Revision of the Taiwanese and Japanese Species of the Genus *Laius* (Insecta: Coleoptera: Malachiidae)

Hiroyuki Yoshitomi and Chi-Feng Lee

1. Entomological Laboratory, Faculty of Agriculture, Ehime University, Tarumi 3-5-7, Matsuyama 790-8566, Japan
2. Applied Zoology Division, Taiwan Agricultural Research Institute, 189 Chung-Cheng Road, Taichung 413, Taiwan

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Species of *Laius* Guérin-Méneville, 1830 (sensu Evers 1994) belonging to the family Malachiidae (Coleoptera: Cleroidea) inhabit rocky seashores from Asia to east Africa (Champion 1921, Satô et al. 2006, Yoshitomi 2008). This genus presently consists of about 250 species, most of which must be transferred to another genus based on the generic redefinition by Evers (1994). Some species were transferred to another related genus (e.g., the genus *Intybia*) by some authors, but many species still remain in the genus *Laius*. The autapomorphies of the genus shown by Evers (1994) are as follows: male protibia thickened basally with the inside of the basal area distinctly hollow, and elytra black with a greenish or bluish luster.

Wittmer (1997) transferred 8 Taiwanese and Japanese species from *Laius* to *Intybia*. However the remaining species were not treated. Until now, *Laius* was represented by 3 species from Taiwan and 2 species from Japan (Miwa 1931, Wittmer 1982, 1986, Satô 1985). In this paper, we review the Taiwanese and Japanese *Laius*, and describe 2 new species from Taiwan.

**MATERIALS AND METHODS**

Type depositories include the following collections: Ehime University Museum (EUM), Matsuyama, Japan; National Science Museum (NSMT), Tokyo, Japan; Naturhistorisches Museum Basel (NHMB), Basel, Switzerland; Taiwan Agricultural Research Institute (TARI), Taichung, Taiwan; Naturhistorisches Museum Wien (NMW), Wien, Austria; and the Laboratory of Systematic Entomology (SEHU), Hokkaido University, Sapporo, Japan.

Specimens were measured as follows: total length (TL; anterior margin of the clypeus to the elytral apex); elytral length along the suture (EL); maximum elytral width (EW); maximum pronotal length (PL); and maximum pronotal width (PW). The arithmetic means of the measurement are given in parenthesis after the range. The label data of the specimens are shown verbatim as

*To whom correspondence and reprint requests should be addressed. Tel: 89-946-9898. E-mail:hymushi@agr.ehime-u.ac.jp*

RESULTS

*Laius lutaoensis* sp. nov. (Figs. 1, 2, 9-11, 21, 25, 31)


*Paratypes* (TARI, EUM, NSMT, NMW, NHMB, SEHU): 2 ♀♂, same data as for holotype; 4 δ ♂ and 4 ♂♀, “near Jhaorih Rudao Isl. SE of TAIWAN 5-6. IV. 2004 H. Yoshitomi leg.”, genit. s. no. HY 1003 (♂) and HY 1057 (♀); 3 δ ♂, 6 ♀♀, “Lyudao, Taiwan 4-7. IV. 2004 M. Satô leg.”

Description: Male (Fig. 1): Body oblong, strongly shiny, closely covered with short, black setae. Color of body black with bluish luster; clypeus and surrounding parts of antennal sockets yellowish-brown; antennal segments I-III yellowish-orange.

Head narrower than pronotum; vertex flattened. Eyes moderate in size, prominent. Antennae (Fig. 9) stout; segment I slightly curved laterally; segment III (Fig. 11) transverse in dorsal view, deeply concave on mesal part of dorsal surface; L/W = 0.8; approximate ratio of each antennal segment as (n = 1) 8.7: 1.0: 4.0: 2.0: 1.8: 1.7: 1.7: 1.7: 1.7: 2.7. Pronotum quadrate, widest near anterior margin, antero- and posterolateral angles rounded, closely covered with fine punctures; PW/PL 1.23-1.38 (1.32).

