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ORIGINAL ARTICLE

Some new Hydroidomedusa (Cnidaria) from the northern South China Sea

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Abstract The study reviews all medusa genera and species belonging to the families Bougainvilliidae, Eucodoniidae, Proboscidactylidae, Corymorphidae and Sugiuridae from the northern South China Sea. A new genus Xu, Guo & Wang, **gen. nov.** is erected under the family Sugiuridae, based on the monotype, *Monocanna ovale* (Mayer, 1900) **comb. nov.** from *Gastroblasta*. Four new species, *Nubiella terminaliknoba* Xu, Guo & Wang **sp. nov.**, *Paranubiella shenzhenensis* Xu, Huang & Wang, **sp. nov.**, *Eucodonium crassonemalis* Xu, Guo & Lin, **sp. nov.** and *Proboscidactyla trifurcata* Xu, Huang & Guo, **sp. nov.**, are described and illustrated here. The species *Euphysora knides* Huang, 1999 **stat. rev.** is revised to be a valid species. The keys to known genera of families Corymorphidae, Sugiuridae and species of genera *Paranubiella*, *Eucodonium*, *Proboscidactyla* are provided. All type specimens are deposited in the College of Ocean and Earth Sciences, Xiamen University.

Key words Hydroidomedusa, new genus, new species, status revivisco, new combination.

1 Introduction

The taxonomic research of medusa was well done in the northern part of the South China Sea, such as in the Hainan Island (Hsu, 1965), coast of the east Guangdong (Xu & Zhang, 1978), coastal waters of the northern South China Sea (Xu & Zhang, 1981, Du *et al.*, 2009), Daya Bay (Du *et al.*, 2010, 2013) and Beibu Gulf (Huang, 1987; Xu *et al.*, 2008; Du *et al.*, 2012).

The present publication revised the families Bougainvilliidae, Eucodoniidae, Proboscidactylidae, Corymorphidae and Sugiuridae, including a new genus, four new species, a new combination and a revised status. The keys to known genera of the families Corymorphidae, Sugiuridae and all medusae species of genera *Paranubiella*, *Eucodonium* and *Proboscidactyla* are provided.

2 Materials and methods

All samples were collected from the northern South China Sea. Most of them were collected from the Dapeng Bay of Shenzhen (22°33′–2°36′N, 114°18′–14°25′E) in August, 2018, others were collected from the Fangcheng Harbour (21°36′–2°20′N, 108°09′–08°36′E) in May, 2015. Based on specifications for oceanographic survey (General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China & Standardization Administration of the

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People's Republic of China, 2007), all planktonic samples were collected using a large-type zooplanktonic net (80 cm in diameter, 0.505 mm in mesh size) by vertical towing from the near bottom to the surface, but in Dapeng Bay at 3-hour intervals for 24 hours during August 26–27, 2018.

All zooplankton samples were preserved on the vessel in seawater with 5% neutralized formalin added. Samples were identified under a stereoscopic microcopy. All drawings were made from preserved specimens using an attached camera lucida. Microphotographs were taken using Leica M205C dissecting microscopy. Type specimens are deposited in the college of Ocean and Earth Sciences, Xiamen University.

3 Taxonomy

List of the new taxon in present work

Class Hydroidomedusa Claus, 1877 emend. Bouillon & Boero, 2000

Subclass Anthomedusae Haeckel, 1879
Order Filifera Kühn, 1913
Family Bougainvilliidae Lütken, 1850
Genus *Nubiella* Bouillon, 1980
Nubiella terminaliknoba Xu, Guo & Wang, **sp. nov.**
Genus *Paranubiella* Xu, Huang & Lin, 2018
Paranubiella shenzhenensis Xu, Huang & Wang, **sp. nov.**
Family Eucodoniidae Schuchert, 1996
Genus *Eucodonium* Hartlaub, 1907
Eucodonium crassonemalis Xu, Guo & Lin, **sp. nov.**
Family Proboscidactylidae Hand & Hendrickson, 1950
Genus *Proboscidactyla* Brandt, 1835
Proboscidactyla trifurcata Xu, Huang & Guo, **sp. nov.**
Order Capitata Kühn, 1913
Family Corymorphidae Allman, 1872
Genus *Euphysora* Maas, 1905
Euphysora knides Huang, 1999 **stat. rev.**
Subclass Leptomedusae Haeckel, 1866
Order Conica Broch, 1910
Family Sugiuridae Bouillon, 1984
Genus *Monocanna* Xu, Guo & Wang, **gen. nov.**
Monocanna ovale (Mayer, 1900) **comb. nov.**

Family Bougainvilliidae Lütken, 1850

Bougainvilliidae Bouillon *et al.*, 2006: 126–127; Schuchert, 2007: 196–197; Xu *et al.*, 2014: 200–201; Guo *et al.*, 2018: 99.
Synonyms see Calder, 1988: 12.

Diagnosis. The family is diagnosed by: medusa bell-shaped; mouth circular, with simple or dichotomously branched oral tentacles inserted distinctly above mouth rim, ending in cnidocyst clusters; four radial canals and circular canal; marginal tentacles solid, either solitary or in clusters, borne on 4, 8 or 16 tentacular bulbs; gonads on manubrium, either forming a continuous ring or in adradial, interradial or perradial position; adaxial ocelli absent or present.

Remarks. The taxonomic systems of this family see Bouillon *et al.* (2006), Schuchert (2007), Xu *et al.* (2014) and Guo *et al.* (2018).

The family Bougainvilliidae medusa included 9 genera: *Bougainvillia* Lesson, 1830, *Chiarella* Maas, 1897, *Koellikerina* Kramp, 1939, *Lizzella* Haeckel, 1879, *Nemopsis* L Agassiz, 1849, *Nubiella* Bouillon, 1980, *Paranubiella* Xu, Huang & Lin, 2018, *Silhouetta* Millard & Bouillon, 1973, *Thamnostoma* Haeckel, 1879 (Bouillon *et al.*, 2006; Guo *et al.*, 2018).

Genus *Nubiella* Bouillon, 1980

Nubiella Bouillon, 1980: 315; Bouillon *et al.*, 2006: 135; Schuchert, 2007: 238; Xu *et al.*, 2014: 232; Guo *et al.*, 2018: 101.
Type species: *Nubiella mitra* Bouillon, 1980.

Diagnosis. The genus can be recognized by following: medusa with simple and unbranched oral tentacles rising well above mouth rim and terminal slightly swollen with concentration of nematocysts; umbrella with 4 marginal bulbs, each with single tentacle; without ocelli.

Remarks. The genus *Nubiella* is similar to *Silhouetta* Millard & Bouillon, 1973 and *Paranubiella* Xu, Huang & Lin, 2018, but *Silhouetta* has 4 tentacular bulbs with ocelli, and *Paranubiella* has 4 marginal tentacular bulbs without tentacles.

So far, a total of 16 medusa species in the *Nubiella* are reported (Bouillon *et al.*, 2006; Xu *et al.*, 2014; Guo *et al.*, 2018).

***Nubiella terminaliknoba* Xu, Guo & Wang, sp. nov.** (Figs 1, 7–8)

Material examined. Holotype (AOB-HL331), one specimen collected from Fangcheng Harbour, northern of the South China Sea, FCFD003 (21°36′N, 108°23′E), depth 16.2 m, 7 May 2015, coll. Xuefeng Wang, Kun Lin and Shaosen Wu.

