

A survey on Hydroidomedusae from the upwelling region of southern part of the Taiwan Strait of China

I. On new species and records of Anthomedusae

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Abstract

Through the examination of 377 samples of the Anthomedusae, eight new species and one new record are described.

Key words: Anthomedusae, taxonomy, Taiwan Strait

1 Introduction

This report of the Anthomedusae collected by research vessels *Yanping II* in the upwelling region from the southern part of the Taiwan Strait (21°40' ~ 23°51' N, 116°47' ~ 118°56' E) during July 2004 to July 2006. Through the analysis of 377 samples of the Anthomedusae, having eight new species i. e. , *Bougainwillia chenyapingii* n. sp. , *Nubiella paramitra* n. sp. , *N. tubularia* n. sp. , *Leuckartiara octonema* n. sp. , *Timoides latistyla* n. sp. , *Ectopleura apicisacciformis* n. sp. , *E. gemmifera* n. sp. and *E. xuxuanii* n. sp. , as well as one new record, i. e. *Bougainwillia frondosa* Mayer, 1900 are described. All type specimens are deposited in the Department of Oceanography, Xiamen University.

2 List and taxonomic position of new species and new records

Class Hydroidomedusae Claus, 1877

Subclass Anthomedusae Haeckel, 1879

Order Filifera Kuhn, 1913

Family Bougainvillidae Lutken, 1879

Bougainwillia frondosa Mayer, 1900

Bougainwillia chenyapingii n. sp.

Nubiella paramitra n. sp.

Nubiella tubularia n. sp.

Family Pandeidae Hackel, 1879

Leuckartiara octonema n. sp.

Timodes latistyla n. sp.

Order Capitata Khun, 1913

Family Tubulariidae Fleming, 1828

Ectopleura apicisacciformis n. sp.

Ectopleura gemmifera n. sp.

Ectopleura xuxuanii n. sp.

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3 Account of new species and new record

Family Bougainvillidae Lutken, 1850

Bougainvillia frondosa Mayer, 1900 (Fig. 1)

Bougainvillia frondosa Mayer, 1910: 171, pl. 16, Fig. 6; Kramp, 1959:110, 231, Fig. 95; 1961: 77

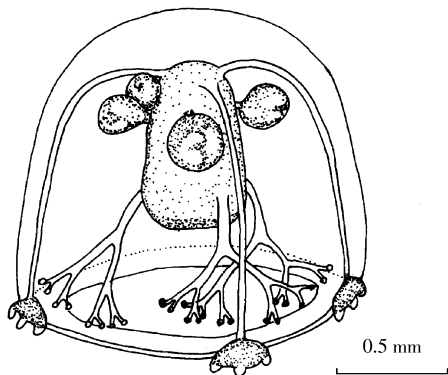


Fig. 1. *Bougainvillia frondosa* Mayer, 1900.

Umbrella nearly dome-like with vertical sides, about 1.5 mm high, higher than wide, mesoglea thick in the apical region; manubrium short, thick, and cylindrical-shaped, about half as long as bell cavity; with simple circular mouth; 4 perradial oral tentacles with long basal trunks, divided dichotomously 2 ~ 3 times, inserted distinctly above mouth rim and armed with cnidocyst clusters, oral tentacles with very long first branch, approaching length of basal trunks; 8 adradial gonads; planulae develop on manubrium walls; 4 radially placed tentacular bulbs, nearly kidney-shape, each with 3 tentacles; no ocelli; with 4 radial canals and a ring canal; velum narrow.

Type locality: One specimen was collected from the upwelling region of the southern part of the Taiwan Strait in July 2005, and new record in China seas.

Distribution: Cape Hatteras to Florida in the West-Atlantic tropical region.

