Acta Oceanologica Sinica 2004, Vol. 23, No. 3, p.549~562
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A survey on Anthomedusae (Hydrozoa: Hydroidomedusae) from the Taiwan Strait with description of new species and new combinations

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Received 11 October 2003; accepted 20 January 2004

Abstract

New data on Anthomedusae are included. Seven new species and 2 new combinations are described. An additional *Teissiera polypofera* Xu, Huang and Chen, 1991 is redescribed and its position of taxonomy is discussed. Other lists of species on Anthomedusae are summarized.

Key words: Anthomedusae, taxonomy; Bougainvillidae, Pandeidae, Protiaridae, Tessieridae, Zancleidae

1 Introduction

This report provides a systematization of the Anthomedusae collected from the Minnan–Taiwan Bank fishing ground upwelling region, the Luoyuan Bay, and the varied island waters of Fujian from 1985 to 2001.The Anthomedusae represents 88 species belonging to 21 families, 42 genus. Seven new species (see Table 1) are described, i.e., *Bougainvillia longistyla* n. sp., *Koellikerina staurogaster* n. sp., *Nubiella atentaculata* n. sp., *Leuckartiara jianyinensis* n. sp., *Leuckartiara neustona* n. sp., *Halitiara obtusus* n. sp., and *Halitiarell apicea* n. sp. In addition, two new combinations are revised, i. e., *Merga minutum* (Xu, Huang and Chen, 1991) transl. nov., *Zanclea macrocystae* (Xu, Huang and Chen, 1991) transl. nov. *Teissiera polypofera* Xu, Huang and Chen, 1991 is redescribed and its position of taxonomy is discussed. The present paper uses this material to update the Anthomedusae in our previous monograph. All type specimens are deposited in the Department of Oceanography, Xiamen University.

2 Account of species

Family Bougainvillidae Lütken, 1850

Bougainvillia longistyla n. sp. (see Fig. 1)

Umbrella nearly hemispherical, height: 1.0~1.5 mm, width: 1.2~2.0 mm; apex rounded, with mesoglea thick at apex, thinning towards the lateral walls; stomach quadrangular, very flat, adnate to subumbrella, without peduncle and mouth tubular, with simple circular mouth, rim thicker, with 4 perradial oral tentacles, divided dichotomously 3 or 4 times, inserted distinctly above mouth rim and armed with cnidocyst clusters, oral tentacles with very long basal trunks,about 5/6 as long as oral tentacles,

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Table 1. List of species on Anthomedusae (1962-2003)

Class Hydroidomedusae Claus, 1877
emend (Bouillon and Boero,2000)
Subclass Anthomedusae Haeckel, 1879
Order Filifera Kühn, 1913
Suborder Margelina Haeckel, 1879
Family Australomedusidae Russell,1971
Genus *Platystoma* Zhang, 1982
P. bitentaculata Xu, Huang and Chen,1991
P. dongshanensis Xu and Huang,1994
P. nanhaiensis Zhang, 1982
Family Bougainvillidae Lütken, 1850
Genus *Bougainvillia* Lesson, 1830
B. bitentaculata Uchida, 1925
B. britannica (Forbes,1841)
B. fulva Agassiz and Mayer, 1899
B. longistyla n. sp.
B. niobe Mayer, 1894
B. paraplatygaster Xu, Huang and Chen, 1991
B. platygaster (Haeckel, 1879)
B. ramosa (van Beneden, 1844)
Genus *Koellikerina* Kramp, 1939
K. constricta (Menon, 1932)
K. diforficulata Xu and Zhang, 1978
K. fasciculate (Péron and Lesueur, 1810)
K. heteronemalis Xu, Huang and Chen, 1991
K. staurogaster n. sp.
K. taiwanensis Xu, Huang and Chen, 1991
Genus *Nemopsis* L. Agassiz, 1849
N. bachei L. Agassiz, 1849
N. hexacanalis Huang and Xu, 1994
Genus *Nubiella* Bouillon, 1980
N. atentaculata n. sp.
Family Clavidae McCrady, 1859
Genus *Turritopsis* McCrady, 1859
T. lata Ledenfeld, 1884
T. nutricula McCrady, 1859
Family Cytaeididae L. Agassiz, 1829
Genus *Cytaeis* Eschscholtz, 1829
C. tetrastyla Eschscholtz, 1829
Family Hydractiniidae L. Agassiz, 1862
Genus *Hydractinia* van Beneden, 1841
H. apicata Kramp, 1959
H. carnea M. Sars, 1846
H. minima (Trinci, 1903)
Family Rathkeidae Russell, 1953
Genus *Allorathkea* Schmidt, 1972
(=*Pseudorathkea* Xu and Huang, 1990)
A. macrogastrica (Xu and Huang, 1990)

To be continued

Continued from Table 1

Genus *Rathkea* Brandt, 1838
R. octopunctata (M. Sars, 1835)
Suborder Pandeidae Haeckel, 1879
Family Bythotiaridae Maas, 1905 (=Calycopsidae)
Genus *Heterotiara* Maas, 1905
H. minor Vanhöffen, 1911
Genus *Gymnogonium* Xu and Huang, 1994
G. zhengzhongii Xu and Huang, 1994
Family Niobiidae Petersen, 1979
Genus *Niobia* Mayer, 1900
N. dendrotentaculata Mayer, 1900
Family Pandeidae Haeckel, 1879
Genus *Amphinema* Haeckel, 1879
A. australis (Mayer, 1900)
A. dinema (Péron and Lesueur, 1810)
A. physophorum (Uchida, 1927)
A. rugosum (Mayer, 1900)
A. turrida (Mayer, 1900)
Genus *Cirrhitiara* Hartlaub, 1913
C. simplex Xu, Huang and Chen,1991
Genus *Leuckartiara* Hartlaub, 1914
L. hoepplii Hsu, 1928
L. jianyinensis n. sp.
L. neustona n. sp.
L. octona (Fleming, 1823)
L. orientalis Xu, Huang and Chen,1991
Genus *Merga* Hartlaub, 1914
M. macrobulbosa Xu, Huang and Chen, 1991
M. minutum (Xu, Huang and Chen, 1991), transl. nov.
M. tergestina (Neppi and Stiasny, 1912)
Genus *Pandea* Lesson, 1843
P. conica (Quoy and Gaimard, 1827)
Genus *Pandeopsis* Kramp, 1959
P. ikarii Kramp, 1959
Family Proboscidactylidae Hand and Hendrickson, 1950
Genus *Proboscidactyla* Brandt, 1834
P. ornate (McCrady, 1859)
Family Protiaridae Haeckel, 1879
Genus *Halitiara* Fewkes, 1882
H. obtusus n. sp.
Genus *Halitiarella* Bouillon, 1980
H. apicea n. sp.
Genus *Latitiara* Xu and Huang, 1990
L. orientalis Xu and Huang, 1990
Genus *Paratiara* Kramp and Damas, 1925
P. digitalis Kramp and Damas, 1925
Order Capitata Khün, 1913

