

## Notes on the Bembidiinae (Carabidae) of Japan

### III. *Bembidion semilunium* NETOLITZKY and its New Relative

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**Abstract** Two Japanese bembidiine carabids related to *Bembidion lunatum* (DUFT-SCHMIDT) are dealt with. *Bembidion semilunium* is redescribed and a new related species is described under the name of *B. bandotaro*. *Bembidion yanoi* is regarded as a synonym of *B. semilunium*. Brief notes concerning *B. lunatum* and *B. serorum* NETOLITZKY are also given.

In 1986, *Bembidion yanoi* JEDLIČKA (1951, p. 108) was redescribed by myself as a full species based on ample material, not as a subspecies of *B. semilunium* NETOLITZKY (1914, p. 170), because constant differences were observed between the so-named two forms mainly in the coloration of antennal segments and legs as well as in the shape of aedeagal apical lobe (cf. MORITA, 1986, pp. 67–72). After the publication of my paper, I was given opportunities to examine the type material of both *B. semilunium* and *B. yanoi* through the kindness of Dr. STORK and Dr. BÍLÝ. Contrary to my expectation, a direct comparative study has made it evident that they are specifically identical with each other.

On the other hand, according to my investigations and to the accounts of related species given by NETOLITZKY (1943, pp. 32–34), JEDLIČKA (1965, pp. 119–122) and KRYZHANOVSKIJ (1979, pp. 26–38), the species regarded by myself as “*B. semilunium*” must be new to science. To avoid further confusion, I am going to redescribe NETOLITZKY’s species, one of the common bembidiines in Japan, and to describe its new relative under the name of *B. bandotaro*.

The abbreviations used herein are as follows: HW – greatest width of head; PW – greatest width of pronotum; PL – length of pronotum, measured along the median line; PA – width of pronotal apex; PB – width of pronotal base; EW – greatest width of elytra; EL – greatest length of elytra; M – arithmetic mean; BM – British Museum (Natural History); NW – Naturhistorisches Museum Wien; NP – National Museum, Prague; NSMT – National Science Museum (Nat. Hist.), Tokyo.

I wish to express my deep gratitude to Dr. Shun-Ichi UÉNO of the National Science Museum (Nat. Hist.), Tokyo, for critically reading the manuscript of this paper. Thanks are also due to Dr. V. G. SHILENKOV of Irkutsk State University and to Dr. Alexander DOSTAL of Wien for giving me very useful information, and to Dr. Heinrich SCHÖNMANN and Dr. Manfred JÄCH of the Naturhistorisches Museum Wien for their kind help. Further, I am deeply indebted to Dr. Svatopluk BÍLÝ and Dr. Ivo

KOVÁR of the National Museum, Prague, and Dr. N. E. STORK and Mr. M. J. D. BRENDELL of the British Museum (Natural History) for loan of type material under their care. My deep indebtedness is also due to the following colleagues and friends, whose kind aid and support enabled the completion of this paper: Dr. Kazuyoshi KUROSA, Dr. Sadahiro OHMOMO, Dr. Yûki IMURA, Messrs. Michiaki HASEGAWA, Shôichi IMASAKA, Tsutomu MATSUDA, Hideo OHKAWA, Masahiro ÔHARA, Shôtârô TANAKA, Satoshi YAMAUCHI and Masataka YOSHIDA.

*Bembidion (Peryphus) semilunium* NETOLITZKY

[Japanese name: Futamon-mizugiwa-gomimushi]

[=Nise-tsumaki-mizugiwa-gomimushi]

(Figs. 1-4)

*Bembidion semilunium* NETOLITZKY, 1914, Ent. Mitt., Berlin-Dahlem, **3**: 170; 1914, Ent. Bl., Berlin, **7/8**: 171; 1943, Koleopt. Rdsch., Wien, **29**: 33.

*Bembidion (Peryphus) semilunium janoi*: KIRSCHENHOFER, 1984, Koleopt. Rdsch., Wien, **57**: 81.

*Bembidion (Peryphus) Yanoi* JEDLIČKA, 1951, Acta Soc. ent. čech., **48**: 108.