Scutellum semicircular, punctuation similar to that of pronotum. Elytra oblong, broadest at apical 1/3; sides gradually expanded posterolaterally; EL/EW 1.29-1.55 (1.43); EL/PL 2.48-2.83 (2.72); EW/PW 1.35-1.56 (1.44); TL/EW 2.04-2.60 (2.33). Legs relatively long and stout; protibia slightly thickened basally with basal area internally excavated.

Caudal margin of tergite VIII shallowly emarginate (Fig. 21). Spiculum bidentate at anterolateral corners. Aedeagus (Fig. 25) long, irregularly curved; spine short, strikingly curved; apex broad, square, apical margin shallowly emarginate, covered with minute punctures.

**Female** (Fig. 2): Similar to male in color. Antennae (Fig. 10) rather slender; segment III oblong, L/W = 2.0; approximate ratio of each antennal segment as \((n = 1)\): 1.0: 4.0: 2.0: 2.4: 2.4: 2.0: 1.8: 3.0. PW/PL 1.25-1.39 (1.33); EL/EW 1.35-1.54 (1.48); EL/PL 2.63-2.82 (2.76); EW/PW 1.32-1.50 (1.41); TL/EW 2.35-2.67 (2.54).

**Measurements**: Male \((n = 6)\): TL 4.80-5.45 (5.18) mm; PW 1.45-1.6 (1.55) mm; PL 1.12-1.3 (1.18) mm; EL 3.12-3.25 (3.19) mm; EW 2.08-2.5 (2.24) mm. Female \((n = 6)\): TL 5.20-5.88 (5.51) mm; PW 1.45-1.60 (1.54) mm; PL 1.10-1.20 (1.16) mm; EL 3.05-3.38 (3.20) mm; EW 2.00-2.30 (2.17) mm.

**Distribution**: Lutao (Green I.), about 30 km off the southeastern coast of Taiwan.

**Biological notes**: Members of this species inhabit rocky seashores (Fig. 30). The following marine insects were collected at the same localities: Collarocoris satoi (Miyamoto) (Omaniidae), Hermatobates weddi China (Hematobatidae), Bembidion (Armatocillenus) sp. (Carabidae), Carpelimus sp. (Staphylinidae), Babalimnichus taiwanus Satô, Hyphalus taekoae Satô, Parathroscinus sp. (Limnichidae), and L. taiwanus sp. nov.

**Remarks**: This species is related to *L. lutaoensis* sp. nov.; *L. taiwanus* sp. nov.; *L. miyamotoi* Nakane; *L. asahinai* Nakane.
taiwanus sp. nov., but differs by its larger body size and the shapes of the male antennal segment III and male genitalia.

**Etymology:** The species epithet is derived from the island type locality.

*Laius taiwanus* sp. nov.

(Figs. 3, 4, 12-14, 22, 26)

**Holotype** (TARI): ♂, "Ludao, Taiwan 4-7. IV. 2004 M. Satô leg."


**Additional materials examined:** 2 ♂ ♂, 1 ♀, "Lanshu Taiwan 5-10. VIII. 1998 M. Satô leg."; 4 ♀ ♀, "Lanshu Taiwan 26-28-III-1998 M. Satô leg."; 11 ♂ ♂, 4 ♀ ♀, "Sanhsientai Taitung, Taiwan 13-VIII-2000 M. Satô leg.", genit. s. no. HY 1068 (♀) and HY 1069 (♂); 1 ♀, "TAIWAN: Taitung Sanhsientai, leg. Lee 12. VIII. 2000"; 2 ♂ ♂, 3 ♀ ♀,

"Lung Keng Pintung, Taiwan 10-VIII-2000 M. Satô leg.", genit. s. no. HY 1070 (♂).

**Description:** Male (Fig. 3): Body oblong, strongly shiny, closely covered with short black setae. Coloration of body black; head and pronotum with bluish-green luster; elytra with bluish-purple luster; antennal segments I-III yellowish-orange.