Bougainvillia chenyingpii n. sp. (Fig. 2)

Medusa with bell-shaped umbrella, 0.8 ~

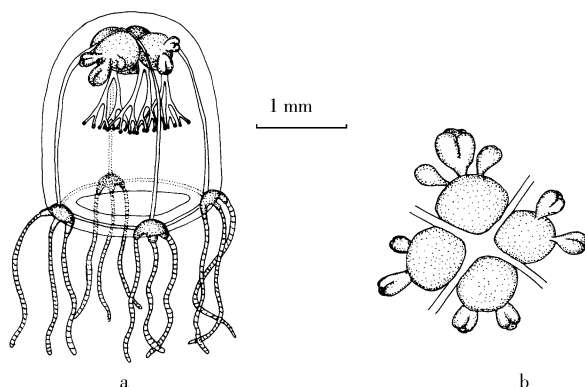


Fig. 2. *Bougainvillia chenyingpii* n. sp.

a. Lateral view and b. facing dorsal view.

2.0 mm high and wide, with very thin walls; manubrium quadrangular, very flat, adnate to subumbrella, without peduncle and mouth tubular, mouth simple, broad and large, quadrangular opening; with 4 perradial oral tentacles, inserted distinctly above mouth rim, oral tentacles with short and thick basal trunk, divided 3 ~ 4 times, and ending in nematocyst clusters, first branches very long, about 1/2 as long as oral tentacles; with 4 globular-like gonads in interradial position on manubrium walls; medusabuds developed directly from gonads; with 4 perradial marginal bulbs small, nearly kidney-shaped, about 1/2 broad as interspaces of between bulbs, each bearing 2 ~ 3 clusters of hollow marginal tentacles with ring cnidocyst; without ocelli on tentacular bulbs; with 4 radial canals and circular canal rather narrow; velum middle broad.

This new species has 4 perradial clusters of identical marginal tentacles; 4 perradial oral tentacles dichotomously branch, distinctly inserted above mouth rim, gonads on manubrium. So it belongs to *Bougainvillia* Lesson, 1830.

At the present time, only 25 valid species in the *Bougainvillia* are known (Xu et al., 2007; Xu and Huang, 2006, 2004; Bouillon and Boero, 2000; Xu et al., 1991; Xu and Zhang, 1978; Kramp, 1968). This new species has peduncle absent and marginal tentacles without ocelli. These

features differ from the other species in this genus, but similar to *B. longistyla* Xu et Huang, 2004, *B. frondosa* Mayer, 1900 and *B. muscoides* (M. Sars, 1846); though new species main characteristics are oral tentacles with short and thick basal trunk, di-

vided 3 ~ 4 times; with medusa-buds developed directly from gonads; each marginal bulbs with 2 ~ 3 tentacles. These characteristics differ from the similar species of above mention (Table 1).

Table 1. The key to the main distinguishing characteristics of new species and similar species

1. Basal trunk of oral tentacles long	2
– Basal trunk of oral tentacles short	3
2. 8 adradial gonads with planulae develop upon sides of manubrium; oral tentacles divided 2 ~ 3 times; marginal bulbs with 2 ~ 3 tentacles	<i>B. frondosa</i> Mayer, 1910
– 4 preradial gonads, upside of gonads connected to the stomach wall, downside extending along to upside of dichotomously branch, without medusa-buds; oral tentacles divided 3 ~ 4 times; marginal bulbs with 4 ~ 6 tentacles	<i>B. longistyla</i> Xu et Huang, 2004
3. 4 interradial gonads; without medusa-buds; oral tentacles divided 4 ~ 5 times; marginal bulbs with 5 ~ 7	
.....	<i>B. muscoides</i> (M. Sars, 1846)
– 4 interradial gonads with medusa-buds developed directly from gonads; oral tentacles divided 3 ~ 4 times; marginal bulbs with 2 ~ 3 tentacles	<i>B. chenyingjui</i> n. sp.

Type specimens: holotype (AOB – HL190), paratype (AOB – HL191 ~ 208). Thirty specimens were collected from the upwelling region of the southern part of the Taiwan Strait in July 2006.