To be continued

Continued from Table 1

Suborder Moerisiida Poche, 1914
Family Moerisiidae Poche, 1914
Genus *Moerisia* Boulenger, 1908
M. inkermanica (Paltschikowa-Ostroumova, 1925)
Genus *Odessia* Paspaleff, 1937
O. microtentaculata Xu, Huang and Chen, 1991
Family Halimedusidae Arai and Brinckmann-Voss, 1980
Genus *Tiaricodon* Browne, 1902
T. coeruleus Browne, 1902
Family Hydrocorynidae Rees, 1951
Genus *Hydrocoryne* Stechow, 1907
H. miurensis Steckow, 1907
Suborder Tubulariida Fleming, 1828
Family Corynidae Johnston, 1836
Genus *Dicodonium* Haeckel, 1879
D. jeffersoni (Mayer, 1990)
Genus *Dipurena* McCrady, 1859
D. strangulata McCracy, 1859
Family Corymorphidae Allman, 1872
Genus *Euphysora* Maas, 1905
E. abaxialis Kramp, 1962
E. apiciloculifera Xu and Huang, 2003
E. bigelowi Maas, 1905
E. brunnescentis Huang, 1999
E. crassocanalis Xu and Huang, 2003
E. interogona Xu and Huang, 2003
E. knides Huang, 1999
E. macrobulbus Xu and Huang, 2003
E. solidonema Huang, 1999
E. taiwanensis Xu and Huang, 2003
E. verrucosa Bouillon, 1978
Genus *Vannuccia* Brinckmann-Voss, 1967
V. forbesii (Mayer, 1894)

To be continued

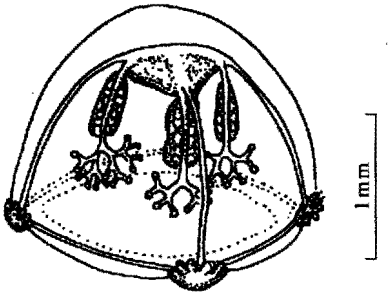

Fig. 1. *Bougainvillia longistyla* n. sp.

length of whole oral tentacle almost extending to umbrella margin; upside of 4 elliptic-like gonads connected to perradial stomach wall, downside extending along the oral tentacles basal trunk to upside of oral tentacles dichotomously; from lateral view, each gonad looking like hanging down in subumbrella cavity; with 4 radial canals and ring canal; 4 radially placed tentacular bulbs, each bearing 4~6 clusters of solid marginal tentacles, without ocelli; velum narrow.

This new species has radially placed clusters of solid marginal tentacles; the tentacle of

Continued from Table 1

Family Euphysidae Haeckel, 1879
Genus *Cnidocodon* Bouillon, 1978
C. xiamenensis (Zhang and Wu, 1981)
Genus *Euphysa* Forbes, 1848
E. aurata Forbes, 1848
Genus *Euphysilla* Kramp, 1955
E. pyramidata Kramp, 1955
Genus *Euphysomma*, 1962
E. brevia Uchida, 1947
Family Tubulariidae Fleming, 1828
Genus *Ectopleura* L. Agassiz, 1862
E. dumortieri (van Beneden, 1844)
E. guangdongensis Xu, Huang and Chen, 1991
E. latitaeniata Xu and Zhang, 1978
E. minerva Mayer, 1900
E. sacculifera Kramp, 1957
E. xiamenensis Zhang and Lin, 1984
Genus *Hybocodon* L. Agassiz, 1862
H. prolifer L. Agassiz, 1862
Suborder Zancleida Russell, 1953
Family Porpitidae Goldfuss, 1818
Genus *Porpita* Lamarck, 1801
P. porpita (Linnaeus, 1758)
Genus *Velella* Lamarck, 1801
V. velella (Linnaeus, 1758)
Family Tesieridae Bouillon, 1974
Genus *Teissiera* Bouillon, 1974
T. australe Bouillon, 1978
T. polypofera Xu, Huang and Chen, 1991
T. medusifera Bouillon, 1978
Family Zancleidae Russell, 1953
Genus *Zanclea* Gegenbaur, 1857
Z. costata Gegenbaur, 1857
Z. macrocystae (Xu, Huang and Chen, 1991), transl. nov.

each cluster all alike; with 4 perradial oral tentacles dichotomously branching; gonad on manubrium in perradial position; without ocelli. So it belongs to *Bougainvillia* Lesson, 1830. At the present time only 22 valid species in the *Bougainvillia* are known. This new species with very flat stomach, quadrangular, without peduncle, differs from the other species in this genus, but similar to *B. platygaster* (Haeckel, 1879) and *B. paraplatygaster* Xu, Huang and Chen, 1991. A comparison of these two species with our new species is given in Table 2.

Type specimens: holotype, No. AOB–HL125; paratype, No. AOB–HL126. Two specimens were collected from the southern part of the Taiwan Strait in September 1988.

