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Notas / *Notes*

An occurrence of ring sea anemones (Anthozoa, Actiniaria) in the Azores region

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Four species of ring sea anemones (Cnidaria, Anthozoa, Actiniaria) have been recorded from the Indo-Pacific region (Hiles, 1899; Ocaña *et al*., 2004). They occur in parasitic association with gorgonian and pennatulacean species and surround these cnidarian hosts with a solid piece of pedal disc tissue. Until now, these species have been placed in the Family Actinostolidae (Carlgren, 1949). According to Ocaña *et al.* (2004) they may constitute a new family of sea anemones. Unfortunately, most of the material of ring sea anemones was stored in the octocoral collections and consequently fixed in ethanol. Ethanol is not a good chemical to fix material for histological purposes and also makes it very difficult to observe the capsules of the cnidome. We wait till new material can be collected in order to study the species from the point of view of taxonomy.

The present paper reports a new species of ring sea anemone (*Peronanthus* sp.5) from the Atlantic (Azores Islands) that was found attached to the gorgonian *Keratoisis grayi* Wright, 1869 (Octocorallia, Gorgonacea, Isididae). Unfortunately, the two specimens of *Peronanthus* sp.5 studied were fixed in alcohol together with their hosts and this makes it very difficult to study this material with taxonomical purposes. New material will be necessary to advance with the study of this interesting species.

Two fragments of *Keratoisis grayi* Wright, 1869 (Fig. 1) harbouring the ring sea anemones were collected in the Sedlo Seamount (40º20.8680'N; 26º50.2600'W) near the Azores, at depths between 1069 and 1156 m. We only found two specimens of *Peronanthus* sp.5 associated with two small pieces of the material of *K. grayi*. The material was sampled during the FISHOR expedition carried out in January 2002 onboard the FV Pakura, using a bottom trawl. Seawater temperature ranged between 5º and 6ºC. The specimens were deep frozen, later preserved in 70% ethanol and stored in the biological reference collection of the Department of Oceanography and Fisheries (DOP), Azores (Dop-181-ANT). Four similar species have been previously recorded from the Indo-Pacific (see Ocaña *et al*., 2004).

Tentacles and pedal ring of the fixed material are brown. The expanded specimen is 0.5 cm long and 0.3 cm wide, while the pedal ring of the retracted specimen measures 0.3 cm long.

The species *Peronanthus* sp.2 is morphologically the most similar species. *Peronanthus* sp.1 and *Peronanthus* sp.5 were both growing on species of the genus *Keratoisis* Wright, 1869. This genus presents large polyps and, as a consequence of this characteristic, the anemone is placed between the gorgonian calyces (see Ocaña *et al*., 2004).

As in *Peronanthus* sp.1 and sp.2, *Peronanthus* sp.5 displaces the gorgonian polyps and their coenenchyme (see Fig. 2-3). Some large sclerites and

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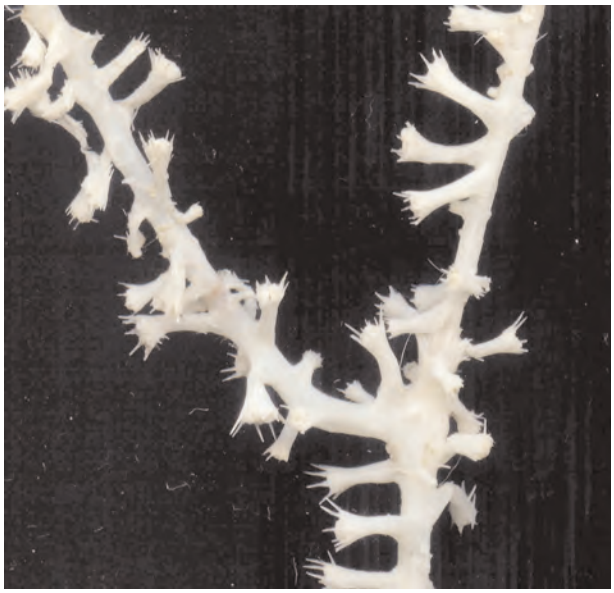

Fig. 1.— Colony of *Keratoisis grayi* from Cape Verde Islands.

