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Funchalia sp. (Crustacea: Penaeidae) associated with *Pyrosoma atlanticum* (Thaliacea: Pyrosomidae) off the Canary Islands

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Five specimens of the penaeid genus *Funchalia* were found inside living *Pyrosoma atlanticum* taken off Tenerife. No such association has been noted previously. The largest of the *Funchalia* was an immature *F. villosa*; the other four were early post-larvae. Aspects of their morphology are described and compared with previous descriptions. They were probably also *F. villosa*.

Plankton samples were taken with a manual net (200 μm) off the south coast of Tenerife (Canary Islands) in May 2000 during SCUBA diving at 20 m depth. Five specimens of *Funchalia*, a juvenile of 37.2 mm total length, including rostrum and telson, and four early post-larvae of 10.3–14.3 mm total length, were found within *Pyrosoma atlanticum* all of which were alive at the time of capture. Each of the *Funchalia* was in a different specimen of *Pyrosoma* of between 12 and 20 cm length. We can find no specific mention in the literature of a direct association between *Funchalia* and Thaliacea closer that a coincidence of occurrence in samples but Monticelli & Lo Bianco (1901) recorded juvenile *Solenocera membrancea* (Risso) (Dendrobranchiata: Solenoceridae) in the cloacal cavity of *Pyrosoma*. The hyperiid amphipods *Phronima* and *Phronimella* are regularly found within *Pyrosoma* (e.g. Tregouboff & Rose, 1957).

The largest of the present specimens is *F. villosa*. It has seven dorsal teeth on the rostrum and post-rostral carina. There is a small hepatic spine, consistent with Burkenroad's (1936) observation that specimens <60 mm length have such a spine, inversely proportional in size to the size of the specimen. D'Udekem d'Acoz (1999) listed *F. danae* Burkenroad and *F. villosa* (Bouvier) from Canary Island waters but *F. woodwardi* Johnson only from Madeira northwards in the North Atlantic. *Funchalia villosa* comprised 9.6% of dendrobranchiates in Foxton's (1970) samples off Lanzarote but no other *Funchalia* spp. were found. The four post-larvae were therefore most likely to be *F. villosa*.

Morphological features of the four post-larvae were examined without dissection and some characteristics are listed in Table 1 and illustrated in Figure 1. The specimens are retained intact for future reference at the Museo de Ciencias Naturales. Specimens 3 and 4 appear to be the same stage of development and specimens 1 and 2 are probably the preceding two stages.

Bouvier (1905) described post-larvae of 14–17 mm length, as *Grimaldiella richardi*, from the Azores with 4–5 dorsal spines on the rostrum followed by 2 others on the anterior part of the gastric region. According to Burkenroad (1936) Bouvier's material was a mixture of *F. woodwardi* and *F. villosa*.

Gurney (1924) described a similar post-larva taken off New Zealand. The length was 10.3 mm. The rostrum lacked dorsal teeth. Abdominal somites 1–4 had stout median ventral spines. Abdominal somites 5 and 6 each had a pair of lateral spines. Ten ventral spines were illustrated on the sixth abdominal somite but it is not clear if these represent those on one margin of the pleuron or on both. There were three lateral marginal spines and 14 pairs of spines on the posterior margin with no median spine. The posterior two pairs of spines were on the dorsal surface of the margin and barely projecting out beyond the margin. The corresponding spines on the present specimens were similar but not projecting beyond the margin in specimen 1 but clearly doing so in the other three.

Gurney (1924) concluded that a larva described by Monticelli & Lo Bianco (1902) and larvae and early post-larvae described by Stephensen (1923) from the Mediterranean as *Aristeomorpha foliacea* Risso were more likely to be *Funchalia*. The total length of Stephensen's (1923) post-larva was 9 mm. There were three dorsal teeth on the rostrum and five pairs of ventral spines on the sixth abdominal somite. There was one pair of lateral spines on the telson. There were five spines on the outer margin of the antennal scale. The pleopods were uniramous. Gurney regarded both his specimen and Stephensen's to be the first post-larval stage.

Paulinose (1974) described post-larvae, attributed to *F. woodwardi*, of 8 mm, 12 mm and 17 mm length from locations in the Indian Ocean. The smallest specimen had a smooth rostrum and no other carapace spines. There were median ventral spines on abdominal somites 1–3 and five pairs of ventral spines on the last abdominal somite. The antennal scale had four outer spines and the pleopods were uniramous. There were 12 pairs of spines on the concave posterior margin of the telson. The rostrum of the 12 mm specimen had five teeth, the first four abdominal somites had median ventral spines and on the fifth somite had a small lateral spine. There were eight spines on the outer margin of the antennal scale and the pleopods had small endopodites. The telson was almost parallel sided with 16 pairs of spines on the posterior margin. The largest specimen had seven dorsal teeth on the rostrum, a ventral spine on the first abdominal somite, nine or ten pairs of ventral spines on the sixth somite, a stout median spine dividing the posterior margin of the telson and 16 spines on the outer margin of the antennal scale.

