

Morphologically, *Scutariella* sp. of the NE China is very similar to that of *Scutariella japonica*. Several preserved specimens with 5% formalin solution are keeping in Ohtaka's laboratory.

For Chinese freshwater shrimps imported into Japan, see also Nishino & Niwa (2004).

Nishino, M. & Niwa, N., 2004. Inversion of an alien freshwater shrimp *Neocaridina denticulata sinensis?* to Lake Biwa. *Ohmia* (Lake Biwa Res. Inst. News), (80): 3. (In Japanese.) Not mentioned about the temnocephalidans.

Niwa, N. & Nishino, M., 2005. Introduction of Korean and Chinese freshwater shrimps into Japan for live baits in leisure fishings. Program and Abstracts for the Ann. Meet. of the Japanese Soc. of Fisheries Science held in Tokyo, on Mar. 31-Apr. 4, 2005, p. 276. (In Japanese.) Not mentioned about the temnocephalidans.

#### 4) South Korea

- a) *Scutariella japonica* (Matjašič, 1990)? of Wolchul-san Reservoir, South Korea (Fig. 9, locality 28).

In late October of 2004, Nishino (in cooperation with Dr. Oh of Mokpo National University) collected *Scutariella* specimens (*S. japonica?*) from an outlet stream of the Wolchul-san Reservoir, Yeongam, Chonnam-Do, South Korea. This is the first occurrence record of *Scutariella* species in Korea.

See also Niwa & Nishino (2005) and the foregoing item e) in 'China.'

For the Literature Cited in the Section II, see the Section I. See also "References for Temnocephalid taxonomy and Taxa" in the present publication.

Publication listed in the Sections I and II are in alphabetical order of the authors' names. They are in chronological order as follows (authors' names and publishing years only):

1912: Annandale.  
1913: Kemp.  
1917: Kemp.  
1918: Kemp; Kawamura.  
1919: Komai.  
1922: Annandale.  
1935: Kobayashi; Negishi.  
1936: Lee; Umemoto.  
1937: Honjô.  
1938: Okada.  
1943: Katô.  
1947: Katô.  
1953: Baer.

1954: Yanada.  
1955: Yanada.  
1955: Yanada.  
1960: Katô.  
1961: Baer.  
1965: Katô.  
1970: Kamita.  
1971: Kawakatsu.  
1972: Uchida.  
1973: Okugawa.  
1976: Kawakatsu.  
1977: Suzuki.  
1979: Katô.  
1983: Suzuki, Ninagawa & Kawakatsu.  
1985: Tamura, Oki, Kawakatsu, Ninagawa, Matsusato & Suzuki.  
1988: Uchida; Kawakatsu.  
1989: Kawakatsu; Kawakatsu, Nunomura & Suzuki.  
1990: Matjašič.  
1991: Lo & Wu.  
1993: Kawakatsu & Nishino; Oki, Tamura, Takai & Kawakatsu.  
1994: Kawakatsu & Nishino.  
1995: Oki, Tamura, Takai & Kawakatsu; Ribâ-Furonto Seibi Sentâ (Kawakatsu).  
1997: Kawakatsu & Nunomura.  
1998: Kawakatsu (a, b).  
1999: Gelder; Kawakatsu, Murayama, Nishino & Ohtaka; Shimazu.  
2000: Gelder & Ohtaka; Nishino; Tyler (& Bush).  
2003: Shimazu; Tanaka.  
2004: Kawakatsu, Sluys & Sasaki; Niwa & Ohtaka; Ohtaka.  
2006: Niwa & Ohtaka.

### Acknowledgements

Nishino, Ohtaka and Kawakatsu are indebted to Messrs. Norio Kobayashi, the Freshwater Biological Research Co., Ltd. (Saitama Pref., Japan), for the supplying photographs and samples of *Temnocephala* sp. of Kagoshima. Nishino is also indebted to Dr. Chul-Wong Oh (Major in Marine Resources, Division of Biotechnology & Resources, Mokupo National University, Republic of Korea) for his kind assistance in the 2004 collection trip. Finally, Kawakatsu is indebted to Dr. Hiroshi Suzuki (Yokosuka, Japan) for his permission to reproduce his original photographs of *Temnocephala* sp. of Iriomote-jima Island (Figs. 5 1-4). Dr. Suzuki also gave to Kawakatsu a single whole-mount specimen of the unidentified species.

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**Some related publication not cited in the text.**

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## ADDENDUM I (February 20, 2007)

After the final draft of the present web article was completed (March, 2005), additional short Japanese papers on Chinese and Korean freshwater shrimps have been published. *Scutariella* sp. (spp.?) is found from some of the host shrimps examined by Niwa.

Nishino, M. & Niwa, N., 2005. Exotic populations of Chinese and Korean *Neocaridina denticulata* group found in Japan. Program, the 52<sup>nd</sup> Ann. Meet. of the Ecol. Soc. of Japan held in Ôsaka, on March 27-30, 2005, p. 50. (In Japanese.)

Niwa, N., 2005a. My recent research: Story of the discovery of crayfish worms (Branchiobdellida) found from freshwater shrimps I studied. Academia, Kyôto, (90): 24-28. (In Japanese.)

Niwa, N., 2005b. Introduction of my lecture given at the International Conference on the Assessment and Control of Biological Inversion Risks (2004). Program, the 8<sup>th</sup> Ann. Meet. of the Hyôgo Biological Society held in Kôbe, on December 12, 2004. Hyogo Biology, 13 (1): 85. (In Japanese, with an English abstract given at the ICACBIR, 2004.)

Niwa, N., 2006a. The present condition of Chinese crayfish worms found from imported living specimens of freshwater shrimps (*Neocaridina denticulata* group) in the Sugo River, Hyôgo Prefecture, Kinki Region, Honshû, Japan. Program, the 9<sup>th</sup> Ann. Meet. of the Hyôgo Biological Society held in Kôbe, on December 11, 2005. Hyogo Biology, 13 (2): 48. (In Japanese.)

Niwa, N., 2006b. Ecological observation of crayfish worm found from exotic freshwater shrimps (*Neocaridina denticulata* group) of the Sugo River, Hyôgo Prefecture, Kinki Region, Honshû, Japan. (Preliminary Report 2: Breeding behavior). Program, the 44<sup>th</sup> Ann. Meet. of the Carcinol. Soc. of Japan held in Hakodate, on October 14, 2006. Lecture 03. (In Japanese.)

Niwa, N., 2007a. Save the native populations of *Neocaridina denticulata denticulata* (De Haan, 1849), a proper subspecies of freshwater shrimp distributed in southwestern Japan. Program, the 10<sup>th</sup> Ann. Meet. of the Hyôgo Biological Society held in Kôbe, on December 2, 2006. Hyogo Biology. 13 (3). (In Japanese.)

Niwa, N., 2007b. The present condition of imported living specimens of freshwater shrimps (*Neocaridina denticulata* group) from China at pet shops in Japan. Abstracts for the Ann. Meet. of the Japanese Soc. of Fisheries Science held in Tôkyô, on Mar. 27-31, 2007, p. 259. (In Japanese.)

