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ADDITIONS TO THE OCTOPODA (MOLLUSCA: CEPHALOPODA) FAUNA OF MADEIRA

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With 2 figures

SUMMARY. Two research cruises carried out in Madeiran waters in 1990 and 1991 by the Harbor Branch Oceanographic Institution, collected two species of Octopoda not previously recorded from the region, namely: *Scaeurgus unicirrhus* (ORBIGNY, 1840) and *Pteroctopus tetracirrhus* (DELLE CHIAJE, 1830). The behaviour and chromatic pattern of *P. tetracirrhus* are described, based on video tapes taken during submersible dives.

SUMÁRIO. ADIÇÕES PARA A FAUNA DE OCTOPODA (MOLLUSCA: CEPHALOPODA) DA MADEIRA. Como resultado de duas campanhas de biologia marinha, realizadas em 1990 e 1991, pela "Harbor Branch Oceanographic Institution" nas águas da Madeira, duas espécies de Octopoda foram capturadas pela primeira vez na Região: *Scaeurgus unicirrhus* (ORBIGNY, 1840) e *Pteroctopus tetracirrhus* (DELLE CHIAJE, 1830). São dadas algumas informações sobre o comportamento e padrão cromático de *P. tetracirrhus* no seu habitat natural, com base em filmagens de video tiradas do submersível.

A review by REES & MAUL (1956) of the Cephalopoda of Madeira recorded 34 species, 9 from the Order Octopoda (3 additional specimens in poor condition, which these authors referred to *Octopus* sp., are not considered here). Of these, 18 species were found in stomachs of the fish *Alepisaurus ferox*.

The cephalopods in the region were studied later by CLARKE & MAUL (1962) and CLARKE (1960, 1962), mainly squid found in stomach of fish and sperm whales, but there were no new records on Octopoda species.

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HARTMANN (1970) confirmed the presence of *Argonauta argo* and *Tremoctopus violaceus*, and some other cephalopods in the waters around Madeira. CLARKE & LU (1974) confirmed the presence of *Japetella diaphana* and *Vitreledonella richardi* in the region.

METHODS

During each of two cruises carried out by the Harbor Branch Oceanographic Institution in 1990 (R/V "Sea Diver") and 1991 (R/V "Seward Johnson"), sampling near Madeira provided an Octopod. The first was caught by a triangular dredge and was preserved in ethanol. The other specimen was collected during a dive of the "Johnson-Sea-Link I" submersible and was deep frozen. After defreezing it was preserved according to a method recommended by ROPER & SWEENEY (1983). The latter animal and another one from a different dive were filmed on video tape in their natural habitat.

The specimens were handed over to the Department of Oceanography and Fisheries of the University of the Azores for further study and were identified as *Scaeurgus unicirrhus* and *Pteroctopus tetracirrhus* (MANGOLD & BOLETZKY, 1987; NESIS, 1987; ROBSON 1929; and ROPER *et al.*, 1984). Counts, measurements, weights and indices were taken according to ROPER & VOSS (1983).

The behaviour and body pattern of *Pteroctopus tetracirrhus* is described from video tapes taken during the dives.

RESULTS AND DISCUSSION

The two species recorded here for the first time from Madeiran waters have the common feature of having 3rd left arm hectocotylized, contrary to the more common (3rd right arm) in the sub-family Octopodinae. NESIS (1987, 1991) considers both species as characteristic for the fauna of the tops of seamounts and submarine banks. Data for the specimens caught are shown in Table 1.

1 - *Scaeurgus unicirrhus* (Orbigny, 1840)

A small juvenile female (Table 1)(Fig. 1) was collected in Madeiran waters in a triangular dredge in 1990 at 150 m depth.

According to TOLL (1988) the geographic distribution of *Scaeurgus unicirrhus* is confined to tropical and warm waters of the Atlantic, Indian Ocean and in the Mediterranean Sea. The species has recently been reported from Azorean waters (GONÇALVES, 1991).