Fig. 1. Colonia de *Keratoisis grayi* procedente de las Islas de Cabo Verde.

part of the thin coenenchyme of the gorgonian were observed in the pedal ring of the *Peronanthus* sp.5. We observed the same damage in some *Keratoisis* polyps from New Zealand waters.

In the axis of the gorgonian we observed some characteristic denticulate calcification outgrowth that protruded from the axis. Nevertheless, this cannot be linked with the presence of the crustacean *Isidascus bassindalei* Moyse, 1983, also found on species of *Keratoisis* (see Barrier *et al*., 1991).

Peronanthus sp.5 belongs to the first morphological group of these species (see Ocaña *et al*., 2004: 144) that comprises most of the species known within this genus, with the exception of *Peronanthus* sp.4 that belongs to the second morphological group (see Ocaña *et al*., 2004: 144).

As we pointed out (see Ocaña *et al*., 2004: 148), ring sea anemones may constitute a new family of sea anemones based on morphological changes. Nevertheless, Actinostolidae still is, for the time being, the most appropriate family to place these ring sea anemones (see Carlgren, 1949).

Although we cannot be sure that there are some neglected specimens of *Peronanthus* spp. from the Atlantic Ocean in the collections of European Museums and other scientific institutions, we suspect that the group of ring sea anemones is widely distributed in the Indo-pacific (see Ocaña *et al*., 2004).

The presence of this group of ring sea anemones in the Azores underlines the importance of the corals community of this archipelago in the Atlantic Ocean. The Azores register the highest coral biodiversity (Anthozoa but also calcareous Hydroids) of all the Macaronesian archipelagos, and this fact can not only be explained by the num-

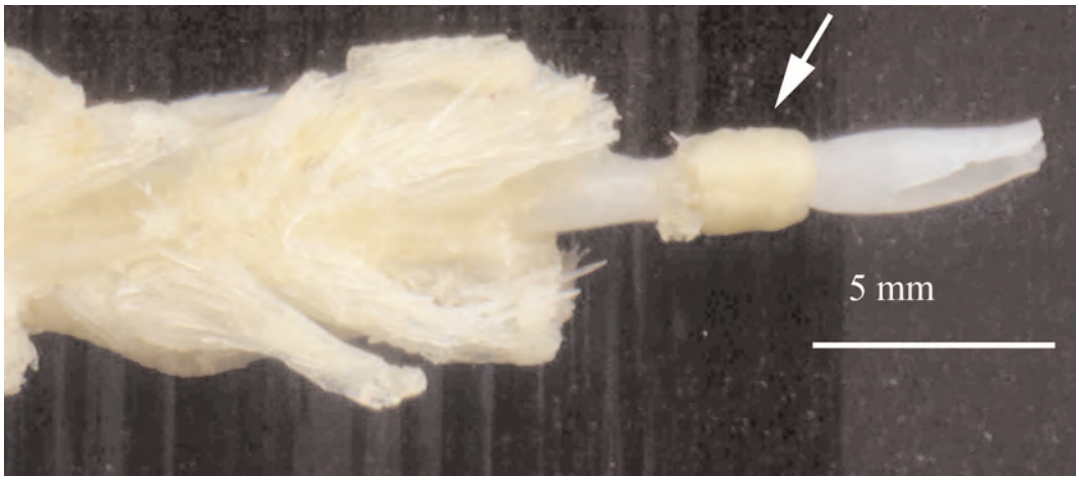

Fig. 2.— Small specimen of *Peronanthus* sp.5 showing remains of coenenchyme and sclerites.

Fig. 2.— Pequeño espécimen de *Peronanthus* sp.5 mostrando restos de cenénquima y escleritos.

