

Four Hydromedusae (Cnidaria: Hydrozoa) from Korean Waters

Jung Hee Park

(Division of Life Science, The University of Suwon, Kyönggi-do 445-743, Korea)

ABSTRACT

Some hydromedusae were collected from the western and southern coasts of Korean Peninsula during May to October, 1995. They were identified into *Turritopsis nutricula* (McCrary, 1856); *Cladonema radiatum* Dujardin, 1843; *Eirene menoni* Kramp, 1953 and *Gonionemus vertens* A. Agassiz, 1862. Of which the hydromedusa of *T. nutricula* is preliminary known in Korean waters, and the remainders are new to the Korean fauna.

Key words: Hydromedusae, systematics, Korea

INTRODUCTION

The hydromedusae were never known from the Korean Peninsula and its adjacent waters. They are one stage of the life cycle in hydroids, and alternate with polyp hydroids, reproduce sexually in common except some species, and contribute to species dispersal. They are distinguished from scyphomedusae in having velum, thin mesoglea and small size.

Some hydromedusae were collected from the western and southern coasts of Korean Peninsula during May to October, 1995. They were preserved in 5% neutral formalin after narcotization and/or reared in growth chamber which was kept at around 20°C. The identification were based on the morphological characters: bell shape, position and number of tentacles, shape and position of gonads, number of radial canals, presence or absence of centripetal canal and shape of manubrium. Four hydromedusae were identified in this-work. The redescrptions and figures on them were given. The systematic scheme of Stephen *et al.*, 1991 were refered.

SYSTEMATIC ACCOUNTS

Class Hydrozoa: 히드라충강

Order Anthomedusae 꽃해파리목(신칭)

Family Clavidae 진곤봉해파리과(신칭)

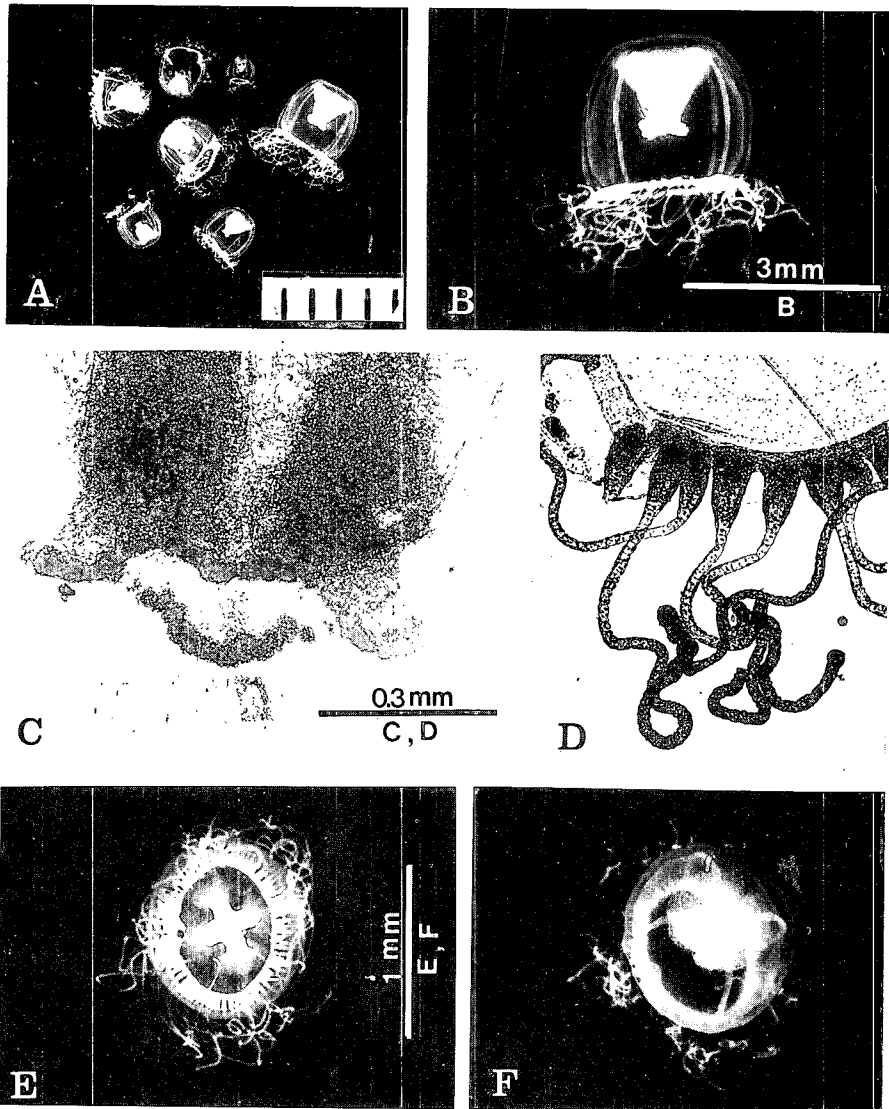
1. *Turritopsis nutricula* (McCrary, 1856) 작은보호탑해파리(신칭) (Fig. 1A-F)*Oceania (Turritopsis) nutricula* McCrary, 1856, p. 55, pls. 4, 5.

