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ON THE TAXONOMY AND DISTRIBUTION OF *CROCIDURA COSSYRENSIS* AND *CROCIDURA RUSSULA* (INSECTIVORA, SORICIDAE) IN MAGHREB

LONGINO CONTOLI* AND GAETANO ALOISE"

* *Via Arno 38, 00198 Roma, Italy; contoli@tiscalinet.it*
° *Dipartimento di Ecologia, Università della Calabria, 87036 Arcnvacata di Rende (CS), Italy; aloise@unical.it*

ABSTRACT - The paper examines the taxonomic status of North African *Crocidura russula Auctorum.* On the basis of morphological data, the taxon needs to be divided into at least two species: C. *russula* (Hermann, 1780) from western Europe, coastal Morocco and middle-western Algeria, up to about the Algiers area, and possibly even Sardinia and Ibiza, and another species, distributed in coastal middle-eastern Algeria, Tunisia, Pantelleria and, possibly, La Galite archipelago.
The first and only available name for the above, eastern taxon is *Crocidura cossyrensis* Contoli, 1989.

Key words: Crocidura cossyrensis, Crocidura russula, Maghreb, biometry, taxonomy.

A lot of converging evidence from various studies in morphology, karyology, genetic and ecogeography (Vesmanis, 1975; Rzebik-Kowalska, 1988; Sarh and Zanca, 1992; Vogel *et al.*, 1992; Sarà and Vogel, 1996; Contoli, 1998, in press) suggests that observed differences among populations of, "*Crocidura russula Auctorum",* could be linked to speciation phenomena in the mid Algerian region, for historical reasons (e.g. climatic variables), already mentioned by Sarà and Vogel (1996). This seems to be linked to the rise towards the north of desert land, which is evident due to a rise of the 30°C summer isotherm towards the Mediterranean sea (Fig. 1). These phenomena, perhaps more effective in the past, seem very similar to those affecting a lot of other taxa, in the same area: Reptilia (Caputo, 1987), Amphibia Anura (Lanza *et d.*, 1986), Insecta Phasmidae (Bullini and Nascetti, 1987).
Vesmanis and Vesmanis (1980) suggested there is a possible subspecific separation of the bigger *C. russula* in Tunisia and Algeria, in comparison to the smaller one, from Morocco.
Furthermore SarB and Zanca (1992), found that the Tunisia and Morocco populations are morphometrically well separated. Moreover, also in agreement with Rzebik-Kovalska (1988), Vesmanis (1977, 1981) recorded bigger dimensions in *C. russula* populations found eastward of Algiers, including La Galite archipelago (Vesmanis, 1972).
Vogel *et al.* (1992) and SarBand Vogel (1996), in their important papers, showed a difference between the bigger shrews from eastern Algeria and Tunisia (provisionally ascribed by the above mentioned authors to *C. russula* cf. *agilis*) and those in Morocco and western Algeria, which were attributed to *C. russula yebalensis* (Cabrera, 1913), and from the nominal subspecies *C. russula russula* (Herman, 1780) in Switzerland. Moreover, the Western-Maghrebian and the European shrews were shown to be very similar to each other.
On the other hand, the Tunisian "cf. *agilis*" populations show «a karyotype...identical>> (Sarà and Vogel, 1996) and are genetically quite similar (showing a diagnostic *locus)* to those in Pantelleria island, considered *(Sarh,* 1998) «...di chiara derivazionetunisina». More specif-

