

Two New Records with Ecological Notes of the Spider Riffle Beetles (Coleoptera: Elmidae) from Laos

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Abstract Two species of the genus *Ancyronyx*, *A. acaroides acaroides* and *A. yunju*, are newly recorded from Laos. Ecological notes based on a field investigation and distribution are discussed. Keys to the Indochinese species and a world check list of the species with ZooBank LSIDs are given in appendices.

Key words. New distributional record, Indochina, *Ancyronyx*, elmidae fauna.

Introduction

Ancyronyx Erichson, 1847 (Elmidae, Elminae) is one of the strangest and most famous elmidae genera due to their body shape (very long legs and compact body), and are called “spider riffle beetles” (Jäch, 1993). This genus shows quite clear disjunct distribution in North America and Southeast and South Asia, and is represented by 21 species and 1 subspecies (see Appendix 2).

Three species of the genus, *A. acaroides*, *A. malickyi*, *A. procerus*, have been recorded from the Indochinese subregion, and one species from China (Jäch, 1994; Bian *et al.*, 2012). One of these species, *A. malickyi*, has been recorded from Laos (Jäch, 1994). In the present paper, two species of the genus are newly recorded from Northern Laos.

Materials and Methods

Sampling

All the specimens described in this paper were collected in a survey I conducted at two locations in North Laos (<https://sites.google.com/site/waterbeetlesofjapan/home/field-investigation/Collecting%20sites%20in%20LAOS%20Expedition%202013.pdf>):

LA7 (Fig. 1E): Ban Dokmai, Xieng Khouang Prov., Laos, N19 14.256 E103 39.744, 1,329 m, 24 & 29. V. 2013. River width: 2 m; depth: 10–30 cm; water temperature: 25°C. [Environmental keywords: paddy field, river, secondary forest]

LA15 (Fig. 1F): Ban Muang, Xieng Khouang Prov., Laos, N19 15.107 E103 36.341, 1,294 m, 30. V. 2013. River width: 2–4 m; depth: 10–50 cm; water temperature: 25°C.

[Environmental keywords: paddy field, river, secondary forest]

In the field, pieces of immersed wood (9 in LA7, 3 in LA15) were picked up by hand from the river, and all elmidae beetles attached to the surface of wood were collected using tweezers. The samples were separated by each piece of wood (combined in LA15). Table 1 shows the characteristics of each piece of immersed wood.

The specimens described in this paper are preserved in the Ehime University Museum, Matsuyama (EUMJ) and the Naturhistorisches Museum, Wien (NMW).

Morphological observation

General observation and dissection were made under a stereoscopic microscope (Leica MZ95). Microstructures were observed, under a microscope (Olympus BH-2), of the dissected part mounted on hollow slides with pure glycerine. After observation, the dissected parts were mounted on the same card of each specimen. Technical terms for the genitalia follow Kodada & Jäch (2005).

Abbreviations used in measurement are as follows: PL = length of pronotum; PW = width of pronotum; EL = length of elytra; EW = width of elytra; TL = PL + EL. The average is given in parentheses after the range.

New records

Ancyronyx acaroides acaroides Grouvelle, 1896 (Figs. 1A, C, 2A–C, G, H, K, M)

Ancyronyx acaroides Grouvelle, 1896, 50

Ancyronyx acaroides acaroides: Jäch, 1994, 602.

Specimens examined. 4 Male & 7 exs. (EUMJ), LA7: Ban Dokmai, Xieng Khouang Prov., Laos, N19 14.256 E103 39.744, 1,329 m, 24. V. 2013, H. Yoshitomi leg.; 16 exs. (EUMJ, NMW), ditto, 29. V. 2013, H. Yoshitomi leg.; 14 exs. (EUMJ, NMW), LA15: Ban Muang, Xieng Khouang Prov., Laos, N19 15.107 E103 36.341, 1,294 m, 30. V. 2013, H. Yoshitomi leg.