Koellikerina staurogaster n. sp. (see Fig. 2)

Umbrella nearly ovaliform, with thick jelly, apex rounded, height:1.8 mm, width: 1.5 mm; manubrium without peduncle, with short and thick mouth tubular, from facing dorsal view, stomach cruciform(see Fig.2b), with simple circular mouth; with 4 perradial, elliptic-like gonads, smooth, slightly extending outwards along the radial canals; 4 perradial oral tentacles with short and thick trunks, divided into 3 bifurcations, with very short branches, each with a terminal nematocyst knob; 4 broad radial canals and ring canal; velum development; with 8 groups of marginal tentacles, all alike in structure, with 5 marginal tentacles in each perradial, 3 in each interradial group; perradial bulbs triangular, larger, about 1.5 times as long as interspaces, interradial bulbs small, linear, about 3 times as long as interspaces, all tentacles bulbs abaxial with dark-red ocelli.

This new species has 8 groups of marginal tentacles, 4 perradial and 4 interradial, all alike in structure; with 4 perradial oral tentacles, divided into 3 bifurcations; gonads on manubrium perradial, so they belong to *Koellikerina* Kramp, 1939. At the present time, only 10 valid species in *Koellikerina* are known. This new species umbrella has no apical projection, manubrium without peduncle, with short and thick mouth tubular, stomach cruciform; these features differ from all *Koellikerina* species, but the closest species is *K. massi* (Browne, 1910) and *K. multicirrata* (Kramp, 1928). *K.massi* also has stomach cross-shaped, though they are

Table 2. Comparison of main shape characteristics of 3 species of *Bougainvillia*

Characteristic	*B. paraplatygaster*	*B. platygaster*	*B. longistyla* n. sp.
Umbrella	nearly globe-shape, mesoglea thick	globe-shape, mesoglea thick	nearly hemispherical, mesoglea thick
Manubrium	no peduncle and mouth tubular	no peduncle, with mouth tubular	no peduncle and mouth tubular
Gonads	perradial, extending along adradial sides of stomach, smooth	interradial, short and flat, with medusa buds and polypoid buds	perradial, upside of gonads connected to stomach wall, downside extending along oral tentacle basal trunk to upside of dichotomously branch
Oral tentacles	very short trunk, 4 thick cluster of oral tentacles, each with 4 main oral tentacles, 6~7 times	short, divided 5~6 times immediately from base	very long trunk, about 5/6 as long as oral tentacles, divided 3~4 times
Marginal bulbs	kidney-shape, with 14~17 tentacles	triangular, with 10~13 tentacles	kidney-shape, with 4~6 tentacles
Ocelli	present	present	none

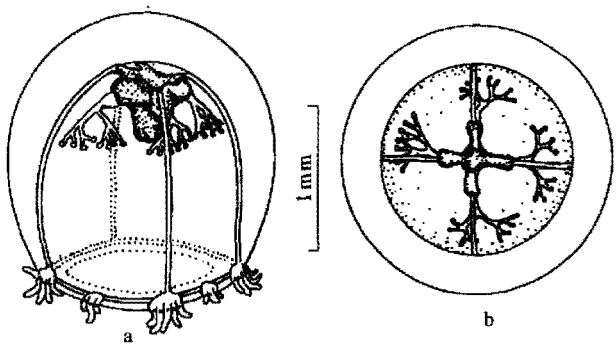

Fig. 2. *Koellikerina staurogaster* n. sp. a. Lateral view and b. facing dorsal view.

gonad 4 masses,covering nearly the whole interradial wall of stomach; 4 oral tentacle divided 7~8 times; 8 marginal groups of 5~7 tentacles each; no ocelli; *K. multicirrata* has stomach short without cross-shaped; gonads perradial, V-shaped, each with 1 median and 2~3 pairs of lateral folds; oral tentacles divide 6~7 times, or more; marginal bulbs linear, broader than interspaces, each with 12~16 tentacles; with ocelli. These features differ from *K.staurogaster* n. sp.,as follows: with stomach cruciform; with 4 perradial, elliptic-like gonads, smooth, slightly extending outwards along the radial canals; oral tentacle divided into 3 bifurcations; perradial bulbs larger, triangular, with 5 tentacles, interradial bulbs small, linear, with 3 tentacles, all tentacles bulbs with ocelli (see Table 3).

Type specimens: holotype, No. AOB–HL 127. One specimen was collected from the southern part of the Taiwan Strait in July 1988.

Nubiella atentaculata n. sp. (Fig. 3)

Umbrella bell-shaped, 2 mm high, 1.5 mm wide, with slight rounded top, mesoglea thick especially in the apical region, thinning gradually toward umbrella margin; subumbrella cavity spacious, presenting 4 apical interradial conical projections into the apical mesoglea; stomach elliptic-like, about 1/3 the length of subumbrella cavity; mouth simple, without lips, surrounded by conspicuous ring of dark-brown pigment; with 12 simple unbranched oral

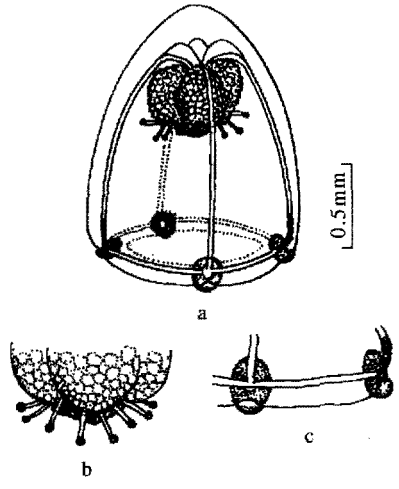

Fig. 3. *Nubiella atentaculata* n. sp.
a. Lateral view, b. enlargement of gonad and oral tentacle and c. detail of marginal bulb.