Fig. 1. *Turritopsis nutricula*. A, medusae in different stage of growth (scale in 4 mm); B, lateral view of adult medusa; C, recurved lips with nematocyst warts of manubrium; D, bell margin showing tentacles and velum; E, oral view; F, aboral view showing four vacuoles.

Turritopsis nutricula: Mayer, 1910, p. 143, pl. 14, fig. 10, pl. 15, figs. 10-13; Uchida, 1925, p. 84; Chow and Huang, 1958, pp. 176, 189; Kramp, 1961, p. 66; Kramp, 1968, p. 27, fig. 66; Russell, 1970, p. 235; Bouillon *et al.*, 1995, p. 10; Stepanjants and Scheiko, 1989, p. 126, fig. 44.

Material examined. Chakyakto, May 30 and Jun. 9, 1995 (W. J. Lee).

Description. Bell higher than hemisphere, 2.5 mm high, 2 mm wide, with about 80 marginal tentacles. Tentacle capable of much contraction, with large tentacular bulb. Number of tentacles, ratio of height to width and size variable according to age (days). Young medusae slightly pyriform. Manubrium large, reached half of bell height, with four somewhat recurved lobes which armored beed-like knobs of nematocyst. Proximal part of radial canal vacuolated forming stomach. Four narrow canals, a ring canal and velum well developed. Gonads developed upon four interradial sides of stomach.

Remark. Hydroids of *T. nutricula* have been known in Korean fauna (Park, 1990).

Distribution. British coasts (Whitstable, mouth of Thames, Plymouth), S.W. North Sea and Strait of Dover, N.W. Europe, Mediterranean, Suez Canal, French Channel coast, France (Roscoff), Italy (Naple, Trieste), W. Africa (off Sierra Leone, Gulf of Guinea, Senegal), Mozambique, Laing Island, central tropical Atlantic, Woods Hole, Florida, Brazil, Indian Ocean (between Chagos Islands and Seychelles), China (Chefoo, Tsingtao, Chekiang coast), Japan (Tanabe Bay, Kagoshima Gulf).

Family Cladonematidae 분지해파리과 (신칭)

2. *Cladonema radiatum* Dujardin, 1843 방사분지해파리 (신칭) (Fig. 2A-K)

Cladonema radiatum: Mayer, 1910, p. 99, figs. 53-55; Leloup, 1952, p. 195, fig. 112; Naumov, 1960, p. 226, figs. 113, 117A-H; Kramp, 1961, p. 57; Kramp, 1968, p. 22, fig. 52; Brinckmann-Voss, 1970, p. 76, pl. V, figs. 1, 2, textfigs. 88, 89; Petersen, 1990, p. 214; Russell, 1970, p. 235.

Cladonema mayeri: Mayer, 1910, p. 101, pl. 9, figs. 2, 3; Chow and Huang, 1958, pp. 175, 189, pl. 1, fig. 7.

Cladonema perkinsii: Mayer, 1910, p. 101, pl. 9, fig. 1.

Cladonema radiatum mayeri: Uchida, 1925, p. 81, fig. 7a, b; Uchida, 1927, p. 157, fig. 14, pl. 10, fig. 4; Uchida, 1938-39, p. 38.

