Deep-water Actiniaria from East Pacific hydrothermal vents and cold seeps

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ABSTRACT: Four species of sea anemones from East Pacific hydrothermal vents and one species from cold seeps are discussed. A species from cold seeps, Seepactis galkini gen. nov., sp. nov., possesses acontia and belongs to Kadosactiidae. Previously the specimens of this species were preliminarily referred to the ultraabyssal actinostolid Hadalanthus knudseni. Cyananthea hydrothermala, an obligate hydrothermal species and genus known previously only from an incomplete damaged specimen is redescribed and tentatively assigned to the Actinoscyphiidae. Cyananthea is closely related to several monotypic genera described recently from hydrothermal vents, especially to Pacmanactis and Marianactis which were assigned to the Actinostolidae by their authors. In our opinion these genera should be removed from the Actinostolidae and placed in the same family as Cyananthea. Three other recorded species belong to the Hormathiidae: Phelliactis hydrothermala sp.n., Phelliactis callicyclus and Paraphelliactis pabista.

KEY WORDS: Actiniaria, Anthozoa, Cnidaria, hydrothermal vents, cold seeps, deep-water fauna.

Глубоководные Actiniaria из восточно-тихоокеанских гидротермальных источников и холодных сипов

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РЕЗЮМЕ: Обсуждаются четыре вида актиний с восточно-тихоокеанских гидротерм и один вид с холодных сипов. Вид из холодных сипов, Seepactis galkini gen. nov., sp. nov., имеет аконтии и относится к семейству Kadosactiidae. Ранее экземпляры этого вида предварительно считали идентичными ультраабиссальному представителю семейства Actinostolidae Hadalanthus knudseni. Cyananthea hydrothermala, обитатель гидротермальных гидротермальный вид и род, известный ранее только по одному поврежденному экземпляру, переописан нами и предварительно отнесен к семейству Actinoscyphiidae. Cyananthea близко родственна нескольким монотипическим родам, описанным в последние годы с гидротерм, особенно родам Pacmanactis и Marianactis, которые описывающими их авторами были отнесены к семейству Actinostolidae. По нашему мнению, эти рода следует удалить из актиностолид и поместить в одно семейство с
**Cyananthea.** Три других вида относятся к семейству Hoxthiidae: *Phelliactis hydrothermala* sp.n., *Phelliactis callicyclus* и *Paraphelliactis pabista.*

**КЛЮЧЕВЫЕ СЛОВА:** Actiniaria, Anthozoa, Cnidaria, гидротермальные источники, холодные сипы, глубоководная фауна.

**Introduction**

During the cruise 22 of RV "Keldish" in 1990, two research submersibles MIR-1 and MIR-2 discovered a cold seep site in the Monterey Canyon on the depth about 3040 m. This small, about 70 m², site was inhabited by large bivalves related to *Calyptogena* spp. known from many hydrothermal sites (Moskalov, 2002). These bivalves were subsequently described as *Ectenogaena extensa* Krylova et Moskalov, 1996, and in the present paper we describe the sea anemone *Seepactis galkini* gen. nov., sp.n. attached to the anterior end of some specimens of *E. extensa. This anemone possesses acontia and belongs to the Kadosactiidae, a family never reported before from cold seeps or hydrothermal vents.

During the same cruise and during cruise 49 of RV "Keldish" in 2003 the submersibles MIR-1 and MIR-2 explored several hydrothermal sites in the Eastern Pacific where, among other species, several sea anemones were collected. The present paper describes sea anemones collected in three hydrothermal sites: Guaymas Basin, East Pacific Rise (EPR) 21°N and EPR 9°N. These hydrothermal sites belong to east-southeast regional type characterized by the presence of vestimentifers *Riftia pachyptila,* polychaetes *Alvinella pomerjana,* and, in the cold vent zone, bivalves of the families Vesicomidae and Mytilidae. Inside this region the fauna of the Guaymas Basin differs significantly from the other sites and belongs to a different biogeographical province (Galkin, 2002). Guaymas Basin is characterized by extremely thick (more than 500 m) layer of sediments and very high hydrothermal buildings. Many small sea anemones were reported in the warm vent zone (shimmering water zone) on the terraces of the hydrothermal buildings (Galkin, 2002), but unfortunately these anemones are not present in the examined material. The present material from Guaymas hydrothermal site contains several specimens of the large sea anemones *Paraphelliactis pabista* Dunn, 1982, one of which was attached to a *Calyptogena* shell, and a specimen of *Phelliactis callicyclus* Riemann-Zümeck, 1973. The material collected on EPR 21°N includes *Phelliactis hydrothermala* sp.n., a large species collected in the zone of the black and white smokers, *Cyananthea hydrothermala* Doumenc et Van-Praët, 1988, and numerous zooids of *Isozoanthus* sp. (order Zoantharia, Anthozoa, Cnidaria). Only *C. hydrothermala* is present in the material from EPR 9°N.

Cnidae terminology follows England (1991) although we do not distinguish between amastigophores and p-mastigophores. Two types of spirocysts with the following definition are distinguished (modified from Fautin and Barber, 1999: 627):

Robust spirocysts (often called also 'Hormathiid' spirocysts): spirocysts with tubules wound in an untidy fashion and lacked space between the tubule and the capsule's posterior end. They are, in average, wider, but not necessary longer that the spirocysts of the other type.

Gracile spirocysts (the term used by Daly et al, 2004): spirocysts with neatly wound tubules and with the space between the tubule and the posterior end of the capsule. They are, in average, narrower than the robust spirocysts.

The specimens are deposited in Zoological Museum of Moscow State University (ZMMU) and Institute of Oceanology RAS, Moscow (IORAS).

**Station list**

**Fig. 1.**

*Monterey Canyon, cold seeps, RV "Keldish", cruise 22:*

St. 2350, 3028-3045 m, 36°36.6’ N, 122°30.4’ W-36°35.2’N,122°31.4’W,21-22 September 1990.
Fig. 1. Map showing locality of cold seep and hydrothermal vents and stations where the present material was collected.

St. 2355, 3040 m, 36°35.3' N, 122°30.5' W, 24 September 1990.

Guaymas Basin, hydrothermal vents, RV "Keldish", cruise 22 and 49:
St. 2360, 2033-2034 m, 26°59.53' N, 111°24.81' W, 27°01.03' N, 111°24.68' W, 09-10 October 1990.
St. 2362, 1950-2050 m, 27°00' N, 111°24' W, 11 October 1990.
St. 4714, 2000 m, 27°00' N, 111°24' W. Sample 5. At the foot of the hydrothermal building.

Eastern Pacific Rise (EPR), 21° N, hydrothermal vents, RV "Keldish", cruise 22:
St. 2369, 2640 m, 20°50.40' N, 109°05.73' W, 18-19 October 1990.
St. 4679, 2596 and 2602 m, 20°50' N, 109°05' W, 9 October 2003.
Eastern Pacific Rise (EPR), 9° N, Musselbed, hydrothermal vents, RV "Keldish", cruise 49:
St. 4623, 2524 m, 9°50.53' N, 104°17.52' W, 5 September 2003.
Description of species

Family Kadosactiidae

*Seepactis* Sanamyan et Sanamyan gen.n.