Niwa, N., 2007c. The author is apprehensive for the extermination of Japanese strain of *Neocaridina denticulata denticulata* (De Haan, 1849) living in the Yumesaki River System in Hyôgo Prefecture, Kinki Region, Honshû, Japan. In: Hyôgo-Ken Seibutsu-

Gakkai (ed.), “Hyôgo no Shizen / Konjaku” [The Change of Nature in Hyôgo Prefecture], pp. 72-73. The Publ. Center of the Kôbe Shinbun (News Paper), Kôbe. (In Japanese.)

**ADDENDUM II** (Feb. 20, 2007)

The Order Temnocephalida (families Scutariellidae and Temnocephalidae) is listed in the table of the following web information.

Ribâ-Fronto Seibi Sentâ (River Front Adjustment Center) (Guidance: M. Kawakatsu), 2006. Platyhelminthes – Temnocephalida. In: “Heisei-17-nendo Kasen-Suihen no Kokusei-Chôsa, Seibutsu-shu Mokuroku”. Table. River Front Adjustment Center, Tôkyô. (In Japanese.) [http://www.rfc.or.jp/mizube/mizube\\_f.html](http://www.rfc.or.jp/mizube/mizube_f.html)

The following Poster Presentation entitled “Exotic Freshwater Planarians Now Known from Japan (Preliminary Report)” was given at the Public Meeting on the Exotic Freshwater Invertebrate Animals in Japan - The Present Condition and the Problem for Their Control - held on March 22, 2007, in Matsuyama.

Kawakatsu, M., Nishino, M., Ohtaka, A., Yamamoto, K. & Sasaki, G.-Y., 2007. Exotic planarians now known from Japan (Preliminary Report). For the reduced posters and a copy of distribution material for participasnts of the Matsuyama Meeting, see Kawakatsu’s Web Library on Planarians: Feb. 15, 2007. <http://victoriver.com> .

*Temnosewellia minor* (Haswell, 1887) found in Kyûshû, Japan, is mentioned.

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Figures 1-10 (pp. 31-37)  
 Explanations (pp. 37-39)

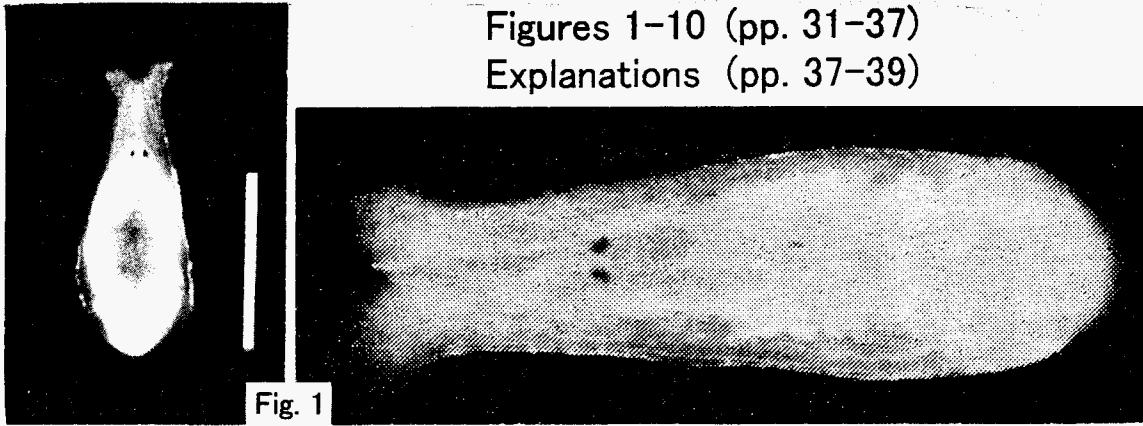
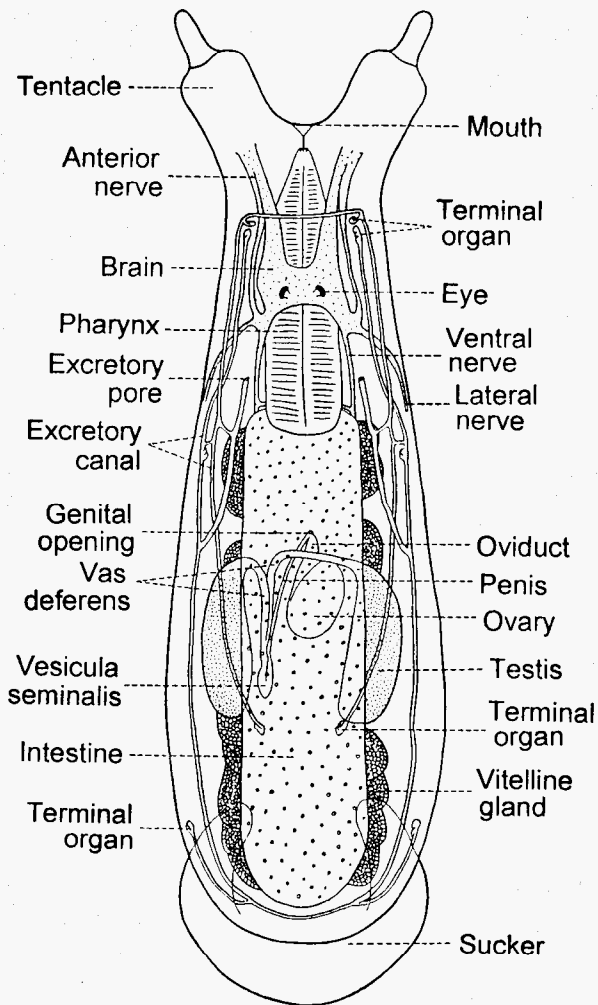
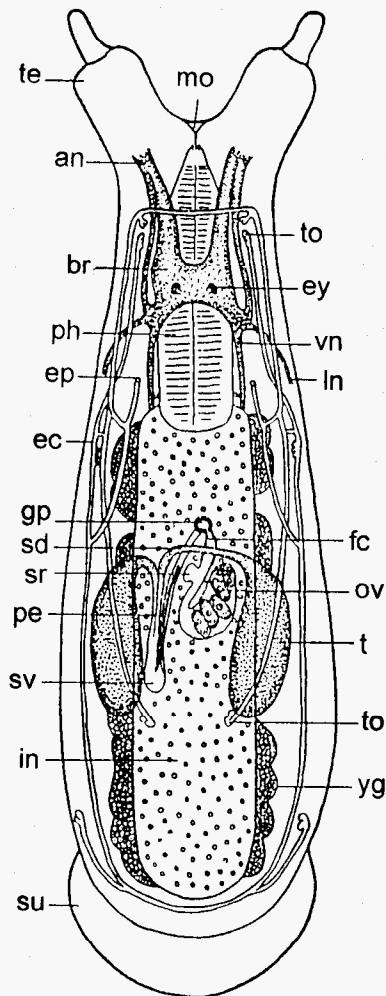


Fig. 1



I. HONJÔ del. (1937)

Fig. 2



KATÔ (1943)