Cladonema myersi: Kramp, 1968, p. 23, fig. 54.

Material examined. Yokchido, Oct. 13, 1995 (H.S. Ko).

Description. Bell about 3 mm high, 3 mm wide in adult medusae. But young medusae smaller, about 0.49 mm high, 0.62 mm wide. Ratio of height to width variable according to age (days). Manubrium more or less spindle- or cylinder-shaped, two-fifth length thrust out of velar opening in adult medusae in common. However manubrium of young medusa not reached to velar opening, with six short capitate oral tentacles. Stomach consisted with six perradial pouches. Six main radial canals, of which three bifurcated near rounded apex, so that nine radial canals in all. Simple and bifurcated canals arranged in alternate with each other. Marginal tentacle arising from base of each radial canal, moniliform, covered with several series of nematocyst clusters, with heavy and swollen tentacular bulb, branched several times and extended usually as three times as bell high, with two or three adhesive capitate tentacles at base in common. A ring canal broader than radial canals. Velum well developed, very broad, with small aperture. Gonads surrounding stomach completely. Black

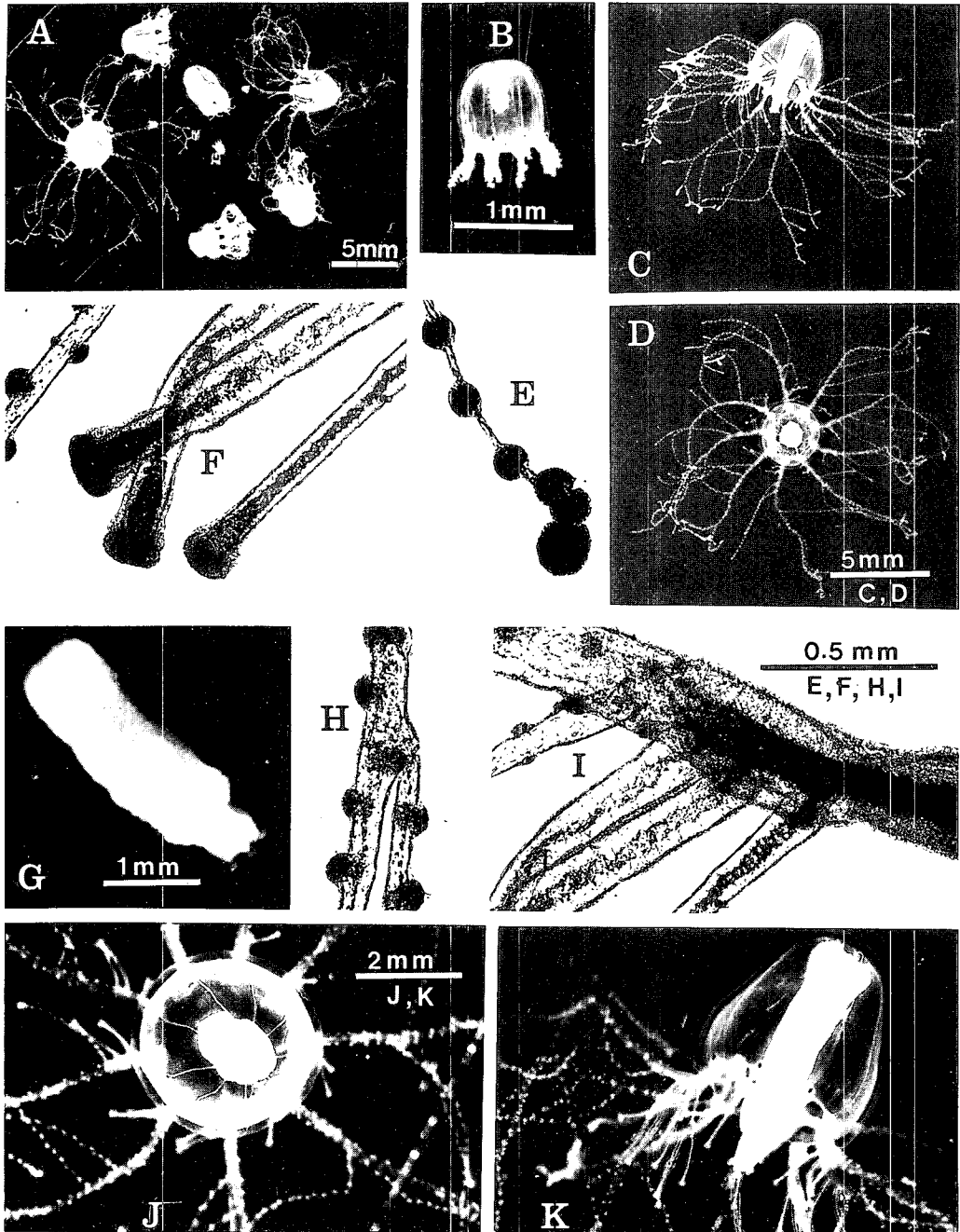


Fig. 2. *Cladonema radiatum*. A, medusae in different age (note on small young medusae and contracted adult medusae); B, contracted young medusa showing short manubrium and small velar opening; C, lateral view of expanded adult medusa showing several bifurcated tentacles and long manubrium; D, aboral view of expanded adult medusa; E, apical portion of bifurcated tentacle with nematocyst warts; F, three adhesive capitulate tentacles without nematocyst warts; G, gonads surrounding stomach; H, bifurcated portion of moniliform tentacle; I, heavy and swollen tentacular bulb; J, enlarged aboral view of medusa showing nine radial canals; K, lateral view of enlarged adult medusae showing short oral capitulate tentacles and black ocelli located on outside of each tentacular bulb.

distinct ocellus located on outside of each tentacular bulb.