Head narrower than pronotum; vertex flattened, extending between eyes to antennal sockets. Eyes moderate in size, prominent. Antennae (Fig. 12) stout; segment I short, apically robust; segment III (Fig. 14) subtrapezoidal in dorsal aspect, projecting in anterolateral corners, with 2 shallow concavities and 1 deep concavity in dorsal surface; L/W = 1.1; approximate ratio of each antennal segment as (n = 1) 9.0: 1.0: 7.0: 2.5: 2.5: 2.3: 2.0: 1.8: 2.0: 2.0: 3.5. Pronotum quadrate, widest near anterior margin, antero- and posterolateral angles rounded, closely covered with fine punctures; PW/PL 1.17-1.38 (1.24). Scutellum semicircular, punctuation similar to that of pronotum. Elytra oblong, broadest at apical 1/3; sides gradually expanded posterolaterally; EL/EW 1.38-1.70 (1.46); EL/PL 2.44-3.31 (2.67); EW/PW 1.41-1.60 (1.48); TL/EW 2.44-2.79 (2.54). Legs

relatively long and stout; protibia thickened basally with basal area internally excavated.

Caudal margin of tergite VIII almost straight (Fig. 22). Spiculum simply pointed at anterolateral corners. Aedeagus (Fig. 26) gently tapered apically; spine long, slightly curved in apical part; apex long, truncate, emarginate apically, bearing short setae.

Female (Fig. 4): Similar to male in color. Antennae (Fig. 13) rather slender; segment III oblong, L/W = 1.8; approximate ratio of each antennal segment as \( n = 1 \) 8.3: 1.0: 4.3: 2.8: 2.3: 2.5: 2.0: 2.0: 2.0: 3.3. PW/PL 1.20-1.37 (1.25); EL/EW 1.37-1.49 (1.43); EL/PL 2.50-2.89 (2.68); EW/PW 1.38-1.59 (1.50); TL/EW 2.39-2.69 (2.51).

Measurements: Male \( n = 13 \): TL 3.90-4.88 (4.18) mm; PW 1.00-1.23 (1.11) mm; PL 0.80-0.98 (0.90) mm; EL 2.20-2.98 (2.39) mm; EW 1.55-1.80 (1.64) mm. Female \( n = 13 \): TL 3.98-4.70 (4.35) mm; PW 1.05-1.23 (1.16) mm; PL 0.85-1.00 (0.93) mm; EL 2.23-2.78 (2.48) mm; EW 1.60-1.90 (1.74) mm.

Distribution: Taiwan, including Lutao (Green I.) and Lanyu (Orchid I.).

Biological notes: At the type locality (Fig. 30), this species was collected with \( L. \) lutaoensis sp. nov.

Remarks: Lanyu specimens are smaller than the Lutao specimens, type series (TL = 3.30-3.62 mm in males, 3.47-3.68 mm in females). Sanhsientai and Lung Keng specimens differ from those of the type series by being smaller (TL = 3.10-3.45 mm in males, 3.10-3.50 mm in females) and in the elytra having a purplish luster. However, the shapes of the male antennal segment III and male genitalia of all specimens examined do not differ from those of the type series; thus we consider all of them to be the same species.

Etymology: The species epithet is derived from the type locality.

**Laius miyamotoi** Nakane 1955
(Figs. 5, 6, 15-17, 23, 27)


**Redescription**: Male (Fig. 5): Body oblong, slightly shiny, closely covered with black short setae. Color of body black; head, pronotum, scutellum, and elytra with dull bluish luster; antenna segments I-II almost black. Antennae (Fig. 15) rather slender; segment III oblong, L/W = 1.0; approximate ratio of each antennal segment as (n = 1) 8.0: 1.0: 3.5: 2.0: 1.8: 2.0: 2.0: 1.8: 2.0: 3.0. PW/PL 1.09-1.22 (1.17); EL/EW 1.39-1.47 (1.43); EL/PL 2.45-2.83 (2.68); EW/PW 1.55-1.65 (1.59); TL/EW 2.20-2.40 (2.29).