Nubiella paramitra n. sp. (Fig. 3)

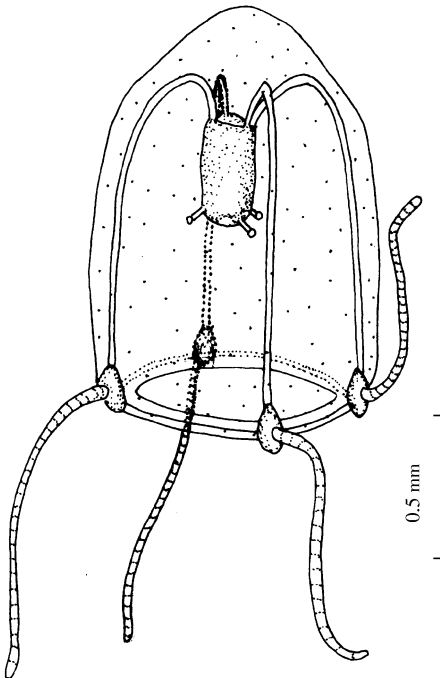


Fig. 3. *Nubiella paramitra* n. sp.

Umbrella bell-shaped, with a conical apical projection, mesoglea thick especially in the apical region, thinning gradually toward umbrella margin; ex-umbrella with scattered nematocyst cluster; height 0.4 mm, width 0.8 mm; manubrium cylindrical-shaped, about 1/3 the length of subumbrella cavity; with conspicuous gastric peduncle, without lip or mouth tubular; mouth simple with 4 simple unbranched oral tentacles, arising above mouth rim and armed with cnidocyst clusters; with 4 radial canals and circular canal very narrow; gonads completely surrounding manubrium wall, without medusa-buds; with 4 solitary marginal tentacles, arising above half of the marginal bulbs, usually thin and long, whole tentacles covered by numerous ring nematocysts; 4 perradial marginal bulbs small, equal size and structure, erect elliptical-shaped; without ocelli on tentacular bulbs; velum middle broad.

This new species has simple unbranched oral tentacles, arising above mouth rim; with 4 perradial marginal bulbs and 4 solitary marginal tentacles; placing this medusa in the genus *Nubiella* Bouillon, 1980. Until two species in the *Nubiella* is known (Bouillon et

al., 2004; Xu and Huang, 2004; Bouillon, 1980). The new species specific characters are: exumbrella with scattered nematocyst cluster; manubrium with gastric peduncle, no lip, mouth tubular and medusa-buds; with 4 simple unbranched oral tentacles; with 4 solitary marginal tentacles, arising above half of the marginal bulbs; with 4 marginal bulbs, equal size, erect elliptical-shaped. These characters differ from the other species in this genus (Table 2).

Type specimens: holotype (AOB – HL209). One specimen was collected from the upwelling region of the southern part of the Taiwan Strait in August 2004.

Nubiella tubularia n. sp. (Fig. 4)

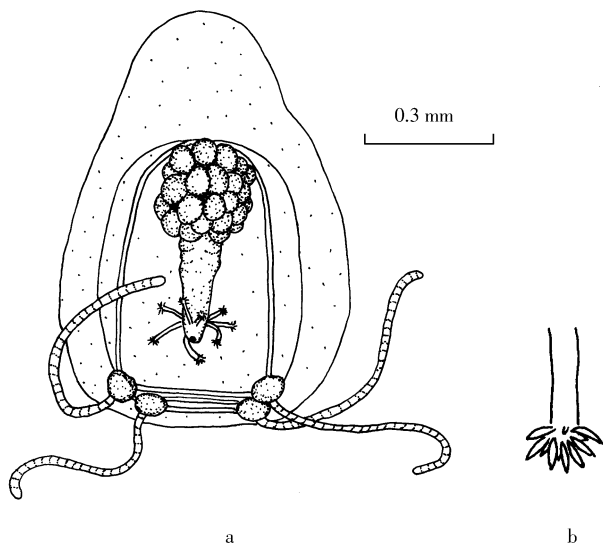


Fig. 4. *Nubiella tubularia* n. sp. a. Lateral view and b. Enlargement of oral tentacle.

Umbrella bell-shaped, with a solid, nearly hemispherical apical projection not exceeding 1/3 of height of the bell, about 1.0 mm high, 0.8 mm wide; exumbrella with scattered nematocysts; manubrium base wide, flask-shaped, about 4/5 of the length of the subumbrella cavity; without gastric peduncle, but with mouth tubular very long, about 1/2 of the length of the manubrium; oral tentacles eight, unbranched, arising above mouth rim, each with a small terminal cluster of nematocysts; mouth simple, circular; gonads completely surrounding on the most proximal part of the manubrium, scattered numerous round, sex cells on the gonads, the outline of gonad resembling a “berryfruit”; radial canals four; narrow ring canal present; tentacle bulbs four, perradial, subspherical, each with a single marginal tentacle; ocelli absent; velum narrow.