Diagnosis. The species is different from others by following: medusa with apical chamber; without gastric peduncle, with oral tube; with 4 unbranched oral tentacles inserted above mouth rim; 4 tentacular bulbs large, nearly spherical, with papillar-shaped endodermal process, extending up to radial canals, tentacles short and thin, ring cnidocysts along the whole tentacles, each terminating in a large, globular cnidocyst knob.

Description. Umbrella bell-shaped, 1.0 mm in height, 0.6 mm in width, jelly evenly thick, without apical projection; manubrium cylindrical, about half of height of bell cavity, no gastric peduncle, and with very short oral tube, with a distinct, papillary apical chamber; mouth simple, circular, with 4 unbranched capitate oral tentacles attached above mouth rim; gonads encircle manubrium; 4 narrow radial canals and circular canal present; 4 tentacular bulbs large, nearly spherical-shaped, each with one tentacle, tentacular bulbs without ocelli and with black endodermal papilla, extending up to radial canals, tentacle short and thin, ring cnidocysts along whole tentacle, each terminating in a large, globular cnidocyst knob; velum narrow.

Distribution. Fangcheng Harbour, northern of the South China Sea.

Etymology. The specific name is from the Latin *terminaliknoba*, meaning terminal-knob, refers to tentacles with a terminal knob of cnidocysts.

Remarks. This new species can be easily distinguished from the other species of *Nubiella* by medusa without apical projection; without gastric peduncle; gonads encircling manubrium; exumbrella without nematocyst pouches; manubrium without medusa buds (Xu *et al.*, 2009; Guo *et al.*, 2018); but similar to *N. papillaris* Xu, Huang & Guo, 2009 and *N. apapillaris* Xu, Huang & Guo, 2018 by having apical chamber, and similar to *N. tubularia* Xu, Huang & Guo, 2007 and *N. macrogastera* Xu, Huang & Lin, 2009 by having oral tube on manubrium. The new species differs from them by: 1) manubrium with apical chamber and oral tube; 2) with 4 unbranched oral tentacles; 3) 4 tentacular bulbs with papillar-shaped endodermal process, extending up to radial canals, tentacle short and thin, each terminating in a large, globular cnidocyst knob.

Key to the new species and similar species of genus *Nubiella*.

1. Umbrella without apical chamber; oral tube very long, about 1/2 of length of manubrium; with 8 unbranched oral tentacles..... ***N. tubularia* Xu, Huang & Guo, 2007**
   Umbrella with apical chamber 2
2. Manubrium without oral tube..... 3
   Manubrium with oral tube..... 4
3. With 8 unbranched oral tentacles; 4 tentacular bulbs with a dense mass of black endodermal process extending up to radial canals... ***N. papillaris* Xu, Huang & Guo, 2009**
   With 16 unbranched oral tentacles; 4 tentacular bulbs without endodermal process, nearly crescent-shaped..... ***N. apapillaris* Xu, Huang & Guo, 2018**
4. With 12 unbranched oral tentacles; manubrium long and large, elliptical-shaped, about 4/5 of height of bell cavity; tentacles long and thick, without terminal knob of cnidocysts ..... ***N. macrogastera* Xu, Huang & Lin, 2009**
   With 4 unbranched oral tentacles; manubrium short, cylindrical, about 1/2 of height of bell cavity; tentacles short and thin, with a terminal knob of cnidocysts ..... ***N. terminaliknoba* Xu, Guo & Wang, sp. nov.**

Genus *Paranubiella* Xu, Huang & Lin, 2018

Paranubiella Xu, Huang & Lin, 2018 *in* Guo *et al.*, 2018: 99–100.

Type species: *Paranubiella atentaculata* (Xu & Huang, 2004).

Diagnosis. The genus can be recognized by following: medusae mouth simple, circular, with simple unbranched oral tentacles rising well above mouth rim and terminal slightly swollen with concentration of cnidocysts; umbrella with 4 marginal bulbs, each without tentacle; gonads on manubrium, either forming a continuous ring or in interradial or perradial position.

Remarks. The genus *Paranubiella* was erected based on *Nubiella atentaculata* Xu & Huang, 2004 by having 4 marginal bulbs without single tentacle (Guo *et al*., 2018). The same structure is also found in other species from the northern South China Sea.

So far, the genus *Paranubiella* comprises three species: *P. atentaculata* (Xu & Huang, 2004), *P. nanhaiensis* Xu, Huang & Guo, 2018 and *P. shenzhenensis* Xu, Guo & Wang, **sp. nov.**

***Paranubiella shenzhenensis* Xu, Guo & Wang, sp. nov.** (Figs 2, 9)

Material examined. Holotype (AOB-HL311), one specimen collected from Dapeng Bay, northern of the South China Sea, station V_4 (22°35′N, 114°19′E), depth 13.5 m, 26 August 2018, coll. Zike Zhao, Guanjie Min and Shihao Deng.

Diagnosis. The species is different from others by following: medusa without apical projection; subumbrella cavity without apical interradial conical projection; manubrium very long, pyramidal with a broad, quadrat base; with 4 unbranched oral tentacles; gonads completely surrounding manubrium; 4 perradial marginal bulbs, near spherical, all of the same size and structure, without developed tentacles.

Description. Umbrella 1.2 mm in height, 1.0 mm in width, bell-shaped, jelly thicker at apex, but thinner toward bell margin, without apical projection; manubrium very long, pyramidal, with a broad, quadrat base, about 3/4 height of bell cavity; mouth simple, circular, with 4 simple, unbranched oral tentacles, inserted distinctly above mouth rim and armed with cnidocyst cluster; gonads completely surrounding manubrium; with 4 radial canals and circular canal; 4 perradial marginal bulbs, near spherical, all of same size and structure, without developed tentacles; without ocelli; velum moderately broad.

Distribution. Dapeng Bay of Shenzhen, northern of the South China Sea.

Etymology. The specific name is from its type locality, Shenzhen (northern of the South China Sea).

Remarks. This species is placed under the genus *Paranubiella* Xu, Huang & Lin, 2018 of Bougainvilliidae Lütken, 1850 by having simple unbranched oral tentacles, and 4 marginal bulbs without single tentacle.

Before this work, only two species were reported under the genus *Paranubiella* (Guo *et al.*, 2018). The new species can be easily distinguished from the other two by: 1) manubrium very long, pyramidal, with a broad, quadrat base, about 3/4 height of bell cavity; 2) gonads completely surrounding manubrium; 3) umbrella without apical projection.

Key to the known species of genus *Paranubiella*.