Fig. 3



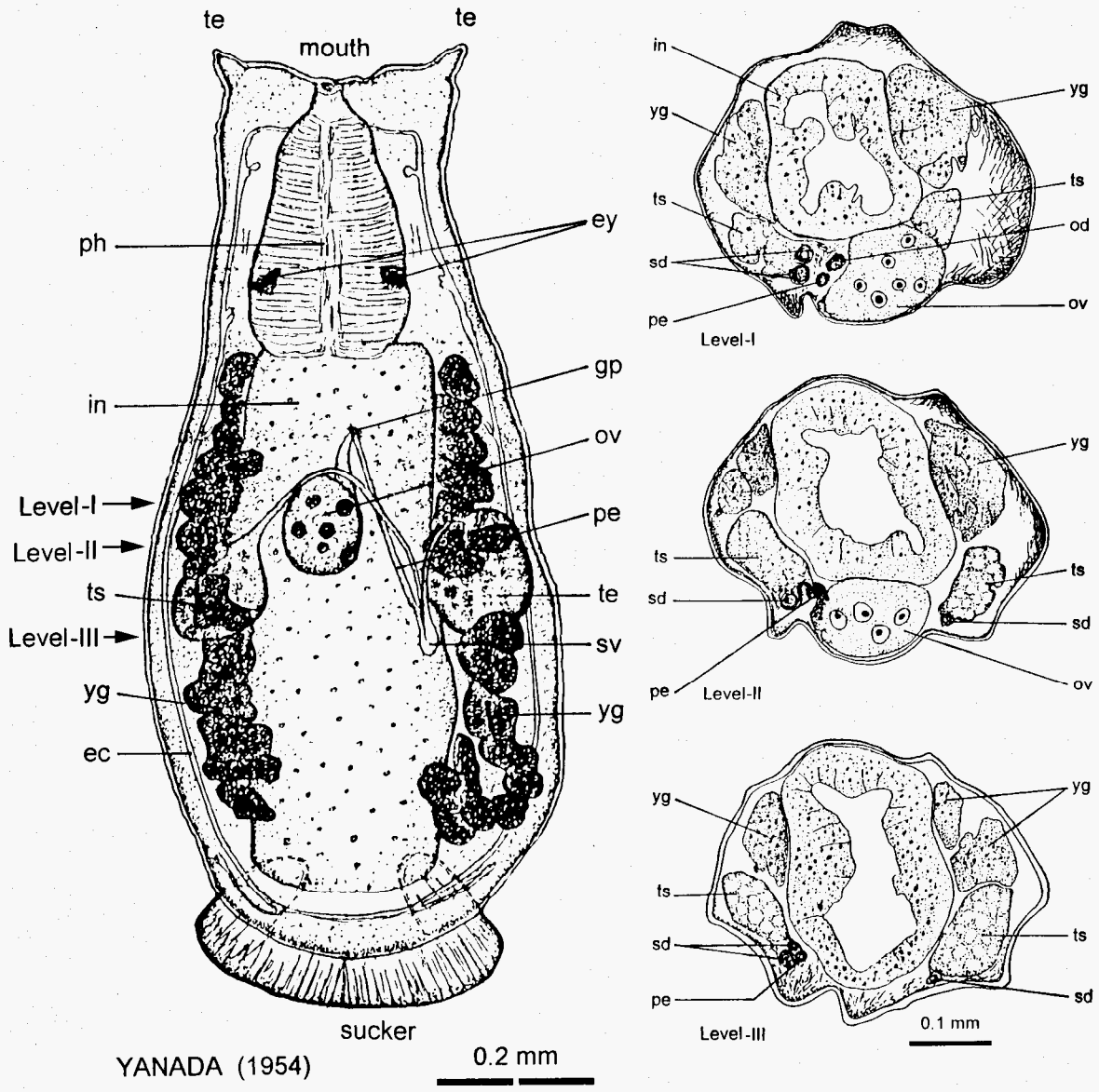


Fig. 4

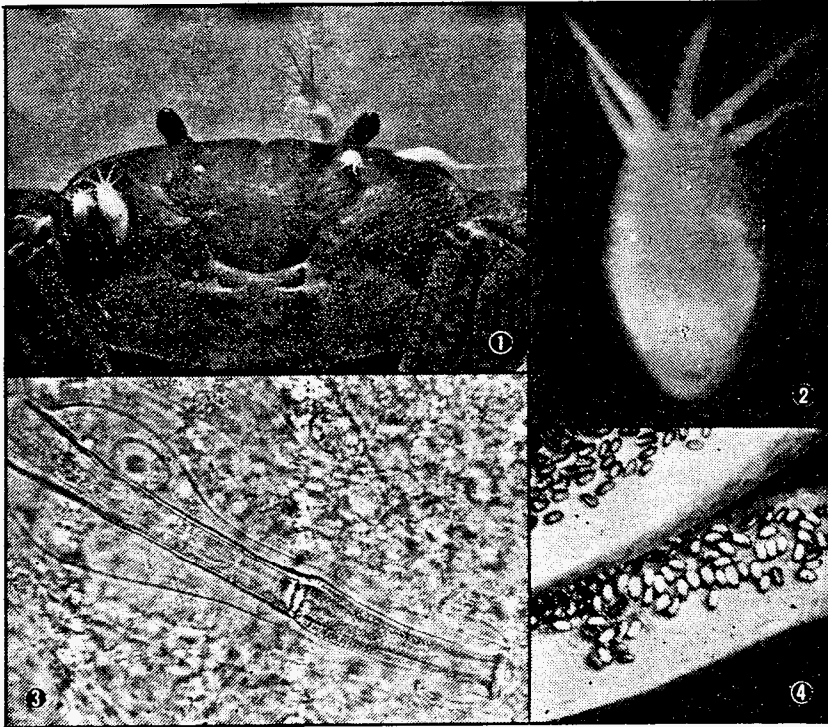
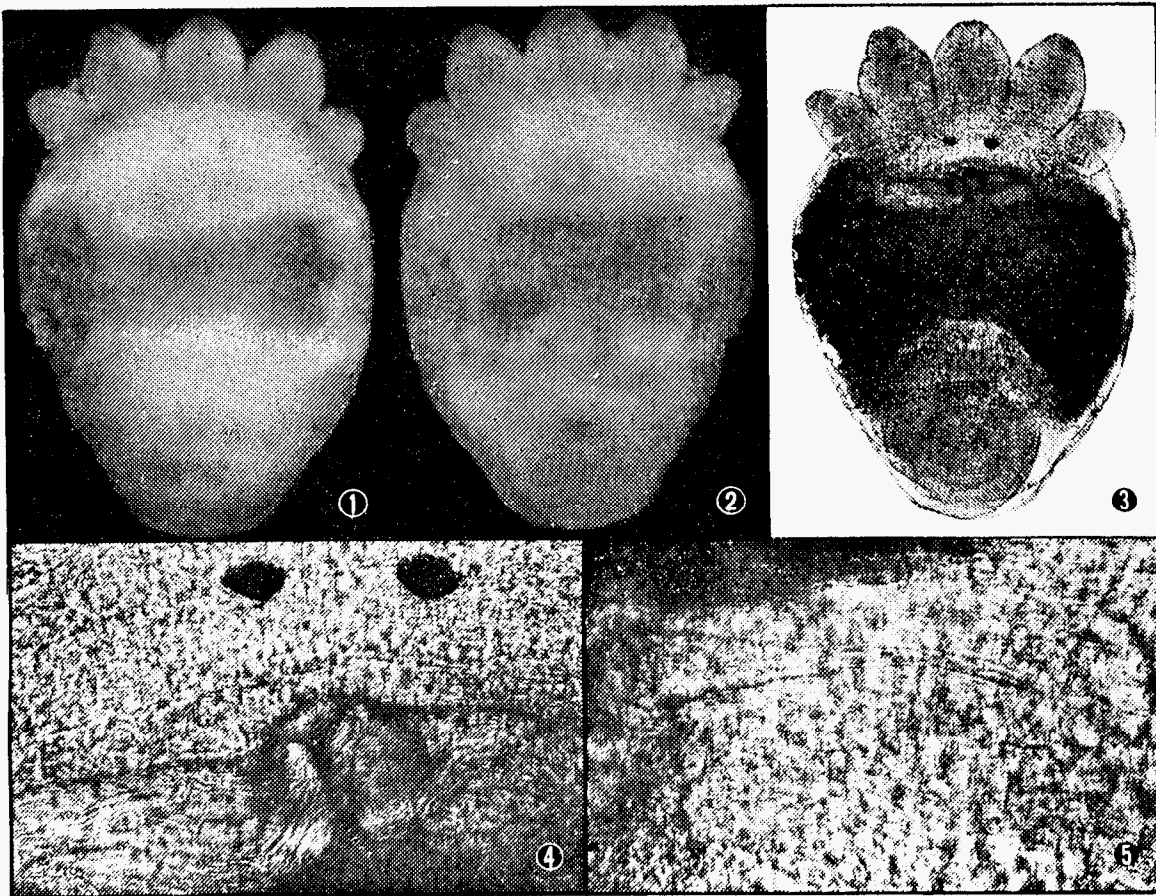


