

A NOTE CONCERNING THE SCORPIONS (ARACHNIDA: SCORPIONES) OF THE MALTESE ISLANDS (CENTRAL MEDITERRANEAN)

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ABSTRACT

All scorpions collected from the islands of Malta, Gozo, Comino and St. Paul's belonged to *Euscorpium* (s.str.) *carpathicus* (Linnaeus, 1773) ssp. *candiota* Birula, 1903 as used by Kinzelbach (1975) for populations showing a complex of morphological characters intermediate between *E.carpathicus carpathicus* and *E.mesotrichus* Hadzi. Similar intermediate populations are found in several eastern Mediterranean localities (Greece, some Greek islands and Crete) however the Maltese populations are more heterogenous than any other so far studied. The literature contains records of other species of scorpion from the Maltese Islands whereas the collections of the British Museum (Natural History), London include specimens of *Mesobuthus gibbosus* (Brulle) reportedly collected from Malta. These records are discussed and it is postulated that they are either errors of identification or labelling, or else represent introduced exotics now locally extinct.

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INTRODUCTION

It has long been known that scorpions occur in the Maltese Islands; in fact, the Maltese language has three different terms for these animals: *Għakreb* (Serracino-Inglott, 1976 p.153), and *Mqass* or *Imqass* (Serracino-Inglott, 1979 pp. 206-207), (literally meaning 'scissors', an obvious reference to the pincers), both derived from the Arabic, and the more recent *Skorpjun* (Serracino-Inglott, 1984 p. 194), derived from the Italian. Uncertainty however exists as to the number of species which occur and their specific identity.

Gulia (1889-90) in his list of the Maltese names of local flora and fauna records under "*Imkass*" (an old form of the word *Mqass*), *Scorpio europaeus* as the only species and repeats this record in his later survey of the Maltese fauna (Gulia, 1913). Cremona (1966) in his unpublished compilation of Maltese technical terminology gives "*Imqass* or *Għakreb* var. spec. (Borg) (a) (*Butus scorpio europaus*) rare (b) (*Euscorpium flavicandis*) frequent (c) (*Euscorpium italicus*) common". The "Borg" in this entry refers to Professor John Borg, a medical doctor, botanist and horticulturist who occupied the Chair of Natural History at the University of Malta between 1921 and 1933, and from whom Cremona obtained his information. Apart from occasional generic mentions of scorpions in the popular and semipopular literature (e.g. Lanfranco, 1954; Coke, 1969), no other specific records of scorpions from the Maltese Islands exist. However, in his map of the circummediterranean distribution of scorpions of the family Buthidae, Kinzelbach (1975, legend to Fig. 6) states "Auf Malta lebt ein noch unbestimmter Vertreter der Buthidae" (a species of Buthidae living in Malta is not yet determined).

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The literature therefore contains records of at least three different species of scorpions from the Maltese Islands as follows:

*Buthus occitanus* (Amoreux, 1789) - the "*Scorpio europaeus*" of Gulia (1889-90, 1913) and the "*Butus scorpio europaus*" of Borg (in Cremona, 1966);

*Euscorpius (Polytrichobothrius) flavicaudis* (De Greer, 1778) - the "*Euscorpio flavicandis*" of Borg (in Cremona, 1966);

*Euscorpius (Polytrichobothrius) italicus* (Herbst, 1800) - the "*Euscorpio italicus*" of Borg (in Cremona, 1966);

additionally there is the unidentified buthid mentioned by Kinzelbach (1975).

However, the present authors have only ever met with a single species of *Euscorpius* in the Maltese Islands. The problem of the number of Maltese species and their identity was therefore investigated.

## MATERIAL AND METHODS

Scorpions were collected from various localities in the Maltese Islands by systematically searching likely habitats. Specimens were killed and fixed in 70% ethanol. Measurements were taken using vernier calipers while counts of the number of pectine teeth and of trichobothria were made using a stereomicroscope.

Additional to these field and laboratory investigations, attempts were made to trace specimens of scorpions collected from the Maltese Islands in a number of public and private collections.