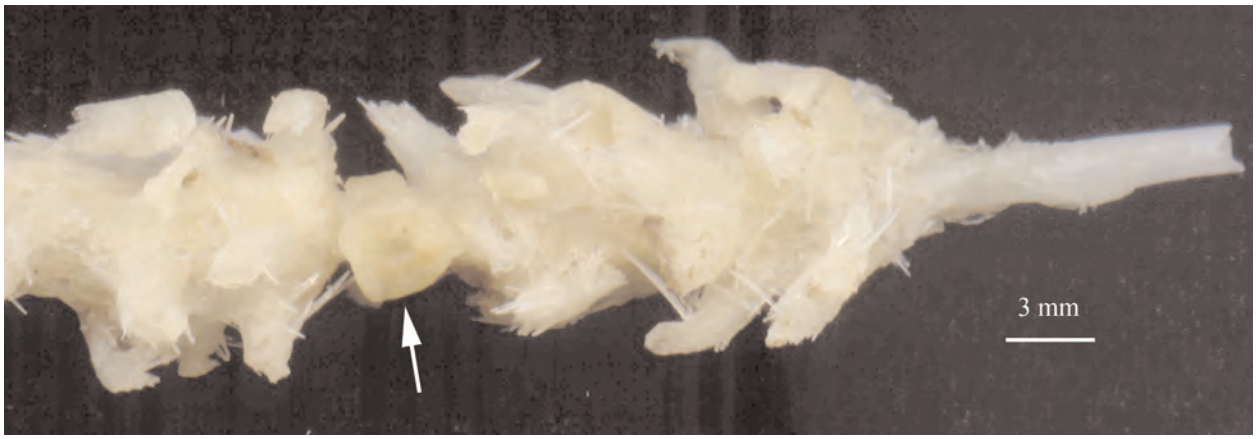

Fig. 3.— Specimen of *Peronanthus* sp.5 among the gorgonian polyps of *K. grayi* from Azores.

Fig. 3.— Espécimen de *Peronanthus* sp.5 entre los pólipos de la gorgonia *K. grayi* procedente de las Azores.

ber of scientific expeditions and the exploration efforts in this region.

A tentative explanation of the presence in Azores of ring sea anemones may be considered in relation with the possible Tethyan origin of *Peronanthus* sp.5 Some other species found in the Macaronesian archipelagos have already been linked with the Tethys (see Hensley, 1986; Böhlke & Brito, 1987). Moreover, the presence of a bathyal community in the paleontological site of Carboneras (placed on the shores of the present-day Alboran Sea, South Spain, Almería) proves the persistence of this type of Tethyan fauna until recent geological times (see Barrier *et al*., 1991).

As pointed out by Braga and Martín (1997), "the decrease in coral diversity in the upper Miocene at Almería reflects the progressive cooling of the Mediterranean following the worldwide decline in temperatures during this period", although the Messinian crisis (concerning the draining of the Mediterranean Sea) has to be taken into account in relation to the later coral decrease. The region of the Azores presents the most diversified fauna of bathyal Stylasteridae (Cnidaria: Hydrozoa) of the northeastern Atlantic (Zibrowius & Cairns, 1992), with the presence of five genera of Stylasteridae, and three of these genera (*Lepidora* Pourtalés, 1871; *Stylaster* Gray, 1831 and *Crypthelia* Milne Edwards & Haime, 1849) are also present in the Carboneras paleontological site (see Barrier *et al*., 1991). This fact is consistent with a possible relation between the ancient hydro-fauna of Carboneras and the actual hydro-fauna of Azores. The finding of the genus *Keratoisis*, also a bathyal species, in Carboneras, underlines the presence of the *Peronanthus* sp.5 host in the Tethyan community, at least from the Miocene.

The existence of the Azores bathyal bottoms in the Tertiary and the connection between the Atlantic and the ancient Tethys along the Mesozoic is consistent with our hypothesis of the possible Tethyan origin of *Peronanthus* sp.5. The presence of some other Atlantic fauna in the Macaronesian archipelagos (see Hensley, 1986; Böhlke & Brito, 1987; Böhlke *et al*., 1989) without any relation to the actual fauna spread along the Atlantic and the Mediterranean additionally supports the possible Tethyan relation of ring sea anemone recorded in Azores. The influence of the lenses of middle Mediterranean water in the distribution of some Mediterranean species along the central Atlantic strengthens our hypothesis (see Morton *et al*., 1998).

Peronanthus sp.5 may have existed from the Eocene and it is also plausible that the species could be present in the northwestern Atlantic. As far as we know, there is a very rich deep-water stylasterid community in the West Indian Sea extended also towards a very complex coral bank (see Zibrowius & Cairns, 1992). However, according to Valentine (1971) the opening of the Atlantic and the presence of the middle Atlantic ridges could present deep-sea barriers that prevent the expansion of

Peronanthus sp.5 (see Valentine, 1971). According to Zibrowius & Cairns (1992), deep-water stylasterids may also have been more successful in the Pleistocene Mediterranean.