This new species specific characteristics are: manubrium base wide, flask-shaped, with mouth tubular very long, about 1/2 of the length of the manubrium; with 8 unbranched oral tentacles, armed with terminal cluster of nematocysts; on the most proximal part of the manubrium scattered numerous sex cells; no medusa-buds; with 4 marginal bulbs, subspherical, each with a single tentacle. These characteristics differ from the other species in genus *Nubiella* (Table 2).

Table 2. The key to the species of the genus *Nubiella*

1. 4 perradial marginal bulbs differing in size and structure, without tentacles; with 12 simple unbranched oral tentacles	.....	<i>N. atentaculata</i> Xu et Huang, 2004
– 4 perradial marginal bulbs, all of the same size and structure, each with a single tentacle	.....	2
2. with 8 simple unbranched oral tentacles; mouth tubular very long; oval-like sex cells surrounding on the most proximal part of manubrium; no medusa-buds; 4 marginal bulbs subspherical	.....	<i>N. tubularis</i> n. sp.
– with 4 simple, unbranched oral tentacles	.....	3
3. exumbrella without scattered cnidocyst; with medusa-buds; tentacular distal half thicker and armed with cnidocyst; marginal tentacular bulbs spherical	.....	<i>N. mitra</i> Bouillon, 1980
– exumbrella with scattered cnidocyst; without medusa-buds; whole tentacles with ring cnidocyst; marginal tentacular bulbs erect elliptical	.....	<i>N. paramitra</i> n. sp.

Type specimens: holotype (AOB – HL 210), paratype (AOB – HL 211, 212). One specimen was collected from the upwelling region of the southern part of the Taiwan Strait in August 2004, two specimens were collected from the Beibu Gulf in April 2007.

Family Pandeidae Haeckel, 1879

Leuckartiara octonema n. sp. (Fig. 5)

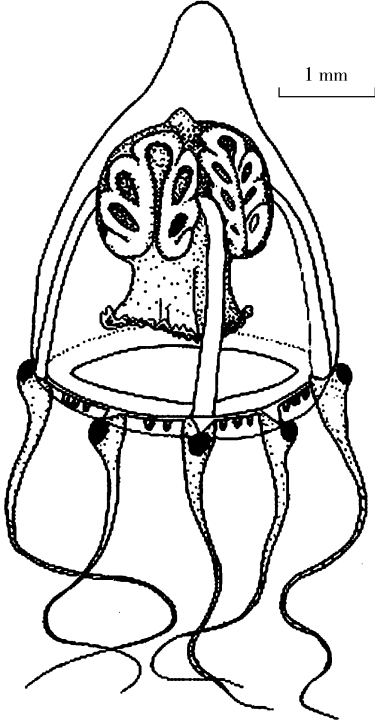


Fig. 5. *Leuckartiara octonema* n. sp.

Umbrella bell-shaped, with a long conical apical projection not exceeding 1/2 of the height of the bell, height 5 mm (including the apical projection), width 3.5 mm; stomach large and broad, almost occupying the whole subumbrella cavity, but not exceeding velar opening, about 1/2 of the height of the manubrium connected to the radial canals by mesenteries; mouth broad, quadrangular, with complex crenulated margin; 4 horseshoe-shaped interradial gonads, each with bipartite but connected interradially, with 4 ~ 5 horizontal folds directed perradially, connected by an elliptical trans-

verse bridges in the uppermost part of 2 adradial series; without transverse bridges in the middle of the gonads; with 4 radial canals very broad and ribbon-like, without jagged edges; ring canal narrows; with 8 hollow developed tentacles, 4 perradial, 4 interradial; with elongated, laterally compressed basal bulbs, each bearing a conspicuous long abaxial spur with brown red ocelli, about 1/3 clasp to the exumbrellar margin; with 2 ~ 3 short, club-shaped marginal rudimentary tentacles in between successive tentacles; none ocelli; velum middle broad.