Fig. 5

Fig. 6



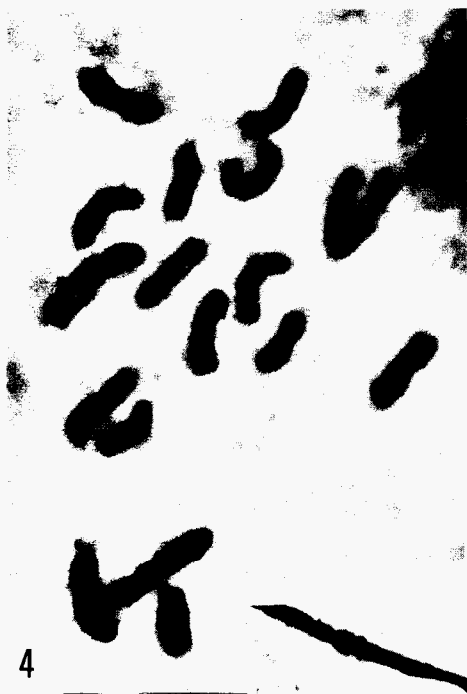
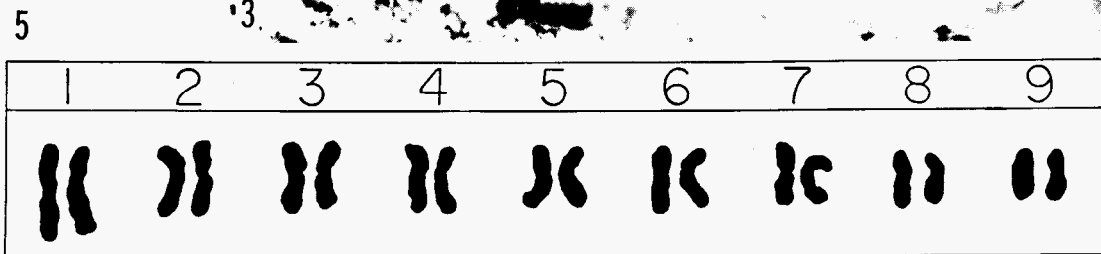