Type species: *Seepactis galkini* Sanamyan et Sanamyan sp.n.

**Definition.** Kadosactiidae with broad adherent pedal disc. Column divided in scapus and scapulus. Scapus with numerous papillae covered with cuticle. No cinclides. Sphincter mesogloea, strong. Longitudinal muscles of the tentacles and radial muscles of the oral disc ectodermal to meso-ectodermal. Mesenteries more numerous distally than proximally, hexamerously arranged, only first cycle perfect. Typically two siphonoglyphs and two pairs of directives. Retractors diffuse. All stronger mesenteries fertile. Typically two siphonoglyphs and two pairs of directives. Hexamerously arranged, only first cycle perfect. Typsenteries more numerous distally than proximally, the oral disc ectodermal to meso-ectodermal. Radial muscles of the tentacles principally ectodermal to meso-ectodermal. Radial muscles of the oral disc ectodermal. Most specimens have two siphonoglyphs supported by directives and hexamerously arranged mesenteries. One specimen (IORAS IV-9-Act-07-004) has four siphonoglyphs, four pairs of directives and irregularly arranged mesenteries. Typically only four cycles of mesenteries and occasionally several very small mesenteries of the fifth cycle are present in the middle region of the body. The mesenteries of the fifth cycle are better developed and more numerous in the most distal part of the body and the number of mesenteries is greater distally than proximally: the specimen with about 120 tentacles has about 95 mesenteries in the middle part of the body. Only the

set close to each other. Its surface is clear, without attached particles of sand or mud which are occasionally present on the scapus between the tentacles. No traces of cuticle detected between the tubercles on preserved specimens. The scapus is smooth, without distinct scapular ridges. The tentacles are long and cylindrical, without mesogloeaal swellings at the base, usually hidden by upper part of column, occasionally not completely withdrawn, the inner are longer than the outer ones. They are capable to invaginate into the body through their own bases. Such invaginated tentacles with their ectoderm turned inside are found between the mesenteries in some specimens. About 120 tentacles were counted in a 12 mm (diameter) specimen (IORAS IV-9-Act-07-004); in other specimens the number of tentacles is obscured by strong contraction and cannot be assessed without strong mutilation of the material (especially if some tentacles are invaginated into the body).

**Internal structure.** Pale beige ectoderm is retained on the column of almost all specimens, it is much thinner on mesogloeaal tubercles than on the rest of the column. The ectoderm of the tentacles and especially of the oral disc is darker, sometimes dark brown. The mesogloea of the body is firm, up to 2 mm thick in the middle part of the column, about the same thickness in scapus and scapulus, but much thinner near the limbus and on the pedal disc.

The mesogloeaal sphincter is strong, alveolar, with clear limits, situated close to the endoderm. It extends over the whole scapus (where it occupies a half of the width of the mesogloea and almost reaches the bases of tentacles), diminishes proximally and ends abruptly in the upper part of the scapus. In one specimen (ZMMU Ec-105) the sphincter was strong and well developed in a half of the body, and represented only by a weak concentration of muscle meshes near the endoderm in another half (Fig. 2D, E). In this specimen the tentacles were also unequally developed being longer and more numerous where the sphincter was well developed but strongly reduced in size and number where the sphincter was weak. Longitudinal muscles of the tentacles principally ectodermal to meso-ectodermal. Radial muscles of the oral disc ectodermal. Most specimens have two siphonoglyphs supported by directives and hexamerously arranged mesenteries. One specimen (IORAS IV-9-Act-07-004) has four siphonoglyphs, four pairs of directives and irregularly arranged mesenteries. Typically only four cycles of mesenteries and occasionally several very small mesenteries of the fifth cycle are present in the middle region of the body. The mesenteries of the fifth cycle are better developed and more numerous in the most distal part of the body and the number of mesenteries is greater distally than proximally: the specimen with about 120 tentacles has about 95 mesenteries in the middle part of the body. Only the

**Material examined.** Holotype: Monterey Canyon, st. 2350, 3028-3045 m, (ZMMU Ec-105). Paratypes: Monterey Canyon, st. 2350, 3028-3045 m, three specimens; st. 2355, 3040 m, three specimens. Other specimens: Monterey Canyon, st. 2355, 3040 m, two specimens.

**Description. External structure.** Preserved contracted specimens are hemispherical or with flattened bodies, not large, 12-32 mm diameter and 3—12 mm high (the holotype is 32x10 mm). Flat, wide and strongly adhesive pedal disc produces a thin sheet of yellow easily deciduous cuticle. The column is divided into scapus and scapulus. The scapus is provided with small, 0.5-1.5 mm diameter, flattened, hemispherical or occasionally elongated irregularly distributed mesogloeaal tubercles. Each tubercle is covered with a thin cuticle often forming characteristic concentrically wrinkled caps (Fig. 2B). The cuticle is slightly darker than the ectoderm of column and stratified although the strata are few and
Fig. 2. *Seepactus galkini* sp.n.
A — external appearance; B — columnar tubercles; C — cross section of column showing mesenteries of first-fourth cycles and one very small pair of fifth cycle (arrow); D, E—cross sections of the marginal sphincter (unequally developed on opposite sides of the same specimen); F — detail of the marginal sphincter (A, B — paratype IORAS IV-9-Act-07-004; C-F — holotype ZMMU Ec-105).

Рис.2. *Seepactus galkini* sp.n.
А — внешний вид; В — колумнарные туберкулы; С — срез колумны, показывающий мезентерии первого-четвертого циклов и одну маленькую пару пятыго цикла (стрелка); D, E — срез маргинального сфинктера (неодинаково развит с двух сторон одного и того же экземпляра); F — деталь маргинального сфинктера. (А, B — паратип IORAS IV-9-Act-07-004; C-F — голотип ZMMU Ec-105).
mesenteries of the first cycle are perfect. Mesenteries of the first three cycles including the directives are fertile, those of the fourth and fifth cycle are sterile and lack filaments. The retractor muscles are well developed, diffuse, long, with numerous branched lamellae arising from the thick mesogloea of the mesentery. On transverse sections the retractors almost reach the column wall. Very weak parietobasilar muscles are discernible only on some stronger mesenteries. Basilar muscles are present.

Well developed acontia were found only in one specimen (ZMMU Ec-105), they are thick (0.2-0.3 mm diameter) and coiled, reddish, attached to the proximal parts of the mesenteries of the first, second and third cycles. In other specimens acontia are have disintegrated, the remaining tissue and mucus containing nematocysts characteristic for acontia can be found between the mesenteries near the base.

All dissected specimens had only male gonads with the spermatic vesicles up to 1 mm diameter.