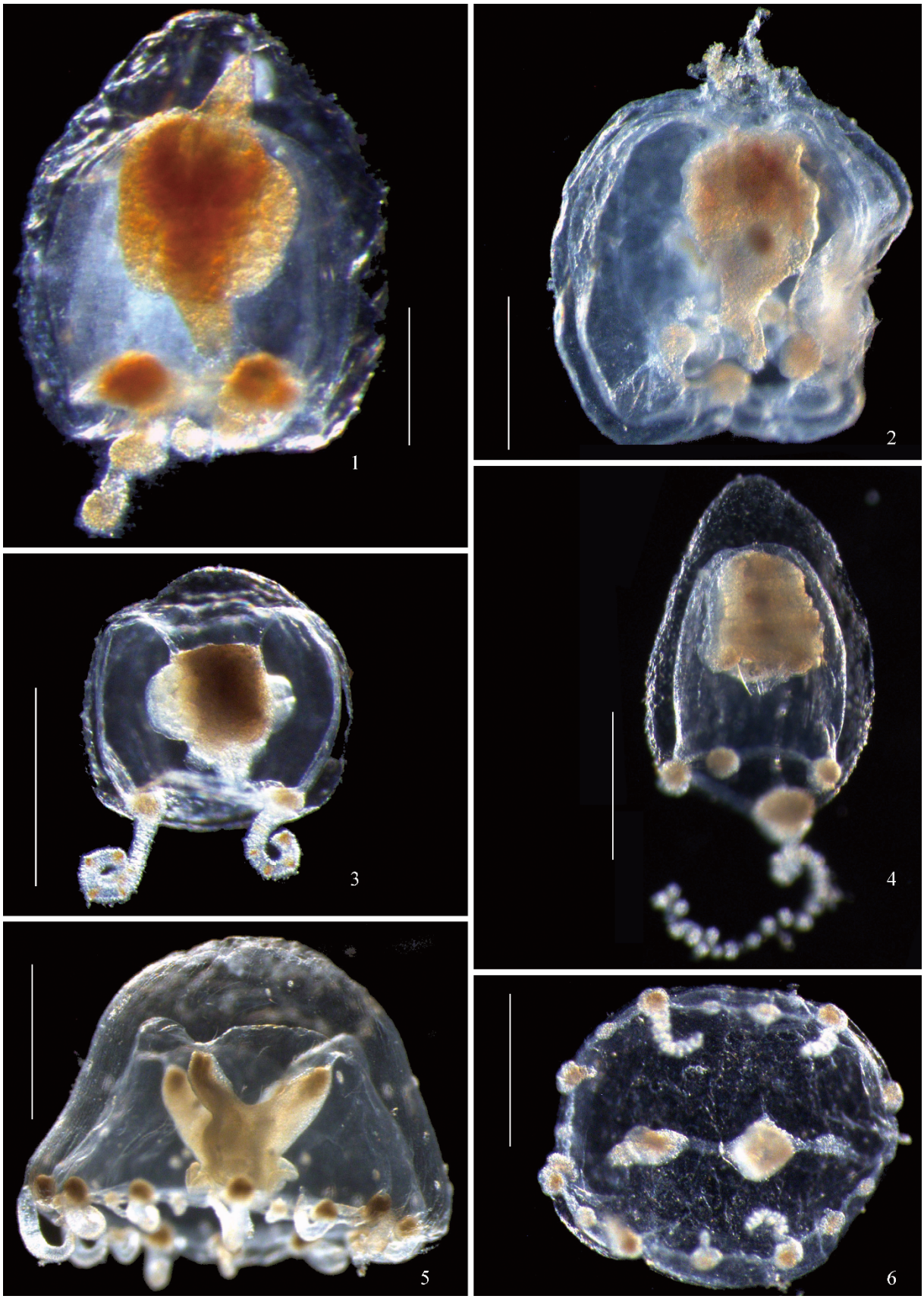
1. Four perradial marginal bulbs, differing in size and structure; with 12 unbranched oral tentacles; gonads on perradial region of manubrium ..... ***P. atentaculata* (Xu & Huang, 2004)**
   Four perradial marginal bulbs, all of same size and structure; with 4 unbranched oral tentacles 2
2. Bell with apical projection; manubrium very short, spherical, with 4 large, ovaliform gonads on interradial region of manubrium ..... ***P. nanhaiensis* Xu, Huang & Guo, 2018**
   Bell without apical projection; manubrium very long, pyramidal, with a broad, quadrat base; gonads completely surrounding manubrium ..... ***P. shenzhenensis* Xu, Guo & Wang, sp. nov.**

Family Eucodoniidae Schuchert, 1996

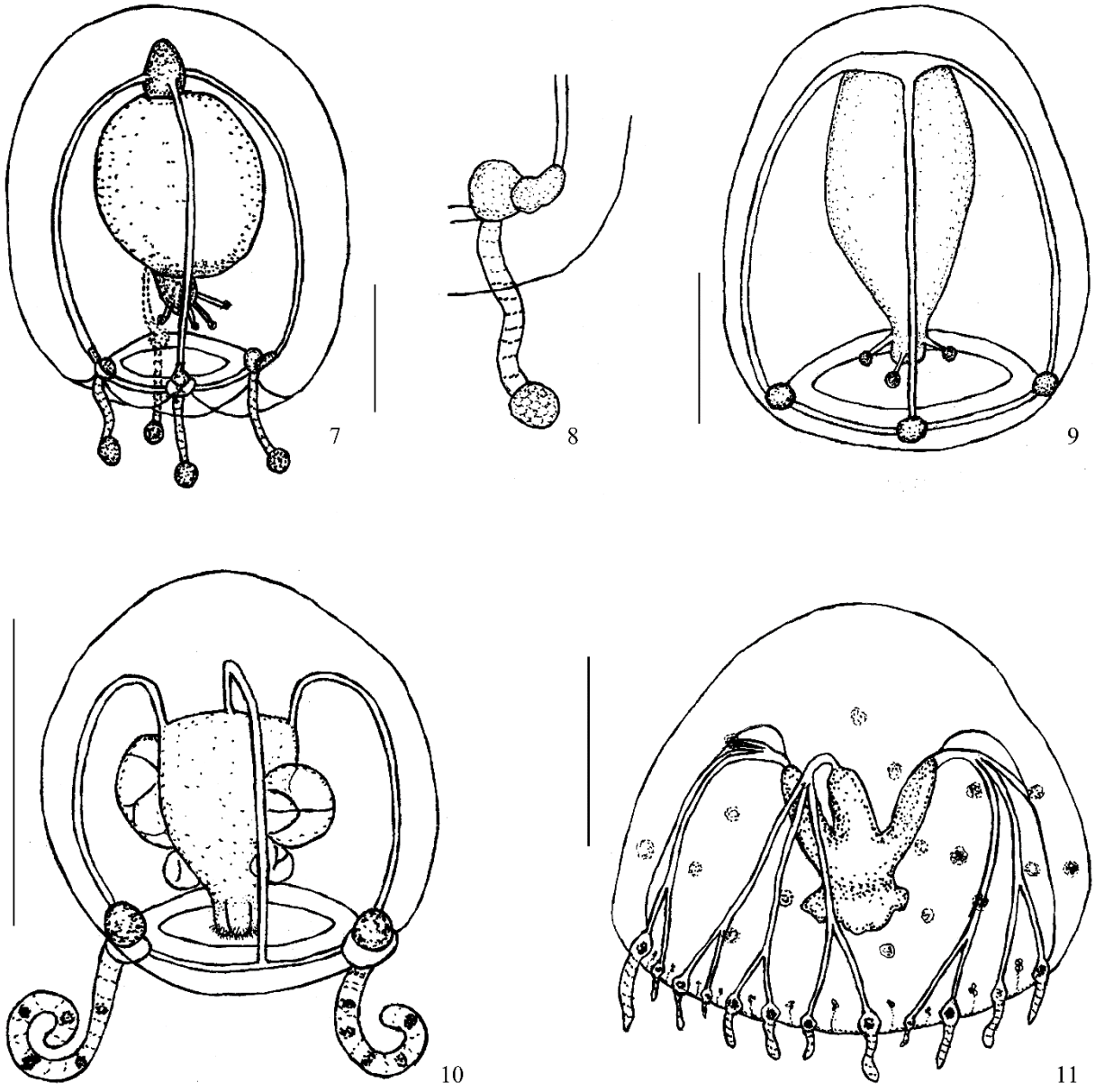
Eucodoniidae Schuchert, 1996: 88–89; Bouillon *et al.*, 2006: 147; Lin *et al.*, 2016: 49.