This new species has 4 horseshoe-shaped gonads with diverging horizontal folds, connected by interradial transverse bridge. So it belongs to *Leuckartiara* Hartlaub, 1914. At present time, only 18 valid species in *Leuckartiara* are known (Xu and Huang, 2006; Bouillon et al., 2004; Xu and Huang, 2004; Schuchert, 1996). This new species has exumbrella without canal-like bands or ribs; with apical projection; with developed tentacles bulbs with abaxial spurs; without filiform rudimentary tentacles. These characteristics differ from the other species in this genus, but similar to *L. octona* (Fleming, 1823) and *L. simplex* Bouillon, 1980. While this new species specific characteristics are: with 8 developed tentacles, with ocelli at marginal bulbs; with 2 ~ 3 club-shaped rudimentary tentacles between adjacent tentacles, without ocelli; gonad with 4 ~ 5 horizontal folds, two adradial parts connected by interradial, elliptical bridge at the uppermost part. These characteristics also differ from the similar species of above mention (see Table 3).

Type specimens: holotype (AOB – HL213), paratype (AOB – HL214 ~ 216). Four specimens were collected from the upwelling region of the southern part of the Taiwan Strait in July 2005.

Timoides latistyla n. sp. (see Fig. 6)

Medusa nearly spherical-shaped with round dome,

Table 3. Comparisons of main characteristics of new species and similar species of *Leuckartiara*

Characteristic	<i>L. octona</i>	<i>L. simplex</i>	<i>L. octonema</i>
Apical canals	none	present	none
Number of marginal developed tentacles	12 ~ 32, usually 16	4	8
Number and shape of rudimental tentacles between tentacles	1 ~ 3, club-shaped, with ocelli	1, rudimentary knobs, interradial, with ocelli	2 ~ 3, club-shaped, without ocelli
Position and shape of connected by transverse bridge in two adradial gonads	a narrow bridge, at middle part	a round bridge at uppermost part	a elliptical bridge at uppermost part

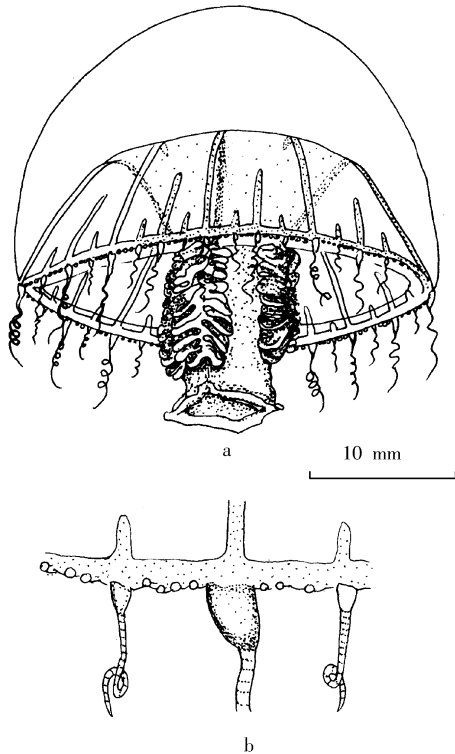


Fig. 6. *Timoides latistyla* n. sp. a. Lateral view and b. Enlargement of umbrella margin.

apex very thick; 2.2 mm wide, 15 mm high; with gastric peduncle, short and broad, flaring at its base about 1/2 as long as bell diameter, reduced gradually toward stomach; manubrium short and wide, barrel-shaped, slightly exceeding beyond the bell opening; mouth quadrangular with 4 simple lips; with 4 large, complexly folded gonads on the perradial position of stomach, just lower part of peduncle, each with a number of simple and branched papiliform processes on both sides of perradial position of stomach, thus forming 4 prominent, double bridges, re-

sembling “gill slit”; with 4 radial canals and 7 blindly ending centripetal canals of different lengths arise from the ring canal in each quadrant, of which 1 interradial centripetal canal most length, about 1/2 as long as bell height, and 2 adradial ones slight short, about only 1/2 interradial canal length, other 4 very shorts between perradial and adradial, and adradial and interradial position; with 32 tentacles, 4 radial, 4 interradial, 8 adradial, and 16 intermediate, large tentacles alternating with intermediate tentacles; with 2 ~ 3 marginal warts between successive tentacles, but no lateral cirris; all tentacles base without black pigment patches; velum narrow.