Fig. 7



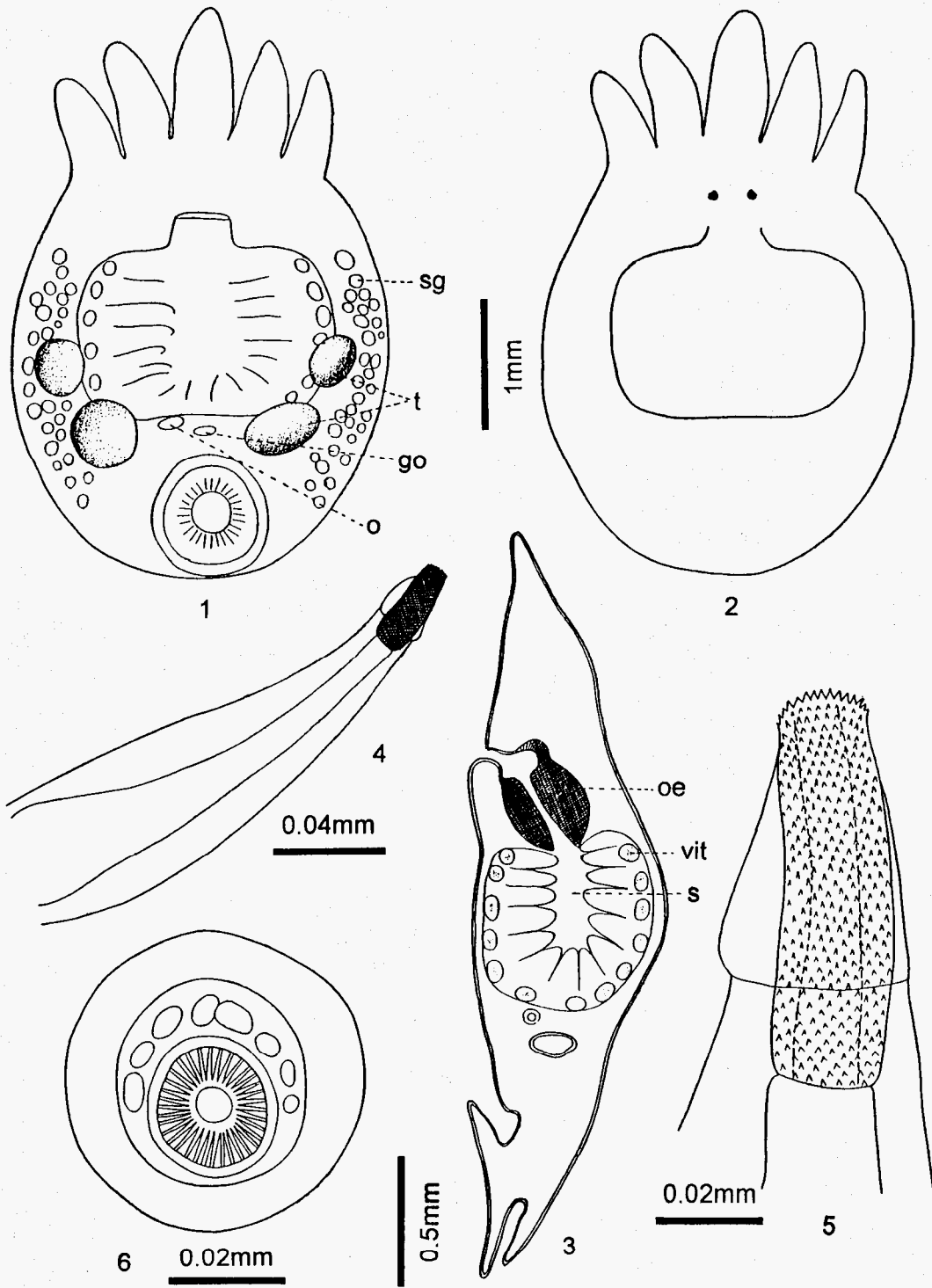


Fig. 8

Lee: - On a New and a Rare Trematoda

# MAP OF THE FAR EAST

- : *Scutariella japonica* (Matjašič, 1990)
- ◊ : *Scutariella* sp. of Okinawa Island
- ◻ : *Temnocephala* s.l. sp. of Iriomote-jima Is.
- ◆ : *Temnocephala* s.l. sp. of Tane-ga-shima Is.
- ⋈ : *Temnocephala* s.l. sp. of Okinawa Is.
- ▲ : *Temnocephala* s.l. sp. of Ishigaki-jima Island
- : *Temnocephala* s.l. sp. of Kagoshima
- ▣ : *Temnosewellia minor* (Haswell, 1887)
- ◼ : *Temnocephala* s.l. sp. of Sôzan, Taiwan
- : *Temnosewellia semperi* (Weber, 1889)