Diagnosis. The family is diagnosed by: medusae without apical projection; umbrella bell-shaped; no exumbrellar cnidocyst tracks; manubrium on conical gastric peduncle; mouth quadrangular, with 4 inconspicuous cnidocyst-armed lips; with 4 radial canals and circular canal; gonads completely surrounding manubrium; medusae budding from stomach; without mesenteries; 2 or 4 perradial marginal bulbs and 2 or 4 tentacles with or without terminal swelling; no ocelli.

Remarks. The family Eucodoniidae was erected by Schuchert (1996). Schuchert (1996) and Bouillon *et al.* (2006) provided a generic diagnosis for the monotypic family Eucodoniidae by having four tentacles and four marginal bulbs, based on *Eucodonium brownei* Hartlaub, 1907. Contrasting to *E. brownei*, Lin *et al.* (2016) reported another 3 new species of *Eucodonium* in the South China Sea by having only two tentacles, two marginal bulbs, and other two opposite rudimentary bulbs. Therefore, the diagnosis of the family was modified.



Figures 1–6. Hydroidomedusa spp. 1. *Nubiella terminaliknoba* Xu, Huang & Guo, **sp. nov.**, lateral view. 2. *Paranubiella shenzhenensis* Xu, Guo & Wang, **sp. nov.**, lateral view. 3. *Eucodonium crassonemalis* Xu, Guo & Lin, **sp. nov.**, lateral view. 4. *Proboscidactyla trifurcata* Xu, Huang & Guo, **sp. nov.**, lateral view. 5. *Euphysora knides* Huang, 1999, lateral view. 6. *Monocanna ovale* (Mayer, 1900) **comb. nov.**, oral view. Scale bars: 1 = 0.2 mm; 2–3, 5–6 = 0.5 mm; 4 = 1.0 mm.



Figures 7–11. Hydroidomedusa spp., line drawing. 7. *Nubiella terminaliknoba* Xu, Huang & Guo, **sp. nov.**, lateral view. 8. Ditto, enlargement of marginal tentacle. 9. *Paranubiella shenzhenensis* Xu, Guo & Wang, **sp. nov.**, lateral view. 10. *Eucodonium crassonemalis* Xu, Guo & Lin, **sp. nov.**, lateral view. 11. *Proboscidactyla trifurcata* Xu, Huang & Guo, **sp. nov.**, lateral view. Scale bars: 7 = 0.2 mm; 9–10 = 0.5 mm; 11 = 1.0 mm.

Genus *Eucodonium* Hartlaub, 1907

Eucodonium Hartlaub, 1907: 71; Mayer, 1910: 68; Schuchert, 1996: 89; Bouillon *et al.*, 2006: 147; Lin *et al.*, 2016: 49.
Type species: *Eucodonium brownei* Hartlaub, 1907.

Diagnosis. As in the diagnosis of the family.

Remarks. So far, the genus comprises 5 medusa species: *E. brownei* Hartlaub, 1907, *E. bitentaculatum* Xu, Huang & Guo, 2016, *E. brevistyle* Xu, Huang & Lin, 2016, *E. longitentaculatum* Xu, Huang & Wang, 2016 and *E. crassonemalis* Xu, Guo & Lin, **sp. nov.** (Schuchert, 1996; Lin *et al.*, 2016), of which only four species are reported in the East China Sea and the South China Sea. Another species, *E. arctica* Hand & Kan, 1961, original reported under the genus, was synonymized by *Plotocnide borealis* Wagner, 1885 by Arai & Brinckmann-Voss (1980).

***Eucodonium crassonemalis* Xu, Guo & Lin, sp. nov.** (Figs 3, 10)

Material examined. Holotype (AOB-HL312) and paratypes (AOB-HL313–321), ten specimens collected from Dapeng Bay, northern of the South China Sea, station V_4 (22°35′N, 114°19′E), depth 13.5 m, 26 August 2018, coll. Zike Zhao, Guanjie Min and Shihao Deng.

Diagnosis. The species is different from others by following: umbrella nearly spherical-like, slightly higher than wide, with a slight rounded apical projection, lateral wall thin; gastric peduncle short and broad, manubrium large on broad gastric peduncle; oral tube very short, manubrium cylindrical; mouth simple, quadrangular, covered with cnidocysts; medusa buds on interradial sides of manubrium; 4 narrow radial canals and circular canal present; 2 opposite perradial marginal tentacles, short and thick, with ring cnidocysts and 4–5 prominent brown spots at regular intervals; no terminal knob, marginal bulbs spherical-like, inside swelling, no red-brown pigment granules; two other opposite marginal bulbs no present; no ocelli; velum narrow.

Description. Medusa nearly spherical-like, up to 0.6–0.8 mm in height, 0.5–0.7 mm in width, with a slight rounded apical projection, lateral wall thin; gastric peduncle very short and broad, shorter than length of manubrium; manubrium large on broad gastric peduncle, oral tube very short, about 1/3 length of manubrium; manubrium cylindrical, about 1/2 as long as bell cavity; mouth simple, quadrangular, lips inconspicuous, covered cnidocysts; medusa buds on interradial sides of manubrium; 4 narrow radial canals and circular canal present; 2 opposite perradial marginal tentacles short and thick, extending to 1/3 height of umbrella, with ring cnidocysts and 4–5 prominent brown spots on tentacles at regular intervals, and no terminal knob; marginal bulbs spherical-like, inside swelling without red brown pigment granules, and two other opposite marginal bulbs no present; no ocelli; velum narrow.

Distribution. Dapeng Bay of Shenzhen, northern of the South China Sea.

Etymology. The specific name is from Latin *crassonemalis*, meaning crass-nema, referring to the morphology of the very thick tentacles.

Remarks. The new species can be distinguished from the other species of *Eucodonium* by: 1) two opposite perradial marginal tentacles, shorter than the bell height; 2) gastric peduncle short and broad, shorter than the length of manubrium; 3) oral tube in conspicuous. This new species is close to *E. brevistyle*, but differs from the latter by following: 1) two opposite perradial marginal tentacles short and thick, without terminal knob; 2) with 4–5 prominent brown spots in the tentacles at regular intervals.

Key to medusa of all known *Eucodonium* species.

1. Four perradial marginal bulbs and four tentacles present; tentacles with terminal swelling ..... ***E. brownei* Hartlaub, 1907**
   Two perradial marginal bulbs and two tentacles present; tentacles with or without terminal swelling 2
2. Two opposite perradial tentacles very long and thin, length up to 3 times bell height, with numerous prominent brown spots at irregular intervals..... ***E. longitentaculatum* Xu, Huang & Wang, 2016**
   Two opposite perradial tentacles shorter than bell height..... 3
3. Gastric peduncle broad conical, half as long as manubrium; oral tube long, about same length as that of manubrium ..... ***E. bitentaculatum* Xu, Huang & Guo, 2016**
   Gastric peduncle short and broad, shorter than length of manubrium 4
4. Two opposite perradial marginal tentacles short and thin, thread-like, with ring cnidocysts, but no brown spots, with a small terminal swelling..... ***E. brevistyle* Xu, Huang & Lin, 2016**
   Two opposite perradial marginal tentacles short and thick, with ring cnidocysts, but with 4–5 prominent brown spots at regular intervals, without terminal knob..... ***E. crassonemalis* Xu, Guo & Lin, sp. nov.**

Family Proboscidactylidae Hand & Hendrickson, 1950

Proboscidactylidae Hand & Hendrickson, 1950: 74; Bouillon *et al.*, 2006: 199; Schuchert, 2009: 456–457; Xu *et al.*, 2014: 334.
Willsiadae Forbes, 1848: 17, 19.

