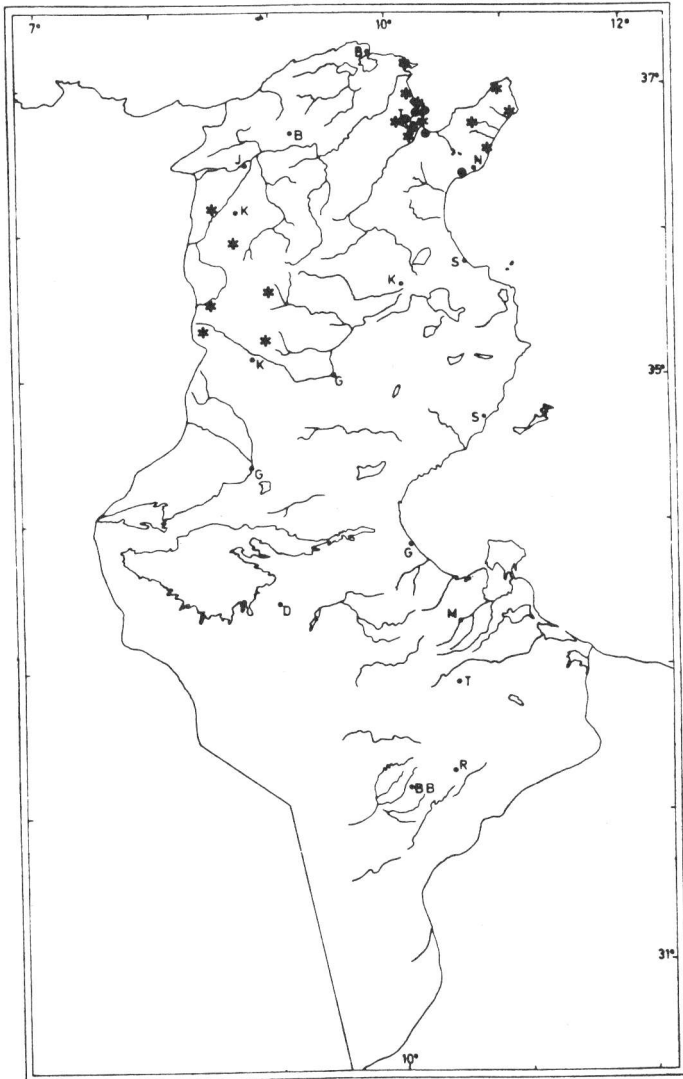
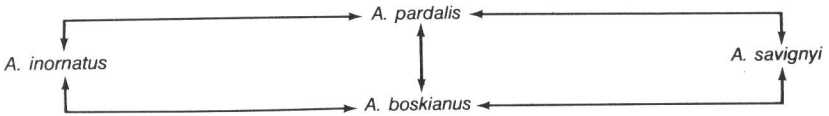


FIGURE 1. Geographic distribution of *Acanthodactylus inornatus*. Capital letters represent the major cities. The black dots represent locality records from the literature and the stars are new observations.

FIGURE 2. Geographic distribution of *Acanthodactylus boskianus*.

FIGURE 3. Geographic distribution of *Acanthodactylus pardalis*.

FIGURE 4. Geographic distribution of *Acanthodactylus savignyi*.



B. Bioclimatic distribution.

Tunisia offers an extensive zone of bioclimatic sections which may be defined by the pluviothermic quotient of Emberger, extensively used by phytogeographers in North-Africa (Le Houérou, 1969):

$$Q_2 = \frac{2000P}{(M + m)(M - m)}$$

where P represents annual rainfall in millimetres and M, the mean of maxima of the hottest month, and m, the mean of minima of the coldest month (in degrees Kelvin). Starting from the zone of highest humidity (the region of Ain Draham) to the Saharien (region of Chotts), the bioclimatic stages form a marked flexure along the coasts where the oceanic influence attenuates the dryness induced by the adjacent desert. The mountainous regions form bioclimatic regions, distinguished from the drier surrounding plains.

TABLE 1. Bioclimatic range of the *Acanthodactylus* in Tunisia.

Species of <i>Acanthodactylus</i>	Sub-humid	Semi-arid		Arid		Saharien	
		upper	lower	upper	lower		
<i>A. savignyi blanci</i>	↔						
<i>A. boskianus</i>				←-----→			
<i>A. inornatus</i>						←-----→	
<i>A. pardalis</i>		-----	←-----→				

The distribution maps allow one to circumscribe the region of each species: Table 1.

A. inornatus appears to be typically Saharien. Its northern limit corresponds closely to the northern limit drawn by the phytogeographers for the Saharien bioclimate. Its occurrence in Djerba (M. Blanc, 1935) need to be checked.

A. savignyi appears restricted to the semi-arid zone. Its occurrence on the top of the Djebel Semmama corresponds to a limited extension of this bioclimate.