tentacles, rising well above mouth rim and armed with cnidocyst cluster; velum moderately broad; 4 radial canal and ring canal conspicuous; 4 large, ovaliform gonads situated on the perradial of the stomach and extending toward interradial, scattered numerous round, granulose sex cell on the gonads, the outline of each gonad ressembling a "berryfruit"; 4 perradial marginal bulbs, differing in size and structure, of which 2 opposite bulbs are smaller than the others, with a short club-shaped endodermal process, extending slightly upwards from the basal bulbs into radial canal, surface of club-shaped precess with brown pigment, all marginal bulbs elliptic-like, from subumbrella

Table 3. Comparisons between the different species of the genus *Koellikerina*

Species	Apical projection	Shape of manubrium	Number and position of gonads	Size of oral tentacles trunk	Number of oral tentacle dichotomously	Number of each cluster marginal tentacles	Shaped of tentacle bulbs tentacle	Interspaces of between bulbs	Ocelli
Koellikerina constricta	present	short peduncle, stomach globular	4 perradial, 3 pair of lateral folds	slender	6~7	7~8	triangular	1/2 as broad as interradial	present
K. diforficulata	none	short peduncle, stomach large, broad	4 perradial 3~4 transversal folds	short, thick	2	5	linear	narrow	present
K. fasciculate	none	short, broad peduncle	4 perradial, horseshoe–shaped, with 9~10 transverse furrows	slender, short	6~8	up to 23	triangular	narrow	present
K. elegans	none	slender, conical peduncle, stomach pear-shaped	4 interradial, smooth	short, thick	divided 3 times, each tip with 3 small branches with nematocysts	4 perradial, 3 interradial	triangular	narrow	present
K. heteronemalis	present	short, conical peduncle, stomach very flat	8 adradial, ovaliform, no folds	short, thick	5~6	5	kidney-shapeed	broad	present
K. maasi	none	without peduncle, stomach large, crossshaped	4 interradial, mass-shaped	short, thick	7~8	5~7	triangular	narrow	none
K. multicirrata	none	no peduncle, stomach short	4 perradial, V-shaped, 2~3 pairs lateral folds	long, thick	6~7 or more	12~16	linear	narrow	present
K. octonemalis	none	stomach upon a short, wide, conical peduncle	4 interradial, doubly cleft, smooth	very short	4~5	7~9 perradial, 5~7 interradial	small triangular	broader	present
K. ornata	presenting a large orange patch at tip	slender pedencle, mouth tube long and slender, stomach doliform folds	4 perradial, elongated horseshoe-shaped, 4~5 lateral folds	unknow	5~6	11~13, each bulb with 2 bright orange abaxial sports	linear	narrow	present
K. taiwanensis	presenting a large globose at tip	short peduncle, stomach bowl-shaped	8 adradial, 3~4 oblique split folds each	very short	4 clusters, each with 4 main oral tentacles, each with 4~5 branches	12~14 perradial, 8~10 interradial	linear perradial and interradial tentacle bulbs unequal size	narrow	present
K. staurogaster n. sp.	none	no peduncle, with short and thick mouth tube, stomach cruciform	4 perradial, elliptic-like smooth, extending out-wards radial canal	short, thick	3	5 perradial, 3 interradial	triangular in perradial, linear in interradial	broad	present

margin slightly clasping the exumbrella margin, without developed tentacles; without ocelli.

This new species has simple unbranched oral tentacles; with 4 marginal bulbs, placing this medusa in the genus *Nubiella* Bouillon, 1980. At the present time, only 1 species in the *Nubiella* is known: *N. mitra* Bouillon, 1980, with 4 simple unbranched oral tentacles; with 4 solitary marginal tentacles but all of the same structure; and medusa buds surrounding stomach wall. These features differ from *N. atentaculata* n. sp., as follows: with 12 simple unbranched oral tentacles; with 4 perradial marginal bulbs differing in size and structure, of which 2 opposite bulbs have a short club-shaped endodormal process, extending slightly upwards from the basal bulbs into radial canal; 4 perradial gonads, "berryfruit" like; all marginal bulbs without developed tentacles.

Type specimens: holotype, No. AOB–HL 128. One specimen was collected from the southern part of the Taiwan Strait in December 1987.

Family Pandeidae Haeckel, 1879

Leuckartiara jianyinensis n. sp. (Fig. 4)

Umbrella bell-shaped, with a large, solid, globular apical projection not exceeding 1/2 of the height of the bell, height: 10 mm (including the apical projection); width: 7.5 mm; stomach large and broad, almost occupying the whole subumbrella cavity, but not exceeding velar opening, 2/3 of the height of the manubrium connected to the radial canals by mesenteries, mouth quadrangular, with short, folded, crenulata lips; 4 horseshoe-shaped, interradial gonads, each with two adradial series of 4~5 transverse folds directed towards the perradii, connected by 2 transverse bridges situated in the middle of the gonad; 4 broad radial canals, slightly jagged; ring canal narrows; 4 marginal tentacles, perradial, hollow, long, laterally compressed, each bearing a conspicuous short abaxial spur, with ocelli; 1 interradial, short, filiform, rudimentary tentacles in between successive tentacles, completely adnate to the exumbrellar margin, abaxial ocelli on the terminal each rudimentary tentacles; velum narrow.

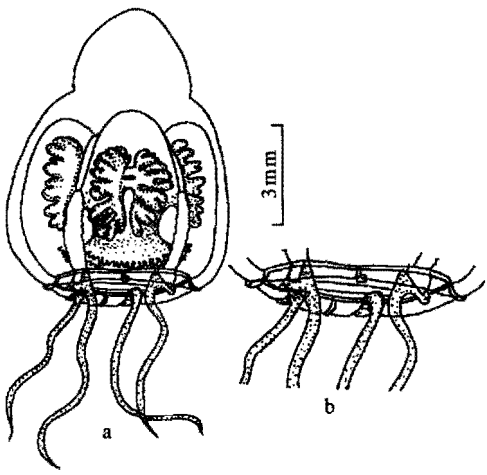

Fig. 4. *Leuckartiara jianyinensis* n. sp.