Size and distribution of cnidae (letters in brackets refer to Fig. 3, all measurements in microns; N is the proportion of examined specimens that had a particular type of cnidae):

**Pedal disc**: basitrichs (a) — 18-25x2-3 (common), N = 5/5.

**Scapus**: basitrichs (a) — 16-23x2-3 (common), N = 5/5; p-mastigophores B (b) — 19-31x4-6 (common), N = 5/5.

**Scapulus**: basitrichs (a) — 17-23x2-3 (common), N = 3/3; p-mastigophores B (b) — 18-26x3.5-7 (common), N = 3/3.

**Tentacles**: gracile spirocysts (a) — 18-59x2.5-6.5 (common), N = 4/4; robust spirocysts (b) — 19-50x3.5-8 (numerous), N = 4/4; basitrichs (c) — 18-29x2-3 (common), N = 4/4; p-mastigophores B (d) — 19-38x4-6.5 (common), N = 4/4; heterotrichs (e) — 21-32x5-7.5 (rare), N = 4/4.

**Actinopharynx**: basitrichs (a) — 15-22x2-2.5 (common), N = 3/4; p-mastigophores B (b) — 27-34x3.5-6 (common), N = 4/4.

**Filaments**: basitrichs (a) — 13-19x2-2.5 (common), N = 4/4; p-mastigophores B (b) — 21-35x4-6 (common), N = 4/4.

**Acontia**: basitrichs (a) — 14-20x2-2.5 (common), N = 2/2; p-mastigophores B (b) — 41-53x5-6.5 (common), N = 2/2.

Nematocysts of acontia were measured in specimens ZMMU Ec-105 and IORAS IV-9-Act-07-006 (only a small piece of acontia has been found in the latter specimen). In four other specimens p-mastigophores B characteristic for acontia (38-52x5-6.5) have been found in the mucus and disintegrated tissue between the mesenteries.

**Habitat.** Cold seep site, attached to shells of bivalve *Ectenagena extenta*.

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*Fig. 3. Seepactis galkini sp.n., cnidom.*

*Рис. 3. Seepactis galkini sp.n., книдом.*
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Etymology. The species is named after the collector, Dr. S.V. Galkin.

Remarks. The present species has acontia with basitrichs and p-mastigophores and some other features characteristic for Sagartiidae and Kadosactiidae. It cannot be assigned to any genus of Sagartiidae of which only Choriactis may bear tubercles on the column and Phellia and Sagartiogonea possess tentaculi. Choriactis has three or two cycles of perfect mesenteries and Phellia has about two times fewer tentacles than mesenteries, strong restricted retractors on the oldest cycles and almost always irregularly distributed mesenteries. Spioecysts of Choriactis and Phellia are of usual gracile (not robust) type and their cnidom is typical for Sagartiidae with p-mastigophores A in the pharynx and filaments. Sagartiogonea is a heterogeneous genus the type species of which (S. robustus Carlgren, 1924) has considerably fewer tentacles than mesenteries and more than 12 pairs of perfect mesenteries. This genus currently contains more than 10 species and none is similar to S. galkini sp.n.

The cnidom of the present species is similar to the cnidom of Kadosactis, with p-mastigophores B in all epithelia, no p-mastigophores A and robust ("hormathiid") spiroecysts and the species is assigned to the family Kadosactidae as was created by Riemann-Zürneck (1991) who considered cnidom of Kadosactis rather archaic and inconsistent with its position within the family Sagartiidae. One of the most important features on which her decision was based is the absence of p-mastigophores A in Kadosactis, a feature characteristic for "early Mesomyaria", while Sagartiidae have p-mastigophores A in pharynx and filaments and are placed in the "late Mesomyaria" (Schmidt, 1974). The present species cannot be assigned to Kadosactis, which differs mainly in its extremely large p-mastigophores and also by two cycles of perfect mesenteries. The presence of the heterotrichs in S. galkini sp.n. also might constitute a valid generic difference. Although these nematocysts are not abundant and may be easily overlooked, their absence in Kadosactis appears to be real rather than apparent: heterotrichs were not overlooked, their absence in H. knudseni failed to find heterotrichs in available specimens of H. knudseni by Carlgren (1956) and cannot be assigned to this monotypic genus. Hadalanthus knudseni is an ultra-abyssal species known from only three specimens collected in the Kermadec Trench, SW Pacific. Carlgren (1956) failed to find acontia in this species and assigned it to the Actinostolidae. The cnidae of H. knudseni were reported by Carlgren (1956) and López-González et al. (2003, type revision). Although the latter authors noted that the condition of the type specimens of H. knudseni does not allow obtaining enough measurements of cnidae for statistic analysis, the differences in cnidae between H. knudseni and S. galkini are obvious. In particular, columnar p-mastigophores have not been reported in type specimens of H. knudseni (Carlgren, 1956, López-González et al., 2003). It is unlikely that they were overlooked since p-mastigophores are common in the present material and "common" to "very common" in the material identified as H. aff. knudseni by López-González et al. (2003: 230).

Tentacle basitrichs of H. knudseni are of two size ranges (one size range in S. galkini sp.n.) and large basitrichs (34-43x3.0 mm) are larger than those in any tissue of the present species. Hadalanthus knudseni apparently has sparse large and thick basitrichs in the
tentacles (48-53x5 mm) which are not present in the S. galkini sp.n. Further, according to Carlgren (1956) his species has the same number of mesenteries distally and proximally and the data he provided support this statement: a medium sized (more than 1.5 cm high) specimen of H. knudseni has three cycles of mesenteries (=48 mesenteries) and 48 tentacles, and a larger (3 cm) specimen has the incomplete cycle of the mesenteries of the fourth order and, correspondingly, about 70 tentacles. In S. galkini sp.n. the mesenteries are more numerous distally than proximally and the total number of mesenteries (four and an incomplete fifth cycle) and tentacles (120 in 12 mm specimen) is significantly higher than in H. knudseni.

**Seepactis galkini** sp.n. is known only from cold seeps of the Eastern Pacific: Monterey Canyon (3028-3045 m) and Middle American Trench off Manzanillo, Mexico (3354-3795 m). All known specimens were attached to bivalves of the family Venericoidae (Calyptogena sp. and Ectenagena extensa).

