

ON A PELAGIC PENAEID PRAWN, *FUNCHALIA WOODWARDI* JOHNSON, NEW TO THE BRITISH FAUNA

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(Text-fig. 1)

On 30 July 1955 Dr J. H. Fraser, of the Scottish Home Department, Marine Laboratory, Aberdeen, sent to the British Museum for determination two adult females of a penaeid prawn collected at 01.56-02.0 h B.S.T. near the surface (15 fm.) at Rosemary Knoll, to the north-west of the Outer Hebrides, on 22 July 1955. The actual depth at this locality, 59° 12' N., 10° 09' W., is 229 fm (419 m). These specimens were identified by one of us (R. W. I.) as *Funchalia woodwardi* Johnson. Later the senior author confirmed this determination and wrote to Dr Fraser as follows:

This is the first British record of the genus *Funchalia*. . . For some reason not understood adult specimens of *Funchalia* are rarely captured, unless by fish. . . In 1936 Burkenroad showed that two species had been confused under *Funchalia* (*Funchalia*) *woodwardi* Johnson and in 1940 he added two new species in the *Dana* collection, one from the Indian Ocean, the other from the Canaries. The older references do not, therefore, necessarily refer to *woodwardi*. Authentic adult specimens of *F. woodwardi* are known from Madeira (holotype, ♀ in B.M.); off South Africa (Calman, 1925, 3 ♀♀, 2 in B.M.; Barnard, 1950, 16 ♂♂, 6 ♀♀, all from stomachs of stock-fish, *Merluccius*); and off Nice in the S. of France (2 ♀♀ in Villefranche-sur-mer Colln. Roger, 1938).

She also asked to see the third specimen, which proved to be an adult male. Dr Fraser's reply was interesting:

I had no idea, when we caught them [*Funchalia*], that they would turn out to be anything so unusual. We only retained three, out of a total of 84 in a half-hour haul, thinking a quick glance through the literature at Aberdeen would tell us that they were something common enough. (I must confess the remainder of the catch went to prove their comestible value!) Indeed it seems as though they are common enough, given the right type of gear to catch them and used in the right place. Our programme in July was specifically arranged to look into the identification of traces made on the echo sounder and these prawns were the cause of one of them. . . The gear was an Icelandic Pelagic Trawl specially fitted with a small mesh cod-end (the net designed for catching herring), and I expect we are the first to use such a net near the surface over these oceanic banks.

I do not know yet for certain if they are subject to diurnal migration, but I strongly suspect they are distributed in the deeper layers during the day, where they are caught by the deeper living fish, such as *Merluccius*, and swarm at the surface at night as we found them. [Letter to I. G. dated 17 November 1955.]

Later in September Dr Fraser sent a photo copy of the appropriate part of the echo trace.

It starts at 00.40 h on 21/vii/55 with a distinct double trace, at 15–20 fm. and at 35–40 fm. approximately, and we chose to sample the lower one first. This gave a haul of small fish only—*Gadus poutassou* and scopelids, mostly *Myctophum glaciale*. By the time we had completed the first haul the two traces had merged—at about midnight (01.40 h B.S.T. at that longitude)—and our second haul thus sampled the mixture. This caught similar numbers of *G. poutassou* and scopelids, and in addition 84 *Funchalia*, so that it seems justifiable to infer that the upper trace prior to midnight was *Funchalia*. This was first seen to appear as a scattered trace at about 23.00 h the previous evening, i.e. about 2½ h before midnight, either because we steamed into the shoal at that time, or because the prawns had started shoaling in the upper layers.

The colour, in life, of the specimens was a pleasant yellowish-orange with a very bright scarlet area (still to be seen in the preserved specimen, though not so brilliantly) on the back of the cephalothorax. [Letter to I. G. dated 26 November 1955.]

Funchalia Johnson

For references and synonymy see *Burkenroad*, 1936, p. 126; *Barnard*, 1950, p. 608.