*Bembidion janoi*: JEDLIČKA, 1965, Ent. Abh. Mus. Tierk. Dresden, **32**: 124.

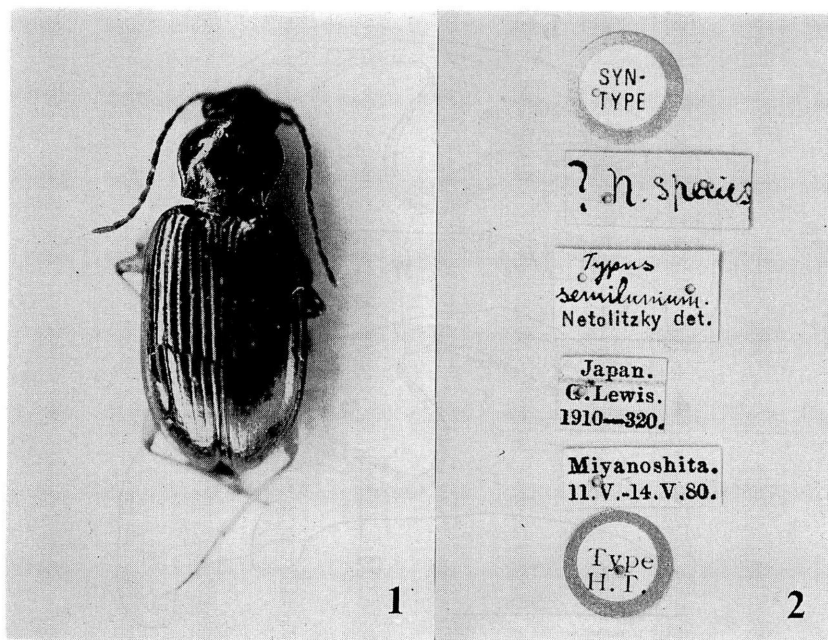
*Bembidion (Peryphus) yanoi*: NAKANE, 1978, Nature & Insects, Tokyo, **13**(6): 22. — MORITA, 1986, Ent. Rev. Japan, Osaka, **41**: 67, figs. 1-2.

Length: 5.25–6.30 mm (from apical margin of clypeus to apices of elytra).

Body elongate and convex. Colour as in *B. lunatum* (DUFTSCHMIDT), though the antennae, proximal third to halves of femora, and metatrochanters are always dark brown; elytral spots variable in size, usually separated from each other, sometimes large and fused at the apical part, or rarely disappearing.

Head rather large, without punctures; frontal furrows wide, deep, almost parallel and extending to anterior supraorbital pores; posterior supraorbital pores situated a little before the post-eye level; eyes prominent; antennae fairly long, reaching basal third of elytra; scape dilated; relative lengths of antennal segments II and III = 1:1.74; microsculpture almost vanished, but forming isodiametric or wide meshes on neck.

Pronotum transverse subcordate, widest at a level a little before the middle; PW/HW 1.24–1.38 (M 1.31) in 33 ♂♂, 22 ♀♀, PW/PL 1.21–1.36 (M 1.28) in 33 ♂♂, 22 ♀♀, PW/PA 1.46–1.64 (M 1.51) in 33 ♂♂, 22 ♀♀, PW/PB 1.16–1.29 (M 1.25) in 33 ♂♂, 22 ♀♀; apex narrower than base, almost straight or slightly emarginate; PA/PB 0.76–0.88 (M 0.82) in 33 ♂♂, 22 ♀♀; sides more strongly convergent towards apex than towards base; apical angles rounded, not advanced; hind ones nearly rectangular, with carinae; base nearly straight or very slightly oblique on each side; median line distinct, reaching neither apex nor base; anterior transverse impression with coarse punctures; basal foveae rather large and deep; basal area densely and coarsely punctate; anterior marginal setae situated a little before the widest part, posterior ones situated just before hind angles; microsculpture composed of trans-