This new species has a manubrium connected to radial canals by mesenteries; its gonads are interradial and typically horseshoe-shaped. So it belongs to *Leuckartiara* Hartlaub, 1914. At the present time only 15 valid species in *Leuckartiara* are known. This new species can easily be distinguished from the other species of *Leuckartiara* by 2 main characteristics: 4 short, filiform, interradial rudimentary tentacles, completely adnate to the exumbrellar margin; 2 adradial series of gonads, connected by 2 transverse bridges situated in the middle of the gonad; other less specific characteristics are the shape of apical projection, number of marginal tentacles, and the length of mesenteries. The closest species is *L.brownei* Larson and Harbison, 1990, which also has filiform rudimentary tentacles and 4 developed tentacles, though they are umbrella margin with 28 long filiform tentacles, grow in succession, and clasp the exumbrella, without ocelli on the terminal (see Table 4).

Type specimens: holotype, No. AOB–HL 129. One specimen was collected from the southern part of Jianyin Islands waters of Fujian in August 1990.

Leuckartiara neustona n. sp. (Fig. 5)

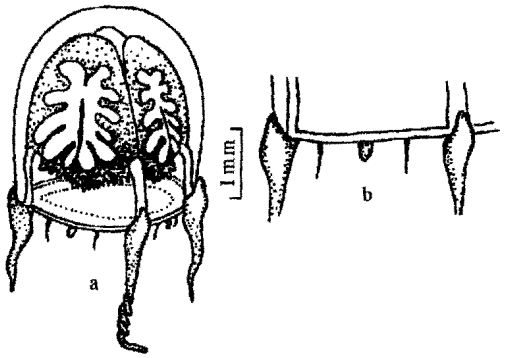

Fig. 5. *Leuckartiara neustona* n. sp. a. Side view and b. enlargement of umbrella margin.

Umbrella bell-shaped without apical projection, height: 3.0 mm, width: 2.0 mm, stomach large and broad, almost filling the subumbrella cavity, but not extending beyond the umbrellar margin; mouth broad and large, quadrangular, with short, folded, crenulate lips; 4 horseshoe-shaped, interradial gonads each with 2 adradial series of 5~6 transversal folds slightly obliquely downwards towards the perradii, the adradial parts interradially connected in the uppermost part of the gonad, 2/3 of the height of the manubrium connected to the radial canals by mesenteries; 4 medial broad radial canals without jagged margins; ring canal narrows; 4 well developed hollow marginal tentacles, tentacles bulbs laterally compressed, with distined abaxial spurs, none ocelli; 2 adradial, short, filiform, rudimentary tentacles, without ocelli, and 1 interradial, club-shaped marginal rudimentary bulbs, with abaxial red ocelli on tentacular bulbs in between successive perradial marginal tentacles; velum broad.

This new species has a manubrium connected to radial canals by mesenteries; its mouth has a crenulated margin; its gonads are interradial and typically horseshoe-shaped, allowing its inclusion in the *Leuckartiara*. Main characteristics of this new species are: umbrella without apical projection; 4 developed marginal tentacles, bulbs without ocelli; 2 adradial, short, filiform, rudimentary tentacles without ocelli, and 1 interradial, club-shaped marginal rudimentary bulbs with ocelli in between successive perradial marginal tentacles. The closest species is *L. octona* (Fleming, 1823), which also has 1~3 club-shaped marginal rudimentary bulbs, though they are umbrella with apical projection, umbrella margin with 12~32 developed tentacles, without adradial filiform rudimentary tentacles (see Table 4).

Type specimens: holotype, No. AOB–HL 130. One specimen was collected with the Manta neustox net from the southern part of the Taiwan Strait in August 1988.

Merga minutum (Xu, Huang and Chen, 1991) transl. nov. (Fig. 6).

Halitiarella minutum Xu, Huang and Chen, 1991, 475~476, Figs 9a–b.

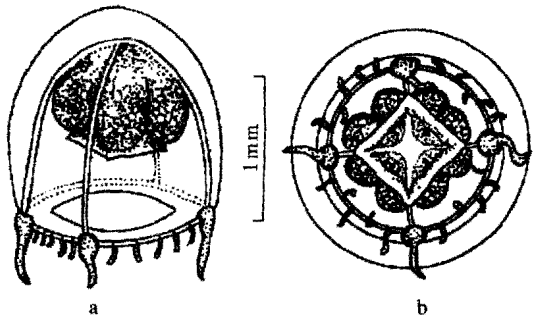

Fig. 6. *Merga minutum* (Xu, Huang and Chen, 1991) transl. nov. a. Side view and b. facing oral view.

Xu, Huang and Chen (1991) described a *Halitiarella minutum* with 8 adradial gonads at the manubrium. It does not belong to the genus *Halitiarella*. According to the number and position of gonads, tentacles structure and long mesenteries of *Halitiarella minutum* allow its inclusion in the genus *Merga*, family Pandeidae.

At the present time, only 6 species in the *Merga* are known. This medusa's main characteristics are as follows: umbrella without api-