**Measurements**: Male (n = 4): TL 3.5-4.2 (3.88) mm; PW 1.00-1.23 (1.10) mm; PL 0.90-1.00 (0.94) mm; EL 2.40-2.75 (2.53) mm; EW 1.55-1.90 (1.67) mm. Female (n = 4): TL 4.08-4.40 (4.25) mm; PW 1.10-1.22 (1.17) mm; PL 0.90-1.10 (1.00) mm; EL 2.50-2.83 (2.67) mm; EW 1.70-1.95 (1.86) mm.

**Distribution**: Japan (Tokara-nakano-shima, Okierabu-jima, Amami-Oshima, Okinawa-jima, Kume-jima, Ishigaki-jima, Iriomote-jima, Yonaguni-jima).

**Biological notes**: The following marine insects are frequently collected at the same locality where this species occurs: Babalimnichus masamii Satô, Hyphalus taekoae Satô (Limbichidae), and Cicindela yuasai okinawaensis Hori et Cassola (Carabidae: Cicindelinae). The larva of this species was described by Satô (1964) and Asano and Kojima (2009). Remarks: This species, closely related to the allopatric L. asahinai Nakane, differs by the shape of male antennal segment III and the apex of the aedeagus.

**Laius asahinai** Nakane 1955
(Figs. 7, 8, 18-20, 24, 28)


**Additional material examined**: 3 ♀, “Koza Wakayama Pref. 4-7. viii. 1978 Y. Kurosawa”; 1 ♀, “Amatsu-kominato, Chiba Pref. 22-VII-1988...
Redescription: Male (Fig. 1G): Body oblong, slightly shiny, closely covered with black short setae. Color of body black; head, pronotum, scutellum, and elytra with dull, bluish luster; antennal segments I-III yellowish-brown, but with infuscate dorsobasal region of segment I.

Head narrower than pronotum; vertex flattened. Eyes moderate in size, prominent. Antennae (Fig. 2J) stout; segment I slightly curved outwardly; segment III (Fig. 2L) transverse in dorsal view, dorsal surface deeply concave; L/W = 0.9; approximate ratio of each antennal segment as \((n = 1) 10.8: 1.0: 7.3: 2.3: 2.0: 2.0: 2.3: 2.0: 2.0: 3.3\).

Pronotum subquadrate, widest near anterior margin, antero- and posterolateral angles rounded, closely covered with fine punctures; PW/PL 1.16-1.31 (1.25). Scutellum semicircular, punctation similar to that of pronotum. Elytra oblong, broadest at apical 1/4; sides gradually expanded posterolaterally; EL/EW 1.38-1.53 (1.44); EL/PL 2.84-3.05 (2.96); EW/PW 1.54-1.77 (1.64); TL/EW 2.08-2.45 (2.23). Legs relatively long and slender; protibia slightly thickened basally with basal area internally excavated.

Caudal margin of tergite VIII shallowly emarginate (Fig. 3D). Spiculum simply pointed at anterolateral corners. Aedeagus (Fig. 4D) tapered apically; spine long, slightly curved; apex somewhat produced, obtusely rounded, covered with minute punctures.

Female (Fig. 1H): Similar to male in color, but antennal segments I and II almost black. Antennae (Fig. 2K) rather slender; segment III oblong, L/W = 1.8; approximate ratio of each antennal segment as \((n = 1) 8.0: 1.0: 4.0: 2.3: 2.0: 2.0: 2.0: 2.0: 3.5\).

Scutellum semicircular, punctuation similar to that of pronotum. Elytra oblong, broadest at apical 1/4; sides gradually expanded posterolaterally; EL/EW 1.50-1.58 (1.54); EL/PL 2.80-3.16 (2.95); EW/PW 1.54-1.77 (1.64); TL/EW 2.08-2.45 (2.23). Legs relatively long and slender; protibia slightly thickened basally with basal area internally excavated.

Measurements: Male \((n = 3)\): TL 3.95-4.65 (4.27) mm; PW 1.10-1.23 (1.17) mm; PL 0.90-0.95 (0.93) mm; EL 2.70-3.00 (2.83) mm; EW 1.80-1.90 (1.83) mm.