Remarks. The marginal tentacles of *C. radiatum* are branched for several times, and the manubrium is growing longer with growth, and thrust out of small velar aperture. The living expanded forms and the dead contracted forms differ from each other in external features. So that they seem to be named with other species, or subspecies according to age and preserved conditions. *C. mayeri* (Mayer, 1910) is considered contracted form and *C. perkinsii* (Mayer, 1910) is considered expanded form of adult medusae. *C. myersi* (Kramp, 1968) and *C. radiatum mayeri* (Uchida, 1927) are considered contracted forms of young medusae.

Distribution. British coasts, Helgoland, W. Europe, Denmark, Belgium, France (Boulogne-sur-mer, Villefranche), Italy (Trieste, Naples), Adriatic Sea, Mediterranean, Black Sea, Florida, Bahamas, China (Chefoo), Japan (Akkeshi Bay, Asamushi, Sado, Tanabe Bay).

Order Leptomedusae 연(연)해파리목(신칭)

Family Eirenidae 평화해파리과(신칭)

3. *Eirene menoni* Kramp, 1953 메논평화해파리(신칭) (Fig. 3A-K)

Eirene menoni: Kramp, 1955, p. 353; Kramp, 1961, p. 189; Kramp, 1968, p. 90, fig. 242; Sugiura, 1979, p. 5, figs. 1-3; Bouillon *et al.*, 1995, p. 42.

Phortis sp.: Menon, 1932, p. 18.

Phortis lactea: Ling, 1937, p. 357, figs. 9-10.

Eirene ceylonensis: Nair, 1951, p. 64: smaller type.

Material examined. Chunjangdae (Piin), Aug. 2, 1995 (W.J. Lee).

Description. Bell hemisphere or somewhat flatter than hemisphere, about 11 mm wide, 7 mm high. Gelatinous substance (mesoglea) thick above, about 4.5 mm, but becoming thin at bell margin, 2 mm. Manubrium short, with four light yellowish crenated lobes, centering points of lobes black-colored, connected with slender, long peduncle which as long as bell height or somewhat beyond bell margin. Marginal tentacle slender and simple, about 30-45, with distinct large conical tentacular bulbs, covered with warts of nematocysts. Distance between tentacles variable. A minute statocyst located between successive tentacles, without concretion in common. Four gonads well developed upon four radial canals from near base of peduncle to bell margin. Four radial canals and a ring canal simple and narrow. Velum not so wide. Gonads, tentacles and manubrium milky white and remainders high transparent in preserve conditions in 5% neutral formalin.