S. unicirrhus has been found previously between 100 m and 800 m, most commonly between 100 m and 350 m depth, associated with sandy and coralline bottoms (MANGOLD & BOLETZKY, 1987).

The biology of this species is little known, except for the data published by MANGOLD-WIRZ (1963) and BOLETZKY (1977, 1984). The species is meso-benthic in adult and juvenile stages and has planktonic larvae (MANGOLD & BOLETZKY, 1987, 1988). The maximun mantle length recorded is 12 cm in females and 7.5 cm in males (MANGOLD & BOLETZKY, 1987), the maturity being attained in males at 5 cm mantle length (MANGOLD-WIRZ, 1963).

From laboratory studies BOLETZKY (1984) found the spawn of *S. unicirrhus* could include about 1 000 small eggs (2.5 mm length), spawned in clusters, and the planktonic paralarvae attain 2-3 mm in total length when hatching. Until NESIS & NIKITINA (1981) and HANLON *et al.* (1985) established definitively that ''macrotritopus larvae'' belong to *Octopus defilippi*, it was commonly thought that they were *S. unicirrhus* (*cf.* REES, 1954; BOLETZKY, 1974). HOCHBERG *et al.* (1992) give information about the paralarva of this species.

Table 1

Characteristics	*Scaeurgus unicirrhus**	*Pteroctopus tetracirrhus***
Date of capture	14/08/90	26/05/91
Capture position (Latitude)	32° 41.70' N	32° 37.00 N
(Longitude)	16° 45.73 W	16° 50.75 W
Capture depth (m)	150	791
Capture method	Triangular dredge	manipulator arm of submersible
Collector	John Reed	Amy Wright (Helen Martins)
Skin texture	rugose, covered with small round papillae	smooth and gelatinous
Total weight (g)	4.13	194.10
Total length (mm)	64	370
Dorsal mantle length (mm)	20	98
Mantle width (mm)	15	68
Sex	Female	Male
Maturity stage	Immature	Mature
Hectocotylized arm		3th left
No. of gill lamellae (GiLC)(outer)	13	8
(inner)	14	9
No. cirrus over each eye	1	2
Web depth index (WDI)	24	27
Hectocotylized length index (HcLI)		6
Arm sucker index (ASIn)	7	4
Web formula (WF)	A>>B>>C>>D>>E	B>>C>>D>>E=A

* measurements taken after preservation in ethanol (70%)

** measurements taken after defreezing

2 - *Pteroctopus tetracirrhus* (Delle Chiaje, 1830)

The specimen caught in Madeiran waters, was a mature animal (Table 1)(Fig. 2). Although only one individual was taken, a second animal was observed during another dive performed by the submersible.

P. tetracirrhus was reported from the Azores by JOUBIN (1900) but further material is not known from Azorean waters.

Although the species is amphi-Atlantic, its distribution is restricted to this ocean and to the Mediterranean sea (BOLETZKY, 1981). Initially, it was thought that the eastern and western Atlantic populations were different sub-species (VOSS, 1954, 1956), due to the different depths at which they occur. The western population occurs deeper than 25 m depth at 27 °C and the eastern population lives much deeper (from the edge of the continental shelf down to 700 m at temperatures less than 15°C). MANGOLD-WIRZ (1973) compared specimens from both populations and considered that the differences observed were not enough to presume the existence of two sub-species.

P. tetracirrhus has a wide vertical distribution range, similar to *S. unicirrhus*. It occurs from 25 m (VOSS, 1954, 1956) to 750 m depth (MANGOLD-WIRZ, 1963) on muddy bottoms, but in the Mediterranean it is more abundant between 250 m and 550 m depth (MANGOLD & BOLETZKY, 1987). The specimen from Madeira was caught at 791 m which is the deepest limit of its vertical distribution.

The maximum mantle length is 14 cm in females and 11 cm in males (MANGOLD & BOLETZKY, 1987). Maturity is attained at a mantle length of 11 cm in females and 8.5 cm in males.