Table 1. Funchalia *sp. Morphological characteristics of four post-larvae found within* Pyrosoma *sp. The concave posterior margin of the telson is bounded by strong terminal spines. The marginal spines on the telson exclude spines immediately adjacent to but outside the strong terminal spines.*

Specimen	1	2	3, 4
Total length (mm)	10.3	11.6	13.5, 14.3
Carapace length including rostrum (mm)	3.6	4.3	4.8, 5.0
Telson length (mm)	2.2	2.3	2.5, 2.7
Dorsal teeth on rostrum and post-rostral carina	3	4	5
Abdominal somite 5 lateral spine	Well developed	Small	Absent
Abdominal somite ventral spines (pairs)	7	7	10, 9
Abominal somites with median ventral spines	1–4	1–3	1–3
Spines on outer margin of antennal scale	7 (r) & 8 (l)	8	10
Pleopod endopods	absent	Bud with single apical projection	setose
Telson, distal margin : proximal margin	2	1.6	~1.1
Telson spines on concave posterior margin	15+1+15	16+1+16	16+1+16
Telson lateral marginal spine	3	3	3

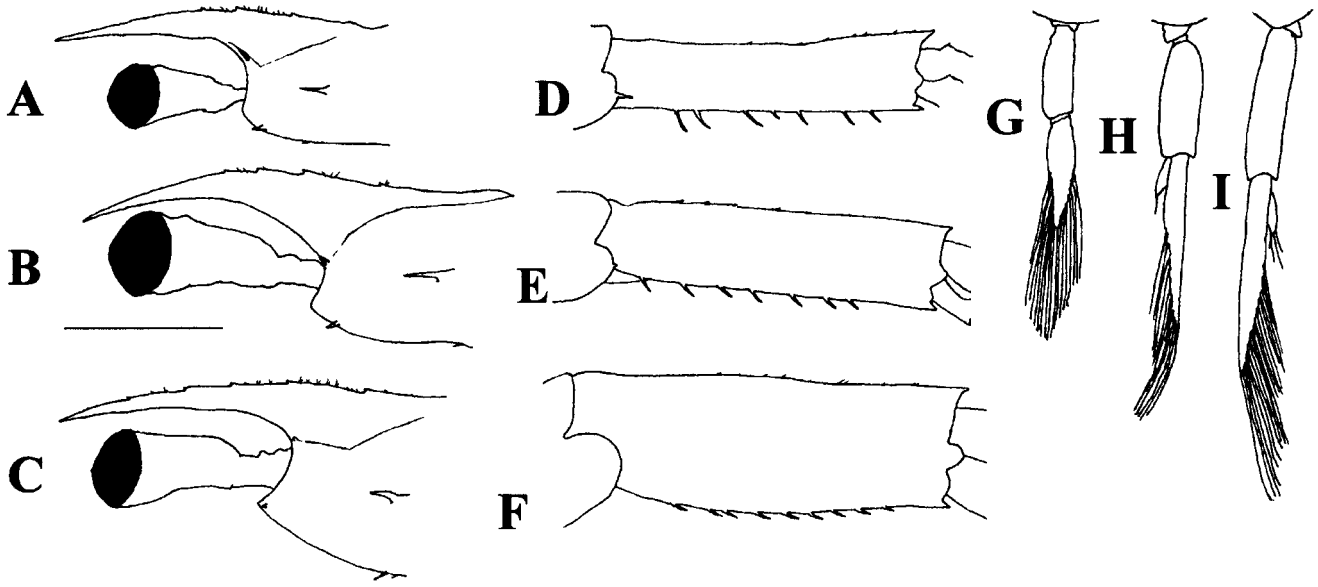

Figure 1. *Funchalia* sp. Post-larvae. A, D&G, specimen 1; B, E&H, specimen 2; C, F&I, specimen 4. (A–C) Rostrum and anterior part of carapace; (D–F) abdominal somite 6 and posterior margin of somite 5; (G–I) pleopod 3. Scale bar: 1 mm.

The contrasts between the present specimens and Stephensen's (1923) specimen may represent specific differences. The lack of any carapace spines in Paulinose's (1974) smallest specimen suggests that this specimen was possibly a different species from his later specimens. Further study of a range of specimens linked with identified adults by laboratory rearing or genetic methods are needed to define specific differences in these stages.

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