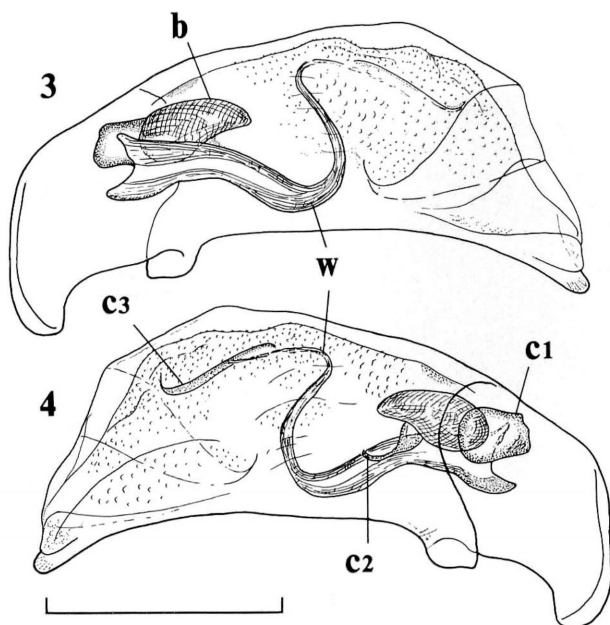
Figs. 1-2. *Bembidion semilunium* NETOLITZKY; 1, holotype; 2, labels attached to the holotype.

verse meshes.

Elytra elongate-ovate; EW/PW 1.46-1.65 (M 1.56) in 33 ♂♂, 22 ♀♀, EL/EW 1.46-1.64 (M 1.56) in 33 ♂♂, 22 ♀♀; sides nearly parallel at about middle and slightly emarginate before apices; striae superficial, rather strongly punctate, becoming shallower towards apices; stria 7 visible but marked with a row of fine punctures; scutellar striole long, rather strongly punctate; apical striole short and shallow, usually free at the anterior end, rarely close to stria 5 or 7 (in the latter case, the apical striole is rather long); intervals moderately convex but flat at apices; microsculpture composed of transverse lines partially forming transverse meshes in ♂, of transverse meshes partially forming transverse lines in ♀.

Metasternal process very widely bordered at the median part.

Male genital organ small and moderately sclerotized. Aedeagus short and robust; viewed laterally, apical lobe short and simply rounded at the extremity. Inner sac covered with very poorly sclerotized scales and armed with five components of sclerites (W, b, C1-C3); a whip-shaped piece (W) strongly twisted at the middle of inner sac; bundle of fibres (b) situated between the proximal part of whip-shaped piece and a small plate (C1); a small piece (C2) situated just at the right side of whip-shaped piece; an additional linear piece (C3) situated at the apical end of whip-shaped piece; viewed laterally, ostium flag moderately wide and not regularly arcuate. Styles long, right style a little longer than the left; right style usually provided with one long seta and three short setae at the apex or subapical part; left style usually provided with



Figs. 3–4. Aedeagus of *Bembidion semilunium* NETOLITZKY from Houkisawa, Kanagawa Pref., Central Japan; 3, left lateral view; 4, right lateral view (W: whip-shaped piece, b: bundle of fibres, C1–C3: copulatory pieces). (Scale: 0.5 mm.)

one long seta and several short setae at the apex or subapical part.