## RESULTS

Specimens of scorpions from the Maltese Islands were traced in two local private collections and in the collections of the British Museum (Natural History), London (BMNH). The collection of Guido Lanfranco (Sliema, Malta) contains specimens collected from Malta between August 1953 and October 1954 and identified as *Euscorpius carpathicus* (L.) by G. Owen Evans of the BMNH in 1956 (G. Lanfranco, personal communication 1987). The collection of Edwin Lanfranco (also of Sliema, Malta) contains a specimen collected from a house in Sliema in 1970 and identified as *E. carpathicus* by D.J. Clark of the BMNH in 1970 (E. Lanfranco, personal communication 1987). The only material from the Maltese Islands in the collections of the BMNH are two specimens of a buthid scorpion labelled as collected on Malta by G.L. Clarke; no precise locality or date of collection are indicated although the latter is probably between 1920-1930 (P.D. Hillyard, personal communication 1986). These two specimens were identified as *Mesobuthus gibbosus* (Brulle) by R. Kinzelbach in 1984 (R. Kinzelbach, personal communication 1984).

A total of 68 specimens were collected from various localities in the Maltese Archipelago during the present study as detailed below:

## MALTA

1 spec. Siggiewi 6.2.77 leg. PJS (SS/RK/01) and 1 spec. 5.7.88 leg. M. Pace (SS/RK/28); 1 spec. Birkirkara 9.11.77 leg PJS (SS/RK/02); 1 spec. Selmun 20.12.79 leg. PJS (SS/RK/03); 1 spec. Għadira 27.12.79 leg. SS (SS/RK/04); 1 spec. Dingli Cliffs 3.11.82 leg. PJS (SS/RK/05); 1 spec. Tal-Kortin (Mistra) 18.3.84 leg. PJS (SS/RK/06); 1 spec. Wied Incita 25.3.84 leg. SS (SS/RK/07); 4 spec. Ballut ta' l-Imġiebaħ 8.4.84 leg. SS & PJS (SS/RK/08); and 3 spec. 11.10.86 leg. PJS & D.M. Johnson (SS/RK/24); 6 spec. Ballut tal-Wardija 8.4.84 leg. SS & PJS (SS/RK/09); 3 spec. Tal-Qroqq (University grounds) 16.4.84 leg. S. Azzopardi & L. Main (SS/RK/10); 2 spec. Wied il-Luq (Buskett) 30.4.84 leg. SS & PJS (SS/RK/11); 4 spec. Beltissebħ (Floriana Bastions) 6.5.84 leg. PJS & M. Gauci (SS/RK/12); 1 spec. Santa Venera 30.5.84 leg. PJS (SS/RK/13); 1 spec. Bingemma Gap 30.3.85 leg. SS (SS/RK/14); 1 spec. Ta' Zammitello (Ġnejna Bay) 12.10.85 leg. D.M. Johnson (SS/RK/15); 1 spec. Birkirkara (Psaila Street) 25.10.86 (SS/RK/25); 2 spec. (no date) (SS/RK/26); and 1 spec. 31.10.87 (SS/RK/27) all leg. D. Galdes Giappone;

6 spec. Malta & Gozo Sept. 1985 - Mar. 1986 leg. SS & D.M. Johnson (SS/RK/23);

## GOZO

5 spec. Dwejra 17.5.84 leg. SS (SS/RK/17); 6 spec. Fort Chambray slopes 3.2.85 leg. PJS & M. Gauci (SS/RK/18); 6 spec. Limits of Kerċem 14.2.85 leg. PJS (SS/RK/19); 2 spec. Ramla (clay slopes) 15.2.85 leg. PJS (SS/RK/20);

## COMINO

1 spec. Comino 23.6.75 leg. PJS (SS/RK/21); and 3 spec. 22.6.86 leg. SS (SS/RK/22);

## ST. PAUL'S ISLANDS

2 spec. St. Paul's Islands 20.4.75 leg. PJS (SS/RK/16).

In general scorpions occurred in three main habitat types: (i) the leaf litter which accumulates underneath trees (e.g. Holm Oak, *Quercus ilex*) and low-growing shrubs (e.g. Carob, *Ceratonia siliqua*); (ii) under stones on clay slopes; and (iii) in association with human habitations, especially in humid microhabitats (e.g. drains, cellars, underneath flowerpots etc); a few specimens also occurred under deeply embedded stones in garigue.