This new species has blindly ending centripetal canal, with large gastric peduncle; without mesenteries; with 4 simple radial canals; gonads on the manubrium; with numerous tentacles and marginal warts, no sense organs. So that, belongs to Family Pandeidae, Genus *Timoides* Bigelow, 1904.

At present time, only one species in the *Timoides* is known (Bouillon and Boero, 2000). This new species differs from *T. agassizi* Bigelow, 1904 as follows.

T. agassizi: with broad and long gastric peduncle, flaring at its base about 1/3 as long as bell diameter; manubrium very long with 2/3 exceeding beyond the bell opening; with 4 long, lance-shaped, complexly folded lips; with 3 blindly ending centripetal canals in each quadrant; with 1 ~ 2 marginal warts between tentacles, all tentacles base with black pigment patches.

T. latistyla: with very broad and short gastric

peduncle, flaring at its base about 1/2 as long as bell diameter; manubrium short and wide, slightly exceeding beyond the bell opening; with 4 simple lips; with 7 blindly ending centripetal canals in each quadrant; with 2 ~ 3 marginal warts between successive tentacles; without black pigment patches.

Type specimens: holotype (AOB - HL217). One specimen was collected in surface waters from the southern part of the Taiwan Strait in July 2005.

Family Tubulariidae Fleming, 1828

Ectopleura apicisacciformis n. sp. (Fig. 7)

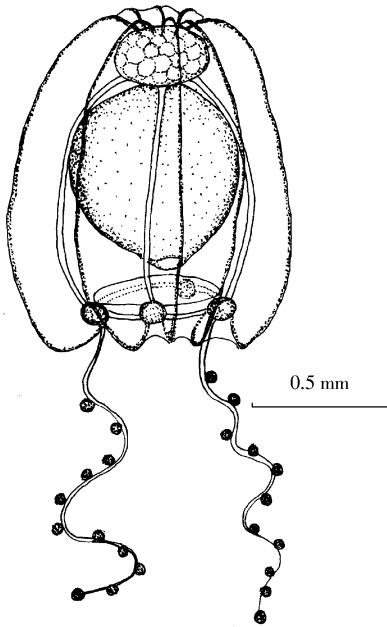


Fig. 7. *Ectopleura apicisacciformis* n. sp.

Umbrella 1.0 ~ 1.2 mm high, 0.8 ~ 0.9 mm wide, bell-shaped; mesoglea thicker, but without apical projection; exumbrella with 4 pairs of longitudinal cnidocysts track originating from the marginal bulbs, continued to apex of umbrella along the edges of eight very prominent ridges; manubrium very long, nearly pear-shaped, about 2/3 length of umbrella cavity, almost occupying the whole subumbrella cavity, but not exceeding velar opening; with a ovaliform brood pouches above manubrium, adnate to subumbrella in the uppermost part of brood-sac, and connected with manubrium; mouth simple, cir-

cular; 4 radial canals and circular canal middle broad, upper radial canals connected with pouch; gonad completely surrounding manubrium; 4 perradial marginal bulbs, equal size, nearly globular-shaped; two opposite perradial marginal bulbs non tentacles and other two opposite perradial marginal bulbs with developed tentacles, each with 9 ~ 10 abaxial cnidocysts clusters, with terminal knob of cnidocysts; velum middle broad.

This new species has 4 tentacular marginal bulbs; with 8 longitudinal exumbrellar cnidocyst tracks; with 4 radial canals, so it belongs to *Ectopleura* L. Agassiz, 1862.