*Additional specimens examined.* 1 ♂ (Holotype), “SYNTYPE”/“? n. species”/“*Typus semilunium*, NETOLITZKY det.”/“Japan. G. LEWIS. 1910–320.”/“Miyanoshita. 11. V. – 14. V. 80.”/“Type H. T.” (BM); 1 ex, “Japan HILLER”/“coll. NETOLITZKY”/“Cotype 1914 *semilunium* NETOLITZKY det.”/“COTYPE”/“Coll. Netolitzky” (NW); 1 ♂, “NEAR OSAKA 11–1949 Coll. Yoshio YANO”/“Cotype”/“Mus. Nat. Pragae 23973 Inv.”/“*Yanoi* sp. n. det. Ing. JEDLIČKA” (NP); 1 ♀, “JAPAN near Osaka coll. K. KULT.”/“TYPUS”/“Mus. Nat. Pragae 23972 Inv.”/“*Yanoi* sp. n. det. ING. JEDLIČKA” (NP); 2 ♀♀, Motomachi, Riv. Shiriuchi-gawa, Shiriuchi-chô, Hokkaido, 28–VI–1986, S. MORITA leg.; 12 ♂♂, 4 ♀♀, Junsainuma, Hokkaido, 27–VI–1986, S. MORITA leg.; 1 ♂, Sawara, Sawara-machi, Hokkaido, 27–VI–1986, S. MORITA leg.; 1 ♂, Mt. Daitô-dake, Miyagi Pref., 25–V–1974, S. MORITA leg.; 2 ♂♂, Tanigawa-onsen, Gunma Pref., 17–VI–1990, S. MORITA leg.; 6 ♂♂, 5 ♀♀, Oppama, Yokosuka-shi, Kanagawa Pref., 15–V–1972, S. MORITA leg.; 2 ♂♂, Hirayu-onsen, Gifu Pref., 16–VII–1988, S. MORITA leg.; 1 ♀, Shinyama, Shimabara-shi, Nagasaki Pref., 15–IV–1979, S. IMASAKA leg.

*Range.* Japan: Hokkaido, Is. Rishiri-tô; Tôhoku District (Aomori Pref., Iwate Pref., Miyagi Pref.), Kantô District (Gunma Pref., Tochigi Pref., Kanagawa Pref., Tokyo), Chûbu District (Shizuoka Pref., Yamanashi Pref., Nagano Pref., Gifu Pref.), Kinki District (Kyoto, Wakayama Pref., Hyôgo Pref., Osaka), Chûgoku District

(Tottori Pref.), Kyushu District (Nagasaki Pref.).

This species is unknown from the Shikoku District, but may probably occur there.

*Notes.* The presence of an additional copulatory piece (C 3) was overlooked when this species was redescribed by myself (1986, pp. 69–70). This fact was indicated by Dr. SHILENKOV (pers. comm.). It is very difficult to examine this copulatory piece, since it is wholly concealed by the membranous walls. Besides, this and the apical end of the whip-shaped piece lie overlapping each other. It can be observed with certainty only when the inner sac is extracted and extended.

LINDROTH's (1953, p. 175, fig. 8–a) and KRYZHANOVSKIJ's (1979, p. 29, figs. 13–16) drawings of the male genitalia of the *lunatum* group do not show presence of this copulatory piece. This is strange since all the members of the *lunatum* group seem to have the same type of copulatory pieces. It is therefore necessary to re-examine their male genital organs.

This species is common both in plains and in mountainous areas. Most specimens recorded above were found from under stones at the edges of rivers, streams and ponds. According to TANAKA (1962), it was taken at light in Tokyo together with the following new species.

***Bembidion (Peryphus) bandotaro* MORITA, sp. nov.**

[Japanese name: Ô-futamon-mizugiwa-gomimushi]

[= Tsumaki-mizugiwa-gomimushi]

(Figs. 5–6)

*Peryphus* (s. str.) *semilunius*: UÉNO, 1954, Shin Konchû, Tokyo, 7: 56 [*partim*].

*Bembidion semilunium semilunium*: JEDLIČKA, 1965, Ent. Abh. Mus. Tierk. Dresden, 32: 121.

*Bembidion (Peryphus) semilunium*: NAKANE, 1978, Nature & Insects, Tokyo, 13 (6): 22.