Remarks. According to Kramp (1955) and Sugiura (1979), *E. menoni* was named to a single specimen from the Great Barrier Reef off north-eastern Australia by Kramp (1953). He identified it as the same species with the medusa formerly reported as *Phortis* sp. from the near Madras, India by Menon (1932). Kramp (1955) described that the smaller type of *Eirene ceylonensis* found off the Trivandrum coast (Nair, 1951) undoubtedly also belongs to the same species. And he also identified it the same with *Phortis lactea* from Chekiang coast, China by Ling (1937). But he considered the *E. menoni* is not the same species with *Phortis lactea* from Florida by Mayer (1900). Mayer (1910) described that the genus *Phortis* is very closely related to *Eirene* and to *Tima* of Eschscholz, 1829, but differs from them in having neither marginal nor lateral cirri. But Kramp (1936) concluded that *Phortis* is nothing but a synonyme of *Eirene* in which cirri are deficient.

Distribution. Coastal water in the Indo-West-Pacific region from Africa to Polynesia. India (Madras,

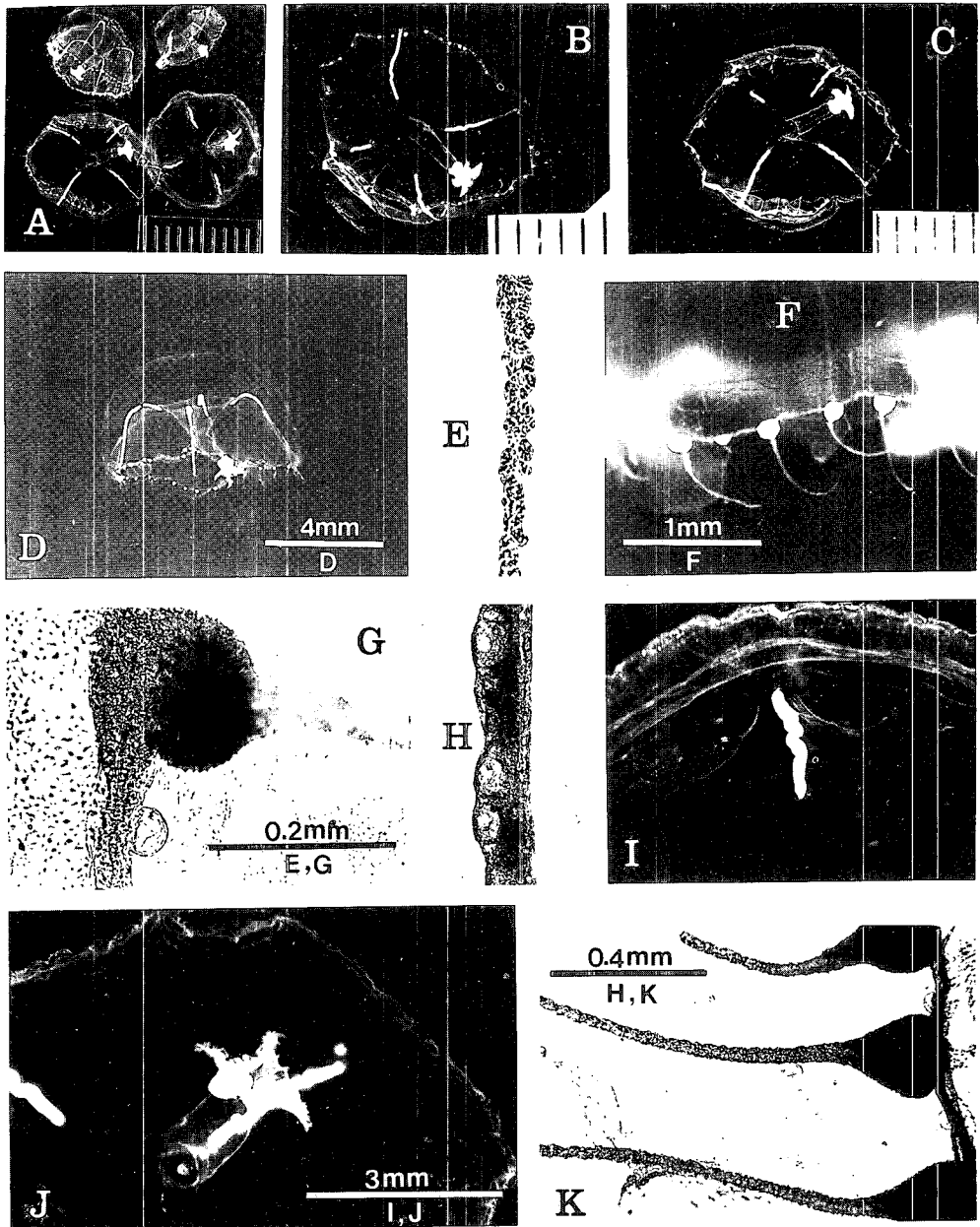


Fig. 3. *Eirene menoni*. A, medusae in different size (scale in 10 mm); B, oral view of mature female medusa (scale in 5 mm); C, aboral view of mature female medusa (scale in 5 mm); D, lateral view; E, enlarged tentacle with nematocysts; F, bell margin with tentacles; G, statocyst without concretion and large tentacular bulb; H, eggs in gonad; I, bell margin showing gonad and velum; J, recurved crenated lips and long peduncle; K, bell margin showing statocysts between tentacles.

Trivandrum, Orissa coast, near Calcutta), Australia (Great Barrier Reef), Laing Island (Hansa Bay, Madang Province), China (Chekiang coast), Japan (Amakusa).