At present the genus *Funchalia* comprises five species, namely *F. woodwardi* Johnson, 1867, *F. villosa* (Bouvier, 1905), *F. danae* Burkenroad, 1940, *F. taaningi* Burkenroad, 1940, and *F. balboae* (Faxon, 1893). Burkenroad (1934, pp. 76–7, and 1936, p. 136) thought it necessary to establish a new subgenus *Pelagopenaeus* for the last-named species, which differs in several minor details from the first two species. But this difference breaks down, at least in part, since the thelycum of his species *Funchalia danae* resembles that of *Pelagopenaeus*, and as moreover there are so few species in the genus, it seems to us that subgenera are unnecessary.

For many years all specimens of *Funchalia*, whether adult or immature, were referred to *F. woodwardi*, but, as stated in the letter to Dr Fraser, Burkenroad (1936, pp. 128–35) found that two species had been confused under that name. Roger (1938, p. 25) arrived independently at the same conclusion, for he writes: 'Il semble bien que le genre *Funchalia* d'après les auteurs présente au moins deux espèces différentes actuellement connues. *Funchalia vanhoeffeni*, que Lenz et Strunck ont décrit, différerait assez notablement de *Funchalia woodwardi* Johnson'. Roger was apparently unaware of Burkenroad's paper when he described the two females of *F. woodwardi* in the Villefranche-sur-mer collection. Burkenroad used Bouvier's name *Hemipenaeopsis villosus*, later retracted in favour of *Funchalia woodwardi*, for this second species. Roger's record of *F. woodwardi* from the Mediterranean would seem to confirm Burkenroad's suggestion that larvae referred to *Aristeus antennatus* by Monticelli and Lo Bianco (1902) and to *Aristeomorpha foliacea* by Stephensen (1923) are probably referable to *Funchalia woodwardi*. Where no information has been given as to the number of rostral spines and other characters, or where the material is immature, it is probable that either

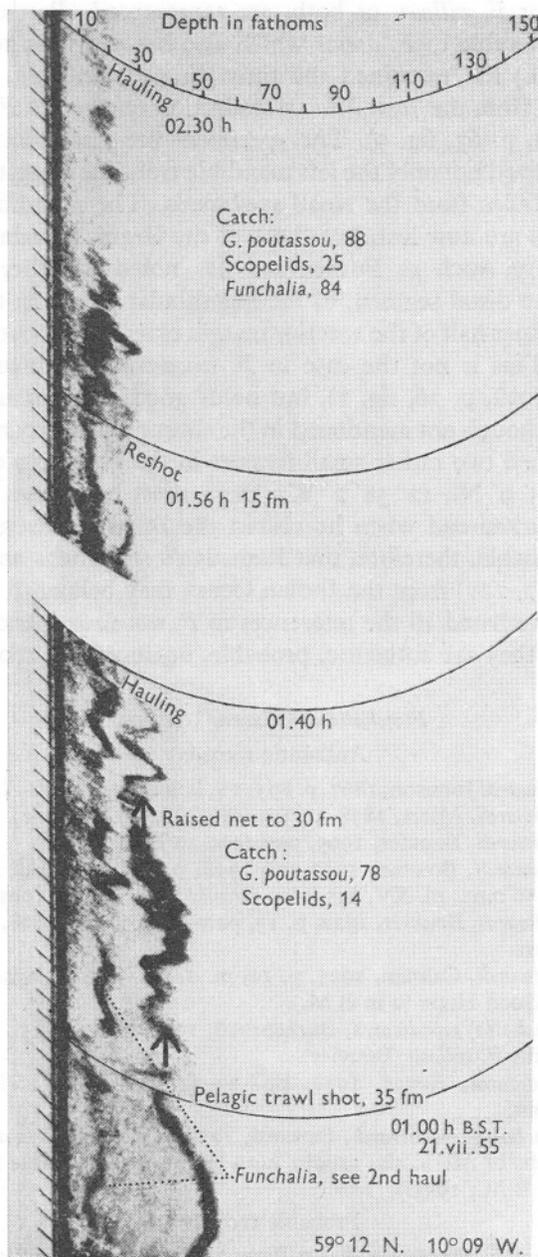


Fig. 1. Echo trace prepared by Dr Fraser. The actual depth is 229 fm and the bottom does not therefore appear on this trace, phased at 0-160 fm. The time scale on left-hand edge is in 2 min ticks. The time at the start and finish of each of the two hauls is given in B.S.T. and the natural midnight at 10° W. is at 01.40 hr. The first catch comprised 78 *Gadus poutassou* and 14 scopelids; the second 88 *G. poutassou*, 25 scopelids and 84 *Funchalia woodwardi* Johnson.