Table 4. The key to the world species of Genus *Leuckartiara*

1	exumbrella with longitudinal canal-like bands or ribs = 2
1a	exumbrella without longitudinal canal-like bands or ribs = 3
2	with 4 large perradial and 8~12 smaller tentacles of varying size; no distinct apical projection; horseshoe fold in the uppermost part of gonads = *L. zacae* Bigelow 1940
2a	with only 4, perradial tentacles and some minute tentaculates; with conical apical projection; transverse bridge in the middle part of gonads = *L.gardineri* Browne 1916
3	umbrella margin with filiform rudimentary tentacles = 4
3a	without filiform rudimentary tentacles = 9
4	filiform rudimentary tentacles clasp or adnate to the exumbrella = 5
4a	filiform rudimentary tentacles without clasp or adnate to the exumbrella = 8
5	with 4 developed tentacles = 6
5a	with up to 8 developed tentacles = 7
6	28 long, filiform, rudimentary tentacles grow in succession, and clasp the exumbrella, without ocelli on the terminal = *L. brownie* Larson and Harbison 1990
6a	4 short, filiform, rudimentary tentacles, adnate to exumbrella, abaxial ocelli on the terminal = *L. jianyinensis* n. sp
7	with 8 large tentacles, with elongated bulbs, with short abaxial spurs, other with 8 small adradial, filiform tentacles, their proximal part adnate to umbrella margin and continued upwards on exumbrella = *L. annexa* (Kramp, 1957)
7a	20~23 large tentacles with laterally compressed elzzongated bulbs, no abaxial spurs, up to 3 rudimentary tentacles between adjacent tentacles completely adnate to exumbrella ridges nearly to summit = *L. adnata* Pages, Gieei and Bouillon, 1992
8	with 8 well developed tentacles, with 24 very short rudimentary tentacles each with a small median cirrus = *L. hoepplii* Hsu, 1928
8a	4 perradial tentacles, equal size, 2 adradial short, filiform, rudimentary tentacles and 1 interradial, club-shaped marginal rudimentary bulbs in between successive tentacles = *L. neustona* n. sp.
9	with well developed apical projection = 10
9a	without well developed apical projection = 15
10	developed tentacles bulbs with abaxial spurs = 11
10a	developed tentacles bulbs without abaxial spurs = 12
11	4 developed tentacles, 4 interradial rudimentary bulbs = *L. simples* Bouillon, 1980
11a	with 12~32 developed tentacles, with 1~3 club-shaped marginal rudimentary bulbs in between adjacent tentacles = *L. octona* (Fleming, 1823)
12	all tentacles of equal structure = 13
12a	all tentacles of unequal structure, with tentacular rudiments between the large tentacles = 14.
13	about 40 tentacles of varying size, with ocelli = *L. nobilis* Hartlaub, 1913.
13a	100 or more densely crowded tentacles, without ocelli = *L. breviconis* (Murbach and Shearer, 1902).
14	4 perradial, 4 interradial, 1~3 marginal bulbs between successive tentacles = *L. foersteri* Arai and Brinckmanvoss, 1980
14a	2 long tentacles issued from voluminous laterally compressed bulbs; 2 short tentacles issued from small conical not compressed bulbs; 3 rudimentary tentacles between each successive tentacles = *L. eckerti* Bouillon, 1985
15	mesenteries along entrire length of stomach = *L. grimaldii* Ranson 1936
15a	mesenteries along 1/2~1/3 length of stomach = 16
16	8 developed tentacles, without abaxial spurs, with ocelli, 1 small rudimentary marginal bulbs between each successive tentacles = *L. orientalis* Xu, Huang and Chen, 1991
16a	4 perradial tentacles, no equal size, 2 opposites are better developed than the other 2 without interradial, club-shaped marginal rudimentary bulbs in between successive tentacles = *L. abyssi*, (Go Sars, 1874)

cal projection; 8 adradial gonads, smooth, at the manubrium; 1/2 of the height of manubrium connected to the radial canal by mesenteries; 4 perradial tentacles with long conical-shaped bulbs without ocelli, and 5 club-shaped tentaculates between tentacles, without bulbs, with ocelli. These features differ from those of the other species of *Merga* (Table 5).

Table 5. The key to the species of Genus *Merga*

1	umbrella with an apical projection = 2
1a	umbrella without an apical projection = 4
2	with 4~8 developed tentacles = 3
2a	with 16 developed tentacles, tentacles bulbs large, triangular, 4 perradial bulbs with band-haped ocelli, 12 other bulbs with dot-like ocelli, stomach with a well developed neck and strongly folded lips = *Merga galleri* Anita Brinckmann, 1962
3	4 perradial tentacles, tentacles bulbs large, long cylindrical shaped, 2 tentaculates between tentacles, without bulbs, all tentacles bulbs without ocelli = *M. bulbosa* Bouillan, 1980
3a	4~8 developed tentacles with cylindrical-shaped bulbs, with ocelli, a few very small rudimentary bulbs without ocelli = *M. tergestina* (Neppi and Stiasny, 1911)
4	gonad interradial: 4 perradial tentacles with large, conical basal bulbs and 4 interradial, tenon-like tentaculates, = *M. reesi* Russell, 1956
4a	gonad adradial, = 5
5	4 perradial tentacles, = 6
5a	8~12 long and 24~36 rudimentary tentacles, all with ocelli. = *M.violacea* (Agassiz and Mayer, 1899)
6	4 perradial tentacles with large, globose bulbs, and 4 rudimentary bulbs, all without ocelli. = *M. macrobulbosa* Xu, Huang and Chen,1991
6a	4 perradial tentacles with long conical-shaped bulbs, without ocelli, and 5 club-shaped tentaculae between tentacles without bulbs, with ocelli, = *M. minutum* (Xu, Huang and Chen,1991) transl. nov

Family Protiaridae Haeckel, 1879.

Halitiara obtusus n. sp. (Fig. 7)

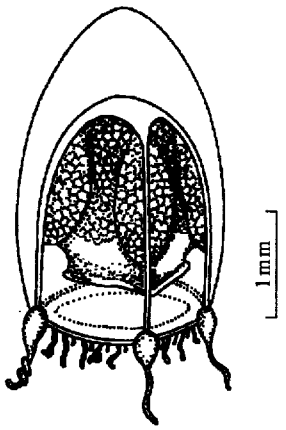

Fig. 7. *Halitiara obtusus* n. sp.