**Family Hormathiidae**

**Paraphelliactis** Carlgren, 1928

Three species were assigned to this genus: *P. spinosa* Carlgren, 1928, *P. michaelsarsi* Carlgren, 1934, and *P. pabista* Dunn, 1982. Carlgren (1942) used two features to distinguish *Paraphelliactis* from *Phelliactis*: a different arrangement of the radial muscles of the oral disc, and a development of probably more mesenteries at the margin than at the limbus. Riemann-Zürneck (1973) revised the genus *Phelliactis* and synonymized *Paraphelliactis* with *Phelliactis* based on the fact that the appearance of the radial muscles is a variable feature that cannot be used to separate the genera. She, however, never discussed the second, more reliable feature, a relation of the number of the tentacles (and hence the number of the mesenteries at the margin) to the number of the mesenteries at the limbus. According to Carlgren (1942) the type species of *Phelliactis* (*P. hertwigi* Simon, 1892) always has fewer tentacles than the mesenteries at the base (148 tentacles and 166 mesenteries counted in one specimen). The same arrangement is characteristic for some other species of *Phelliactis*, e.g. *P. robusta* Carlgren, 1928 (Carlgren, 1942, Molodtsova et al, in preparation). In the type species of *Paraphelliactis* (*P. spinosa* Carlgren, 1928) Carlgren (1942) counted 168 tentacles but only 150 mesenteries proximally, so in this species the mesenteries probably grow from the disc downward. Riemann-Zürneck (1973) supposed that *Paraphelliactis spinosa* may be conspecific with *Phelliactis robusta*. However, they have a different appearance (e.g. characteristic large and smooth tubercles in *P. robusta* and acuminated tubercles in *P. spinosa*) and do not appear to be identical. The taxonomic position of the second species assigned to *Paraphelliactis*, *P. michaelsarsi*, is problematic. In a poorly preserved specimen Carlgren (1934) documented a significant difference in the number of mesenteries at the limbus (114) and margin (about 140), but a recently recorded specimen from the Mid-Atlantic ridge has almost the same number of mesenteries distally and proximally (156 mesenteries distally, 160 proximally) (Molodtsova et al, in preparation). This species has been redescribed by Riemann-Zürneck (1986), who, unfortunately, did not count the mesenteries in her specimens.

In *Paraphelliactis pabista* (see below) the mesenteries of the fifth cycle appear at the margin and grow downward, and 131 mesenteries, the mesenteries are significantly more numerous distally than proximally, e.g. 172 mesenteries at the margin and 98 near the limbus (specimen IORAS IV-9-Act-07-010) and therefore this species does not appear to be congeneric with *Phelliactis*. Thus, although the status of the genus *Paraphelliactis* remains unclear, in the present paper we follow Dunn (1982) in assigning this species to *Paraphelliactis*.

**Paraphelliactis pabista** Dunn, 1982

Figs. 4D, 5.

*Paraphelliactis pabista* Dunn, 1982: 51.

**Material examined.** Guaymas Basin: st. 2360, two specimens; st. 2362, one specimen; st. 4714, three specimens.

**Description.** According to the collector the living specimens have a circular oral disc up to 15 cm in diameter and short tentacles. All preserved specimens are very similar and have a characteristic cup shaped body (Fig. 4D) 54-71 mm high, 44-73 mm in the greatest diameter distally and 20-27 mm diameter near the base. The column is divided into a scapus and a short scapulus. Scapus covered with tubercles arranged into 24 regular longitudinal rows, they become smaller toward the base and disappear near the limbus. The most distal tubercles are larger, up to 5 mm in height and 10 mm in basal diameter, conical, with pointed, often turned up apexes. Scapulus is covered by dark cuticle which remains only in grooves and often on the sides of tubercles in preserved specimens. Scapulus is almost smooth. The tentacles are arranged in several cycles at very periphery of the oral disc, with aboral mesogloea thickenings at base. 105 and 141 tentacles counted in two specimens. The number of the tentacles is almost equal or slightly fewer than the number of the mesenteries at margin, but usually larger than mesenteries at base. The radial ectodermal muscles of the oral
Fig. 4. *Phelliactis callicyclus* Riemann-Zürneck, 1973 (A–C) and *Paraphelliactis pabista* Dunn, 1982 (D, E). A — *in situ* photo of the living specimen (Guaymas Basin); B — preserved specimen; C — transverse section of the oral disc, note that mesogloea is much thicker over endocoels (arrows); D — preserved specimen; E — transverse section of the oral disc, note the same thickness of the mesogloea is over endocoels and exocoels.

Рис. 4. *Phelliactis callicyclus* Riemann-Zürneck, 1973 (A–C) и *Paraphelliactis pabista* Dunn, 1982 (D, E). A—фотография живого экземпляра (бассейн Гуаймас); B—зафиксированный экземпляр; C — поперечный срез через оральный диск, мезоглее значительно толще над эндоцелями (стрелки); D — зафиксированный экземпляр; E — поперечный срез через оральный диск, мезоглее одинаковой толщины над эндоцелями и экзоцелями.
disc are equally developed and the thickness of the mesogloea is the same in parts corresponding to exocoels and endocoels (Fig. 4E). The mesogloea in the middle of column is about 5 mm thick. Mesenteries are arranged in five cycles, the fifth cycle is incomplete. Mesenteries of the fifth cycle are present only between the mesenteries of the third and fourth cycles. Mesenteries of the first-fourth orders are present along the whole length of the column in all specimens. Mesenteries of the fifth order appear at the margin and grow downward. The mesenteries may be slightly or significantly more numerous distally than proximally depending on the number and degree of development of the mesenteries of the fifth order. The largest difference is in a specimen IORAS IV-9-Act-07-010 (98 mesenteries at base, 128 in the middle of column and 172 near the margin). The difference is less evident in the specimens with few mesenteries of the fifth cycle, e.g. 96 mesenteries at base and 101 near the margin (IORAS IV-9-Act-07-007) or 96 at base and 110 at margin (IORAS IV-9-Act-07-008). Other anatomical characters are in good agreement with the original description.

Size and distribution of cnidae (letters in brackets refer to Fig. 5, all measurements in microns; N is the proportion of examined specimens that had a particular type of cnidae):

**Pedal disc:** basitrichs (a) — 11-15x1.5-2 (very rare), N = 3/3; basitrichs (b) — 22-31x2.5-3.5 (common), N = 3/3.

**Column:** basitrichs (a) — 8-15x1.5-2 (rare), N = 3/3; basitrichs (b) — 18-24x2.5-3.5 (common), N = 3/3; p-mastigophores B (c) — 23-34x3-4.5 (rare), N = 3/3.

**Tentacles:** gracile spirocysts (a) — 24—54x3-5.5 (numerous), N=3/3; robust pirocysts (b) — 22-63x3.5-10 (numerous), N = 3/3; basitrichs (c) — 13-22x1.5-2.5 (rare), N = 3/3; basitrichs (d) — 21-38x2.5-3 (common), N = 3/3.

**Pharynx:** basitrichs (a) — 17-22x2-2.5 (very rare), N = 2/3; basitrichs (b) — 28-46x3.5 (numerous), N = 3/3; p-mastigophores B (c) — 25-43x3-5 (common), N = 3/3.

**Filaments:** basitrichs (a) — 12-20x 1.5-2 (common), N = 3/3; basitrichs (b) — 23-34x2.5-3 (very rare), N = 3/3; p-mastigophores B (c) — 23-38x3-4.5 (numerous), N = 3/3.

**Acontia:** basitrichs (a) — 17-22x1.5-2 (common), N = 2/2; basitrichs (b) — 44-55x3.5 (very numerous), N = 2/2.

Bulbous nematocysts characteristic for medusae were detected on smears of filaments of some specimens (supporting the suggestion of Dunn (1982) that the species feeds on medusae).