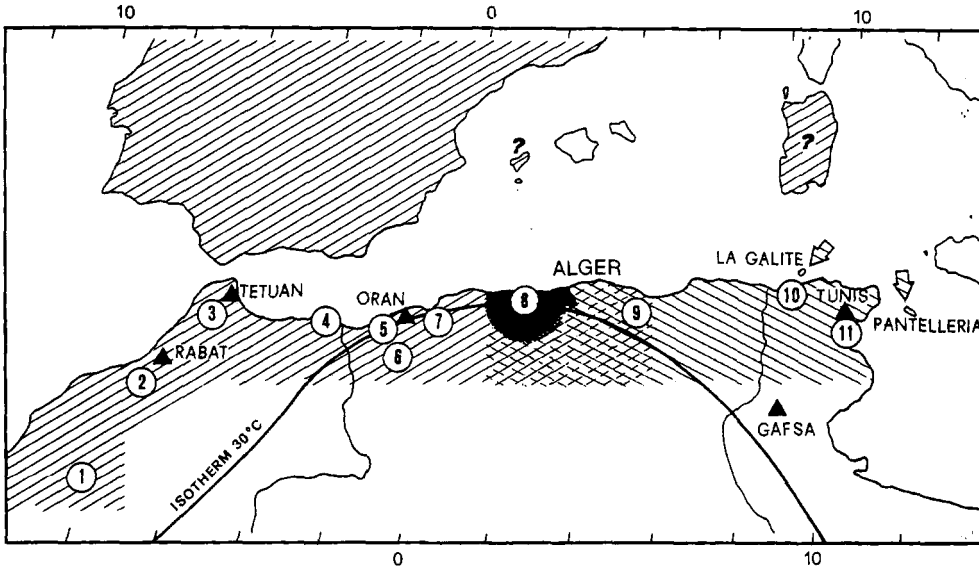

Figure 1 - The hypothetical distribution of *Crociduru russula* (▨) and *C. cossyrensis* (▧). Cross-hatching refers to the "transition zone" *sensu* Sarà and Vogel, 1996. Discontinue hatching refers to approximate southward distribution. Chercliel area is evidenced. Locality numbers refer to Table 1.

ically, the last two groups of shrew populations share two fixed *loci* (Vogel et *al.*, 1992).

Therefore, one can distinguish two groups of populations (Fig. 2): the first, with Tunisian and East-Algerian shrews, including those of the Pantelleria island (described as *C. cossyrensis* Contoli, 1989); the second, with Moroccan and West-Algerian populations.

Unfortunately, up to now there only exists indirect information about syntopic occurrence sites (see data from Rzebik-Kowalska, 1988). Nevertheless, we tried to gather a little more statistical information from such data.

Namely, if each site was monospecific, the variation of body dimensions should not be in any way different (*caeteris paribus*) in the various sites of the studied geographical range. Conversely, we observed an enhanced dimensional variation in correspondence to the presumably syntopy area (from the Aokas site and the middle-Algerian ones, considered (Sarà and Vogel, 1996) the transition zone), perhaps due to the local coexistence of reproductively isolated bigger and smaller taxa (Table 1; Fig. 3). The Cherchel site (No 8) is a significant outlier compared to the others (Dixon test, $P<0.02$, 2t). Moreover, the "standard deviation/variation" relationship was significantly greater in that site (Dixon test, $P<0.02$, 2t; Fig. 4), as would be expected in any case of a multimodal distribution.

This clearly indicates a geographic overlap and, therefore, the specific separation between the West and East Algerian populations, as suggested by Sarà and Vogel (1996, p. 384, 387, 389).

So, at present, the taxon "*Crociduru russula Auctorum*" should be divided into at least two species (Fig. 1). The first, *C. russula* (Hermann, 1780) - with NF= 60, smaller in size and with skull characters (e.g. sphaeno-occipital bridge, upper braincase outline, foramina basisphaenoidalia shape, processus angularis ridge) known to be typical of this species (see Catalan and Poitevin, 1981; Poitevin *et al.*, 1986) - from western Europe, coastal Morocco and Algeria, up to about the Algiers area, and possibly even Ibiza and Sardinia. The second species - with NF= 68 (more exactly, varying from 66 to 70, *fide* an anony-