P. tetracirrhus is benthic in the adult and juvenile stages and has planktonic paralarvae (BOLETZKY, 1981).

MANGOLD-WIRZ (1963, 1973) and MANGOLD (1965) gave information on the biology of this species. The anatomy has been described by MORALES (1973). Reproductive aspects under laboratory conditions have been studied by BOLETZKY (1976, 1981). The latter author found that the spawn of this species could include 1000 large eggs (7-8 mm length). The eggs are spawned individually, not in clusters as is common in other octopuses.

The hatchling of this species is not known (*cf.* HOCHBERG *et al.*, 1992)(rearing has not been successful), but probably a short planktonic phase exists (MANGOLD-WIRZ, 1973; BOLETZKY, 1976).

Behaviour and body pattern in the natural environment. HANLON (1988) pointed out that behavioural and body pattern characters are useful in cephalopod taxonomy.

Both the individual that was caught and the second animal were videotaped in

their natural environment from the submersible ''Johnson-Sea-Link I''.

The first specimen (Table 1) was filmed at 791 m depth, at a water temperature of 11° C. The animal was found motionless on a bottom of mud, corals and rocks. The skin was smooth and the whole animal showed an orange/red colouration, more yellowish on the head. The eyes were clearly visible but the two cirri over each eye were not very prominent. This animal was videotaped for a very short time before it was picked up. When the animal was identified, in the Açores, 15 days later and after being defrozen, it showed the orange-red pattern uniformly on the whole body and the gonad was visible through the transparent skin. The small constricted neck and the two cirri were more visible after death.

The other specimen (not collected) was videotaped twice at 517 m depth (32° 32.51' N, 16° 35.08' W) on the same kind of bottom, at a water temperature of 12.6°C. This animal was more active. It moved slowly searching with the arms on the rocky irregularities. Initially, possibly due to disturbance, the skin showed several papillae over the mantle, the two supra-ocular cirri over each eye were visible but could not be easily distinguished from the other papillae. The colour in this phase was yellowish. Gradually the skin became smoother and the colour changed to reddish and yellowish over the head (the same pattern as the first specimen).

FINAL CONSIDERATIONS

Since REES & MAUL (1956) there have been no more additional species of Octopoda reported from Madeiran waters. HARTMANN (1970) and CLARKE & LU (1974) only confirmed the presence of some octopod species (*Argonauta argo*, *Tremoctopus violaceus*, *Japetella diaphana* and *Viltredonella richardi*) in the region.

Scaeurgus unicirrhus (ORBIGNY, 1840) and *Pteroctopus tetracirrhus* (DELLE CHIAJE, 1830) are here reported for the first time from the Madeira archipelago. With these additions, the list of octopods of Madeira now comprises 11 species (Appendix I). VOSS (1988) showed the presence of deep-sea octopods (*Benthoctopus ergasticus* and *Bathypolypus sponsalis*) close to Madeiran waters. It is surprising that species of Cirrata are not yet recorded in this region.

S. unicirrhus and *P. tetracirrhus* occur in Azorean waters (GONÇALVES, 1991), but their presence in the continental coastal waters of Portugal is not confirmed (SOUSA REIS *et al.*, 1984). *Eledonella pygmaea* is the only species of Madeiran octopods not yet recorded in the Azores.

The body patterns of *P. tetracirrhus* show in the videotaped sequences that the living animal can change the texture and colour of skin, as is common in other octopods, but the colour is almost uniform yellow-orange-red and the skin is smooth

when the animal is not very disturbed. When observed they moved only very slowly.