**Habitat.** According to the collector of the present specimens this species is characteristic for "background" fauna of hydrothermal vents. The oral disc is bent to two catching lobes oriented toward the water current. The specimens occur 15-20 m from each other, often in shallow depressions and are
Remarks. *Paraphelliactis pabista*, known previously only from its original description, is based on numerous specimens recorded from Pacific coasts of Canada. The present specimens agree closely with the original description, although we found more types of cnidac in different tissues than reported by Dunn (1982). In particular, the acontia contain two types of basitrichs (as in most Hormathiidae) and p-mastigophores are present in filaments, pharynx and column (as in most species of *Phelliactis*, *Paraphelliactis* and related genera). The arrangement of the mesenteries, which are more numerous distally than proximally, is also in agreement with the previously described specimens. The statement of Dunn (1982) that the species has an equal number of mesenteries throughout the length of the animal, and at the same time the mesenteries are fewer than the tentacles cannot be correct. In this group of sea anemones only one tentacle arises from each endo- and exocoel, and the number of tentacles cannot be larger than the number of mesenteries at the oral disc. Thus, if the tentacles are more numerous than the mesenteries in the examined region of the body the specimen must have additional mesenteries distally.

*Phelliactis callicyclus* Riemann-Zürneck, 1973

Figs 4A–C, 6.

**Material examined.** Guaymas Basin, st. 4714, one specimen.

**Description.** The living specimen has a cylindrical column and a very wide oral disc bent into two lobes, dorsal and ventral (Fig. 4A). The preserved specimen is large, 186 mm high and 134 mm in greatest diameter distally. The column is more or less the same diameter throughout its length (73 mm) and its distal part significantly and abruptly expanded (Fig. 4B). The oral disc is folded into two unequal lobes. The column is divided into a scapus and a short (1–1.5 cm) scapulus. The scapulus is covered with relatively small crowded hemispherical tubercles which become smaller and flattened in the proximal half of the column and disappear near the limbus. In living specimen the cuticular covering of the scapulus appears to be darker between and paler on tubercles, in preserved specimen the cuticle remains only in grooves. Scapulus has numerous scapular ridges, each with one to three well marked tubercles along its length. The tentacles are arranged in several cycles at very periphery of the oral disc, about 186 in number, all with aboral mesogloea thickenings at base. The mesogloea and radial muscles of the oral disc unequally developed in parts corresponding to exocoels and endocoels; radial muscles are weaker and mesogloea is significantly thicker over the endocoels than over the exocoels (Fig. 4C) that desogloea of column is about 5 mm thick. Mesenteries are in five cycles, the fifth cycle is complete and the mesenteries of the fifth cycle are present along the whole length of column: 192 mesenteries were counted in the middle of column and 194 near the margin. Only mesenteries of first cycle (six pairs) are perfect. Mesenteries of the first and fifth cycle are sterile, other mesenteries fertile, with oocytes about 0.25 mm in diameter. Other anatomical characters are in good agreement with the original description.

Size and distribution of cnidae (letters in brackets refer to Fig. 6, all measurements in microns):

**Pedal disc:** basitrichs (a) — 11-18x1.5-2 (rare); basitrichs (b) — 25-41x3.5—4 (common); Column: basitrichs (a) — 11-15x1.5-2 (rare); basitrichs (b) — 20-29x3—4 (common); p-mastigophores B (c) — 31-43x4-5.5 (rare).

**Tentacles:** gracile spirocysts (a) — 23-62x3-7 (numerous); robust spirocysts (b) — 36-74x5-11 (numerous); basitrichs (c) — 17-23x1.5-2 (rare); basitrichs (d) — 33-52x2.5-3.5 (common).

**Filaments:** basitrichs (a) — 15-24x1.5-2 (common); basitrichs (b) — 45-64x3—4 (rare); p-mastigophores B (c) — 31-47x3.5-5 (common).

**Acontia:** basitrichs (a) — 17-27x2 (common); basitrichs (b) — 49—60x3.5—4 (very numerous).

Large basitrichs in the filaments are of the same length as large basitrichs in the acontia. Bulbous nematocysts characteristic for medusae were detected on some smears of filaments, so the species probably feeds on medusae.

**Remarks.** This species was known previously only from original description based on four specimens collected in the SW Atlantic at 800 and 1220 m. Although the assignment of the present Pacific specimen to a species described from the Atlantic is not obvious, we failed to find any reliable characters that could separate them. Pacific specimen (with small rounded tubercles, flattened and inconspicuous on the proximal half of the column) resembles the holotype of this species (Riemann-Zürneck, 1973, Fig. 14c). Internal structure is identical and size and distribution of cnidae agree very well. The main distinguishing characters of the present species are the presence of six pairs of perfect mesenteries and a complete fifth cycle of mesenteries. The only other species of this genus in which the fifth cycle of mesenteries is complete is *P. capricornis* Riemann-Zürneck, 1973, which differs in having additional
unpaired perfect mesenteries. Large basitrichs in acontia are also characteristic for *P. callicyclus*, they are larger than in most (although not all) other *Phelliactis* species.

**Phelliactis hydrothermala** Sanamyan et Sanamyan sp.n.

Figs 7, 8.

**Material examined.** EPR, 21°N, St. 2369, one specimen.

**Description.** *External structure.* Formalin preserved specimen is about 10 cm in height and greatest diameter, with wide pedal disc spread into thin membrane broader than the proximal portion of the column (Figs 7G, H). The column is divided into scapus and scapulus. The scapus is rough, covered with continuous layer of thin brownish cuticle and pyramidal tubercles arranged into about 30 not very regular longitudinal rows. The tubercles are larger in the distal portion of the scapus where they attain about 1 cm in height and diameter, and become smaller toward the base. The cuticle covering tubercles is darker and slightly thicker than on the rest of scapus, up to 0.05mm, and the cuticle often forms dark pointed tip on the summit of tubercle. The scapulus, 2 cm wide, is clearly demarcated from the scapus by the absence of cuticle and has numerous low longitudinal ridges, probably appearing as a result of contraction, otherwise its surface is smooth, without tubercles. The oral disc is folded in directive direction and mesenterial insertions are visible on its surface as shallow radial furrows. The tentacles, 144 in number, are not completely covered by the upper part of column in preserved specimen. They are long, up to 4 cm, almost cylindrical or slightly tapering to the top and arranged in several cycles at outer third of the oral disc. Basal mesogloeal thickenings are conspicuous on the aboral sides of all tentacles (Figs 7B, F), and thickened mesogloea occasionally continues from the tentacle base to about half of its length.

**Internal structure.** Mesogloea of the body homogeneous, firm and thick, up to 5 mm between the tentacles and up to 1 cm on the tubercles in the middle part of column, about the same thickness in scapus and scapulus. Ectoderm is very thin, about 0.05 mm thick, the thickness is the same on and between the tentacles. The mesogloial sphincter is not strong, alveolar, with clear limits, occupies almost whole breadth of the mesogloea in the distal...
Fig. 7. Phelliactis hydrothermala sp.n., holotype (ZMMU Ec-107).
A — columnar tubercles; B — tentacles with mesogloeval thickenings; C — cross section of column; D — marginal sphincter; E — transverse section of the oral disc; F — cross section of the tentacle showing mesogloveal thickening at base; G, H — external appearance.