F. woodwardi, or *F. villosa*, or both, are represented. Part of the material may even be referable to *F. danae* which also has a similar rostral formula. One of us (I.G.) has examined the three small specimens, the largest an immature male, from the *John Murray* collection referred to *F. woodwardi* by Ramadan (1938, p. 63, fig. 9). The specimens are imperfect and Ramadan apparently removed not only the left mandible from the largest specimen, but also both mandibles from the small specimens. The mandibles of the two small specimens are now lost, but those of the largest remain. They show a slight asymmetry, such as Burkenroad has noted in other specimens of *Funchalia*, in the distal segment of the mandibular palp. In the left mandibular palp the inner half of the anterior margin extends far beyond the shallow emargination. This is not the case in *F. woodwardi* (Calman, 1925, pl. 3, fig. 7; Roger, 1938, p. 26, fig. 1), but holds good for *F. danae* Burkenroad (1940, p. 36), although not mentioned in the short preliminary note. However, we have examined two rather small females in the *Discovery* collection from St. 1594, 04° 15' 9" N., 12° 58' 2" W.; these must have been determined as *F. danae* by Burkenroad when he visited the British Museum in 1938-39. It is highly probable, therefore, that Ramadan's specimens and perhaps that of Balss (1925, p. 227) from the Indian Ocean may belong to *F. danae*.

Below we have listed all the references to *F. woodwardi* known to us indicating whether they are authentic, probable, or uncertain, records.

Funchalia woodwardi Johnson

Authentic records

- Funchalia woodwardi* Johnson, 1867, p. 895. 1 ♀, holotype in B.M. Locality Madeira.
Funchalia woodwardi, Miers, 1878, p. 309 (reference to holotype).
Funchalia woodwardi, Bouvier, 1905, part (acc. to Burkenroad).
Funchalia woodwardi, Bouvier, 1907 and 1908, p. 93, part. For example ♂ from St. 1856, $l = 56$ mm., pl. XV, figs. 1-2; *Grimaldiella richardi* (post-larval) in part.
Funchalia woodwardi, Bouvier, 1922, p. 13, part—♂ from St. 3028, $l = 100$ mm. and perhaps others.
Funchalia woodwardi, Calman, 1925, p. 10, pl. 2, fig. 5, pl. 3, figs. 6-8. 3 ♀♀ from off Cape of Good Hope (2 in B.M.).
Funchalia (Funchalia) woodwardi, Burkenroad, 1936, pp. 129-35. No new records; compared with *F. villosa* (Bouvier).
Funchalia woodwardi, Roger, 1938, pp. 23-32, figs. 1-4. 2 ♀♀ from Western Mediterranean.
Funchalia (Funchalia) woodwardi, Barnard, 1950, p. 609, fig. 112 a-h. 16 ♂♂, 6 ♀♀, from stomachs of *Merluccius* caught Jan.-Feb. 1943, off Table Bay. (3 ♀♀, 6 ♂♂ presented to B.M., 1955.)

Probable records

- Aristeus antennatus*, Monticelli & Lo Bianco, 1902, p. 30. Probable larvae of *F. woodwardi* acc. Burkenroad, 1936, p. 135.
Aristeomorpha foliacea, Stephensen, 1923, p. 15, fig. 6. Probable larvae of *F. woodwardi* acc. Burkenroad, 1936, p. 135.
 ? Larva of *Funchalia woodwardi*, Stephensen, 1923, p. 26, fig. 10.