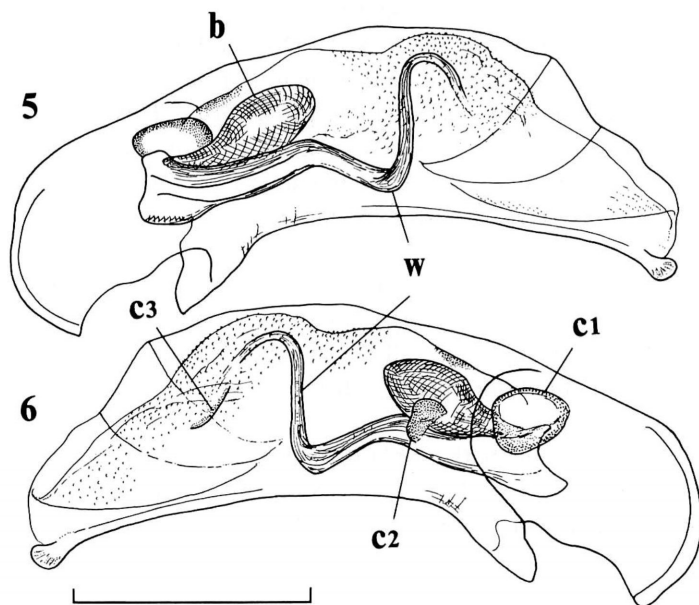
*Bembidion semilunium*: MORITA, 1985, Coleopt. Japan Col., Osaka, 2: 97, pl. 18, fig. 14; 1986, Ent. Rev. Japan, Osaka, 41: 67, fig. 3.

Length: 5.55–6.90 mm (from apical margin of clypeus to apices of elytra).

Relatively large species. Colour as in *B. lunatum* (DUFTSCHMIDT); palpi, antennal segments 1–3 and basal half of segment 4, and legs light reddish brown to reddish brown; rest of antennal segments and mandibles dark brown.

Head rather large with slender antennae; relative lengths of antennal segments II and III  $\doteq$  1: 1.56; scape nearly parallel-sided or very slightly arcuate (in the latter case, the outer area is concave at about middle); microsculpture almost vanished but forming isodiametric or wide meshes on neck.

Pronotum transverse subcordate; PW/HW 1.29–1.37 (M 1.32) in 13 ♂♂, 6 ♀♀, PW/PL 1.24–1.33 (M 1.28) in 13 ♂♂, 6 ♀♀, PW/PA 1.41–1.55 (M 1.49) in 13 ♂♂, 6 ♀♀, PW/PB 1.24–1.32 (M 1.28) in 13 ♂♂, 6 ♀♀, PA/PB 0.82–0.92 (M 0.86) in 13 ♂♂, 6 ♀♀; sides moderately arcuate in front though less strongly so than in *B. lunatum*; reflexed lateral borders gradually becoming wider from the level of anterior marginal setae to the apical end of postangular carinae; median line deeply impressed



Figs. 5-6. Aedeagus of *Bembidion bandotaro* MORITA, sp. nov. from Toride, Ibaraki Pref., Central Japan; 5, left lateral view; 6, right lateral view (W: whip-shaped piece, b: bundle of fibres, C1-C3: copulatory pieces). (Scale: 0.5 mm.)

on disc; anterior transverse impression with no coarse punctures; basal area sparsely punctate; microsculpture composed of wide or isodiametric meshes in apical and basal areas, and of transverse meshes on disc.

Elytra elongate-ovate; EW/PW 1.48-1.60 (M 1.53) in 13 ♂♂, 6 ♀♀, EL/EW 1.51-1.63 (M 1.57) in 13 ♂♂, 6 ♀♀; sides gently arcuate and very slightly emarginate before apices; striae rather weakly punctate; stria 7 usually vanished, rarely marked with a row of microscopic punctures; apical striole deep; microsculpture irregular, largely consisting of transverse lines but partially disordered.

Metasternal process very widely bordered at the median part.

Male genital organ relatively large, elongate and moderately sclerotized. Aedeagus elongate; apical lobe roundly dilated in lateral view; inner structure basically similar to that of *B. semilunium*, though the ostium flag is regularly arcuate in lateral view.