Рис. 7. Phelliactis hydrothermala sp.n., голотип (ZMMU Ec-107).
А — колумнарные туберкулы; Б — щупальца с мезоглоевыми утолщениями; С — поперечный срез колумны; 
Д — маргинальный сфинктер; Е — поперечный срез через оральный диск; 
Ф — поперечный срез щупальца, показывающий мезоглоевое утолщение у основания; 
Г, Г — внешний вид.
part of the scapulus, diminishes proximally and continues to the distal part of the scapulus. Muscular alveoli on sections are spaced and arranged into several longitudinal bands (Fig. 7D). Longitudinal muscles of the tentacles and radial muscles of the oral disc are ectodermal and weak. The radial muscles of the oral disc are equally developed and the thickness of the mesogloea is the same in parts corresponding to exocoels and endocoels (Fig. 7E). Long actinopharynx almost reaches the bottom of the scapulus. Two siphonoglyphs supported by directives are of nearly the same thickness as the rest of actinopharynx, about 1 mm thick. Mesenteries are arranged hexamerously in five cycles, the last cycle incomplete: 6+6+12+24+32 pairs (160 mesenteries) are in the proximal half of column. If only one pair of the mesenteries of the fifth cycle is present in the exocoels of the third order, this pair more often is placed between the mesenteries of the third and fourth cycles. Only mesenteries of the first cycle are present in the exocoels of the third order, this pair more often is placed between the mesenteries of the third and fourth cycles. Only mesenteries of the first cycle (6 pairs) are perfect. Mesenteries of the first cycle are sterile; other mesenteries, except for the smallest ones, are fertile. Acontia well developed. Retractor muscles are weak, diffuse, extending along almost the whole length of the mesentery on transverse sections. Parietobasilar muscles poorly developed.

Size and distribution of cnidae (letters in brackets refer to Fig. 8, all measurements in microns; N is the proportion of examined specimens that had a particular type of cnidae):

- **Scapus**: basitrichs (a) — 10-16x1-2 (rare); basitrichs (b) — 17-26x2.5-3 (common); p-mastigophores B (c) — 31-41x3.5-4.5 (rare).
- **Scapulus**: basitrichs (a) — 14-18x1.5-2 (rare); basitrichs (b) — 25-35x3-3.5 (common).
- **Tentacles**: gracile spirocysts (a) — 32-65x4-6.5 (numerous); robust spirocysts (b) — 20-77x5-11 (numerous); basitrichs (c) — 15-21x1.5-2 (very rare); basitrichs (d) — 29-50x2.5-3.5 (common).
- **Actinopharynx**: basitrichs (a) — 20-22x2-2.5 (very rare); basitrichs (b) — 40-53x3.5-4.5 (common); p-mastigophores B (c) — 31-36x4-5 (rare).
- **Filaments**: basitrichs (a) — 19-22x2-2.5 (common); p-mastigophores B (c) — 33-37x3.5 (common).
- **Acontia**: basitrichs (a) — 22-28x2-2.5 (common); basitrichs (b) — 45-60x3-3.5 (very numerous).

**Habitat.** According to the collector this species occurs in the zone of black and white smokers and is characteristic for “background” fauna of hydrothermal vents. The specimen was attached to a piece of fresh black lava.

**Remarks.** The species is characterized by its pyramidal columnar tubercles arranged in longitudinal rows, presence of only six pairs of perfect mesen-
teries, incomplete fifth cycle of mesenteries, and strong mesogloeval thickenings on the aboral sides of the tentacles. As in most Phelliactis species the mesenteries are somewhat more numerous proximally than distally. Internally the present species resembles P. robusta and P. somaliensis Carlsgren, 1928. Phelliactis somaliensis is known only from its original description based on several specimens from the Indian Ocean. It is much smaller than P. hydrothermala sp.n. and has much smaller nematoctys in acontia. Phelliactis robusta is known from several records in Atlantic where appears to be rather common. Externally it differs quite markedly from P. hydrothermala sp.n., the tubercles are typically smooth, large, crowded, and not arranged in rows, and mesogloeval thickenings at tentacle bases are usually not large. Phelliactis callicyclus also has only six pairs of perfect mesenteries, but fifth cycle of mesenteries is complete, tubercles are relatively small, crowded and hemispherical, not acuminated, and an external appearance is entirely different. Other known species of Phelliactis do not appear to be similar, they either have additional perfect mesenteries (nine species belonging to a group of P. hertwigii, see Riemann-Zürneck, 1973), or 12 pairs of perfect mesenteries (P. gigantea (Carlsgren, 1941), P. lophohelia Riemann-Zürneck, 1973, P. americana Widersten, 1976).

In its acuminated tubercles and six pairs of perfect mesenteries P. hydrothermala sp.n. resemble Paraphelliactis spinosa which, unlike the present species, has more mesenteries distally than proximally, tubercles are not in rows and nematoctys in acontia are significantly smaller than in P. hydrothermala sp.n.

In general shape of the body with thin, widely expanded pedal disc and in the shape and distribution of the pyramidal tubercles the present species is very similar to Hormathia spinosa (Hertwig, 1882) (see Hertwig, 1882, Plate 1, Fig. 3, and Rodriguez, Lopez-Gonzales, 2001, Fig. 6C.D. [type revision]). Anatomy of H. spinosa has been carefully described by Hertwig (1882) who found only four cycles of mesenteries and 96 tentacles without mesogloeval thickenings. Both features are characteristic for Hormathia and not for Phelliactis and an assignment of Hertwig's species to Hormathia appears to be correct.

Family Actinoscyphiidae

Cyananthea Droumec et Van-Praët, 1988

Definition. Actinoscyphiidae (?) with broad adherent pedal disc. Column smooth, without clear division in scapus and scapulus. Cinclides present at least in stronger endocoels. Sphincter mesogloeval, strong. Longitudinal muscles of the tentacles and radial muscles of the oral disc ectodermal to mesodermal. Mesenteries more numerous distally than proximally, hexameroausly arranged, two first cycles (12 pairs) perfect. Two siphonoglyphes and two pairs of directives. Retractors diffuse. All stronger mesenteries fertile. Acontia absent (?). Cnidom: robust and gracle spiroctys, heterotrichs, bastrichs and p-mastigophores B. No p-mastigophores A.

Cyananthea hydrothermala Droumec et Van-Praët, 1988

Figs 9, 10.


Material examined. EPR, 9°N, st. 4623, two specimens, one on a piece of black volcanic glass (obsidian) (IORAS IV-9-Act-07-013 and 014). EPR, 21 °N, st. 4679, one specimen on a stone collected 1.5 m from the top of the hydrothermal building (IORAS IV-9-Act-07-015).