Order Limnomedusae 담수해파리목 (신칭)

Family Olindiidae 꽃모자해파리과 (신칭)

4. *Gonionemus vertens* A. Agassiz, 1862 꽃모자갈퀴손해파리 (신칭) (Fig. 4A-G)

Gonionemus vertens A. Agassiz, 1862, p. 350; Mayer, 1910, p. 343; Naumov, 1960, p. 494, figs. 382-385, pl. 30, fig. 1; Kramp, 1961, p. 223; Kramp, 1968, p. 100, fig. 287; Bouillon *et al.*, 1995, p. 87.

Gonionemus murbachii: Mayer, 1910, p. 343, pl. 45, figs. 1-4, pl. 46, figs. 1-3; Broch, 1928, p. 95, fig. 100; Leloup, 1952, p. 225, fig. 137 A, B.

Gonionemus depressus: Mayer, 1910, p. 348.

Gonionemus agassizii: Mayer, 1910, p. 348.

Gonionemus depressum: Uchida, 1938a, p. 146.

Gonionemus sp.: Uchida, 1938b, p. 54.

Gonionemus murbachii oshoro: Uchida, 1925, p. 94, figs. 18, 19; Uchida, 1927, p. 224; Chow and Huang, 1958, p. 186, pl. 5, fig. 41.

Gonionemus murbachii chekiangensis: Chow and Huang, 1958, p. 186.

Material examined. Pangpoaesuyokchang (Anmyŏndo), Jun. 25, 1995 (J.H. Park).

Description. Bell flatter than hemisphere, about 13 mm wide, 4 mm high, but bell higher in young medusae in common (Uchida, 1927). Gelatinous substance somewhat thin, but quite rigid. Tentacle slender, with well developed oval or conical bulb at base, ringed with helical ridge of nematocysts, so that thick and heavy in appearance, with an aboral adhesive pad near distal end which sharply bent. Manubrium short, hanging like pouch at base, not reached velar opening, with four fringed lobes. Velum well developed, not so wide, about 1.2 mm wide. Gonads developed upon radial canals extended from near base of manubrium to bell margin, but never touched ring canal. Four radial canals a ring canal and manubrium brown colored and oral lobes milky white in preserve condition in formalin.