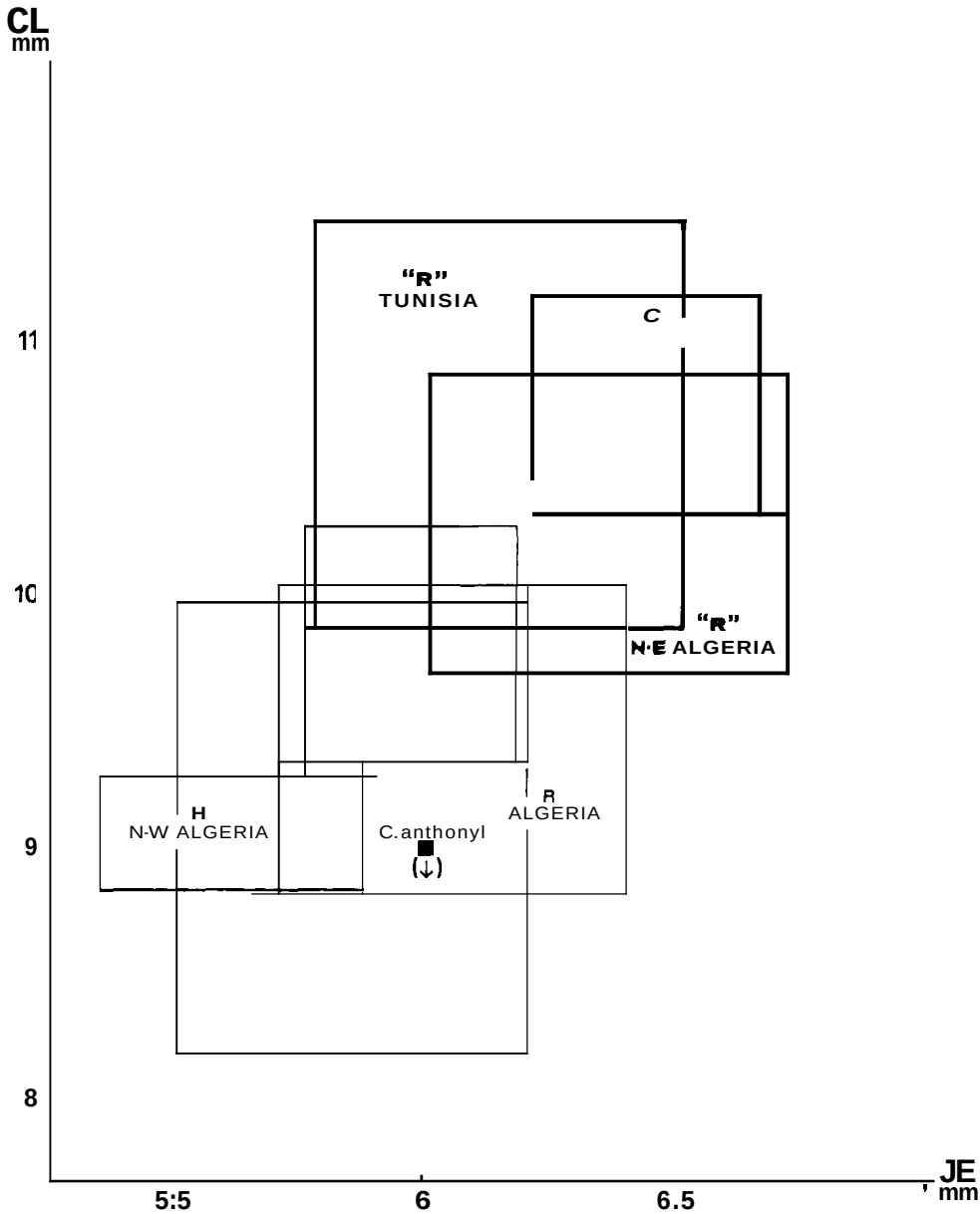

Figure 2 - Dimensional range of condylar length (CL) and zygomatic breadth (JB) of the examined populations of *Crocidura;* R: *russula*, *C: cossyrensis,* H: *helianensis* and W: *whitakeri*. The group of population shrews (bold line) with Tunisian, East-Algerian and Pantelleria island, correspond to *C. cossyrensis*.

mous referee), larger in size and with a different skull morphology (Contoli, 1990, 1992) - from coastal middle-eastern Algeria and Tunisia, Pantelleria and, possibly, La Galite archipelago (Vesmanis, 1972).