Although we failed in finding *Peronanthus* sp.5 on the material of *Keratoisis grayi* from Cape Verde Islands (Rijksmuseum van Natuurlijke Histoire, Leiden, currently Naturalis or National Museum of Natural History, RMNH Coel. 24364), we should take into account the possible distribution of the species and its host along the Macaronesian archipelagos. This hypothesis is supported by the different strategies observed in the species of *Peronanthus* (Ocaña *et al*., 2004). Another possible explanation of the presence of *Peronanthus* sp.5 in Azores could be an invasion of Indo-pacific species via South Africa. A Pleistocene (about 2 Mya) invasion has been shown for mollusks (see Vermeij & Rosemberg, 1993), but we do not know if this also happened to the deep-water fauna. Invasion via the Benguela current has been proven for shallow-water fish (see Rocha *et al*., 2005) in recent times (145.000 years ago). The absence of records of ring sea anemones along the way from South Africa to Macaronesian waters makes this hypothesis of recent invasions of the Atlantic improbable.

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References

BARRIER, P., ZIBROWIUS, H., LOZOUET, P., MONTENAT, C., OTT D'ESTEVOU, P., SERRANO, F. & SOUDET, H., 1991. Une faune de fond dur du bathyal supérieur dans le miocène terminal des cordillères bétiques (Carboneras, SE Espagne). *Mésogée*, 51: 3-13.

BÖHLKE, E. B. & BRITO, A., 1987. *Gymnothorax bacalladoi*, a new moray from the Canary Islands. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 139: 459-463.

BÖHLKE, E. B., MCCOSKER, J. E. & BÖHLKE, J. E., 1989. Family Muraenidae. In: B. Böhlke (ed.). *Fishes of the Western North Atlantic, Part Nine*, Vol. 1, *orders Anguilliformes and Saccopharyngiformes*. Sears Fundation for Marine Research, Yale University. New Haven: 104-206.

BRAGA, J. C. & MARTÍN, J. M., 1997. Los arrecifes del mioceno de Almería. *Investigación y Gestión*, 1: 1-19.

CARLGREN, O., 1949. A survey of the Ptychodactiaria, Corallimorpharia and Actiniaria. *Kungliga Svenska Vetenskapsakademiens Handlingar*, Fjärde Serien, 1(1): 1-121.

HENSLEY, D. A., 1986. A new damselfish genus from the Cape Verde Archipelago based on *Glyphidodon (Parma) hermani* Steindachner, 1887 (Pisces: Pomacentridae). *Copeia*, 1986(4): 857-863.

HILES, I., 1899. The gorgonacea collected by Dr. Willey. *Zoological resuts based on material from New Britain, New Guinea, Loyalty Islands and elsewhere, collected during the years 1895, 1896 and 1897, by Arthur Willey*, 2: 195-206.

MORTON, B., BRITTON, C. J. & FRIAS MARTINS, A. M., 1998. *Ecologia Costeira dos Açores*. Sociedade Afonso Chaves, Associaçao de Estudios Açoreanos, Governo Regional dos Açores. Ponta Delgada. 249 pp.

OCAÑA, O., DEN HARTOG, J. C. & VAN OFWEGEN, L. P., 2004. Ring sea anemones, an overview (Cnidaria, Anthozoa, Actiniaria). *Graellsia*, 60(2): 143-154.

ROCHA, L. A., ROBERTSON, D. R., ROCHA, C. R., VAN TASSELL, J. L., CRAIG, M. T. & BOWENS, B. W., 2005. Recent invasion of the tropical Atlantic by an Indo-Pacific coral reef fish. *Molecular Ecology*, 14(13): 3921.

VALENTINE, J. W., 1971. Plate Tectonics and shallow marine diversity and endemism, an actualistic model. *Systematic Zoology*, 20(3): 253-264.

VERMEIJ, G. J. & ROSENBERG, G., 1993. Giving and receiving: The tropical Atlantic as donor and recipient region for invading species. *American Malacological Bulletin*, 10: 181-194.

ZIBROWIUS, H. & CAIRNS, S., 1992. Revision of the northeast Atlantic and Mediterranean Stylasteridae (Cnidaria: Hydrozoa). *Mémoires du muséum national d'histoire naturelle*, *zoologie*, 153: 136.

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