Diagnosis. Measurement and ratio (n = 6): TL 1.70–2.00 (1.83) mm; PW 0.60–0.75 (0.64) mm; PL 0.60–0.65 (0.61) mm; EL 1.10–1.35 (1.23) mm; EW 0.80–0.95 (0.90) mm; PW/PL 1.00–1.15 (1.05); EL/EW 1.24–1.44 (1.37); EL/PL 1.83–2.17

Table 1. Characteristics of immersed wood.

| loc. No. | date | immersed wood | | | | | |
|----------|-------------|---------------|---------------|-------------|-------------|-------------|---------------------------------|
| | | no. | diameter (cm) | length (cm) | width (cm) | shape | surface area (cm ²) |
| LA7 | 24. V. 2013 | 1 | 10 | 83 | — | cylindrical | 2763.2 |
| | | 2 | 3.5 | 80 | — | cylindrical | 898.4325 |
| | | 3 | 6 | 57 | 1 | board | 810 |
| | | 4 | 12 | 116 | — | cylindrical | 4596.96 |
| | | 5 | 4 | 135 | 8 | board | 3304 |
| | 29. V. 2013 | 6 | 1.5 | 50 | 18 | cylindrical | 239.0325 |
| | | 7 | 6 | 42 | — | cylindrical | 847.8 |
| | | 8 | 18 | 100 | — | cylindrical | 6160.68 |
| | | 9 | 1.5 | 50 | — | cylindrical | 239.0325 |
| LA15 | 30. V. 2013 | 2 | 60 | — | cylindrical | 383.08 | |
| | | 3 | 90 | 20 | board | 4260 | |
| | | 4 | 90 | — | cylindrical | 1155.52 | |