With regards to the name of the last taxon, we agree with Vesmanis (1975) and Sarà and Vogel (1996) who consider the many names

Table 1 - Zygomatic breadth values in the examined shrews populations from Morocco (MA), Algeria (A) and Tunisia (TU). Data from: (1) Vesmanis and Vesmanis 1980; (2) Rzebik-Kovalska, 1988; (3) Sarà and Zanca, 1992.

		Locality	n°	X	max	min	max-min	SD	(X+SD) - (X-SD)	c.v.	s.e.
1	MA	Marrakech district (1)	7	6.03	6.16	5.75	0.41	0.14	0.28	2.32	0.05
2	MA	Rabat district (1)	5	5.82	5.95	5.66	0.29	0.13	0.26	2.23	0.06
3	MA	Tetuan district (1)	5	5.93	6.04	5.79	0.25	0.11	0.22	1.86	0.05
4	MA	Nador district (1)	4	5.81	5.85	5.74	0.11	0.05	0.10	0.86	0.02
5	A	El Amria (2)	7	6.00	6.25	5.78	0.47	0.15	0.30	2.50	0.06
6	A	Sidi Driss (2)	17	5.91	6.30	5.70	0.60	0.13	0.27	2.20	0.03
7	A	Es Senia (2)	11	5.92	6.05	5.65	0.40	0.12	0.25	2.03	0.04
8	A	Cherchel (2)	4	6.09	6.40	5.70	0.70	0.29	0.59	4.77	0.15
9	A	Aokas (2)	30	6.24	6.65	6.00	0.65	0.14	0.29	2.24	0.03
10	TU	Tabarca, Ain Draham, Bulla Regia, Lac Mellègue (3)	7	6.12	6.50	5.75	0.75	0.19	0.38	3.11	0.05
11	TU	Roman aqueduct, Dj. Zaghouan (3)	9	6.17	6.40	6.00	0.40	0.14	0.28	2.27	0.07

found in the literature (*Sorex **agilis*** Levaillant, 1850, *Pachyura pigmaea* Loche, 1867 and *Sorex mauritanicus* Pomel, 1856) to be unsuitable. In particular, they claim that «...with Vesmanis (1975) and Kowalski and Rzebik-Kowalska (1991)... *agilis* is better treated as *species dubia*».

Nevertheless, if (and only if!) *Sorex agilis* is not a *nomen nudum*, in an attempt to rely it to an existing taxon (since the type specimens lack), Levaillant's illustrations should be used for a description (ICZN, 74c), as discussed by Loche (1867). Therefore, the relevant specimen should be considered as the lectotype (ICZN, 74b and c). Consequently, possible criteria could be:

- the uniformly coloured grey pelage, quite different from that of *cossyrensis;*
- the body proportions, in particular the "tail/head+body" relationship; even Vesmanis, in his extensive and careful historical account (1975), underlines the relatively long tail;
- the absolute dimensions; where direct measurement are lacking, one can refer to Loche (1867): «Sa taille ne nous parait pas différer de celle du *Sorex etruscus*...»; in fact, if the middle illustration corresponds to the actual size (note that, e.g., the illustration of *Rattus alexandrinus*, in the same page, is fully compatible with the actual size), the dimensions are very small.

Taking into account some crocidurinae taxa reported in Algeria (*Suncus etruscus, Crocidura whitakeri, C. heljanensis, C. russula)* or its immediate surroundings (C. *cossyrensis, C. tarfayaensis, C. **lusitania,** C. viaria*), the last two characters can be ranked and compared as in Table 2, where *agilis* can be found opposite to *cossyrensis.*

So, ***agilis*** cannot be linked to *cossyrensis* and, therefore, to the large, eastern taxon.