Specimens with reference numbers SS/RK/01 to 25 were sent to Professor Ragnar Kinzelbach of the Institut für Zoologie, Technische Hochschule Darmstadt for examination and were all identified as *Euscorpium* (s.str.) *carpathicus* (Linnaeus, 1773) ssp. *candiota* Birula, 1903. Two specimens from the series SS/RK/09 have been deposited in the Kinzelbach collection; all other specimens are in the collection of PJS.

For each specimen, the following parameters were determined:

Length of the chela of the pedipalp measured from the tip of the fixed finger to the posterior edge (Ch);

Prosoma length measured from the anterior to the posterior border (Pr);

The number of pectine teeth (PT);

The number of trichobothria on the ventral edge of the tibia of the pedipalp (TPT; see Kinzelbach, 1975).

Chela length and prosoma length are highly positively correlated (Pearson product-moment correlation:  $r=0.982$ ,  $d.f.=64$ ,  $P < 0.001$ ); the regression equation is:

$$\text{Ch} = 0.575 + 1.678 \text{ Pr};$$

Either Ch or Pr can thus be used as an index of size and hence age.

Scorpions may be sexed on the basis of size and the number of pectine teeth: males have more pectine teeth than females and are smaller (Millot & Vachon, 1949). Kinzelbach gives the following pectine teeth formula for *E. carpathicus*: males 7-10, females 6-9. Of the 66 specimens measured, 20 (30.3%) had an unequal number of teeth on the two arms of the pectine. For these, the average value was taken (PT left + PT right / 2).

The correlation between PT and prosoma length is not significant (Pearson product-moment correlation:  $r=-0.0378$ ,  $d.f.=64$ ,  $0.5 < P$ ), showing that PT does not increase with size/age. The frequency distribution of PT (Fig. 1) shows two main peaks, one centred on PT=7 and the other on PT=8. To test whether these two peaks represent the different sexes, the mean prosoma length for adult individuals (i.e. with  $\text{Pr} > 2.00\text{mm}$ , see below) with a PT of 7 or less ( $n=24$ ,  $\bar{x}=4.74\text{mm}$ ,  $s.d.=0.80\text{mm}$ ) was compared with that for those with a PT of 7.5 or more ( $n=28$ ,  $\bar{x}=4.41\text{mm}$ ,  $s.d.=1.10\text{mm}$ ); the difference was not significant (Student's t-test:  $t=1.226$ ,  $0.2 < P < 0.5$ ). The Maltese scorpions, therefore, cannot be sexed on the basis of number of pectine teeth and size by this method.

Reliable counts of TPT could not be made for individuals of  $\text{Pr} \leq 2.00\text{mm}$ , of which there were 14 in the sample. These were obviously juveniles. Of the remaining 52 adult specimens, 22 (42.3%) had an unequal TPT on the two pedipalps. For these individuals, the average TPT was calculated (TPT left + TPT right / 2).

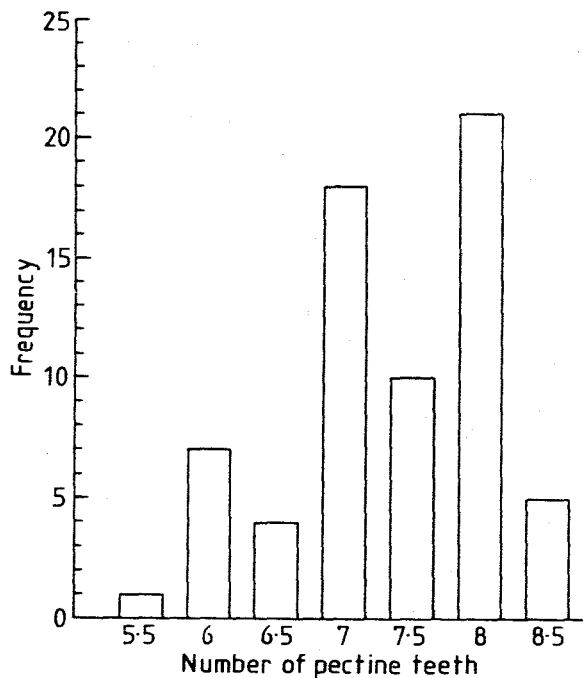
The correlation between TPT and prosoma length is not significant (Pearson product-moment correlation:  $r=-0.0217$ ,  $d.f.=50$ ,  $0.5 < P$ ); TPT does not increase with the size/age of the individual. For the sample considered as a whole, the mean TPT is 9.44 ( $s.d.=0.844$ ,  $n=52$ ), however the TPT frequency distribution (Fig. 2) shows two main peaks, one (the larger) at TPT=9 (30.8% of the sample) and the other at TPT=10 (25.0% of the sample).