Diagnosis. The family is diagnosed by: medusa umbrella mostly hemispherical; with numerous exumbrellar cnidocyst clusters or bands alternating with tentacles; manubrium base with four, six or more radial gastric lobes, extending along proximal portions of radial canals, lobes in some species inconspicuous; radial canals branched, obliterated canals sometimes present; usually no circular canal but with a solid endodermal marginal strand; gonads surrounding manubrium and extending onto gastric lobes; tentacles hollow, with swollen hollow base connected to the lumen of radial canals.

Remarks. The family was original reported as Willsiadae Forbes, 1848 for *Willsia stellata* Forbes, 1946 (Forbes, 1846, 1848). In 1950, Hand & Hendrickson suggested that the family name should be changed to Proboscidactylidae because its type genus *Willsia* Forbes, 1846 was synonymized by *Proboscidactyla* (Uchida & Okuda, 1941). Then, the specific name

Proboscidactylidae was well used (*e.g.* Russell, 1953; Kramp, 1961).

The family current comprises a single genus, *Proboscidactyla* (Bouillon *et al.*, 2006; Schuchert, 2009).

Genus *Proboscidactyla* Brandt, 1835

Proboscidactyla Brandt, 1835: 228; Kramp, 1961: 233; Bouillon *et al.*, 2006: 199; Schuchert, 2009: 456; Xu *et al.*, 2014: 334.
Willsia Forbes, 1846: 268.
Type species: *Proboscidactyla flavicirrata* Brandt, 1835

Diagnosis. As for family.

***Proboscidactyla trifurcata* Xu, Huang & Guo, sp. nov.** (Figs 4, 11)

Material examined. Holotype (AOB-HL322) and Paratype (AOB-HL323–325), four specimens collected from the Dapeng Bay, northern of the South China Sea, station V_4 (22°35′N, 114°19′E), depth 13.5 m, 26 August 2018, coll. Zike Zhao, Guanjie Min and Shihao Deng.

Diagnosis. The species is different from others by following: Umbrella almost hemispherical, exumbrella with scattered cnidocyst clusters; manubrium quadrangular, short, with 4 radial gastric lobes; mouth with a sinuous margin; 4 primary radial canals, each branching 3 secondary radial canals, most secondary radial canals bifurcating, about 24 terminal branches and tentacles as many; gonads on the manubrium and lateral wall of manubrium lobes.

Description. Umbrella nearly hemispherical, 2.5–3.0 mm in width and 2.0–2.2 mm in height; jelly thick at apex, but thinner toward bell margin; exumbrella with scattered cnidocyst clusters; 4 primary radial canals, each branching two times, giving rise to additional branches bearing 24 terminal branches; 3 secondary radial canals arise from each primary one, secondary radial canals very long, each arise bifurcation after a short distance in tertiary canals, and finally almost all bifurcate canals joining solid endodermal marginal exumbrellar core; without ring canal; manubrium short, quadrangular, with large base, extending along to radial gastric lobes, generally with 4 gastric lobes in perradial position of manubrium; mouth with 4 lips often poorly marked, being masked by sinuous margin; gonads situated at base of manubrium wall, extending along lateral wall of radial gastric lobes, slightly onto proximal part of primary radial canals; marginal tentacles up to 24, each situated at end of a radial canal branch, hollow, rather short, stiff, each without adaxial cnidocyst cushion; one cnidocyst exumbrella cluster between each pair of tentacles.

Distribution. Dapeng Bay of Shenzhen, northern of the South China Sea.

Etymology. The specific name is from the Latin *trifucata*, meaning tri-furcate, referring to each primary radial canal branching 3 secondary radial canals.

Remarks. By marginal structure characters, the medusa is placed under the genus *Proboscidactyla*, Proboscidactylidae. The genus current comprises seven valid species, *i.e. P. abyssicola* Uchida, 1947, *P. circumsabella* Hand, 1954, *P. flavicirrata* Brandt, 1835, *P. menoni* Pagès, Bouillon & Gili, 1991, *P. mutabilis* (Browne, 1902), *P. ornata* (McCrady, 1859), *P. stellata* (Forbes, 1846), and five species in doubt: *P. brooki* (Mayer, 1910) and *P. furcata* (Haeckel, 1879) = *P. stellata* (Forbes, 1846), *P. occidentalis* (Fewkes, 1889) and *P. pacifica* (Maas, 1909) = *P. flavicirrata* Brandt, 1835, *P. conica* Menon, 1932 = *P. ornata* (McCrady, 1859) (Bouillon *et al.*, 2006).

The members of the genus *Proboscidactyla* can be distinguished by following characters: the number of radial canals, their branching and the position of the gonads as well as the present of medusa buds or not. The new medusa differs from other valid species by having 4 primary radial canals with terminal branches, with 4 radial gastric lobes, without medusa buds, gonads on manubrium wall and lateral wall of manubrium lobes. It is also similar to *P. menoni* Pagès, Bouillon & Gili, 1991 by having gonad at base of the manubrium wall, extending along lateral wall of gastric lobes, but differs from the latter by: 1) the new medusa has the manubrium with 4 radial gastric lobes, while *P. menoni* has the manubrium with 8 to 16 radial gastric lobes; 2) the new medusa has each primary radial canal branching 3 secondary radial canals, while *P. menoni* has each primary radial canal branching 2 secondary radial canals; 3) *P. trifurcata* Xu, Huang & Guo, **sp. nov.** has the gonads extending onto proximal part of primary radial canals, while *P. menoni* has the gonads extending to the secondary branches of radial canals; 4) the new medusa has 24 terminal branches and tentacles as many, without adaxial cnidocyst cushion, while *P. menoni* has 60 terminal branches and tentacles as many, each with an adaxial cnidocyst cushion.

Key to medusae of all known species in genus *Proboscidactyla*.