Its occurrence at Sfax and Kerkennah (Mayet, 1903, using the imprecise designation *A. vulgaris*) need to be checked; they are the only ones in the higher dry zone. On Kerkennah islands, I noted only one species of *Acanthodactylus*: *A. pardalis*. The localities on Cap Bon are at the limit of the sub-humid.

A. boskianus occupies an intermediate position mostly restricted to the arid zone. We have observed this species at El Hamma in the Djerid and at Nefta, in the Saharien region. Here it occurs only in the interior of the oasis, even though Mertens (1929) emphasized its occurrence outside the palm groves at Gabes. Between Tatahouine and Remada, its populations are very scarce, in contrast to those of *A. pardalis*. These localities are near the limit of the border between the lower arid and the Saharien.

A. pardalis, in contrast to the three preceding forms, has an extensive range which extends from the beach of Sidi Mecherig and El Haouaria, where are isolated two small populations, to the south of Bordj Bourguiba (= Bordj Leboeuf on old maps), as well from the Algerian border to the Gulf of Gabes. It also occupies almost all bioclimates represented in Tunisia, from the Saharien to the limit of the sub-humid.

To summarize: In Tunisia, one species (*A. pardalis*) has a vast bioclimatic and geographic distribution, while the other three are mainly restricted respectively to the semi-arid, arid and hyper-arid or Saharien (Table 1).

The bibliography indicates that *A. boskianus* has long been known to occur in the Sahara. Olivier (1896) indicates that it was "common" in the desert and Lavauden (1926) confirmed this wide-spread distribution; de Witte (1930) and Angel (1944) observed specimens in the vicinity of Hoggar; Gautier (1967), as well as Grenot and Vernet (1973), collected it at Beni Abbes in the Saharien. Nevertheless, we have established that in the region here studied at least, the most important Tunisian populations are essentially limited to the arid zone.

HABITS OF ACANTHODACTYLUS

Regional sympatries pose problems of specifying the habitat of each species.

A. inornatus is restricted to regions of loose sands where open vegetation forms scattered low thickets. Its most typical habitat is that of the Nebkhas, which are small dunes approximately 1/2 meter high. These are formed of free aeolian sands retained by shrubs, notably *Retama retam* (Papilionaceae), *Arthrophytum schmittianus* (Chenopodiaceae) and *Thymelea microphylla* (Thymeleaceae). One encounters them on the beds and edges of the rivers (= Oueds), where the soil is contoured into fairly high knolls (higher than one meter) fixed by dense bushes, as well as on soils of very fine loose texture the surface of which has been sculptured by the wind. *A. inornatus* establishes most of its burrows on the inclines of sand dunes at the foot of plants; only in the case of danger does it use the tunnels of rodents.

The three other species exploit more compact clayey-sandy soils that occasionally contain stones; they do not exploit rocky regions. Sometimes one may discover them hiding beneath a rock, but in general they dig their own shelters. The distribution of their hole appears less tied to the plants. At Sidi Mecherig, *A. pardalis* is abundant in the prairies of close-cropped herbs, back of the littoral belt. We have also encountered this lizard close to Bou Chebka and Bordj Bourguiba, on flat plains in which the vegetation had been reduced to widely dispersed clumps. *A. savignyi* is abundant in the clayey ground among the bushy vegetation which dominates the Romarin, including Ain Boundries to Haidra and Oued Bezirck on Cap Bon. At Gammarth it subsists at a very low density in eucalyptus plantation. At Tazerka, it is abundant on the white sandy dunes that have been fixed by grasses, as well as on the beach itself. *A. boskianus* has been captured in habitat in which the vegetation is entirely herbaceous (Hadjeb el Aioun), in those in which it is bushy (Haidra), more rarely within an oasis (El Hamma of Djerid; Nefta) and on the sandy banks, with scattered grasses, of the Oueds (O. Zeroud; O. Marguelli).

SYMPATRIES

A. Pseudosympatries.

Pseudosympatry occurs where two forms live closely adjacent to one another, but occupy habitats that are clearly distinct. We have observed this situation in a number of localities, notably for *A. inornatus* and *A. pardalis* in the south of Tatahouine. The former here occupies the loose sands on the major course of an Oued; the latter was captured on the adjacent stony reg. The same situation exists at El Hamma of Djerid, between *A. boskianus*, which lives in the oasis, and *A. inornatus* which occupies the Nebkhas. *A. boskianus* and *A. pardalis* are abundant at the foot of the Djebel Semmama, even though *A. savignyi* is not found here, except among the summits.

B. Strict Sympatries.

In the region which we have investigated there are a few localities in which one cannot distinguish the habitat of two species. *A. boskianus* and *A. savignyi* overlap in the main biotopes

between Ain Boudries and Haidra. *A. boskianus* and *A. pardalis*, which represent adjacent islands of populations on the eastern piedmont of Djebel Semmana, are intermittently mixed at Bou Chebka and Remada.