Umbrella 2.6~3.0 mm high, 1.3~1.5 mm wide, apex bluntly, devoid of evidence of apical projection, mesoglea thick especially in the apical region, thinning gradually toward umbrella margin; manubrium broad and large, about 3/4 the length of subumbrella cavity; mouth simple, broad and large, cruciform opening; 4 perradial, diverticule gastric lobes extending from manubrical wall, the whole length not exceeding mouth rim, 2/3 of the length of the gastric lobes connected to the radial canals by mesenteries; gonad interradial, extending toward perradial diverticule gastric lobes; with 4 straight radial canals, and ring canal; with 4 perradial marginal tentacles, base bulbs conical-shaped, without ocelli; with 5~8 solid, cirrus-like, unequal size marginal tentacles between successive tentacles, without bulbs and ocelli; velum broad.

This new species has 4 straight radial canals; with 4 perradial marginal tentacles and 5~8 solid cirrus-like marginal tentacles; without rudimentary marginal bulbs; mouth simple; with mesenteries; interradial gonads; all ten-

tacles without ocelli, placing this medusa in the genus *Halitiara* Fewkes, 1882.

At the present time, only 3 species in the *Halitiara* are known; *Halitiara formosa* (Fewkes, 1882) and *H. inflexa* Bouillon, 1980, manubrium without perradial, diverticule gastric lobes; these features differ from those of the new species, but close to *H. rigida* Bouillon, 1980, providing perradial diverticule gastric lobes. The distinguishing characteristics are:

H. rigida: umbrella with a narrow and short apical projection, jelly rather thin and rigid; apical chamber with a short, diverticule, solid apical canal; 4 perradial gastric lobe terminal free, not connected with manubrium; 4 perradialis marginal tentacles, base bulbs large, long conical, with 4 solid, cirrus-like, equal size marginal tentacles between successive tentacles. These features differ from those of *H. obtusus* n. sp. as follows: umbrella without apical projection and apical canal; with blunt top, jelly thick; 4 perradial gastric lobes adnate to manubrium, without free; 4 perradial marginal tentacles, bulbs conical-shaped; with 5~8 solid, cirrus-like, unequal size marginal tentacles between successive tentacles.

Type specimens: holotype, No. AOB–HL 131, paratype, No. AOB–HL 132. Three specimens were collected from the southern part of the Taiwan Strait in July 1988.

Halitiarella apicea n. sp. (Fig. 8)

Bell 1.2 mm high, 1mm wide, with a large, solid, nearly globular apical projection, measuring 0.5 mm in height, and 0.6 mm in diameter, with mesoglea thick at side wall of the bell; manubrium base wide, flask-shaped 1/3 of the length of the bell cavity, with simple, circular mouth, lip not distinct; with 4 unbranched radial and ring canals; 2/3 of the length of the manubrium connected to the radial canal by mesenteries; with 4 large, interradial gonads, mass-like, smooth, almost completely covered wall of the manubrium; with 4 perradial hollow

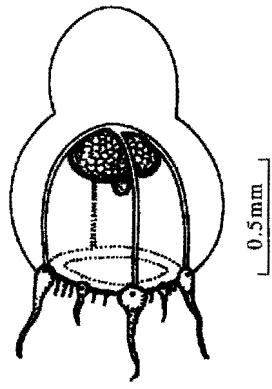

Fig. 8. *Halitiarella apicea* n. sp.

marginal tentacles, base bulbs longth conical-shaped, abaxial ocelli on marginal tentacular bulbs, with 4 interradial intermediate size hollow marginal tentacles, conical bulbs, with abaxial ocelli, with 2~3 short, solid marginal cirri between perradial and interradial marginal tentacles, without swelling bulbs and abaxial ocelli; velum midding broad.

This new species has an interradial gonad, smooth without folds; umbrella margin with 4 perradial and 4 interradial hollow tentacles, base bulbs with abaxial ocelli; with solid marginal cirri. These features place this medusa in the genus *Halitiarella* Bouillon, 1980.

At the present time, only 1 species is known in *Halitiarella ocellata* Bouillon, 1980. The distinguishing characteristics are:

Halitiarella ocellata: umbrella without apical projection; with 4 perradial marginal tentacles; with 3~4 solid, cirrus-like marginal tentacles between successive tentacles; all tentacular bulbs with abaxial ocelli.

Halitiarella apicea n. sp.: umbrella with a large, solid, nearly globular apical projection; bell margin with 4 perradial, hollow tentacles, base bulbs long, conical-shaped, with abaxial ocelli, and 4 interradial, intermedial size, hollow tentacles, conical bulbs with abaxial ocelli; with 2~3 short, solid, cirrus-like tentacles between perradial and interradial marginal tentacles, without swelling

bulbs and abaxial ocelli.

Type specimens: holotype, No. AOB–HL 133. One specimen was collected from the Minjiang River Estuary, Fujian in November 1990.

Family Euphysidae

Euphysilla pyramidata Kramp, 1953 (Fig. 9).

Euphysilla pyramidata, Kramp, 1953, 245, pl. I, Fig. 1, pl. II, Fig.3; Bouillon, 1978, 257, Figs 5,7,8; Xu and Zhang, 1981, 376, pl. I, Fig.1; Li and Chen, 1991, 9~10, Fig. 9.

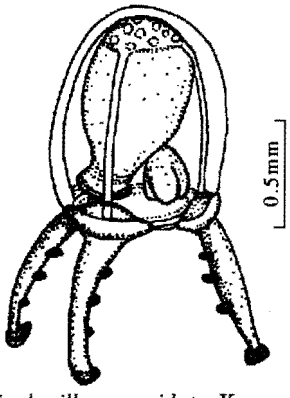

Fig. 9. *Euphysilla pyramidata*, Kramp,1953.

Height: 0.9 mm, width: 0.7 mm, exumbrella smooth, stomach pyramidal, with a broad, quadrale base, completely surrounded by gonad, with medusa-buds on the stomach; 4 tentacles, rather short and stout provided with 3~4 prominent transersal clasps of nematocysts on their inside and a spherical terminal knob; no ocelli.

One specimen with medusa-buds was collected from the southern part of the Taiwan Strait in November 1988.