## DISCUSSION

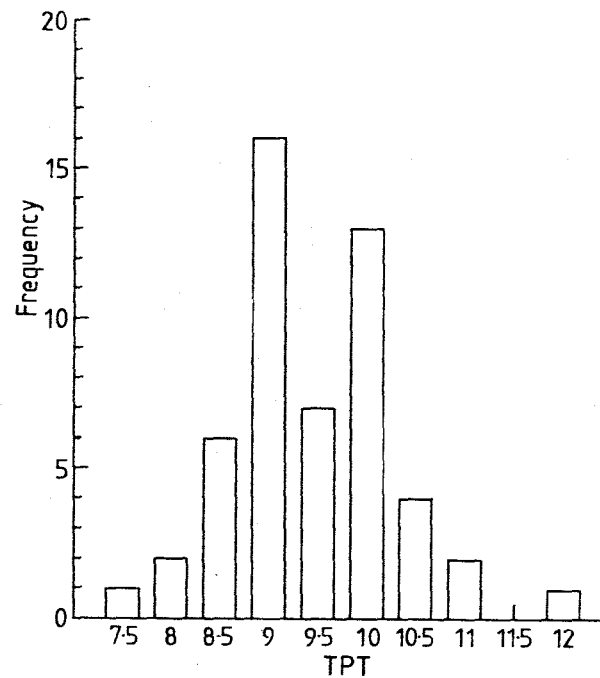
With the sole exception of the two specimens in the collections of the BMNH, all scorpions collected from the Maltese Islands belong to the same taxon, identified as *Euscorpium* (s.str.) *carpathicus* (Linnaeus, 1773) (family Chactidae) by all specialists in the group who have examined Maltese material. The two BMNH specimens have been identified as *Mesobuthus gibbosus* (Brullé, 1832) (family Buthidae), a species whose recorded range is Greece, Cyprus and Asia Minor (see map in Kinzelbach, 1975 p.22). One explanation

for the apparently anomalous record of this species from the Maltese Islands is that the species was introduced, possibly through human agency, and subsequently became locally extinct. Another explanation is that the BMNH specimens are mislabelled and did not originate from the Maltese Islands at all.

Gulia's (1889-90; 1913) record of *Scorpio europaeus* (= *Buthus occitanus*) is most likely a misidentification and refers to *Euscorpius carpathicus*, especially since Gulia mentions no other species of scorpions from the Maltese Islands. Similarly, Borg's (in Cremona, 1966) records of *Euscorpius flavicaudis* and *Euscorpius italicus* probably refer to different forms within the range of variation of the local population of *Euscorpius carpathicus*. Borg's record of "*Butus scorpio europaus*" (= *Buthus occitanus*) is intriguing since Borg could obviously differentiate between *Buthus* and *Euscorpius*. It is possible that Borg never actually encountered specimens of *Buthus* but accepted previous records (e.g. Gulia's) at face value. Alternatively, Borg's *Buthus* may be an introduced exotic, now extinct from the Maltese Islands. It is worth noting that Professor John Borg was very active at the Argotti Botanical Gardens, then belonging to the University of Malta and also at San Anton Gardens where he was Principal of the Agricultural School for Gardeners (Borg, 1979) and was constantly receiving plant material from abroad. It is also possible that Borg's '*Buthus*' and the *Mesobuthus gibbosus* collected by G.L. Clarke in Malta and now at the BMNH represent the same introduced exotic; certainly the period over which Borg was active (c1895 to 1933) and the probable date of collection of Clarke's specimens (c. 1920-1930) overlap.