*Type series.* Holotype: ♂, allotype: ♀, Toride-shi, 9~10-VIII-1982, S. MORITA leg. (NSMT). Paratypes: 9 ♂♂, 14 ♀♀, Toride-shi, 17-IX-1972, K. KUROSA leg.; 3 ♂♂, 1 ♀, Toride-shi, 23-IX-1973, S. MORITA leg.; 1 ♂, Toride-shi, 10-VI-1980, S. MORITA leg.; 19 ♂♂, 18 ♀♀, Toride-shi, 9~10-VIII-1982, S. MORITA leg.; 3 ♂♂, 4 ♀♀, Toride-shi, 20-VIII-1983, S. MORITA leg.; 4 ♂♂, 3 ♀♀, Tatebayashi-shi, 5-V-1973; S. MORITA leg.; 1 ♀, Ashikaga-shi, 5-VI-1973, H. OHKAWA leg.; 2 ♂♂, 1 ♀, Honjō-shi, 13-V-1990, S. MORITA leg.; 4 ♂♂, 3 ♀♀, Honjō-shi, 18-VIII-1990, S.

MORITA leg.

*Localities.* Japan: Toride-shi (type locality!), Ibaraki Prefecture; Tatebayashi-shi, Gunma Prefecture; Ashikaga-shi, Tochigi Prefecture; Honjô-shi, Saitama Prefecture.

A total of 92 specimens available for this study collected on the basin of the River Tone-gawa were selected for the type series.

*Other specimens examined.* \*1 ♀, Shoro, Kushiro-shi, Hokkaido, 26-VI-1981, S. MORITA leg., \*5 ♂♂, same locality, 23-VIII-1983, S. MORITA leg.; \*2 ♂♂, 1 ♀, Mōrai-kaigan, Hokkaido, 25-VIII-1981, S. MORITA leg.; \*Ishikari, Riv. Ishikari-gawa, Hokkaido, 4 ♂♂, 27-VI-1982, S. MORITA leg.; \*6 ♂♂, 5 ♀♀, Ikeda-shi, Riv. Tokachi-gawa, Hokkaido, 9-VII-1982, S. MORITA leg.; \*1 ♂, Obihiro-shi, Riv. Tokachi-gawa, Hokkaido, 18-VI-1976, 2 ♀♀, same locality, 7-VII-1982, S. MORITA leg.; \*1 ♂, Nishiobihiro, Riv. Tokachi-gawa, Hokkaido, 8-VII-1982, S. MORITA leg.; 1 ♀, Kabuto-numa, Sarobetsu, Hokkaido, 5-VII-1982, S. & E. MORITA leg.; 1 ♂, Nayoro-shi, Riv. Nayoro-gawa, Hokkaido, 25-VII-1981, S. OHMOMO leg.; 2 ♂♂, 1 ♀, Motomachi, Riv. Shiriuchi-gawa, Shiriuchi-chô, Hokkaido, 28-VI-1986, S. MORITA leg.; \*1 ♂, Nakasato, Riv. Iwaki-gawa, Aomori Pref., 19-X-1981, Y. IMURA leg.; 1 ♂, Tanuma, Tochigi Pref., 6-V-1972; T. SHIMADA leg.; \*1 ♂, 2 ♀♀, Ikoma-shi, Nara Pref., T. MATSUDA leg.; \*1 ♂, 1 ♀, Taira, Shirahama-chô, Wakayama Pref., S. TANAKA leg.; \*1 ♀, Kamiakui, Riv. Akui-gawa, Tokushima Pref., 20-VI-1962, M. YOSHIDA leg.; \*1 ♂, Iidani, Riv. Katsuura-gawa, Tokushima Pref., M. YOSHIDA leg.; \*1 ♂, Mt. Bizan, Jizôin, Tokushima Pref., 2-VI-1963, M. YOSHIDA leg.

Each record marked with an asterisk has already been reported by myself in 1986.

*Range.* Japan: Hokkaido; Tôhoku District (Aomori Pref.); Kantô District (Ibaraki Pref., Gunma Pref., Tochigi Pref., Saitama Pref.); Kinki District (Nara Pref., Wakayama Pref.); Shikoku District (Tokushima Pref.).

*Notes.* This new species can be distinguished from *B. semilunium* by the following key.