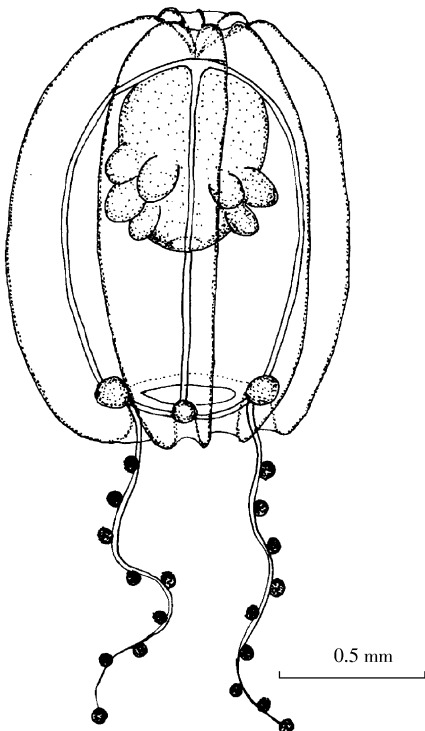
At present time, only 23 valid species medusa in the *Ectopleura* L. Agassiz, 1862 are known (Xu and Huang, 2006; Bouillon et al., 2004; Bouillon and Boero, 2000; Schuchert, 1996; Petersen, 1990; Calder, 1988; Zhang and Lin, 1984; Kramp, 1961). This new species has 2 opposite developed, simple perradial marginal tentacles, these characteristics differ from the other medusa-producing species of *Ectopleura* by having 4 equally developed marginal tentacles, 4 perradial marginal bulbs without marginal tentacles and medusa reduced to eumedusoid gonophore, etc; but similar to species of *Ectopleura* by having 2 opposite developed marginal tentacles; though new species main characteristics are: with a ovaliform brood pouches above manubrium, but connected with manubrium; with 4 equally sized marginal bulbs; with 2 opposite developed, simple perradial marginal tentacles, each with 9 ~ 10 abaxial cnidocysts clusters (see Table 4).

Type specimens: holotype (AOB - HL218), paratype (AOB - HL219 ~ 220). Two specimens were collected from the upwelling region of the southern part of the Taiwan Strait in 2006; one specimen was collected from the Beibu Gulf in July 2006.

Ectopleura gemmifera n. sp. (see Fig. 8)

Table 4. The key to the new species and similar species in the genus *Ectopleura*

1. Umbrella with apical projection	2
– Umbrella without apical projection	4
2. With apical chamber and apical canal; 2 opposite perradial marginal tentacles each with 6 ~ 9 abaxial cnidocyst clusters and a large terminal one	<i>E. minerxa</i> Mayer, 1900
– without apical chamber and apical canal; 2 opposite perradial capitate tentacles before liberation	3
3. manubrium spindle-shaped	<i>E. mayeri</i> Petersen, 1990
– manubrium tubular-shaped	<i>E. pacifica</i> Thonely, 1900
4. exumbrella without longitudinal ridges	5
– exumbrella with 8 longitudinal ridges	6
5. with 4 marginal bulbs, equally size; 2 opposite tentacles, each with a terminal knob of cnidocysts, one or two distally, spherical cnidocysts knobs encircling tentacles and proximally one abaxial cnidocysts cluster	<i>E. wrighti</i> Peterson, 1979
– with 4 marginal bulbs, unequal size; 2 opposite tentacles, each with 6 ~ 12 abaxial cnidocyst clusters; without terminal knob of cnidocyst	<i>E. xiamenensis</i> Zhang et Lin, 1984
6. with 4 equally sized perradial marginal bulbs; with a broad pouches above manubrium; tentacles with 9 ~ 10 abaxial cnidocyst clusters	<i>E. apicisacciformis</i> n. sp.
– with 4 unequal sized perradial marginal bulbs	7
7. gonads surrounding manubrium and forming 4 sac-like interradial pouches; 2 opposite tentacles, each with 20 ~ 25 abaxial cnidocyst clusters	<i>E. sacculifera</i> Kramp, 1957
– gonads only surrounding manubrium and without sac-like interradial pouches	8
8. manubrium cylindrical-shaped, with a whole constriction in nearly middle, without medusa-bud; 2 opposite tentacles, each with 11 ~ 12 abaxial cnidocyst clusters	<i>E. xuxuanii</i> n. sp.
– manubrium elliptical-shaped, without a whole constriction, but with medusa-buds under middle part of manubrium; 2 opposite tentacles, each with 7 ~ 8 abaxial cnidocyst clusters	<i>E. gemmifera</i> n. sp.

Fig. 8. *Ectopleura gemmifera* n. sp.