Remarks. It is very difficult to distinguish the species of the genus *Gonionemus*. Because they are similar with each other in external shape and colors. Uchida (1925) said that the principal differences must be sought in position of the statocysts and the shape of the gonads. However according to Mayer (1910), the lithocysts bear a very definite relation, both is place and time of development, to the tentacles. And also it is said that the shape of gonads changed with growth of medusae (Uchida, 1927). Kramp (1961) treated the following species of *Gonionemus* as synonym: ***Gonionemus vertens*** A. Agassiz, 1862, Puget Sound; Mayer, 1910, Pacific coast of N. America, Gulf of Georgia (west coast of USA); Broch, 1919; Foerster, 1923, Vancouver; Broch, 1929; Theil, 1932; Weill, 1938; Picard, 1951, *G. vertens* = *G. murbachii*, *agassizi* and = probably *depressum* and young specimens of *G. vertens* are very like *G. vindobonensis*, Villefranche; Picard, 1952, French Mediterranean coast. ***Gonionemus murbachii***: Mayer, 1901, New England (USA); Mayer, 1910, New England (USA); Bigelow, 1914, New England (USA); Gordon, 1915, Connecticut (USA); Broch, 1919; Thomas, 1921; Kramp, 1922, Kristianiafjord (Norway); Perkins, 1926, Woods Hole; Broch, 1929; Rugh, 1929; Lönnberg, 1930, Gullmarfjord (Sweden); Rugh, 1930; Teissier, 1930, Roscoff (France); Teissier, 1932, Brittany (France); Kramp, 1937; Weill, 1938; Fraser, 1936, northern Pacific; Fraser, 1947; Leloup, 1948, Belgium; Berrill, 1950; Teissier, 1950, Roscoff;