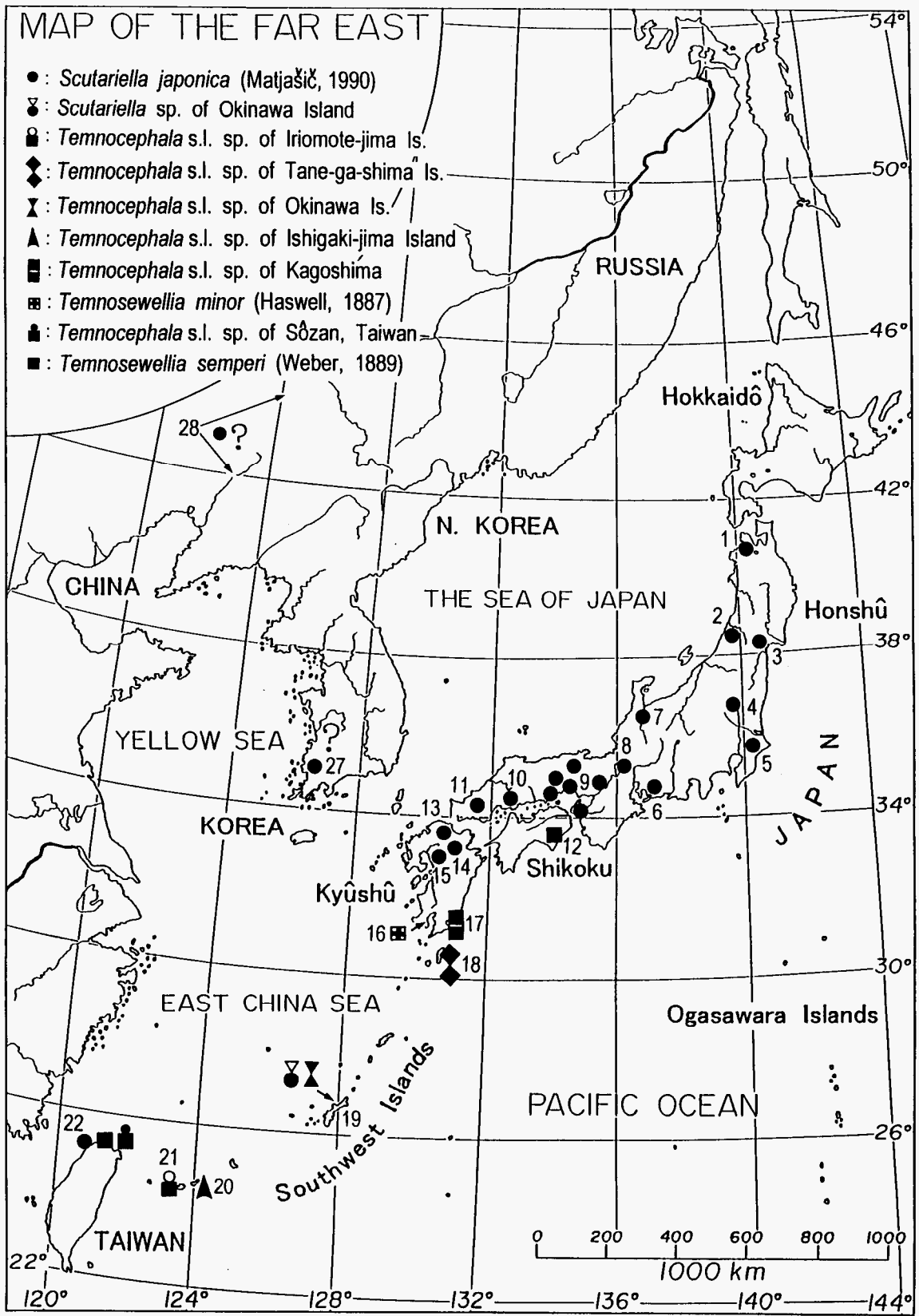


Fig. 9

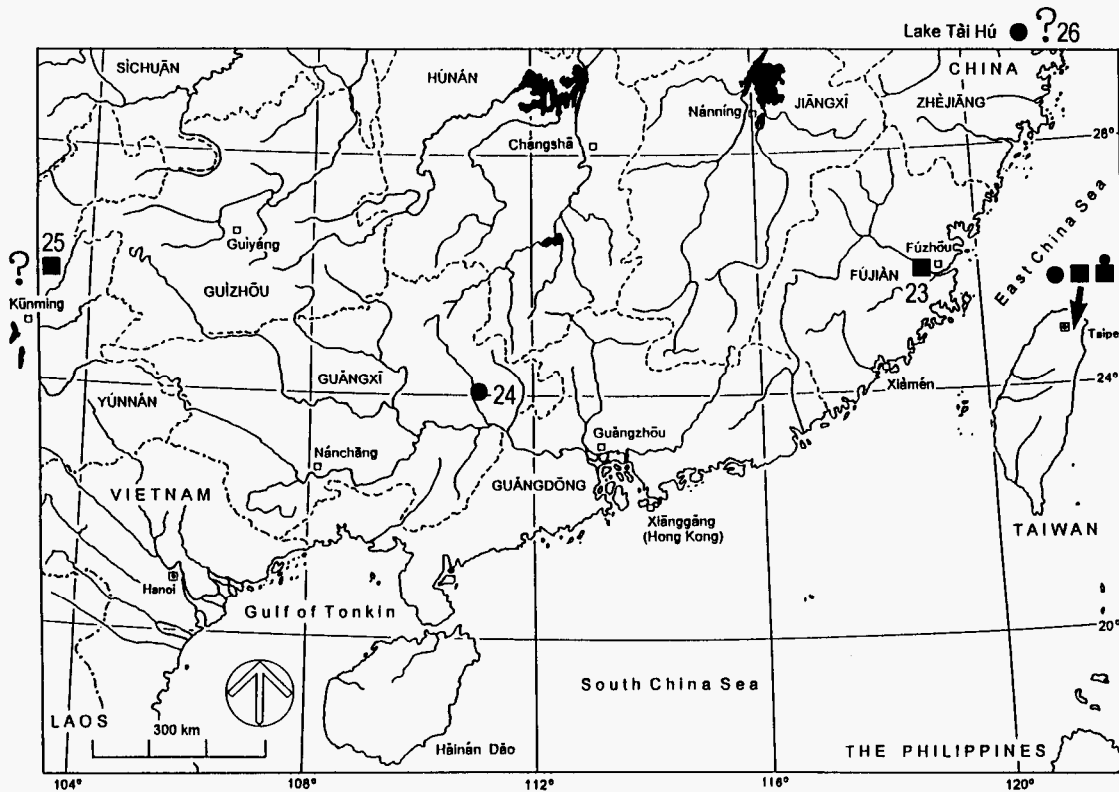


Fig. 10

### EXPLANATION OF FIGURES 1-10

Fig. 1. Living specimens of *Scutariella japonica* from Japan. Left: A specimen from Chiba Pref., Kantô Region, Honshû. Host: *Paratya compressa improvisa*. Scale = 1 mm. Photo by Nishino (after Kawakatsu, Murayama, Nishino & Ohtaka, 1999). Right: Another specimen from Kanagawa Pref., Kantô Region, Honshû. The head is on the left (high magnification). Photo by Dr. H. Suzuki (after Suzuki, Ninagawa & Kawakatsu, 1983).

Figs 2 (left) and 3 (right). Reproduction of anatomical figures of *Scutariella japonica* from Honjô (1937, left) and Katô (1943, right). Lake Biwa-ko specimen. Terms in Honjô's figure were taken from the original paper (partly modified). Abbreviations in Katô's figure were used modern terms (Japanese terms were employed in the original figure). See also Kawakatsu, Murayama, Nishino & Ohtaka (1999: 88, fig. 7).

**an**, anterior nerve; **br**, brain; **ec**, excretory canal; **ep**, excretory pore; **ey**, eye; **fc**, female canal; **gp**, genital pore; **in**, intestine; **ln**, lateral nerve; **mo**, mouth; **ov**, ovary; **pe**, penis; **ph**, pharynx; **sd**, sperm duct (vas deferens); **sr**, seminal receptacle; **su**, sucker; **sv**, seminal vesicle; **t**, testis; **te**, tentacle; **to**, terminal organ; **vn**, ventral nerve; **yg**, yolk gland.

Fig. 4. Reproductions of anatomical figure (left) and 3 sketches of transverse sections (levels I-III) of *Scutariella japonica* from Yanada (1954: 309, pl. 49). Okazaki speimen (Aichi Pref., Chûbu Region, Honshû). Retouched by Kawakatsu and new abbreviations were added. The 3 sketches of transverse sections correspond to Level-I (anterior level of an ovary), Level-II (middle level of testes) and Level-III (posterior level of testes), respectively.

od, oviduct (or fc, female canal). For other abbreviations, see Figs 2 and 3.

Fig. 5. *Temnocephala* s.l. sp. of Iriomot-jima Island. 1, the host crab (*Geothelphusa minei* Shy & Ng, 1998, or *Geothelphusa marginata fulva* Naruse, Shokita & Shy, 2005) and living specimens of *Temnocephala* sp.; 2, enlarged photograph of an alive specimen; 3, photomicrograph of the penis; 4, cocoons. After Suzuki, Ninagawa & Kawakatsu (1983). These 4 photographs were taken by Dr. H. Suzuki. A whole-mount specimen is registered: KSL No. 2370.

Fig. 6. *Temnocephala* s.l. sp. of Tane-ga-shima Island (KSL No. 1648). 1, dorsal view of the preserved speimen; 2, ventral view of the same specimen; 3, photomicrograph of the whole-mount specimen; 4, eyes, mouth and the anterior part of the pharynx; 5, penis. After Suzuki, Ninagawa & Kawakatsu (1983). Photographs were taken by Kawakatsu.

Fig. 7. *Temnosewellia minor* (Haswell, 1887) of Ibusuki, Kagoshima Pref., Kyûshû, Japan. 1, Living specimens; a black arrow indicates alive specimen of *Girardia trgrina* (Girard, 1850); 2, alive specimen of *T. minor* (a sucker is not shown in this enlarge photomicrograph); 3, photomicrograph of the penis; 4, chromosomes ( $2x=18$ ); 5, Idiogram. Photograph 1 (after Tamura, Oki, Kawakatsu, Ninagawa, Matsusato & Suzuki, 1985). Photomicrographs 2, 3 and 4 and an idiogram 5 (after Kawakatsu, Oki, Tamura, Takai, Timoshkin & Porfirjeva, 1993). All photographs were taken by Kawakatsu (an idiogram was Kawakatsu's original figure).

Fig. 8. *Temnosewellia semperi* (Weber, 1889) of Fúzhōu, China (after Lee, 1936, pl. X). Slightly retouched by Kawakatsu (abbreviations and sacs were renewed). 1, ventral view; 2, dorsal view; 3, sagittal section through the median region of the body; 4, penis; 5, terminal portion of the penis (high magnification); 6, cross section of the penis. For the original abbreviations used in Lee's sketches, new terms were given.

go, genital pore; o, ovary; oe, pharynx; s, intestine; sg, glands; t, testes; vit, yolk glands.

Fig. 9. Map of the Far East showing the known localities of temnocephalan species in Japan (1-21), Taiwan (22), China (23-27), and South Korea (28). Local divisions in Japan: 1-11, Honshû; 12, Shikoku; 13-18, Kyûshû; 19-21, Okinawa Pref., the Southwest Islands of Japan. The symbols for each species, see the top-left corner (tentative classification).