Umbrella 1.5 mm high, 1.2 mm wide, bell-shaped, mesoglea middle thick, without apical projection; exumbrella with 8 exumbrella cnidocysts track, issuing in pairs from tentacular bulbs, continued to apex of umbrella along the edges of 8 very prominent ridges; manubrium elliptical-shaped, about 1/2 length of subumbrellar cavity; mouth simple, circular; with 4 radial canals and circular canal middle broad; gonad completely surrounding manubrium, with numerous medusa-buds develop under middle part of manubrium; 4 perradial marginal bulbs, unequal size; two opposite perradial marginal tentacles bulbs, spherical-shaped, large than other two opposite no tentacular bulbs, each tentacle with 7 ~ 8 abaxial cnidocysts clusters, with terminal cluster; velum middle broad.

This new species belongs to *Ectopleura*, of which main distinguishing characteristics are; medusa-buds developed interradial and adradial under

middle part of manubrium; 4 perradial marginal bulbs, unequal size; 2 opposite perradial marginal tentacles, each with 7 ~ 8 abaxial cnidocysts clusters with terminal cluster. These characteristics differ from the other similar species of *Ectopleura* (see Table 4).

Type specimens: holotype (AOB - HL221), paratype (AOB - HL222). Two specimens were collected from the upwelling region of the southern part of Taiwan Strait in 2006.

Ectopleura xuxuanii n. sp. (Fig. 9)

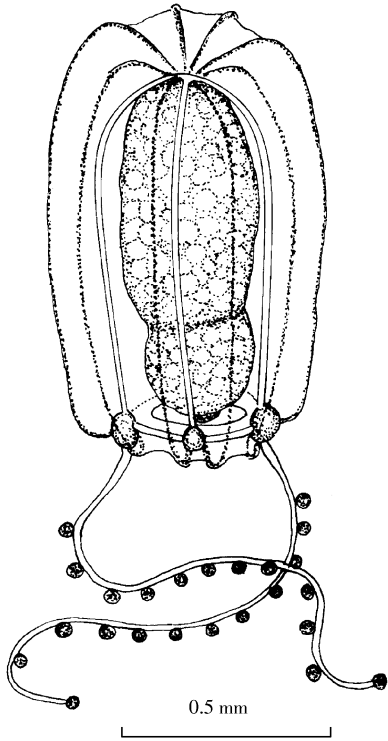


Fig. 9. *Ectopleura xuxuanii* n. sp.

Umbrella 0.9 ~ 1.1 mm high and 0.5 ~ 0.6 mm wide, bell-shaped, jelly moderately thick, without apical process; exumbrella with 8 cnidocysts tracks issuing in pairs from 4 marginal bulbs, extending almost to apex, and forming 8 conspicuous ridges along exumbrella; manubrium cylindrical, about 4/5 length of umbrella cavity, almost reaching velum but not beyond; with a whorl slightly constriction in nearly middle part of manubrium; mouth simple,

circular; 4 radial canals and circular canal moderately broad; gonad completely surrounding manubrium; with 2 moderately broad opposite marginal tentacular bulbs and 2 small none tentacular bulbs; the 2 opposite perradial marginal tentacles each with 11 ~ 12 abaxial cnidocysts clusters and one terminal cluster of similar size as other the clusters; velum middle broad.

This new species has 8 exumbrella cnidocysts tracks; mouth circular; with 4 radial canals; with 4 unequally size marginal bulbs, so it belongs to *Ectopleura* L. Agassiz, 1862. This new species main distinguishing characteristics are; exumbrella with 8 longitudinal cnidocyst tracks and 8 conspicuous ridges along exumbrella to apex; manubrium large and long, cylindrical, with a whorl slightly constriction in nearly middle of manubrium; with 4 marginal bulbs unequally size; with 2 opposite perradial marginal tentacles, each with 11 ~ 12 abaxial cnidocyst clusters. These characteristics differ from the other similar species of *Ectopleura* (see Table 4).

Type specimens: holotype (AOB - HL223), paratype (AOB - HL224 ~ 226). Three specimens were collected from the upwelling region of the southern part of Taiwan Strait in August 2004; one specimen was collected from the Beiwan Bay in July 2006.

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