Uncertain records

(a) Atlantic Ocean

Funchalia woodwardi, Murray & Hjort, 1912, p. 668 in Table.

Funchalia woodwardi, Sund, 1920, p. 32, 67 immature specimens—the majority from night hauls and 45 from between 50 and 150 m depth.

Funchalia woodwardi, Stephensen, 1923, p. 17. 17 specimens—small ♂♂ and ♀♀ from 45 to 70 mm in length, but no details given; the rest young. (8 in 8 hauls at 7 stations in Mediterranean and 9 in 4 hauls at 3 stations in Atlantic.)

Funchalia sp., Lenz & Strunck, 1914, p. 307, fig. 3*a* and *b*. One immature specimen, off St Helena. The number of rostral teeth suggests either *F. woodwardi* or *F. danae*.

(b) Indian Ocean

Funchalia woodwardi, Balss, 1914, p. 593; 1925, p. 227. 1 ♀ about 50 mm long at 16° 8' S., 97° 14' E.

Funchalia (*Funchalia*) *woodwardi*, Ramadan, 1938, p. 63, fig. 9. Three young, the largest an immature ♂. Perhaps referable to *F. danae* Burkenroad (I.G.).

REMARKS

Between 1867 and 1938 adult specimens of *Funchalia woodwardi* were captured sporadically in very small numbers (1 to 3) at various localities in the eastern Atlantic, from the Cape region to approximately 40° N., and in the western Mediterranean. Good descriptions of the female have been given by Calman (1925) and by Roger (1938). For the first time a considerable number of adults were obtained in January–February 1943 from the stomachs of *Merluccius* by Mr Rattray of the Low Temperature Laboratories, Cape Town, while he was studying the food and diseases of the stock-fish. Although many of the specimens were mutilated, Barnard was able to describe and figure for the first time the petasma and appendix masculina of the adult male (Barnard, 1950, p. 609, fig. 112*e* and *f*). The petasma is asymmetrical, either the left or the right half being the longer.

The haul mentioned by Dr Fraser in the letters quoted above (see p. 475) is of special interest because for the first time free-swimming adults were obtained in quantity—84 in a half-hour haul. The three specimens selected at random as a sample for determination are a male and two females measuring from 120 to 130 mm in length, neither female being impregnated. The catch, therefore, apparently consisted of adults of both sexes. Moreover, this is the first British record and by far the most northerly locality for the species. The depth at which the adults were swarming, as indicated by the upper trace on the echo sounder, was approximately 15–20 fm or less than 40 m.

Little is known of the bathymetric range, habits or development of *Funchalia*. Bouvier regarded the genus as bathypelagic, though capable of ascending to the upper layers; 'from the catches of the *Michael Sars* it would appear that the young at least are denizens of the upper water layers though not of the

very surface' (Sund, 1920, p. 32). Most of the *Michael Sars* specimens were collected in night hauls at 50–150 m, but of the seven taken in day hauls four were also from 50 and 100 m (Murray & Hjort, 1912, table on p. 668)*. Burkenroad says that *Funchalia* is a pelagic genus with autogenous statolith in the statocyst chamber which, however, retains an opening to the exterior (1936, p. 128). Sund regarded all his material as immature, although the largest specimen measured 75 mm in length; Bouvier and Stephensen sexed their specimens of about 45–70 mm but the majority of these, if not all, were probably not fully adult. The maximum recorded length is approximately 157 mm (holotype, rostrum damaged). It is quite likely that *F. woodwardi* may exhibit vertical diurnal migrations of considerable magnitude such as have been described for *Gennadas* and other deep-water Crustacea Malacostraca (Waterman *et al.*, 1939).

The British Museum authorities are indebted to the Director of the South African Museum for nine specimens obtained from stomachs of *Merluccius* and to the Director of the Scottish Home Department, Marine Laboratory, Aberdeen, for permission to retain the male and one female from Rosemary Knoll.

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* This work lists sixty-two specimens, but the total given in Sund, 1920, p. 32, is sixty-seven.

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