Description. External structure. The specimen from EPR, 21 °N is strongly damaged; two specimens from EPR, 9°N are in good condition. The larger specimen (IORAS IV-9-Act-07-013) 25 mm high and 30 mm in the greatest diameter has cylindrical body slightly compressed in directive plane. Tentacles are completely covered by upper part of column (Fig. 10A). The column of another specimen (IORAS IV-9-Act-07-014) (19 mm high and 20 mm in greatest diameter) is much broader distally than proximally and the tentacles are exposed (Fig. 10B). Distal part of the column is marked by a marginal circumferential ridge. The column of the preserved specimens is finely wrinkled on proximal half and almost smooth on the upper portion, without any traces of cuticle. A ring of 12 cinclides is present in the upper portion of column some distance (up to 1 cm) down from the margin, exactly at the proximal end of the marginal sphincter (Fig. 10C). Each cinclis is associated with primary or secondary endocoel, and appear externally as rather unclear perforated tubercle or papilla situated in a shallow depression of mesogloea (Fig. 10D). Cinclides are difficult to observe, although those associated with the directives are better visible, with the tubercle about 1 mm diameter and a perforation up to 0.1 mm diameter. Although the column is not separated into distinct regions, its part above the ring of cinclides has slightly thicker mesogloea and somewhat different texture from that of the proximal portion, suggesting the scapus and scapulus may present. Tentacles are long, cylindrical or slightly tapering, the outer much shorter than the inner, numerous, more than 110 are visible externally in a less contacted specimen.
**Cyananthea hydrothermala**

**Internal structure.** Ectoderm is thin, lost on some parts of column. Mesogloea is about 2 mm thick at the margin, narrowing to 1 mm just below the sphincter (on the level of the ring of cinclides), and up to 1.2 mm in the proximal portion of the column.

The main part of rather strong alveolar mesogloea sphincter occupies about half the width of the mesogloea and situated close to the endoderm. Longitudinal muscles of the tentacles and radial muscles of the oral disc are ectodermal. Long actinopharynx has clear longitudinal ridges of thickened mesogloea corresponding to insertion of perfect mesenteries and two deep thick-walled siphonoglyphs supported by directives. The ectoderm of the pharynx is dark brown, siphonoglyphs are whitish. Mesenteries are arranged hexamerously in five cycles, fifth cycle is incomplete and present only in distal part of the column. In one specimen (IORAS IV-9-Act-07-014) 94 mesenteries (6+6+12+23 pairs) were counted proximally and 142 mesenteries (6+6+12+24+23 pairs) distally of which one pair belongs to sixth cycle. Mesenteries of the first and the second order (12 pairs) are perfect. Only mesenteries of the first three cycles are fertile. Mesogloea of the mesenteries is thick, the retractor muscles are weak and diffuse, occupy most length of the mesentery on transverse section (Fig. 10D). Parietobasilar muscles hardly discernible. We failed to find acontia in any specimen.

Size and distribution of cnidae (letters in brackets refer to Fig. 9, all measurements in microns; N is the proportion of examined specimens that had a particular type of cnidae):

<table>
<thead>
<tr>
<th>Limbus</th>
<th>Column</th>
<th>Margin</th>
<th>Tentacle bases</th>
<th>Tentacle tips</th>
<th>Pharynx</th>
<th>Filament</th>
</tr>
</thead>
</table>

- **Limbus:** basitrichs (a) — 12-14x2 (very rare), N = 1/2; basitrichs (b) — 16-26x2-3 (common), N = 2/2.
- **Column:** basitrichs (a) — 19-25x2-3 (common), N = 2/2.
- **Margin:** basitrichs (a) — 18-27x2-3 (common), N = 3/3; p-mastigophores B (b) — 20-26x4-5.5 (very rare), N = 3/3.
- **Tentacle base:** gracile spirocysts (a) — 22-34x2.5-5.4 (common), N = 3/3; robust spirocysts (b) — 19-70x3.5-9 (numerous), N = 3/3; basitrichs (c) — 20-35x2-3.5 (common), N = 3/3; p-mastigophores B (d) — 22-38x3.5-6 (very numerous), N = 3/3.
- **Tentacle tips:** gracile spirocysts (a) — 24-76x3-6 (numerous), N = 2/2; robust spirocysts (b) — 21-60x4-8 (common), N = 2/2; basitrichs (c) — 22-41x2-3 (common), N = 2/2; heterotrichs (d) — 39-72x4-7 (common), N = 2/2.
- **Actinopharynx:** basitrichs (a) — 12-19x2-2.5 (rare), N = 3/3; basitrichs (b) — (21)27-37x2-3 (common), N = 3/3; p-mastigophores B (c) — 26-37x3.5-5 (numerous), N = 3/3; p-mastigophores B (d) — 26-36x2.5-5 (common), N = 2/3.
- **Filaments:** basitrichs (a) — 12-20x1.5-2.5 (rare), N = 3/3; basitrichs (b) — 26-35x2.5-3 (very rare), N = 3/3; p-mastigophores B (c) — 26-40x3.5-5 (numerous), N = 3/3; p-mastigophores B (d) — 25-37x4-5 (common), N = 2/3; heterotrichs (e) — 36-45x4-5.6 (common), N = 2/3.

P-mastigophores are extremely numerous on the bases of the tentacles, but are sparse distally. On exploded capsules of this type the thread is either absent or short, up to 60 microns. Spirocysts are also unequally distributed: robust spirocysts are signifi-
Fig. 10. *Cyananthea hydrothermala* Doumenc et Van-Praët, 1988.

A, B — external appearance; C — section of the marginal sphincter; D — cross section at upper portion of column on the level of the ring of cinclides; cin — cinclis; o.d. — oral disc. (A, C — specimen IORAS IV-9-Act-07-013; B, D — specimen IORAS IV-9-Act-07-014).

Fig. 10. *Cyananthea hydrothermala* Doumenc et Van-Praët, 1988.

A, B — внешний вид; C — срез маргинального сфинктера; D — поперечный срез колумна на уровне круга цинклид; cin — цинклид; o.d. — оральный диск. (A, C — экземпляр IORAS IV-9-Act-07-013; B, D — экземпляр IORAS IV-9-Act-07-014).
cantly more numerous proximally, while gracile spiro-

Remarks. The original description of *C. hydro-

thermala* is incomplete and based on a single strongly
damaged specimen but contains enough details
allowing identification of the present specimens
with this species. According to Doumenc and Van-
Praët (1988) *C. hydrothermala* is abundant on the
EPR 13°N, and is the only species occurring in the
warm (12-20°C) vent zone on the walls of hydro-

thermal strata. The present specimens were col-
lected on the hydrothermal sites of the same region
(EPR 9°N and 21 °N) and from the same environment
(vertical walls of the hydrothermal buildings).
The presence of two times more mesenteries distally than
proximally, a feature originally reported by Dou-
menc and Van-Praët (1988) is confirmed in the
present study. Diagnosis of this species published by
Desbruyères and Segonzac (1997: 28) does not cor-
respond to the original diagnosis given by Doumenc
and Van-Praët (1988) in some details. According to
the former authors "tentacles [are] attached to the
oral disc centre" (up to oral disc centre in original
diagnosis) and the marginal sphincter is on ectoder-
mic face (endodermic in original diagnosis).
Familial placement of Cyananthea. Doumenc
and Van-Praët (1988) failed to detect aconita in this
species in situ, on photographs, and in the examined
specimen and tentatively assigned it to Actinostol-
idae, although mentioned that the species has certain
(specified) characters of Acontiaria. We also failed
to detect any traces of aconita or masses of dis-

