

The status of the genus *Atyaephyra*: comparison of *A. desmarestii* and *A. rosiana* with different populations from Greece

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Introduction

Until relatively recently, the genus *Atyaephyra* de Brito Capello, 1867 was considered to comprise 4 subspecies: *A. desmarestii desmarestii* (Millet, 1831), *A. desmarestii mesopotamica* Al-Adhub, 1987, *A. desmarestii orientalis* Bouvier, 1913 and *A. desmarestii stankoi* Karaman, 1972.

Anastasiadou *et al.* (2004) questioned the validity of these 4 subspecies, since they found that the distinguishing key features significantly overlap. However, they suggested that a detailed examination of the various populations of *A. desmarestii* across its known distribution would reveal the existence of different species.

Based on the above suggestion, Anastasiadou *et al.* (2006) redescribed in detail the species *Atyaephyra desmarestii* (Millet, 1831) based on topotypical specimens (France, Toulouse), while later on, Anastasiadou *et al.* (2008) compared specimens from a population close to the topotypical area (Portugal, Algarve) of *Atyaephyra rosiana* de Brito Capello, 1867 with those of *A. desmarestii* and ascertained that *A. rosiana* is clearly a different species which they also redescribed in detail.

Based on the above, the aim of this study is to present the differences among the two redescribed valid species (*A. desmarestii* and *A. rosiana*) and the three new species found in areas of Greece.

Material and Methods

Numerous specimens from various areas of Greece were collected and examined (Fig. 1). In order to detect possible differences among the populations of Greece and those of the species *A. desmarestii* and *A. rosiana*, a total of 106 morphological features and somatometric ratios were studied. All the characteristic features were processed with the SPSS software package. In this analysis, only the adult individuals (C.L. ≥ 5 mm) were taken into account in order to exclude deviations in the features which appear in the juvenile individuals. Through this analysis, the variation ranges of the different characteristic features of the compared populations were calculated and then, the non-overlapping features among the different populations were detected. These data combined with the relevant literature information led to the selection of key features (Table I) which permitted the creation of a practical key for the distinction of the studied taxa.

Results

The distribution of the main studied populations is shown in Figure 1. The selected key features that distinguish the 5 species among them are given in Table I. For reasons of clarity, certain of the key features are shown in Figures 2, 3 and 4.



Figure 1: Geographical distribution of the five different species. \blacktriangle : *Atyaephyra desmarestii* - France, Toulouse, Garonne River; \blacksquare : *Atyaephyra rosiana* - Portugal, Algarve, São Barnabe River; \bullet : *Atyaephyra* n. sp.1 - Greece, Thiamis River; \star : *Atyaephyra* n. sp.2 - Greece, Acherontas River; \blacktriangle : *Atyaephyra* n. sp.3 - Greece, Nestos River.