Distribution: west of Madagascar, the Gulf of Guinea on the west coast of Africa, Papua New Guinea, the South China Sea of China.

Family Teissieridae Bouillon, 1974.

Teissiera polypofera Xu, Huang and Chen, 1991 (Fig. 10)

Teissiera polypofera Xu, Huang and Chen, 1991, 469~486, Fig. 14.

Umbrella nearly spherical, exumbrella with scattered nematocyst cluster and 4 perradial

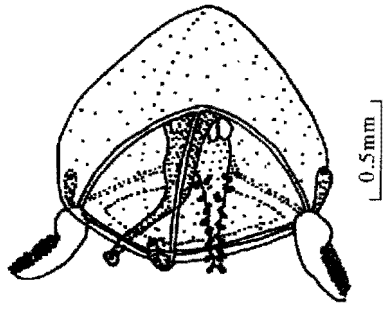

Fig. 10. *Teissiera polypofera* Xu, Huang and Chen, 1991.

ridges protruding; height: 0.5~1.3 mm, width: 0.5 mm, apex rounded; manubrium narrow and long, exceeding beyond the bell opening; with simple, circular mouth; 1~4 polyps issuing from the base portion of medusa manubrium, with a whorl of 4~5 capitate oral tentacles and 20~30 scattered capitate tentacles on the body; 2 medusa buds at the base of hydranths; umbrella margin with 2 perradial opposite marginal bulbs, large, long conical, bearing tentacles with about 80 abaxial cnidophores, ovaliform, each containing about 20 nematocysts; other 2 without tentaculata perradial bulbs; four perradial, ovaliform, exumbrella nematocysts pouches, each with 15 nematocysts, 1 ocellus in the most apical part of the exumbrellar pouches, a slender canal below part of pouches connected to the point where the radial canal adjoins the ring canal.

Remarks: Bouillon and Boero (2000) suggested that Xu et al. (1991) described and illustrated *Teissiera polypofera* insufficiently, which probably belongs to *Zanclea medusopolypata*. They did not report whether those medusae have ocelli. If they are proven to have no ocelli, they should be referred to *Zanclea* (Boero et al., 2000). In fact, *Teissiera polypofera* have 1 ocellus in the most apical part of the exumbrellar pouches. So, the systematic position of the *T. polypofera* belongs to the family Teissieridae (Fig. 10).

Family Zancleidae Russell, 1953.

Zanclea macrocystae (Xu, Huang and Chen, 1991) transl. nov. (Fig. 11).

Teissiera macrocystae, Xu, Huang and Chen, 1991, 480, Fig.16.

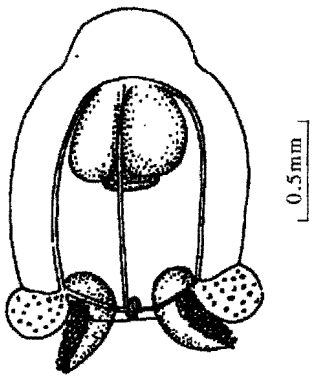

Fig. 11. *Zanclea macrocystae* (Xu, Huang and Chen, 1991) transl. nov.

Umbrella nearly bell-shaped, with a solid, hemispherical apical projection, mesoglea thick; height: 1.5 mm, width: 1.1 mm; manubrium pot-shaped, length 2/5 of the subumbrella cavity, with simple, circular mouth; with 4 large, interradial gonads, mass-like, almost completely covered wall of manubrium; 2 perradial opposite marginal bulbs, large, elongate conical, bearing tentacles with about 70 abaxial cnidophores, each containing about 7~8 nematocysts, exumbrella nematocyst pouches above tentacular bulbs, very large, nearly ovaliform, usually projecting outside, length: 0.45 mm, width: 0.3 mm, each containing about 50~60 nematocysts, without ocellus, with a very short and thick canal at the inside of nematocyst pouches, connected to the adjoining point of the radial canals and the ring canal; other 2 perradial marginal bulbs absent, without tentacles, but with a very small exumbrella nematocyst pouches, each with 30~50 nematocysts, without ocellus in the apical part of the exumbrella pouches, a very short canal below part of pouches, connected to the adjoining point of the radial canals and ring canal; with 4 radial and ring canals.

Remarks: As *Teissiera macrocystae* do not have ocelli in the apical part of the exumbrella pouches, this medusa does not correspond to the characteristics of the genus *Teissiera,* because whether those medusae have ocelli, the characteristic distinguishing *Teissiera* medusae from those of *Zanclea,* they should be referred to *Zanclea.*

At the present time, 14 species in the *Zanclea* are known. Owing to both the apical projection and the 4 perradial, exumbrella nematocyst pouches, unequal size, these features differ from those of the other species, but close to *Zanclea protecta* Hasling, 1930. A comparison of this medusa with *Zanclea macrocystae* is given in Table 6.

Table 5. Comparison of main shape characteristics of *Zanclea protecta* and *Z. macrocystae.*

	Zanclea protecta	*Zanclea macrocystae*
Apical projection	present, round	present, hemisphere-shaped
Manubrium	cylindrical, 2/3 of subumbrellar cavity	pot-shaped, 2/5 of subumbrellar cavity
Number and position of gonads	4, interradial, each with a medial furrow, covering the upper 2/3 of manubrium	4, interradial,each without medial furrow, mass-like, almost covering the whole manubrium.
Number of marginal bulbs	4, 2 non-tentacular ones reduced or absent	2 big, with tentacles, other 2 absent
Cnidophorea on tentacles	more than 100	about 70
Number of nematocyst in each cnidophore	5	7~8
Exumbrella nematocysts pouches	2 big, above tentacular bulbs on prominent apophyses, without short canal at the inside of exumbrella pouches; other 2 smaller and without apophyses.	above tentacular bulbs with 2 big exumbrella pouches, without apophyses, with short canal at the inside of pouches; other 2 smaller and with short canal at bell margin

Acknowledgements

This study was supported by the National Science Foundation of China under contract No.49636220.

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