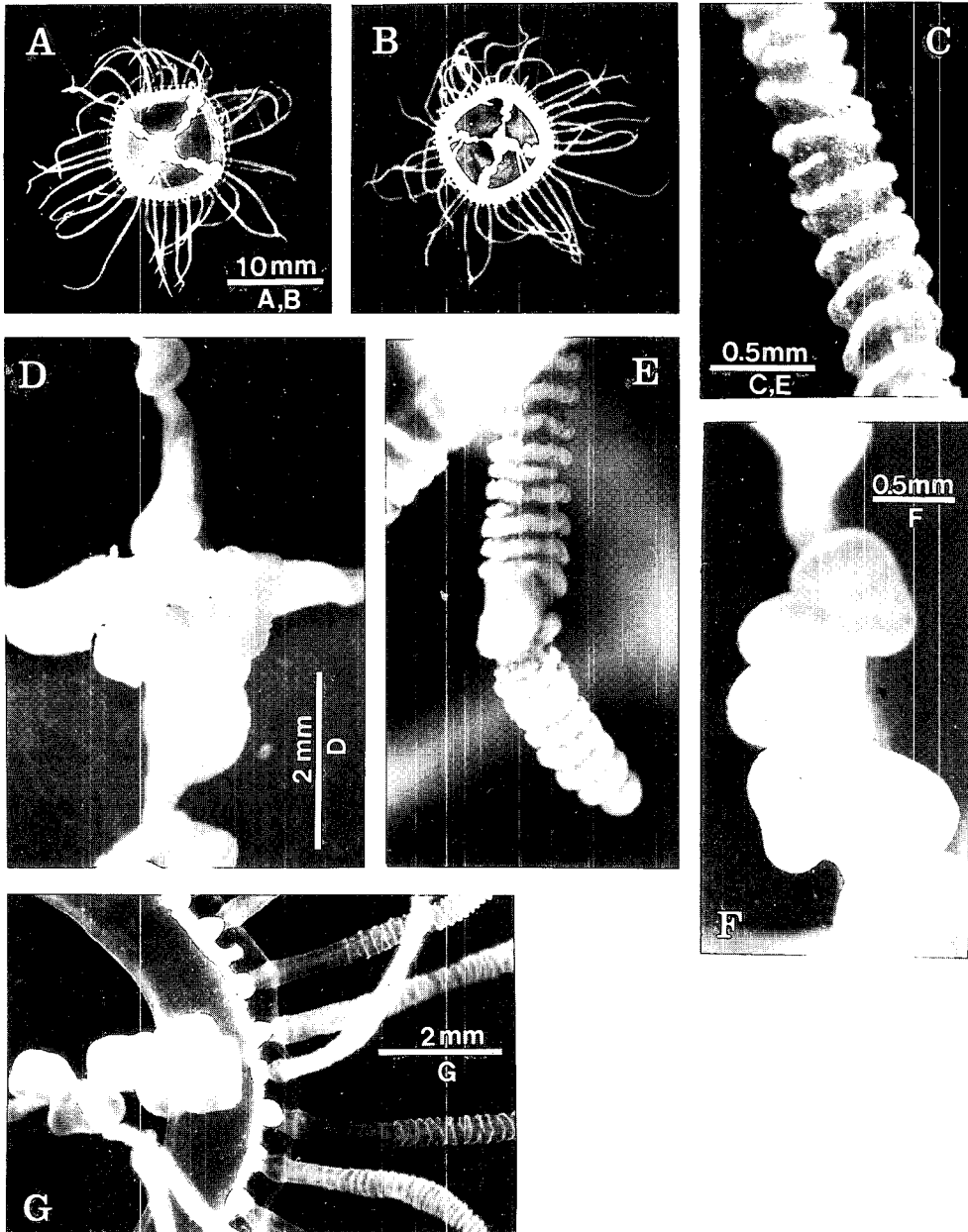


Fig. 4. *Gonionemus vertens*. A, aboral view of adult medusa; B, oral view of adult medusa; C, a part of tentacle showing helical ridge of nematocysts; D, four fringed lips of manubrium and mouth; E, outer end of tentacle with adhesive pad and sharply bent extremity; F, gonad deflected alternately to one side and the other of radial canal; G, bell margin showing gonad, tentacles and velum.

Werner, 1950a, Sylt (S.E. North Sea); Werner, 1950b, Sylt; Carthy, 1958. ***Gonionemus depressum*** Goto, 1903, Japan; Uchida, 1929, Japan; Uchida, 1930, Sagami Bay (Japan); Uchida, 1938, Japan; Komai and Yamazi, 1945, Japan; Komai, 1951, Amakusa (Japan). ***Gonionemus agassizii*** Murbachand Shearer, 1902, Unalaska; Mayer, 1910; Broch, 1919;

Foerster, 1923, Vancouver; Broch, 1929; Thiel, 1932, Arctic; Weill, 1938; Uchida, 1940, Akkeshi Bay; Chiu, 1954, China. **Gonionemus depressum**: Mayer, 1910; Okada, 1932; Weill, 1938; Yamazi, 1958, Tanabe Bay, Cladonema sp.: Robson, 1913, Culler coast (England). **Eleutheria robsonia** Lengerich, 1922; Lengerich, 1923. **Gonionemus oshoro**: Uchida, 1929, Japan; Uchida, 1936, Japan. **Gonionemus vindobonensis**: Weill, 1938. *Gonionemus* sp.: Uchida, 1938, Onagawa (Japan). **Gonionemus murbachii oshoro**: Uchida, 1925, Japan; Uchida, 1927, Japan; Broch, 1929; Chow and Huang, 1958, Chefoo (China). **Gonionemus murbachii chekiangensis** Ling, 1937, Chekiang coast (China); Chiu, 1954, China; Chow and Huang, 1958, Chefoo (China). The author considers that it is reasonable to agree with Kramp's suggestions above mentioned.

Distribution. Norway (Kristianiafjord); Sweden (Gullmarfjord); England (Culler coasts); France (Villefranche, Mediterranean coast, Brittany, Roscoff); Belgium; S.E. North Sea (Sylt); Arctic; Northern Pacific; Aleutian Island (Unalaska); Puget Sound; Vancouver; USA (Gulf of Georgia, New England, Connecticut, Woods Hole); China (Chefoo, Chekiang coast); Japan (Onagawa, Sagami Bay, Tanabe Bay, Akkeshi Bay, Amakusa).

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한국산 히드라해파리 4종(자포동물문: 히드라충 강)

박 정 희

(수원대학교 자연과학대학 생명과학부)

요 약

우리나라의 서해와 남해연안에서 1995년 5월과 10월 사이에 채집된 히드라해파리는 2목 4과 4종으로 동정, 분류되어 재기재와 함께 보고한다. 3종: *Cladonema radiatum* Dujardin, 1843; *Eirene menoni* Kramp, 1953 및 *Gonionemus vertens* A. Agassiz, 1862는 한국 미기록종이고 *Turritopsis nutricula*(McCrady, 1856)의 폴립은 한국해역에서 이미 알려졌으나 해파리는 처음 보고된다.