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APPENDIX I

List of Octopoda of Madeira

Classe CEPHALOPODA Cuvier, 1798
- Sub-Class COLEOIDEA Bather, 1888
  - Order OCTOPODA Leach, 1818
    - Sub-Order INCIRRATA Grimpe, 1916
      - Family BOLITAENIDAE Chun, 1911
        - Genus *Japetella* Hoyle, 1885
          - 1 - *Japetella diaphana* (Hoyle, 1885)
        - Genus *Eledonella* Verril, 1884
          - 2 - *Eledonella pygmaea* Verril, 1884
      - Family Vitreledonellidae Robson, 1932
        - Genus *Vitreledonella* Joubin, 1918
          - 3 - *Vitreledonella richardi* Joubin, 1918
      - Family OCTOPODIDAE Orbigny, 1845
        - Sub-Family OCTOPODINAE Grimpe, 1845
        - Genus *Octopus* Lamarck, 1798
          - 4 - *Octopus vulgaris* Cuvier, 1797
          - 5 - *Octopus macropus* Risso, 1826
        - Genus *Scaeurgus* Troschel, 1857
          - * 6 - *Scaeurgus unicirrhus* (Orbigny, 1840)
        - Genus *Pteroctopus* Fisher, 1882
          - * 7 - *Pteroctopus tetracirrhus* (Delle Chiaje, 1830)
      - Family TREMOCTOPODIDAE Brock, 1882
        - Genus *Tremoctopus* Delle Chiaje, 1829
          - 8 - *Tremoctopus violaceus violaceus* Delle Chiaje, 1830
      - Family OCYTHOIDAE Gray, 1849
        - Genus *Ocythoë* Rafinesque, 1814
          - 9 - *Ocythoë tuberculata* Rafinesque, 1814
      - Family ARGONAUTIDAE Naef, 1912
        - Genus *Argonauta* Linnaeus, 1758
          - 10 - *Argonauta argo* Linnaeus, 1758
      - Family ALLOPOSIDAE Verril, 1882
        - Genus *Haliphron* Steenstrup, 1861
          - 11 - *Haliphron atlanticus* Steenstrup, 1861
            (= *Alloposus mollis* Verril, 1880)

* New records to Madeira Archipelago.

Fig. 1 - The specimen of *Scaeurgus unicirrhus* caught in Madeiran waters (see Table 1).

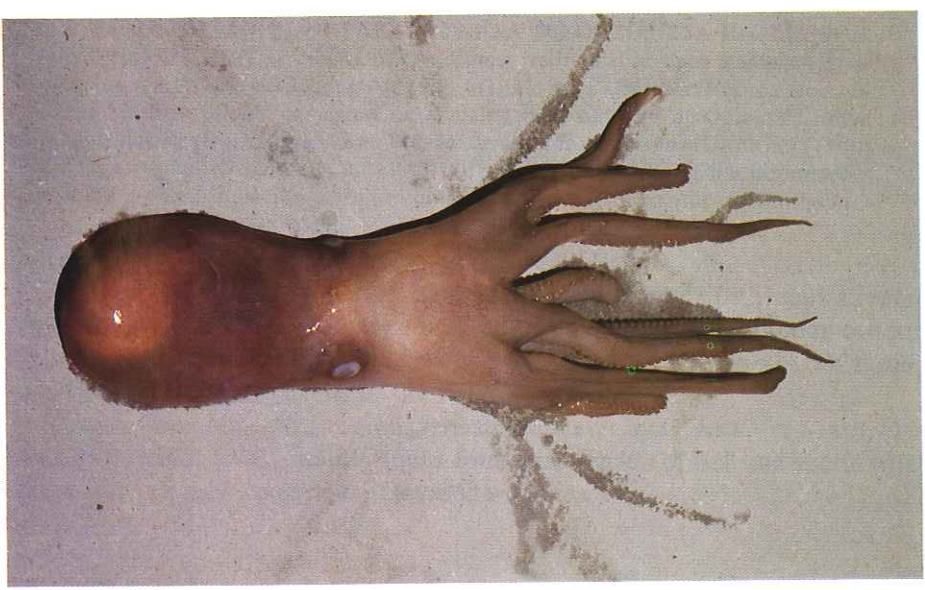

Fig. 2 - The specimen of *Pteroctopus tetracirrhus* caught in Madeiran waters (see Table 1).