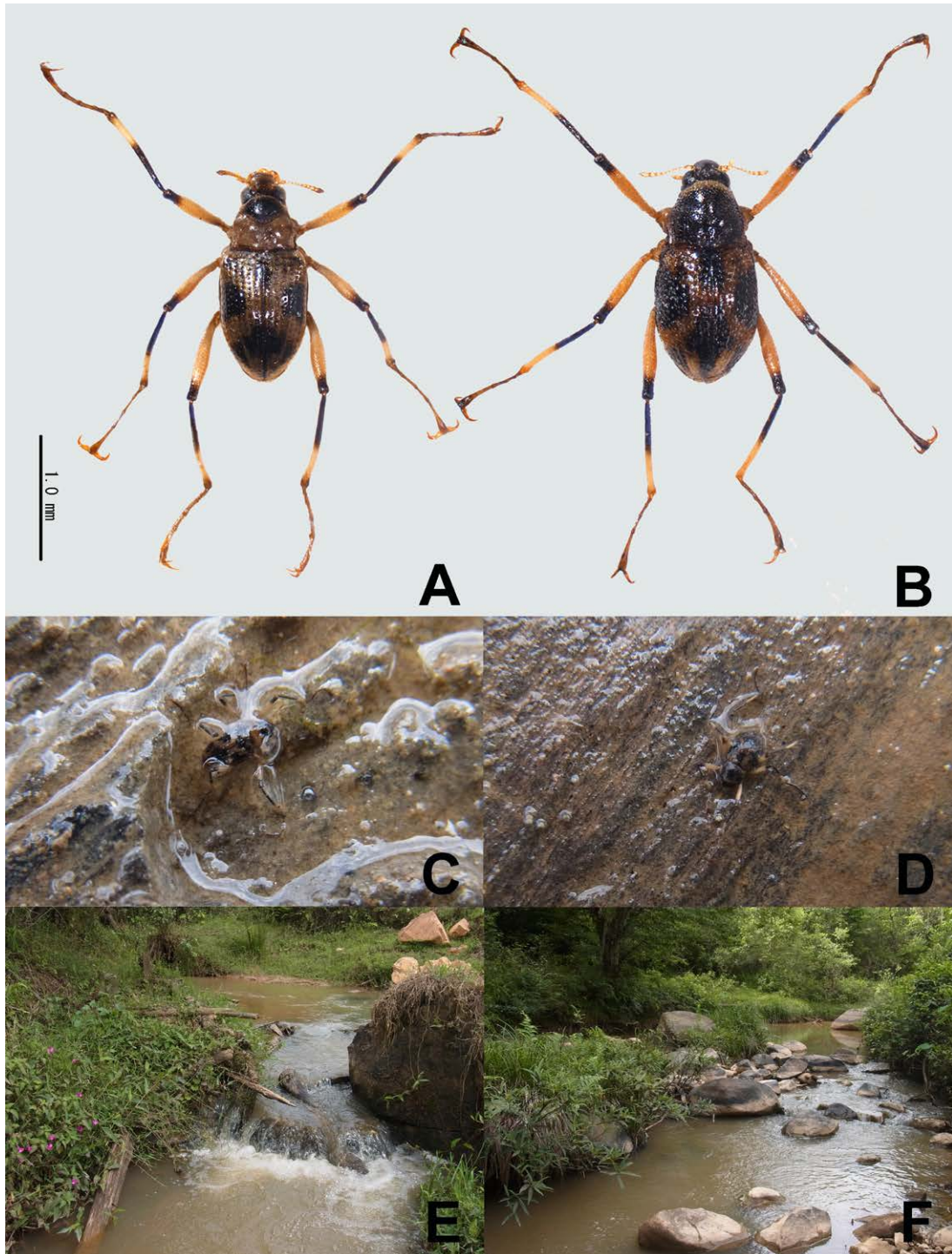


Fig. 1. *Ancyronyx acaroides acaroides* (A, C), *A. yunju* (B, D), and their habitats (E, F). A, B, Habitus in dorsal view; C, D, habitus in the field; E, LA7; F, LA15. Photographs taken by HY.

(2.01); EW/PW 1.27–1.50 (1.41); TL/EW 1.91–2.13 (2.05).

Male. Sternite VII transverse, densely covered with short adpressed setae. Sternite IX slightly asymmetrical; median strut long; apical margin shallowly concave, bearing short setae and spines in lateral parts; spiculum gastrale rather short. Aedeagus ca 0.44 mm; phallobase long, clearly longer than parameres; parameres short, curved intero-ventrally, sparsely punctate; median lobe relatively short, projecting laterally in apical 1/3, sparsely punctate.

Female. Sternite VII relatively longitudinal, densely

covered with short adpressed setae. Ovipositor ca 0.38 mm; stylus short, slightly curved laterally in apical portion; distal portion of coxite closely covered with short and stout setae, densely bearing short spines in basal part of inner margins; basal portion of coxite expanded intero-basally, covered with short and stout setae and short spines; valvifer with some long setae in apical part; approximate ratio of stylus, distal portion of coxite, basal portion of coxite, and valvifer ($n = 1$) as 1.0 : 1.8 : 2.9 : 3.7.