On the other hand, *C. anthonyi* Heim de Balsac, 1940 was described by Gafsa, very southward from the main area of "big shrews" ascribed to C. *russula* (see Sarà and Zanca, 1992). Moreover, it shows a very peculiar coloration and a very different size, which is sim-

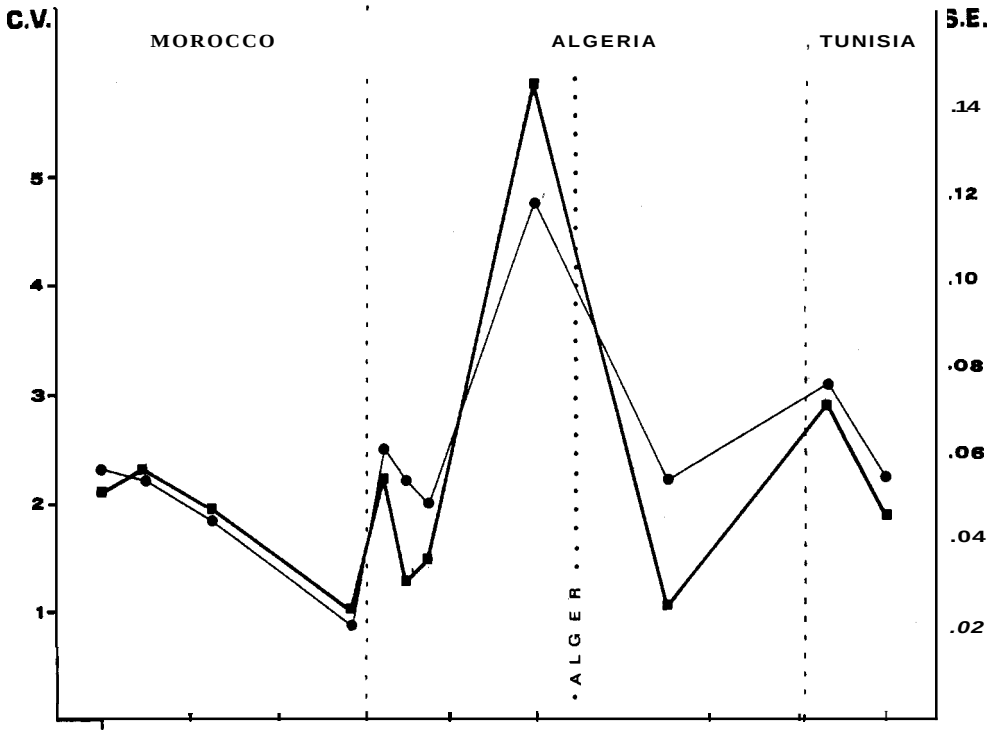

Figure 3 - The variance of "Coefficient of variation" (C.V.; circles) and "Standard Error" (S.E.; squares) values in the examined sites of the studied geographical range (see Fig. 1).

Table 2 - Grouped blocks of ranked proportions [tail/(head+body)] *v.s* dimensions (head+body) of *Suncus etruscus, Crocidura whitakeri, C. heljanensis, C. russula, C. cossyrensis, C. tarfayaensis, C. lusitania, C. viaria.* and *Sorex agilis.*

		Head+body		
		Small	Medium	Large
	Small	*S. etruscus*	C. *whitakeri*	*C. cossyrensis*
Tail/head+body	Medium	C. *heljanensis*	*C. tarfayaensis*	
	Large	C. *lusitania* *S. agilis*		*C. russula* *C. viaria*

ilar to *C. whitukeri* (see Rzebik-Kowalska, 1988). Note that Heim de Balsac (1940), in describing C. *anthonyi*, reported a «...mandibule 9 mm...» measurement; owing to the various meanings of "mandible length" (see Vesmanis, 1976), we compared it with the smallest one, CL (instead of UKL, inclusive of the processus angularis, or a diagonal measurement, often taken in the past) of other taxa; so, in figure 2, the true position