1. With 20 radial canals, some bifurcated; gonads extending along proximal half of all radial canals; no tentacles..... ***P. abyssicola* Uchida, 1947**
   With 4–8 primary radial canals 2

2. With more than 4 primary radial canals 3
   With 4 primary radial canals 4
3. Normally with 6 primary radial canals, up to 24 terminal branches and tentacles as many, with adaxial basal cnidocyst cushions ..... ***P. stellata* (Forbes, 1846)**
   Normally with 8 primary radial canals, 24–54 terminal branches and tentacles as many, without adaxial basal cnidocyst cushions .... ***P. mutabilis* (Browne, 1902)**
4. With medusa buds, arising from corners of manubrium base or forks of radial canals; radial canals with 16–20 terminal branches, and same number of tentacles ..... ***P. ornata* (McCrady, 1859)**
   Without medusa buds 5
5. Gonads restricted to manubrium wall 6
   Gonads at base of manubrium wall, extending along lateral wall of gastric lobes 7
6. Gonads extending slightly onto proximal part of radial canals; lips of manubrium with highly folded and hang; 4 primary radial canals, 54–70 or more terminal branches and same number of short tentacles ..... ***P. flavicirrata* Brandt, 1835**
   Gonads masses, each with a pair of swollen lobes on adradial side of manubrium wall; mouth lips fold, simple; 4 primary radial canals; 24–32 terminal branches and as many tentacles ..... ***P. circumsabella* Hand, 1954**
7. Manubrium with 8 to 16 radial gastric lobes; 4 primary radial canals, 60 terminal branches and tentacles as many, each with an adaxial cnidocyst cushion; gonads extending to secondary branches of radial canals ..... ***P. menoni* Pages, Bouillon & Gili, 1991**
   Manubrium with 4 radial gastric lobes; 4 primary radial canals, 24 terminal branches and tentacles as many, each without adaxial cnidocyst cushion; gonads extend slightly onto proximal part of primary radial canals ..... ***P. trifurcata* Xu, Huang & Guo, sp. nov.**

Family Corymorphidae Allman, 1872

Corymorphidae Bouillon *et al.*, 2006: 226–227; Schuchert, 2010: 377–378; Xu *et al.*, 2014: 366–367.

Diagnosis. The family is diagnosed by: medusa dome-shaped or with apical projection, no exumbrellar cnidocyst tracks, but sometimes long abaxial spurs of marginal bulbs; manubrium mostly not extending beyond umbrella margin, tubular to fusiform, mouth simple, circular; either only one fully developed marginal tentacles, or one fully developed tentacle and three shorter ones differing also in structure; four radial canals and four marginal bulbs present, ocelli lacking; gonad undivided surrounding all length of manubrium and exceptionally also in sac-like processes of manubrium (*Gotoea*).

Remarks. The taxonomic history and synonymies see Calder (1988), Petersen (1990), Pagès & Bouillon (1997), Brinckmann-Voss & Arai (1998), Bouillon *et al.* (2006), Schuchert (2010) and Xu *et al.* (2014).

The family comprises 10 medusa genera: *Corymorpha* M Sars, 1835, *Gosta* Huang, Xu & Lin, 2012, *Eugotoea* Margulis, 1989, *Euphysora* Maas, 1905, *Gotoea* Uchida, 1927, *Mayeri* Xu, Huang & Guo, 2012, *Octovannuccia* Xu, Huang & Lin, 2010, *Paraeuphysilla* Xu, Huang & Guo, 2011, *Paragotoea* Kramp, 1942 and *Yakovia* Margulis, 1989 (Bouillon *et al.*, 2006; Xu *et al.*, 2010, 2014; Wang *et al.*, 2011; Huang *et al.*, 2012), of which 8 genera are reported in China seas.

Key to the known genera (medusa) of family Corymorphidae.

1. With 8 radial canals *2*
   With 4 radial canals 3
2. With one developed marginal tentacle, ending in a large knob of cnidocyst, and three small marginal bulbs ..... ***Octovannuccia* Xu, Huang & Lin, 2010***
   With 4 equally developed tentacles with numerous adaxial transverse cnidocyst claps and 1 small terminal cluster ..... ***Paraeuphysilla* Xu, Huang & Guo, 2011***
3. With 1 fully developed marginal tentacle 4
   Usually with 3 short or rudimentary marginal tentacles and one long, full developed marginal tentacle, different in structure ..... ***Euphysora* Maas, 1905***
4. Exumbrella with longitudinal grooves or ridges and ribs 5
   Exumbrella with uniform surface 6
5. Exumbrella divided in 4 proximal leaf-shaped facets separated by 4 longitudinal large and deep grooves; umbrella without marginal bulb; one developed hollow marginal tentacle; without mesenteries ..... ***Eugotoea* Margulis, 1989**
   Exumbrella with 4 longitudinal ridges and ribs; umbrella with 3 marginal bulbs; with one well developed solid tentacle; with mesenteries ..... ***Costa* Huang, Xu & Lin, 2012***
6. Umbrella margin slightly oblique to vertical axis; one developed marginal tentacle, short and thick, ending in a large knob of cnidocysts and three small marginal bulbs ..... ***Mayer* Xu, Huang & Guo, 2012***
   Umbrella margin at right angle to vertical axis 7
7. Gonads on manubrium and on 4 sausages like interradial manubrium pouches ..... ***Gotoea* Uchida, 1927***
   Gonads simple; manubrium without interradial pouches 8

8. Fully developed marginal tentacle slender, long, moniliform; pointed apical process ..... ***Corymorpha* M. Sars, 1835***
   Fully developed marginal tentacle ending in single cnidocyst capitation or in cluster of cnidocyst capitation; no pointed apical process 9
9. Fully developed marginal tentacle with a terminal cnidocyst knob; with one tentacle and three non-tentacular bulbs..... ***Paragotoea* Kramp, 1942***
   Fully developed marginal tentacle with terminal ramifications ending in numerous cnidocyst cluster, with only one marginal bulb bearing tentacle ..... ***Yakovia* Margulis, 1989**

*Present in China Seas

Genus *Euphysora* Maas, 1905

Euphysora Maas, 1905: 6–7; Huang, 1999: 435–441; Xu & Huang, 2003: 136–144; Bouillon *et al.*, 2006: 230; Xu *et al.*, 2014: 369.
Type-species: *Euphysora bigelowi* Maas, 1905.

Diagnosis. The genus can be recognized by usually with 3 short or rudimentary tentacles and one long principal tentacle, which differs from others in both size and structure.

Remarks. The genus *Euphysora* Maas, 1905 has a complex taxonomic history and had been treated as the synonym of *Corymorpha* M Sars, 1835 (Hartlaub, 1907; Mayer, 1910; Brown, 1916; Uchida, 1927; Kramp, 1961; Sassaman & Rees, 1978; Petersen, 1990; Schuchert, 1996; Bouillon & Boero, 2000). In 2006, Bouillon *et al.* revalidated the genus *Euphysora* because following features differing from the genus *Corymorpha*: hydranth with numerous oral capitate tentacles in irregular whorls; aboral tentacles filiform; medusae with 3 short or rudimentary marginal tentacles, and one long principal tentacle with single row of adaxial cnidocyst knobs differs from both size and structure. We agree with Bouillon *et al.* (2006). However, the systematic position of genus *Euphysora* requires additional life cycle data of various species.

Only 25 valid species of *Euphysora* are reported (Huang, 1999; Bouillon & Boero, 2000; Xu & Huang, 2003, 2006; Bouillon *et al.*, 2006; Du *et al.*, 2012; Xu *et al.*, 2014), of which 19 species are reported in China seas.

***Euphysora knides* Huang, 1999 stat. rev.** (Figs5, 12)

Euphysora knides Huang, 1999: 437–438, fig. 2; Xu *et al.*, 2006:117; Guo *et al.*, 2008: 230; Tang & Gao, 2008: 307; Du *et al.*, 2010: 74; Xu *et al.*, 2012: 298, figs. 3, 39.
non. *Euphysora verrucosa* Bouillon, 1978: 265–266, fig. 11, pls. I, fig. 3; Bouillon *et al.*, 2006: 230.

Material examined. Holotype (AOB-HL111) and paratype (AOB-HL112) collected from the Minnan-Taiwan Bank in July 1988; two specimens (AOB-HL326–327) collected from Dapeng Bay, northern of the South China Sea, station V_4 (22°35′N, 114°19′E), depth 13.5 m, 26 August 2018, coll. Zike Zhao, Guanjie Min and Shihao Deng.