1, Hirosaki in Aomori Pref. (cf. Negishi, 1935); 2, Tsuruoka in Yamagata Pref. (cf. Umemoto, 1936); 3 and 4, Miyagi Pref. and Fukushima Pref., respectively (cf. Kamita, 1970); 5, Chiba Pref. (cf. Nishino, 2000, a photograph only: Kawakatsu, Murayama, Nishino & Ohtaka, 1999, fig. 8; Fig. 1 in the present publication); 6, Okazaki in Aichi Pref. (cf. Yanada, 1954, 1955, 1956); 7, Shô-kawa River in Toyama Pref. (cf. Shimazu, 2003); 8, Lake Biwa-ko in Shiga Pref. (cf. Kobayashi, 1935; Honjô; 1937, Katô, 1943); 9, Over 16 localities in Hyôgo and Okayama Prefs (Niwa's unpublished data of *Scutariella japonica* recently found: several localities lying close together in one district are represented by a single symbol); 10, Seno River in Hiroshima Pref. (cf. Shimazu, 2003); 11, Shinome in Yamaguchi Pref. (cf. Kamita, 1970); 12, Kaifu River in Tokushima Pref. (cf. Shimazu, 2003); 13, Kurokawa River, Nakama, in Fukuoka Pref. (Urabe's unpublished data); 14, Chikugo-gawa River, Hita, in Ôita Pref. (Urabe's unpublished data); 15, Futatsugawa River, Mitsuhashi-machi, in Fukuoka Pref. (Urabe's unpublished data); 16, Ibusuki in Kagoshima Pref. (cf. Tamura, Oki, Kawakatsu, Ninagawa, Matsusato & Suzuki, 1985; Kawakatsu, Oki, Tamura, Takai, Timoshkin & Porfirjeva, 1993; Oki, Tamura, Takai & Kawakatsu, 1995); 17, Anraku River, Shibushi, in Kagoshima Pref. (Nishino's unpublished data); 18, Tane-ga-shima Island (cf. Suzuki, Ninagawa & Kawakatsu, 1983); 19, Okinawa Island (cf. Okada, 1938; Ohtaka's unpublished data); 20, Ishigaki-jima Island (Fujita & Ohtaka's unpublished data); 21, Iriomote-jima Island (cf. Suzuki, 1977; Suzuki, Ninagawa & Kawakatsu, 1983); 22, Keelung and Taipei and the vicinities (cf. Okada, 1938; Lo & Wu, 1991); 27, Shên-yáng and Chángchūn in Northeastern China (cf. Niwa & Ohtaka, 2005); 28, Wôlchul-san Reservoir, Yeongam, Chonnam-Do in South Korea (Nishino's unpublished data).

Fig. 10. Map of the Southern China showing the known localities of temnocephalan species (23-26): The symbols for each species, see Fig. 9. For Taiwan, see Fig. 9.

23, Fúzhou, Fújiàn Province (cf. Lee, 1936); 24, Lijian River, Autonomous Province Guanxi Zhung (cf. Matjašič, 1990; Kawakatsu, 1998b); 25, Yunnan Province (cf. Gravely, 1913; Chauhan & Ramakrishna, 1953); 26, Lake Tàì Hú in Jiāngsū Province (cf. Kemp, 1918).



**APPENDIX I: A Classification System of the Temnocephalida. \*1**

Order **TEMNOCEPHALIDA** Bresslau & Reisinger, 1933 sensu Baer, 1961

Suborder **Scutariellidata** Baer, 1953 sensu Baer, 1961

Superfamily Scutarielloidea Annandale, 1912 sensu Baer, 1961 \*2

Family Scutariellidae Annandale, 1912 sensu Baer, 1961 \*3

Subfamily Bubalocerinae Matjašič, 1980

Genus *Bubalocerus* Matjašič, 1958

Subfamily Caridinicolinae Baer, 1931 sensu Matjašič, 1980

Genus *Monodiscus* Plate, 1914 sensu Baer, 1931

Subfamily Paracaridinicolinae Baer, 1953 sensu Baer, 1961

Genus *Paracaridicola* Baer, 1953 sensu Baer, 1961

Subfamily Scutariellinae Annandale, 1912 sensu Baer, 1953 \*4

Genus *Scutariella* Mrázek, 1907 sensu Baer, 1953

Genus *Stygodytica* Matjašič, 1958 sensu Baer, 1961

Genus *Subtelsonia* Matjašič, 1958 sensu Baer, 1961

Genus *Troglocaridicola* Matjašič, 1958 sensu Williams, 1986

Subgenus *Jeanbaeria* Matjašič, 1990

Subgenus *Troglocaridicola* Matjašič, 1990

Suborder **Temnocephalata** Baer, 1953 sensu Baer, 1961

Superfamily Temnocephaloidea Monticelli, 1899 sensu Baer, 1961 \*5

Family Actinodactylellidae Benham, 1901 sensu Baer, 1961 \*4

Genus *Actinodactylella* Haswell, 1893 sensu Baer, 1961

Family Diceratocephalidae Baer, 1953 sensu Joffe, Cannon & Schockaert, 1998

Genus *Decadidymus* Cannon, 1991

Genus *Diceratocephala* Baer, 1953 sensu Baer, 1961

Family Didymorchiidae Haswell, 1888 sensu Joffe, Solovei & Cannon, 1995

Genus *Didymorchis* Haswell, 1888 sensu Sewell & Cannon, 1998a

Family Temnocephalidae Monticelli, 1899 sensu Baer, 1961 \*6

Subfamily Temnocephalinae Monticelli, 1899 sensu Baer, 1961 \*7

Genus *Achenella* Cannon, 1993

Genus *Craniocephala* Monticelli, 1905

Genus *Dactylocephala* Monticelli, 1899  
Genus *Notodatylus* Baer, 1953 sensu Baer, 1961  
Genus *Temnocephala* Blanchard, 1849 sensu Baer, 1961  
Genus *Temnohaswellia* Perira & Cuocolo, 1941 sensu Cannon, 1993  
Genus *Temnomonticellia* Pereira & Cuocolo, 1941 sensu Baer, 1961  
Genus *Temnosewellia* Damborenea & Cannon, 2001

Subfamily Craspedellinae Baer, 1931 sensu Cannon & Sewell, 1995 \*8  
Genus *Craspedella* Haswell, 1893 sensu Rohde, 1987  
Genus *Gelasinella* Sewell & Cannon, 1998b  
Genus *Heptacraspedella* Cannon & Sewell, 1995  
Genus *Zygopella* Cannon & Sewell, 1995

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- \*1 Mainly based upon the “Temnocephalida” by Tyler (& Bush, 2000). The following papers were also referred: Baer (1931, 1953, 1961), Williams (1981, 1986), Cannon (1986, 1993), Matjašič (1958, 1980, 1990), Cannon & Sewell (1995), Joffe, Solovei & Cannon (1995), Joffe, Cannon & Schockaert (1998), Sewell & Cannon (1998a, b), Cannon & Joffe (2000), and Damborenea & Cannon (2001).

The genus ‘*Caridinicola* Annandale, 1912 sensu Baer, 1953’ in the Caridinicolinae was classified as a synonym of the genus *Scutariella* Mrázek, 1907 sensu Baer, 1953 in the Scutariellinae.

- \*2 - \*4 Cf. ICZN, 4<sup>th</sup> Ed. (1999), Art. 36.1. Statement of the Principle of Coordination applied to family group names. \*2 See also Baer, 1953.
- \*5 - \*7 Cf. ICZN, Art. 36.1. \*5 See also Baer, 1953. \*6 See also Annandale, 1912.  
\*7 The nominotypical subfamily added in the present publication. Cf. ICZN, Art. 37.1, Definition; Example.
- \*8 Baer (1931: 4) established ‘Familie Craspedellidae n. fam.’ Cannon & Sewell (1995: 395) gave a new diagnosis of the subfamily ‘Craspedellidae n. fam.’ Cannon & Sewell (1995: 395) gave a new diagnosis of the subfamily ‘Craspedellinae Baer, 1931.’