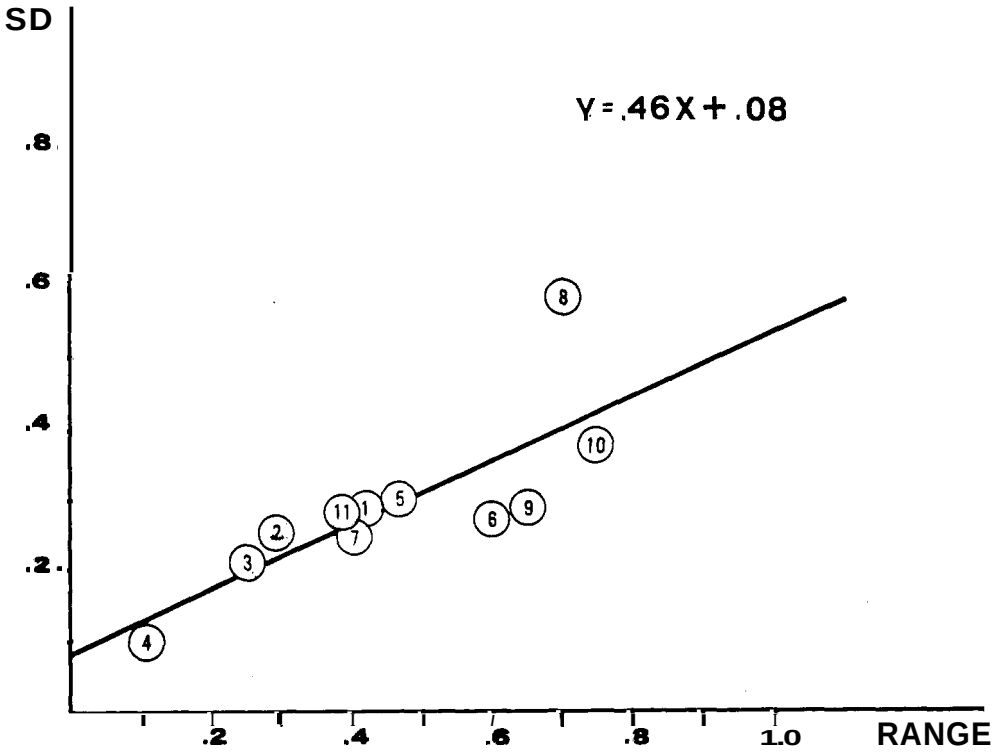

Figure 4 - "Standard deviation/Variation range" relation in the studied sites. Locality numbers refer to Table 1.

of *anthonyi* on the ordinates could be even lower, as indicated by the arrow.

Moreover, *C. yebalensis* described by Cabrera from Tetuan (Morocco) in 1913, is a name which should be included in *C. russula s. s.*, like C. *russula yebalensis.*

Finally, *Crocidura heljanensis* Vesmanis, 1975 should be characterised, according to Vesmanis and Vesmanis (1980), only for its smaller size compared even to *Crocidura russula* (Fig. *2);* apart the criticism by Jenkins (1976), it must be noted that the Typi are from Orano (West Algeria), a geographic area where C. *russula* is characterized by its small size (see data from Vesmanis, 1977; Vesmanis and Vesmanis, 1980; Rzebik-Kowalska, 1988). Moreover, Orano is well westward from the morphologically transitional zone between western and eastern taxa, described previously.

This suggests that if C. *heljanensis,* is not a separate (third) species, then it should be included in C. *russula.* Therefore, *C. heljanensis* cannot be used as a name for the large, east-maghrebian species.

In conclusion, the first and sole available name is *Crocidura cossyrensis* Contoli, 1989.

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