Diagnosis. The species is different from others by following: umbrella bell-shaped, with a slight rounded apical projection; exumbrella with scattered cnidocyst clusters and without wart process and red brown pigment; manubrium cylindrical, above manubrium a distinct elliptical apical chamber; gonads encircling almost the whole manubrium with irregular fold; principal tentacle very long, with 20–30 abaxial knobs of cnidocysts and no clearly large terminal knob.

Description. Umbrella bell-shaped, 1.1–1.5 mm in height, 0.6–0.8 mm in width, jelly thicker at apex, but thinner toward bell margin, with a slightly rounded apical projection; exumbrella with scattered cnidocyst clusters and without wart processes and red brown pigment; manubrium cylindrical, above manubrium a distinct, elliptical apical chamber, about 1/2 height of bell cavity; mouth simple circular; gonads encircling almost whole manubrium with irregular fold; principal tentacle very long, with 20–30 abaxial knobs of cnidocyst and no clearly large terminal knob; bulb of principal tentacle large, nearly spherical, three other marginal bulbs quite rudimentary, very small, all alike, papilla-like, without filiform tentacles; with 4 radial canals and ring canal; velum moderately broad.

Distribution. Minnan-Taiwan Bank of the southern Taiwan Strait; Datan Bay of Hong Kong (Huang, 1999); Dapeng Bay of Shenzhen and Beibu Gulf of the northern South China Sea (Guo *et al.*, 2008; Du *et al.*, 2012); Changjiang River Estuary of the East China Sea (Xu *et al.*, 2006).

Remarks. The species was erected by Huang (1999) from the southern Taiwan Strait. Base on the literature's description of *E. knides* and his own material of *E. verrucosa* Bouillon, 1978 from the Papua New Guinea, Bouillon *et al.* (2006) suggested these two species might be conspecific, and *E. knides* Huang, 1999 was regarded as a synonym of *E. verrucosa* Bouillon, 1978.

However, according to the examined specimens from the Dapeng Bay, northern of the South China Sea, the species differs from *E. verrucosa* (Fig. 13) by followings: 1) umbrella with apical projection, exumbrella covering dense cnidocysts, but without wart processes and brown pigment; 2) manubrium cylindrical, above manubrium with gastric chamber; 3) gonads encircling whole manubrium with irregular fold. As a result, *Euphysora knides* Huang, 1999 is treated as a valid species here.

Table 1. Comparison between *Euphysora knides* Huang, 1999 (Figs 5, 12) and *E. verrucosa* Bouillon, 1978 (Fig. 13).

Characters	*E. knides*	*E. verrucosa*
Size of umbrella	1.0–1.5 mm in height, 0.6–0.8 mm in width	2.5 mm in height, 1.9 mm in width
Apical projection	Present	None
Shape of exumbrella covering cnidocyst	Dense, without wart processes and brown pigment	Scattered, with wart processes and brown pigment
Apical chamber	Present	None
Shape of gonad	Fold	Without fold
Color of rudimentary tentacular bulbs	Without pigment	With pigment

Family Sugiuridae Bouillon, 1984

Sugiuridae Bouillon, 1984: 98–99; Xu, 1993: 200; Bouillon *et al.*, 2006: 398; Xu *et al.*, 2014: 689.

Diagnosis. The family is diagnosed by: umbrella more or less elliptical, hemispherical; with up to 6 manubria (exceptionally 9), generally with 2 or 4 radial canals per well-developed manubrium; in mature animals usually all joining circular canal but often incomplete and blind canals; no centripetal canals, all canals formed centrifugally from manubria; 2–6 ovoid gonads near manubria or near umbrella margin or in the middle of some canals; marginal tentacles numerous, numerous statocysts; asexual reproduction by fission.

Remarks. The family Sugiuridae was erected by Bouillon (1984) for the monotypic genus *Sugiura* based on *S. chengshanense* (Ling, 1937) by having up to 6 manubria and no centripetal canals. Previously, the species had been associated with the families Eucopidae, Campanulariidae and Campanulinidae (Ling, 1937; Kramp, 1961; Sugiura, 1973). Boero (1980) indicated that *Gastroblasta chengshanensis* Ling, 1937 should not be placed in genus *Gastroblasta* because of its medusa without centripetal canals and hydroid not belong to type Campanulariidae. So a new family Sugiuridae was established by Bouillon (1984) to accommodate *Sugiura chengshanense* (Ling, 1937).

In previous reports (Mayer, 1900; Kramp, 1961; Xu & Huang, 1983; Bouillon *et al.*, 2006; Guo *et al.*, 2008; Xu *et al.*, 2014), the species *Gastroblasta ovale* (Mayer, 1900) was reported under the genera *Gastroblasta* Keller, 1883, *Clytia* Lamouroux, 1812 or *Phialidium* Leuckart, 1856. Our reexamination shows that the medusae has 2–4 manubria and has centripetal canals absent, which are different from the type species of the genus *Gastroblasta*.

According to these features, *Gastroblasta ovale* (Mayer, 1900) is removed from the genus *Gastroblasta*, and a new genus *Monocanna* Xu, Guo & Wang, **gen. nov.**, is erected for *G. ovale* (Mayer, 1900). The diagnosis was adapted to fit the new scope of the family.

So far, the family Sugiuridae comprises two genera: *Sugiura* Bouillon, 1984 and *Monocana* Xu, Guo & Wang, **gen. nov.**

Key to medusa of all Sugiuridae genera.

1. With 2–4 manubria, all manubria along single straight radial canal..... ***Monocanna* Xu, Guo & Wang, gen. nov.**
   Up to 6 manubria present, not all manubria located along the same radial canal, but per manubrium with 3–5 radial canals..... ***Sugiura* Bouillon, 1984**