APPENDIX II: A Tentative List of Numbers of Taxa in the Temnocephalida. \*1

TAXA	NUMBERS								
Order TEMNOCEPHALIDA									
Suborder SCUTARIELLIDATA	1								
Superfamily SCUTARIELLOIDEA	1								
Family Scutariellidae	1								
Subfamily Bubalocerinae	1								
Genus	1								
Species	3								
Subfamily Caridinicolinae	1								
Genus	1								
Species	2								
Subfamily Paracaridinicolinae	1								
Genus	1								
Species	1								
Subspecies	(3)								
Subfamily Scutariellinae	1								
Genus	4								
Subgenera	(2)								
Species	16								
Subspecies	(8)								
Subtotal:	1	1	1	4	7	(2)	21	1	(11)
Suborder Temnocephalata	1								
Superfamily Temnocephaloidea	1								
Family Actinodactylellidae	1								
Genera	1								
Species	1								
Family Dicertocephalidae	1								
Genera	2								
Species	2								
Family Didymorchiidae	1								
Genus	1								
Species	4								
Family Temnocephalidae	1								
Subfamily Temnocephalinae	1								
Genera	8								
Species	48								
Subfamily Craspedellinae	1								
Genera	4								
Species	14								
Subtotal:	1	1	4	2	16	(0)	69	(0)	(0)
Total:	2	2	5	6	23	(2)	90	(11)	(11)

\*1. See the footnote (\*1) of the APPENDIX I.

*Addresses of the Authors:*

Dr. Masaharu KAWAKATSU, 9jô 9chôme 1-8, Shinkotoni, Kita-ku, Sapporo (Hokkaidô)  
001-0909, Japan.

Tel & Fax: (International: +81 11 762 4450); (Domestic: 011 762 4450).

E-mail (Miss Miyuki Kawakatsu): DQA01524@nifty.ne.jp (The 4<sup>th</sup> character is "zero,"  
not the letter O.)

Dr. Stuart R. GELDER, Prof., Department of Biology, University of Maine at Presque Isle,  
181 Main Street, Presque Isle, Maine 04769-2888, U.S.A.

Tel: 207-768-9443.

Fax: 207-768-9608.

E-mail: [gelder@polaris.umpi.maine.edu](mailto:gelder@polaris.umpi.maine.edu)

Dr. Rodrigo PONCE DE LEÓN, Prof., Laboratorio de Zoología de Invertebrados, Facultad de  
Ciencias, Iguá 4225, 11400 Montevideo, Uruguay.

Tel: (International: +598-2-525-86-18=7147).

Fax: (International: +598-2-525-86-17).

E-mail: [rodrigo@fcien.edu.uy](mailto:rodrigo@fcien.edu.uy)

Mrs. Odile VOLONTERIO. Address, Tel & E-mail. The same as Dr. R. Ponce de LEON.

Dr. Shi-Kuei WU, Professor / Curator Emeritus, University of Colorado, Campus Box 265,  
Boulder, CO 80309-0265 U. S. A.

Tel: 303-492-7359

E-mail: [skwu@colorado.edu](mailto:skwu@colorado.edu)

Dr. Machiko NISHINO, Lake Biwa Research Section, Shiga Prefectural Institute of Public  
and Environmental Science Center, Yanagasaki 5-34, Ôtsu, (Shiga) 520-0022, Japan.

Tel: (International: +81-77-526-4806); (Domestic: 077-526-4806).

Fax: (International: +81-77-526-4803); (Domestic 077-526-4803).

E-mail: [nishino-m@lberi.jp](mailto:nishino-m@lberi.jp)

Dr. Akifumi OHTAKA, Prof., Faculty of Education, Hirosaki University, Bunkyô-chô 1,  
Hirosaki, (Aomori) 036-8560, Japan.

Tel: (International: +81-172-39-3369); (Domestic: 0172-39-3369).

Fax: (International: + 81-172-32-1478); (Domestic: 0172-32-1478).

E-mail: [ohataka@cc.hirosaki-u.ac.jp](mailto:ohataka@cc.hirosaki-u.ac.jp)

Dr. Nobuaki NIWA, Kôbe Municipal Rokkô Island Senior High School, Kôyô-chô 4-4,  
Higashinada, Kôbe, (Hyôgo) 658-0032, Japan.

Tel: (International: +81-78-858-4000); (Domestic: 078-858-4000).

Fax: (International: +81-78-858-0145); (Domestic: 078-858-0145).

E-mail: [minaminiwaebi@hi-net.zaq.ne.jp](mailto:minaminiwaebi@hi-net.zaq.ne.jp)

Dr. Yoshihisa FUJITA, University Education Center, University of the Ryukyu, 1 Senbara, Nishihara-chô, (Okinawa) 903-0213, Japan.

Tel: (International: +81-98-893-7595); (Domestic: 098-893-7595).

Fax: (International: +81-98-893-7595); (Domestic: 098-893-7595).

E-mail: [galatheids@yahoo.co.jp](mailto:galatheids@yahoo.co.jp)

Dr. Fujita's NPO Address is as follows:

Marine Learning Center, 2-95-101 Miyagi. Chatan-chô, (Okinawa) 904-0113, Japan.

Tel: (International: +81-98-800-8016); (Domestic: 098-800-8016).

Fax: (International: +81-98-800-8017); (Domestic: 098-800-8017).

Domain: <http://www.marinelearning.org>

Dr. Misako URABE, Associate Prof., Department of Ecosystem Studies, School of Environmental Science, The University of Shiga Prefecture, Hassaku-chô 2500, Hikone, (Shiga) 522-8533, Japan.

Tel: (International: +81-749-28-8308); (Domestic: 0749-28-8308).

Fax: (International: +81-749-28-8463); (Domestic: 0749-28-8463).

E-mail: [urabe@ses.usp.ac.jp](mailto:urabe@ses.usp.ac.jp)

Mr. Gen-yu SASAKI, Biology teacher of Jôtô High School of Tôkyô.

Roppongi 1-3-49, Minato-ku, Tôkyô 106-0032, Japan.

Tel: (International: +81-3-3585-1785); (Domestic: 03-3585-1785).

E-mail: [gen-yu@mtc.biglobe.ne.jp](mailto:gen-yu@mtc.biglobe.ne.jp)

Miss Miyuki KAWAKATSU. Home address, Tel and E-mail: The same as Dr. M. KAWAKATSU.

Mr. Tetsuya KAWAKATSU. Home address: Hachimandai 5-33-12, Kisarazu 292-0814, Japan.

Tel (Domestic: 0438-37-7274; 090-4095-3140).

E-mail: [traviq@jcom.home.ne.jp](mailto:traviq@jcom.home.ne.jp)

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