Distribution. Myanmar, Vietnam, Malaysia (Borneo,

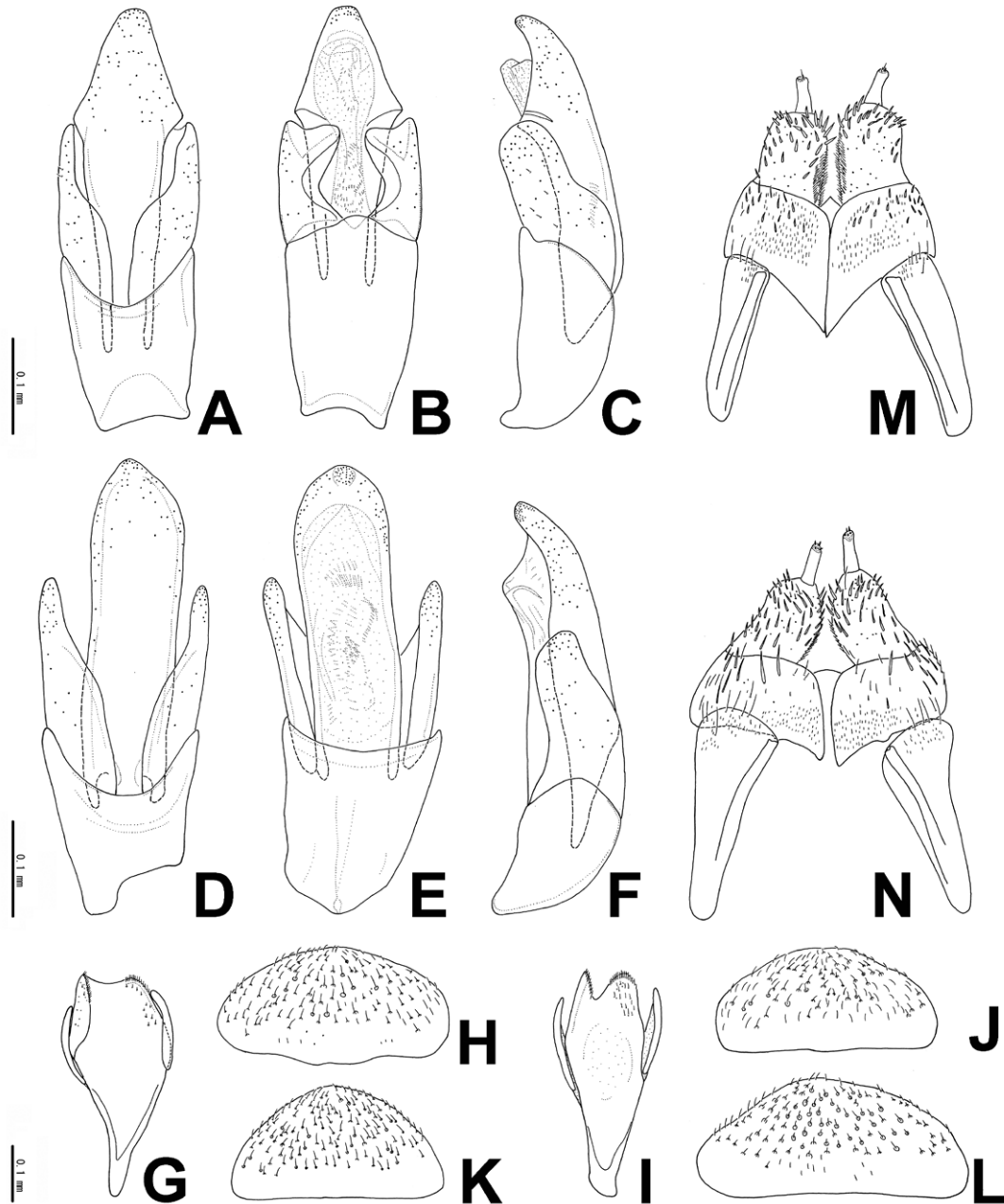


Fig. 2. Male (A–J) and female (K–N) genitalia of *Ancyronyx acaroides acaroides* (A–C, G, H, K, M) and *A. yunju* (D–F, I, J, L, N).

Peninsula), Brunei, Indonesia (Sumatra, Java), Laos (new record).

***Ancyronyx yunju* Bian, Guo et Ji, 2012**
(Figs. 1B, D, 2D–F, I, J, L, N)

Ancyronyx yunju Bian, Guo et Ji, 2012, 58.

Specimens examined. 1 Female (EUMJ), LA7: Ban Dokmai, Xieng Khouang Prov., Laos, N19 14.256 E103 39.744, 1,329 m, 24. V. 2013, H. Yoshitomi leg.; 7 exs. (EUMJ, NMW), ditto, 29. V. 2013, H. Yoshitomi leg.; 6 exs. (EUMJ, NMW), LA15: Ban Muang, Xieng Khouang Prov., Laos, N19 15.107 E103 36.341, 1,294 m, 30. V. 2013, H. Yoshitomi leg.

Diagnosis. Measurement and ratio (n = 6): TL 1.85–2.15 (2.02) mm; PW 0.70–0.90 (0.79) mm; PL 0.60–0.72 (0.68) mm; EL 1.25–1.45 (1.34) mm; EW 0.92–1.20 (1.07) mm; PW/PL 1.07–1.29 (1.17); EL/EW 1.18–1.36 (1.26); EL/PL 1.86–2.08 (1.98); EW/PW 1.20–1.50 (1.35); TL/EW 1.79–2.01 (1.89).

Male. Sternite VII transverse, densely covered with short adpressed setae. Sternite IX slightly asymmetrical; median strut short and wide; apical margin deeply notched, bearing short setae and spines in lateral parts; spiculum gastrale rather long. Aedeagus ca 0.48 mm; phallobase relatively short, as long as parameres; parameres long, straightly projecting, sparsely punctate; median lobe long, as long as parameres and phallobase combined, subparallel-sided near base to apical 1/5, closely punctate in apical portion.