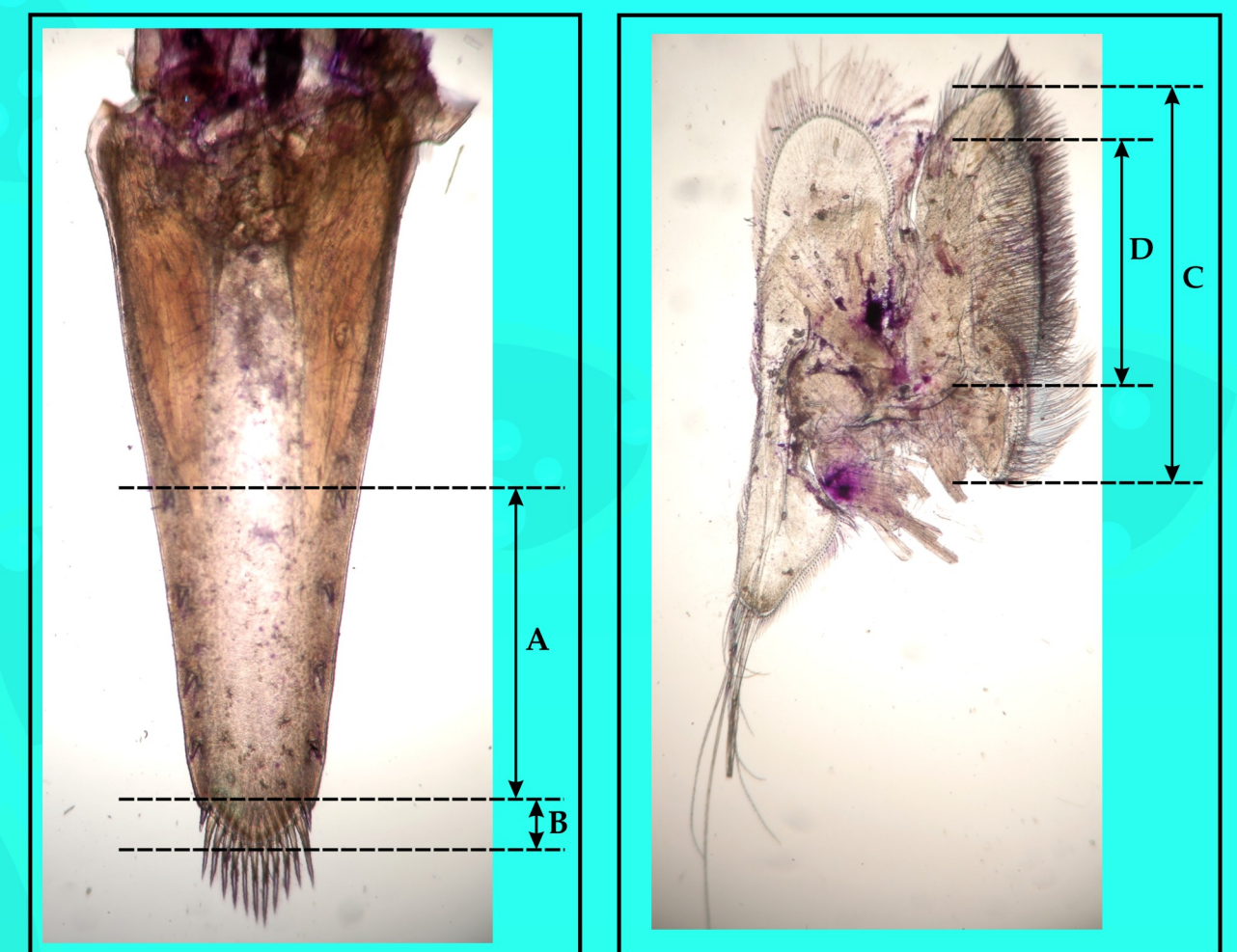


Figure 2: Dorsal view of telson. A, distance between distal and proximal pairs of spines. B, distance between distal pair of spines and tip of telson.

Figure 3: Right maxilla in ventral view. C, height of endite. D, height of lower basipodial endite.

Table I: Comparison of the key morphological features of the five species of the genus *Atyaephyra*. The green and the red colour of the numbers are used for the contradistinction of the features among them. Symbols in parenthesis as in Figure 1. Ratios abbreviations as in Figures 2 and 3.