- 1 (2) Smaller on an average (5.25–6.30 mm); antennal segments and basal halves of femora darker; elytral apical spots usually small; relative lengths of antennal segments II and III  $\doteq$  1: 1.74; scape dilated; elytral striae rather strongly punctate, 7 visible; aedeagus short and robust, apical lobe simply rounded in lateral view; ostium flag not regularly arcuate. . . *B. semilunium* NETOLITZKY.
- 2 (1) Larger on an average (5.55–6.90 mm); antennal segments 1–3 and basal half of 4 as well as legs light reddish brown to reddish brown; elytral apical spots always large and fused; relative lengths of antennal segments II and III  $\doteq$  1: 1.56; scape nearly parallel-sided or very slightly arcuate; elytral striae rather weakly punctate, 7 usually vanished; aedeagus elongate, apical lobe roundly dilated in lateral view; ostium flag regularly arcuate. . . . *B. bandotaro* sp. nov.

As was already mentioned in the introduction of this paper, I assigned the name *semilunium* to the species from the River Tone-gawa, as most Japanese carabid spe-

cialists did. Besides, in his key to the bembidiine carabids of East Asia, JEDLIČKA (1965, p. 121) also expressed the same view, as follows:” ..... dreieinhalb Fühlerglieder, Palpen und Beine hellgelb, Rest der Fühler mehr oder weniger geschwärzt ..... der siebente Streifen fehlt”. Probably, he was unable to make a critical re-examination of the type of *B. semilunium* at that time.

On the other hand, this new species is closely allied to *B. serorum* NETOLITZKY (1934, p. 68) described from China.<sup>1)</sup> This Chinese form was later reduced to a subspecies of *B. semilunium* (NETOLITZKY, 1943, p. 33; JEDLIČKA, 1965, p. 121). I had an opportunity to examine the holotype of *B. serorum* in the Naturhistorisches Museum Wien, and found slight differences between the Chinese and Japanese forms: in *B. bandotaro*, the pronotum has less arcuate sides, deeper basal foveae, and more strongly punctate basal part. I was, however, unable to study it in more detail at that time. At my request, Dr. DOSTAL took trouble to re-examine it and to measure the length of antennal segments. Judging from our investigations, *B. serorum* must be regarded as a full species, and *B. bandotaro* is more closely similar in general appearance to *B. serorum* than to *B. semilunium*. There is, however, a very wide geographical gap between their ranges, and I prefer to consider *B. bandotaro* to be a full species.

Like *B. semilunium*, *B. bandotaro* has a wide range in Japan. In my experience, this beetle always inhabits lower places, though often coexisting with the former. Its type locality is the bed of the River Tone-gawa by Toride, which is one of the best known collecting sites of carabid beetles, yielding nearly one hundred species.

The specific name of this new species is derived from a variant name of the River Tone-gawa.

## 要 約

森田誠司：日本産ミズギワゴミムシ類の知見. III. *Bembidion semilunium* NETOLITZKY と近縁の 1 新種. — 筆者は、1986 年に、ニセツマキミズギワゴミムシ *Bembidion yanoi* JEDLIČKA を再記載し雄交尾器を図示した. ところが最近、*B. semilunium* と *B. yanoi* の正、副基準標本を直接、比較検討した結果、*B. yanoi* は、*B. semilunium* の同物異名であるという結論に達した. そして、じゅうらい多くの研究者がツマキミズギワゴミムシ *B. semilunium* とみなしてきた種は、新種であることが明らかになった. 本篇では、両者を記載し、さらに検索表で区別点を明示した. また、混乱を避けるために、じゅうらい用いられてきた和名を破棄し、新たに *B. semilunium* にフタモンミズギワゴミムシ、*B. bandotaro* にオオフタモンミズギワゴミムシという和名を与えた.

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1) Specimen examined. 1 ♀ (holotype), “Hweisin Kansu”/“Coll. NETOLITZKY”/“*serorum* det. NETOLITZKY! Type ”/“TYPUS”/“coll. NETOLITZKY”. It has the following coloration and relative lengths of antennal segments 2 and 3: legs and antennal segments 1–3 yellowish brown; rest of segments darker; 2: 3 = 1: 1.63 (left), 1: 1.53 (right).



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