CONCLUSION

This summary of our knowledge regarding the distribution and the restriction of *Acanthodactylus* to diverse habitats in Tunisia permits us to circumscribe those zones in which some effort needs to be made for further study. This should first serve to perfect the distribution maps and secondly should define the precise characteristics of each habitat. These data are indispensable for evaluating the magnitude of the several environmental factors by which they are influenced. Attention should obviously be given to regions in which two species coexist in strict sympatry.

ACKNOWLEDGMENTS

I am indebted to Carl Gans who translated this paper. I am also grateful to J. Bons, G. Pasteur and H. Saint-Girons for generously sending me their publications on the herpetofauna of Morocco.

LITERATURE CITED

- Anderson, O. A. 1892. On a small collection of mammals, reptiles and batrachians from Barbary. Proc. Zool. Soc. London: 11-24.
- Angel, F. 1944. Contribution à l'étude de la faune herpétologique du Sahara central. Bull. Mus. nat. Hist. nat. Paris, 16:418-419.
- Blanc, C. P. 1979. Etudes sur les Acanthodactyles de Tunisie. II. Relations biométriques. Arch. Inst. Pasteur Tunis, 56:57-65.
- . In press. Etudes sur les Acanthodactyles de Tunisie. III. Variabilité morphologique et ses implications systématiques. Bull. Soc. Zool. France.
- Blanc, M. 1935. Faune tunisienne, Tunis (ronéo), 280 pp. Reptiles et batraciens, 239-277.
- Bons, J. 1968. Addition à la faune du Maroc: *Acanthodactylus savignyi* Aud. (Sauria, Lacertidae). Bull. Soc. Sci. nat. phys. Maroc, 47:387-394.
- Boulenger, G. A. 1891. Catalogue of the reptiles and batrachians of Barbary (Morocco, Algeria, Tunisia), based chiefly upon the notes and collections made in 1880-1884 by M. Fernand Lataste. Trans. Zool. Soc. London, 13:93-164.
- Busack, S. D. 1975. Biomass estimates and thermal environment of a population of the Fringe-toed lizard *Acanthodactylus pardalis*. Brit. J. Herpetol., 5:457-459.
- Chabanaud, P. 1916. Sur divers reptiles de Kébili (Sud tunisien) recueillis par M. le Commandant Vibert. Bull. Mus. nat. Hist. nat. Paris, 22:226-227.
- Chaignon, H. de 1904. Contributions à l'histoire naturelle de la Tunisie. Bull. Soc. Hist. nat. Autun, 17:1-154.
- Doumergue, F. 1899-1901. Essai sur la faune herpétologique de l'Oriente avec des tableaux analytiques et des notions pour la détermination de tous les reptiles et batraciens du Maroc, de l'Algérie et de la Tunisie. Bull. Soc. Geogr. Archéol. Orlan, 19-21, 404 pp.
- Gauthier, R. 1967. La faune herpétologique du Sahara N.O. algérien. Additions et mises à jour. Bull. Mus. nat. Hist. nat. Paris, 39:819-828.
- Grenot, C. et Vernet, R. 1973. Les reptiles dans l'écosystème au Sahara occidental. C. R. Soc. Biogéog. Paris, 49:96-112.
- König, A. 1892. Die Kriechtierfauna Tunesiens. S. B. nieder Ges., 3-26.
- Lataste, F. 1881. Liste des vertébrés recueillis par M. le Dr. André pendant l'expédition des Chotts. Arch. Miss. Sci., 1:398-300.
- . 1885. Les Acanthodactyles de Barbarie et les autres espèces du genre. Ann. Mus. Genova, 2:476-516.
- Lavauden, L. 1926. Les vertébrés du Sahara. Eléments de zoologie saharienne, A. Guénard, Tunis. IV. Reptiles: 137-166.
- Le Houerou, H. N. 1969. La végétation de la Tunisie steppique. Ann. I.N.R.A.T., Ariana, 42: 624 pp.
- Mayet, V. 1903. Catalogue raisonné des reptiles et batraciens de la Tunisie, in Exploration scientifique de la Tunisie, Paris, 1-32.
- Mertens, R. 1929. Beitrage zur Herpetologie Tunesiens. Senck. Biol., 11:291-310.
- Mosauer, W. 1934. The reptiles and amphibians of Tunisia. Publ. Univ. Calif. Los Angeles, 1:49-64.
- Mosauer, W. and Wallis, K. 1928. Beiträge zur Kenntnis der Reptilienfauna von Tunesien. I. Über die Sandspuren einiger Kleintiere der Sahara und ihre Deutung aus dem Bewegungsmechanismus. Zool. Anz. Leipzig, 79:195-207.
- Olivier, E. 1896. Herpétologie algérienne. Catalogue des reptiles et des batraciens. Mém. Soc. Zool. France, 1:98-131.
- Witte, G. F. 1930. Mission saharienne Augéris—Draper, 1927-1928, Reptiles et batraciens. Bull. Mus. nat. Hist. nat. Paris, 2:614-618.