charged nematocysts usually found in deep-water
species in which acontia often disintegrate during
the process of sampling. However, the presence of
an outer tentacles, sometimes forming a solid
mass, is incomplete and based on a single strongly
damaged specimen but contains enough details
allowing identification of the present specimens
with this species. According to Doumenc and Van-
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idae, although mentioned that the species has certain
(specified) characters of Acontiaria. We also failed
to detect any traces of aconita or masses of dis-

charged nematocysts usually found in deep-water
species in which acontia often disintegrate during
the process of sampling. However, the presence of
no p-mastigophores A and, thus (if primary importance of cnidom fea-
tures claimed by Riemann-Zürneck (1978) is accept-
ed), cannot be placed to the Actinostolidae. Al-
though the cnidom of many species assigned to the
Actinostolidae is insufficiently known, in the present
paper we are inclined to agree with Riemann-Zür-
neck (1978) that the presence of p-mastigophores A
(often associated with the absence of robust spiro-
cysts in tentacles) is a significant feature of the
Actinostolidae: Riemann-Zürneck (1978) reported
the presence of these cnidae in *Actinostola, Paraci-
nostola* and *Stomphia*, and, in addition, we found
them in *Sicyonis, Antholoba, Ophiodiscus* and
*Paranthus*.

Relation of Cyananthea and other genera. Sev-
eral monotypic genera described recently from hy-

drothermal vents are closely related to *Cyananthea*. *Pa-
manactis hashimotoi* López-González et al., 2005 is especially similar in its cnidom and internal
morphology with 12 pairs of perfect mesenteries,
dists only in an equal number of mesenteries
distally and proximally (while *Cyananthea* has an
additional fifth cycle of mesenteries distally). "Tuber-

cle-like" structures in directive endocoels in

*P. hashimotoi* are similar to cinclides found in *C.

hydrothermala*. Similar cinclides, often on a short
tubercles or papillae, are characteristic for certain

genera possessing aconita, but not for the

Actinostolidae. In particular, several species of

*Amhianthus* (Hormathiidae) have one cinclis in
each directive endocoel similar to tubercles on the
photo reproduced by López-González et al. (2005,
Figs 3D-F). Cinclides were not reported for another
monotypic vent genus *Marianactis*. Nevertheless,
the cirrhm of *Marianactis bythios* Fautin et
Hessler, 1989 is almost identical with those of *C.

hydrothermala*. Actually there are only a few
minor differences, e.g. rare basitrichs in filaments
and pharynx observed in the present specimens not
found in *M. bythios*, tentacle basitrichs in *M.

bythios* are larger and heterotrichs not reported. The
most striking similarity is extremely numerous
mastigophores on the aboral basal portion of the
outer tentacles, sometimes forming a solid
layer in both species. Identified as p-mastigophores in Cyananthea and as amastigophores in Marianactis these cnidae are very similar and both belong to "p-rhabdoids B" sensu Schmidt (1972). The same cnidae are concentrated on the aboral sides of the outer tentacles in Pacmanactis supporting the hypothesis concerning a close relationship of three species. At our opinion Pacmanactis and Marianactis should be removed from the Actinostolidae and placed in the same family as Cyananthea.

Conclusion

Sea anemones known from hydrothermal vents include obligate hydrothermal taxons (known only from hydrothermal sites) and nonobligate taxons.

In the Atlantic only one obligate hydrothermal species has been documented: Maractis rimicarivora Fautin et Barber, 1999. This species is known from the hydrothermal vents of the Mid-Atlantic Ridge (MAR) where it is very abundant in some localities. It has been initially described from the TAG (Trans-Atlantic Geotraverse), and subsequently from the Snake Pit (Fautin, Barber, 1999; López-González et al., 2003). It is also present on the MAR 9°N, Logatchev (14°45.15′N) and Broken Spur (our unpublished data). Parasicyonis ingolfi Carlgren, 1942 is listed in a "List of sampled and/or observed species" of the Snake Pit hydrothermal site and a reproduced figure shows numerous specimens on the periphery of a hydrothermal building (Segonzac, 1992, Fig. 2). This species has been reported to be "very frequent at the periphery of active edifices" on Snake Pit (Desbruyères, Segonzac, 1997: 27). However, all subsequent authors, who had a chance to examine actual specimens, reported only M. rimicarivora on mid-Atlantic hydrothermal sites (including Snake Pit), where it is very common (Fautin, Barber, 1999; López-González et al., 2003; our unpublished data). There is no doubt, that a record of P. ingolfi on Snake Pit is based on a wrong identification of M. rimicarivora and this species should be excluded from the list of taxons known from hydrothermal vents.

In the Pacific obligate hydrothermal taxa include the following species: Cyananthea hydrothermala recorded on the walls of black smokers (warm vent zone) of several East Pacific hydrothermal sites (EPR 9°N, 13°N and 21°N). Marianactis bythios described from the vicinity of the hydrothermal vents in Mariana back-arc basin, Western Pacific, where it forms crowded settlements of many specimens. Paranthosactis denhartogi López-González et al., 2003 was recorded in Gyaumas Basin. The species was probably collected in a warm vent zone (3°-25°C) since underwater photographs show it with the vestimentiferas Riftia pachyptila. Pacmanactis hashimotoi was recorded in Manus Basin vents, south-western Pacific.

Nonobligate species from Pacific hydrothermal vents include Phelliactis pabista and P. callicyclus reported from the Guaymas Basin (present study). Phelliactis hydrothermala sp.n., is reported only from vents (EPR 21°), although according to the records made by collectors, it may be a nonobligate species.

Doumenc and Van-Praët (1988) reported several nonobligate species from EPR 13°, which were subsequently included into several lists of hydrothermal fauna (e.g. Desbruyères, Segonzac, 1997). The identification of the specimens, however, appears to be too dubious, or, sometimes wrong. In particular, a species reported by Doumenc and Van-Praët (1988) as Actinostola sp. (but the figure is captioned "Actinostola callosa") does not resemble Actinostola in any way. It has distinct longitudinal rows of tubercular columnar tentacles, a feature not characteristic for Actinostola. Actinostola callosa reported by Desbruyères and Segonzac (1997) from EPR 13° certainly is a Phelliactis species. The provided photograph of the living specimen (Desbruyères, Segonzac, 1997: 27) shows a species with longitudinal rows of tubercles on the column, rather long tentacles arranged in several cycles at the periphery of a wide oral disc, and distinct radial ridges running from the mouth to the bases of some tentacles. The latter feature is especially characteristic for Phelliactis. We agree with Arellano and Fautin (2001) who suggested that a specimen identified under the question as "Corallimorphaia" by Doumenc and Van-Praët (1988, Fig. 1) might be a species belonging to the Exocoelactidae.

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References