Distribution: Japan (Honshū, Shikoku, Kyūshū, Yakushima).

Biological notes: The following marine insects are frequently collected at the same localities where this species occurs: Babalimuthus masamii Sato (Limnichidae) and Cicindela yuasai yuasai Nakane (Cicindelidae). Hashimoto (1970) wrote that adults of this species are able to stay submerged in seawater for up to 30 h. The larvae and biology of this species were described by Asano and Kojima (2009).

Remarks: The obtusely rounded aedeagal apex is highly unusual in Laius and the related Intybia, a probable sister taxon of Laius. Until now, the occurrence of this species in Niigata Prefecture was the northernmost limit of the genus (Kurosawa 1974). This species was assigned the rank of "Data Deficient (DD)" by the Japanese Insects Red List (JME 2007).

New combinations for Laius species recorded from Taiwan

We propose to transfer 2 species treated as members of Laius to Intybia (Evers 1994, Wittmer 1997).

Intybia erectodentatus (Wittmer, 1982), comb. nov.

Laius erectodentatus Wittmer 1982: 368.

Holotype: (NHMB) "Taipei 3. IV. 77", "Taiwan 1977 J. and S. Klapperich", "PARATYPUS", "MALACHIIDEA MALAC 0001639".

Paratypes: (NHMB) 1 ♀, same, "MALAC 0001586"; 1 ♂, same, "MALAC 0000108"; 1 ♂, "Yangmingshan Mts.", "Taiwan 1977 6. 4 J. and S. Klapperich", "PARATYPUS".

Intybia sexmaculatus (Pic, 1919), comb. nov.


Species not treated in this paper

*Laius pici* Miwa 1931

*Laius sexmaculatus* Pic 1926: 78. (nec Pic 1919).  

**Remarks:** We did not examine specimens of this species, and do not refer to the taxonomic status. However, from the original description, this species is similar to *I. yapensis* (Wittmer) and *I. sexmaculatus* (Pic).

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Key to species of *Laius* from Taiwan and Japan

1. Antennal segment I yellowish-orange in both sexes; pronotum and elytra with shiny luster; Taiwanese species
   - Antennal segment I infuscate dorsobasally (male) or black (female); pronotum and elytra with faint luster; Japanese species
2. TL 4.80-5.88 mm, EL 3.05-3.38 mm, PW 1.45-1.60 mm; antennal segment I slightly curved, about 2.0x length of segment III; male antennal segment III transversally oblong; aedeagal spine strikingly curved
   - *Laius lutaoensis* sp. nov.
3. TL 3.90-4.88 mm, EL 2.20-2.98 mm, PW 1.00-1.23 mm; antennal segment I strongly curved, about 1.3x (male)

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**Fig. 29.** Maximum pronotal width (PW) and elytral length along the suture (EL) of each *Laius* species.

**Figs. 30, 31.** 30. Habitat; 31. male of *Laius lutaoensis* sp. nov. Photographed near Jhaorih, Lyudao (Green I.), 5 Apr. 2004, by HY.
or 1.9x (female) length of segment III; male antennal segment III subtrapezoidal, projecting at anterolateral corners; aedeagal spine slightly curved..............................
.................................................... Laius taiwanus sp. nov.
3. Male antennal segment III semicircular; apex of aedeagus shallowly emarginate.............................................................
.................................................. Laius miyamotoi Nakane
- Male antennal segment III transversal oblong; apex of aedeagus obtusely rounded........ Laius asahinai Nakane

DISCUSSION

The 2 Taiwanese species described herein are sympatric (Fig. 32), having been collected at the same time and place at Lutao (Green I.). The difference in body sizes makes them clearly distinguishable in the field (Fig. 29). On the other hand, the 2 Japanese species are allopatric (Fig.
A distributional boundary line occurs between the Yakushima and Tokara Is. This line has been described as “Watase’s line” (Suzuki 2003). Body sizes of the 2 species overlap each other (Fig. 29).

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