Species	<i>Atyaephyra desmarestii</i> (Millet, 1831) France, Toulouse Garonne R. (\blacktriangle)	<i>Atyaephyra rosiana</i> de Brito Capello, 1867 Portugal, Algarve, São Barnabe R. (\blacksquare)	<i>Atyaephyra</i> n. sp.1 Greece, Thiamis R. (\bullet)	<i>Atyaephyra</i> n. sp.2 Greece, Acherontas R. (\star)	<i>Atyaephyra</i> n. sp.3 Greece, Nestos R. (\blacktriangle)
Rostrum					
Dorsal rostral teeth behind the orbit	2-4 (88 %)	1-3 (96 %)	1-3 (96 %)	1-3 (96 %)	0 (99 %)
Dorsal rostral teeth beyond the orbit	20-26 (93 %)	26-36 (100 %)	18-25 (93 %)	19-25 (91 %)	14-23 (91 %)
Ventral rostral teeth	5-10 (93 %)	4-7 (83 %)	4-8 (79 %)	4-6 (76 %)	0-3 (90 %)
Length/Height	3.33-4.80 (98 %)	5.0-11.25 (83 %)	5.80-10.0 (86 %)	4.90-6.71 (96 %)	5.56-8.80 (92 %)
Telson					
Dorsolateral spine pairs	3 (93 %)	4 (91 %)	5-8 (90 %)	4 (79 %)	3-4 (91 %)
Distal posterior spines	11-14 (78 %)	8-10 (92 %)	8-10 (93 %)	11-13 (88 %)	12-14 (97 %)
A/B ratio	5.13-10.12 (100 %)	12.29-18.74 (100 %)	8.75-20.92 (100 %)	5.75-8.40 (100 %)	4.43-7.78 (100 %)
Antennula					
Spines on distal segment of antennular peduncle	1-2 (100 %)	1-2 (72 %)	1-4 (94 %)	1-2 (93 %)	0 (84 %)
Maxilla					
Simple seta rows on basipodial endite	18-20 (96 %)	14-17 (90 %)	13-16 (97 %)	18-21 (96 %)	12-16 (97 %)
Simple setae on 6 th -8 th rows of basipodial endite	14-22 (100 %)	12-18 (100 %)	7-14 (100 %)	16-23 (100 %)	8-13 (100 %)
C/D ratio	1.49-1.68 (100 %)	1.71-1.84 (100 %)	1.78-2.27 (100 %)	1.21-1.67 (100 %)	1.80-2.21 (100 %)
Mxp₃					
Lateral spines on propodus	0-4 (100 %)	2-7 (100 %)	11-38 (100 %)	0-6 (100 %)	1-7 (100 %)

Key to the *Atyaephyra* species for individuals with carapace length ≥ 5.0 mm.

- Rostrum without dorsal teeth behind the orbit. Distal segment of antennular peduncle without submedial spines. Rostrum with 0-3 ventral teeth.....*Atyaephyra* n. sp. 3
- Rostrum with 1-4 dorsal teeth behind the orbit. Distal segment of antennular peduncle with 1-4 submedial spines. Rostrum with 4-10 ventral teeth.....2
- Propodus of mxp3 bearing more than 10 lateral spines. Telson with 5-8 pairs of dorsolateral spines.....*Atyaephyra* n. sp. 1
- Propodus of mxp3 bearing less than 8 lateral spines. Telson with 3-4 pairs of dorsolateral spines.....3
- Rostrum length/height less than 4.8. Telson with 3 pairs of dorsolateral spines.....*Atyaephyra desmarestii*
- Rostrum length/height more than 4.9. Telson with 4 pairs of dorsolateral spines.....4
- The ratio A/B (Fig. 2) of telson ranges 12-19. Telson with 8-10 distal posterior spines. Rostrum with 26-36 dorsal teeth beyond the orbit.....*Atyaephyra rosiana*
- The ratio A/B (Fig.) of telson ranges 6-8. Telson with 11-13 distal posterior spines. Rostrum with 19-25 dorsal teeth beyond the orbit.....*Atyaephyra* n. sp. 2

Literature

- Anastasiadou, Ch., A. Koukouras, M. Mavidis, N. Chartosia, Md. Mostakim, M. Christodoulou & Ch. Aslanoglou, 2004. Morphological variation in *Atyaephyra desmarestii* (Millet, 1831) within and among populations over its geographical range. *Mediterranean Marine Science*, 5(2): 5-13.
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Figure 4: Detail of third maxilliped (mxp₃) propodus showing the lateral spines. A, *Atyaephyra* n. sp. 2 (5 spines). B, *Atyaephyra* n. sp. 1 (20 spines).