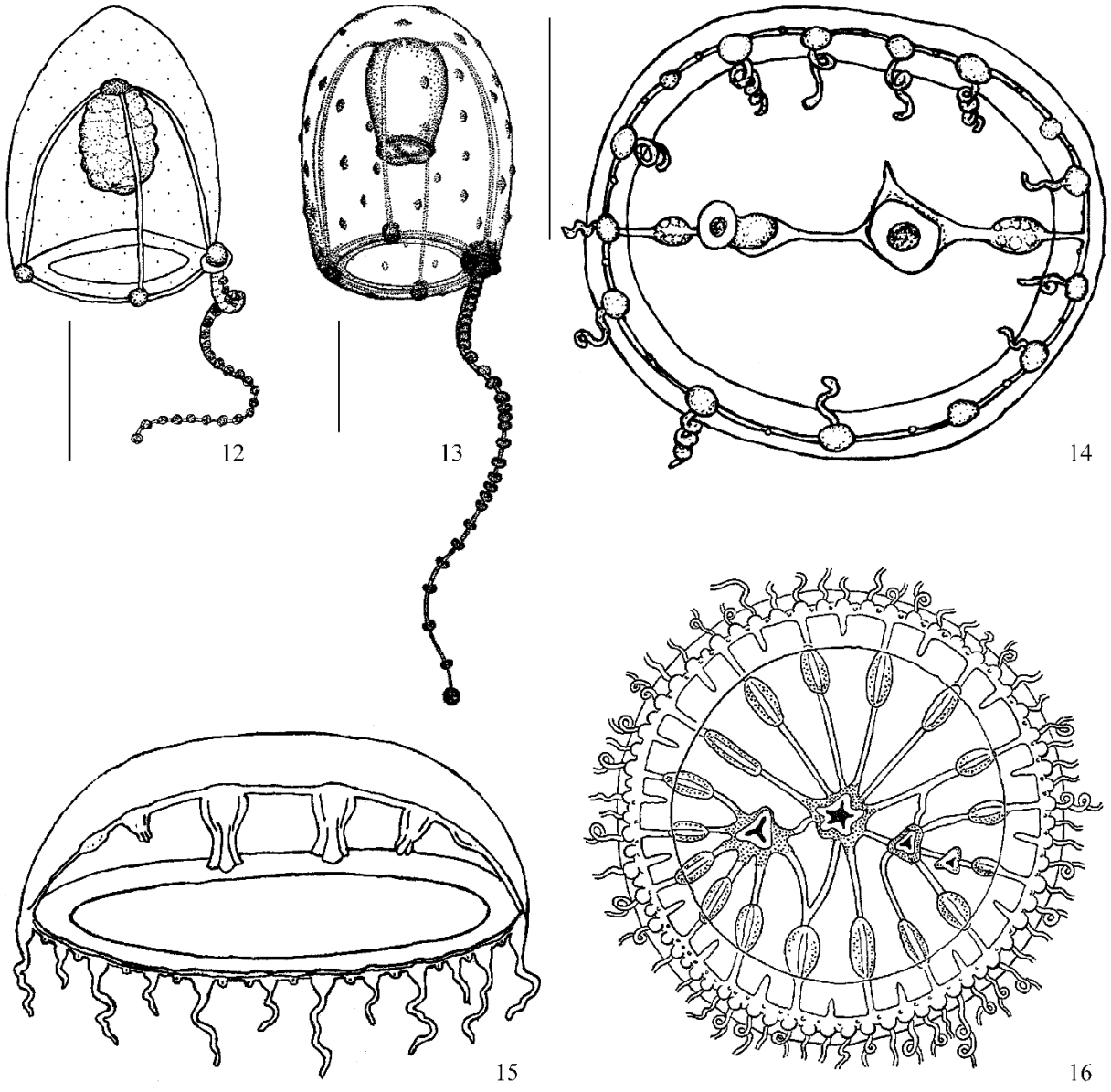
Genus *Monocanna* Xu, Guo & Wang, gen. nov.

Type-species: *Multioralis ovalis* Mayer, 1900 = *Gastroblasta ovale* (Mayer, 1900).

Diagnosis. The genus can be recognized by: medusa nearly spherical-like; with 2–4 manubria, all manubria along a straight radial canal, and along major axis of bell; no centripetal canals; all canals formed centrifugally from manubria; with 2–3 small, ovoid gonads on radial canals; with numerous marginal tentacles and statocysts.

Remarks. Although *Gastroblasta ovale* has the 2–4 manubria, similar to *G. timida* Keller, 1883, the type species of *Gastroblasta*, its structural features of radial canals and blindly canals are different from the latter, which has 1–4 manubria and 4–17 radial canals with 17 blindly ending centripetal canals (Fig. 16). As a contrast, *G. ovale* has 2–4 manubria and all manubria along a straight canal, and no centripetal canals (Figs 6, 14–15). Therefore, *G. ovale* is removed from the genus *Gastroblasta* and transferred to the new genus *Monocanna* Xu, Guo & Wang, **gen. nov.**

Etymology. The generic name is derived from the Latin *Monocanna*, meaning mono-canna, referring to the single straight radial canal.



Figures 12–16. Hydroidomedusa spp., line drawing. 12. *Euphysora knides* Huang, 1999, lateral view. 13. *Euphysora verrucosa* Bouillon, 1978, lateral review (after Bouillon, 1978). 14. *Monocanna ovale* (Mayer, 1900) **comb. nov.**, oral view. 15. Ditto, lateral view (after Mayer, 1910). 16. *Gastroblasta timida* Keller, 1885, oral view (after Mayer, 1900). Scale bars: 12, 14 = = 0.5 mm; 13 = 1.0 mm.

***Monocanna ovale* (Mayer, 1900) comb. nov.** (Figs 6, 14–15)

Multioralis ovalis Mayer, 1900: 54–55, pl. 30, figs. 129–130.
Gastroblasta ovalis: Mayer, 1910: 281, pl. 35, figs. 7–8.
Gastroblasta ovale: Bouillon *et al.*, 2006: 417; Xu *et al.*, 2012: 310, fig. 3. 48; Xu *et al.*, 2014: 717, fig. 616a–b.
Phialidium ovale: Kramp, 1961: 171; Xu & Huang, 1983: 101–102, pl. 1, figs. 1–2; Li & Chen, 1991: 90.
Clytia ovalis: Guo *et al.*, 2008: 231; Tang & Gao, 2008: 319.

Material examined. 3 specimens (AOB-HL328–330) collected from Dapeng Bay, northern of the South China Sea, station V_4 (22°35′N, 114°19′E), depth 13.5 m, 26 August 2018, coll. Zike Zhao, Guanjie Min and Shihao Deng.

Diagnosis. The species is different from others by following: umbrella elliptical in outline; a straight canal along major axis of bell; with 2 to 4 manubria along a straight canal; no centripetal canal; two small gonads near ends of canal; 12–25

short marginal tentacles; marginal statocysts slightly more numerous than tentacles, with one concretion.

Description. Umbrella 2.4–4.0 mm in width, flat, elliptical or hemispherical; with a slender circular canal, and a straight canal along major axis of bell; with 2–4 manubria, 2 equally developed large manubria on either side of center of subumbrella, upon straight canal, and 2 small manubria upon same canal centrifugally away from larger manubria; without centripetal canal; 2 small gonads upon near ends of canal; with 12 to 25 short, simple, coiled marginal tentacles with well-developed basal bulbs; statocysts slightly more numerous than tentacles, usually 1, but occasionally 2, being found between each successive pair of tentacles, each with one concretion; velum simple and quite broad.

Distribution. Haichang on the Jiulong River Estuary of Fujian (Xu & Huang, 1983); Dapeng Bay of Shenzhen and Beibu Gulf (Guo *et al.*, 2008) of the northern South China Sea; Nansha Island (Li & Chen, 1991) of the southern South China Sea; Tortugas, Florida on the east coast of North America (Mayer, 1900); Brazil (Kramp, 1961).

Remarks. This species was reported by Mayer (1900) as *Multioralis ovalis* from Tortugas, Florida, USA. Then, it was redescribed in detail (Mayer,1910), and transferred from the genus *Multioralis* to the genus *Gastroblasta* by having 2 or more radial canal and more than one manubrium. Kramp (1961) indicated that *ovale* could not be placed in the genus *Gastroblasta*, because its medusa had not centripetal canals and with numerous statocysts, and regarded it as an abnormal species of *Phialidium* (a junior synonym of *Clytia*). However, the change was not well accepted and the species was reported under *Gastroblasta*, *Phialidium* and by different scholars.

Although only 10 specimens were obtained from the Dapeng Bay, their good preservation provides enough morphological evidences to us. A redescription of *Monocanna ovale* (Mayer, 1900) **comb. nov.** is done here as the type species of the genus *Monocanna* Xu, Guo &Wang, **gen. nov.**

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