**Fig. 1** Frequency distribution of the number of pectine teeth for *Euscorpius carpathicus* from the Maltese Islands.



**Fig. 2** Frequency distribution of the number of trichobothria on the ventral edge of the tibia of the pedipalp (TPT) for *Euscorpius carpathicus* from the Maltese Islands.

On the basis of his studies of the Aegean scorpions, Kinzelbach (1975) split the *Euscorpium carpathicum* of older authors into two species: *E. carpathicum* s.str. and *E. mesotrichus* Hadzi. These two species are distinguished by a number of characters (see Kinzelbach, 1975 Table 2), chief among which is the number of trichobothria on the ventral edge of the tibia of the pedipalp (TPT); *E. carpathicum* has TPT= (6)7-8(9) *E. mesotrichus* has TPT=10-12(14) (extremes in parentheses). Populations intermediate between *carpathicum* and *mesotrichus* occur in several localities in Greece and on the island of Crete. These intermediate forms are characterized by a TPT of 9-10, a reddish brown coloration without a distinct pattern in black pigment, and by the relative smoothness of the edges of the chelae. A name already being available for forms showing this complex of characters, Kinzelbach (1975) assigned these intermediate forms to *E. carpathicum candiota* (Birula). Kinzelbach is of the opinion that the Maltese populations also belong to this entity. We concur with this view. The majority of specimens studied by us had a TPT in the range 9-10, however, there is also considerable variation; 17.3% of the specimens examined had a TPT of less than 9, which is in the range of *E. carpathicum carpathicum*, while 13.5% had a TPT of more than 10, which is in the range of *E. mesotrichus*. In this respect, the extreme forms are of particular interest: at the lower end, one specimen (SS/RK/11) had a TPT formula of 7:8 while at the upper end four individuals had a TPT formula of 10:11 (SS/RK/15,21,23), two of 10:12 (SS/RK/22,23) and one of 11:13 (SS/RK/23); The Maltese *candiota* population seems to be more heterogeneous than other *candiota* populations so far studied; for example, populations from Kefallinia and Crete both had a TPT range of 8-11 (see Kinzelbach, 1975 Fig. 13). In any case, the presence of a mixed *carpathicum/mesotrichus* population in the Maltese Islands similar to those on Greece, Crete and small Aegean islands, links the Maltese Islands faunistically with the Eastern Mediterranean.

*E. carpathicum candiota* is found on all three main islands of the Maltese Archipelago as well as on one of the minor islets of the group, and is common where found. On the whole it appears to prefer dark humid habitats (e.g. leaf litter, human habitations) although it also occurs in more arid habitats such as garigue and clay slopes. On the latter, scorpions are particularly abundant, sometimes as many as five individuals being found under a single stone covering an area of only a few tens of square centimetres. However, in both garigue and clay slopes, scorpions may actually be occupying relatively humid microhabitats since the soil under embedded stones retains some moisture even during the very dry Maltese summer, particularly if it is clayey.

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#### ADDITIONAL NOTE

During recent surveys of the Filfla Island Nature Reserve conducted jointly by the Department of Biology of the University of Malta, and the Secretariat for the Environment of the Ministry of Education and the Interior, two specimens of scorpions were collected and are reported upon below:

1 spec. Filfla Island (plateau) 23.2.90: Ch = 11.30 mm: Pr = 6.00 mm: PT (left/right) = 7/8; TPT (left/right) = 10/9

1 spec. Filfla Island (plateau) 13.3.90: Ch = 6.20 mm: Pr = 4.30 mm; PT (left/right) = 7/7; TPT (left/right) = 9/8.

Both specimens were found under stones embedded in soil. The Filfla scorpions correspond well with *E. carpathicus candiota* as defined by Kinzelbach (1975). It is interesting that the scorpions of Filfla are not different from those of the other islands of the Maltese group as Filfla is the most outlying island of the archipelago and one of the most inaccessible and least visited. This suggests that the Maltese *candiota* populations were not introduced through human agency.

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