Table 2. Elmidae collected at LA7 and LA15.

| loc. No. no. | LA7 | | | | | | | | | LA15 | TO TAL |
|---------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|-----------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | |
| <i>Ancyronyx yunju</i> | | | | | 1 | 1 | 1 | 5 | | 6 | 14 |
| <i>Ancyronyx acaroides</i> | 2 | 2 | | 6 | 1 | | | 13 | 3 | 14 | 41 |
| <i>Aesobia</i> sp. | 20 | | | | | 17 | 8 | 2 | 23 | 2 | 72 |
| <i>Graphelmis elegans</i> | 55 | 18 | 19 | 20 | 25 | 8 | 4 | 15 | 23 | 46 | 233 |
| <i>Graphelmis schillhammeri</i> | 4 | 1 | 9 | 7 | 3 | 3 | 2 | 3 | 5 | 12 | 49 |
| <i>Grouvellinus</i> spp. | 17 | | 1 | 9 | 2 | | 5 | 11 | 7 | | 52 |
| <i>Macronychus reticulatus</i> | 18 | | 1 | 1 | 1 | 14 | | 11 | | 43 | 89 |
| <i>Macronychus</i> sp. | | | 2 | | | | | | | | 2 |
| Macronychini Gen. et sp. | | | | 1 | | | | | | 1 | 2 |
| <i>Pseudamophilus</i> sp. | | | | | | | | | | 1 | 1 |
| <i>Stenelmis</i> sp. | 2 | | | | 1 | | | | 14 | | 17 |
| <i>Potamophilinus</i> sp. | | | | | | | 1 | | | | 1 |
| <i>Elmomorphus</i> sp. | 7 | | | 1 | | | 2 | | 3 | 3 | 16 |
| no. of species | 8 | 3 | 5 | 7 | 7 | 5 | 7 | 7 | 7 | 9 | 13 |
| no. of individuals | 125 | 21 | 32 | 45 | 34 | 43 | 23 | 60 | 78 | 128 | 589 |
| density | 0.04524 | 0.02337 | 0.03951 | 0.00979 | 0.01029 | 0.17989 | 0.02713 | 0.00974 | 0.32632 | 0.33413 | 0.101 |

Female. Sternite VII as in male. Ovipositor ca 0.42 mm; stylus short and straight; distal portion of coxite closely covered with rather long and stout setae, bearing short spines in basal part of inner margins; basal portion of coxite bearing rather long and stout setae; valvifer with some long setae in apical part; approximate ratio of stylus, distal portion of coxite, basal portion of coxite, and valvifer (n = 1) as 1.0 : 2.2 : 2.6 : 4.7.

Distribution. China (Jiangxi Prov.), Laos (new record).

Discussion

Ecological notes

As shown in Table 2, two *Ancyronyx* species reported here were collected together with ten other elmidae beetles and one dryopid (*Elmomorphus* sp.) beetle at LA7 and LA15. It seems that very rich elmidae fauna are established in these two localities, because 1–5 elmidae species were collected in another locality in research I conducted using the same method employed in this survey (HY, unpublished data). Most of the immersed wood in LA7 and LA15 originated from the upstream side of a small dam, flowed down the river, and became stuck on rocks. The artifact factor provides a good elmidae habitat. In addition, it is possible that these elmidae species work as ‘keystone’ taxa or ‘ecosystem engineers’ (McKie & Cranston, 1998).

The localities LA7 and LA15 were small rivers running through rice paddy fields, and the water was moderately polluted by water flowing into the paddy fields. In this area, local people do not use agricultural chemicals to cultivate rice, so the pollution was caused only by soil muddiness. Generally, most elmidae beetles live in clean river water (Kodada & Jäch, 2005). Ogata (2000) reported that two surfactants (alkylbenzene sulfonate and linear alkylbenzene sulfonate) seriously affected two elmidae beetles. On the other hand, Freitag (2012) noted that some *Ancyronyx* species (*A. jaechi*, *A. helgeschneideri*, *A. schillhammeri*) were collected from slightly to moderately polluted rivers, while other species (especially members of the *A. patrolus* species group) appear to be limited to clean water. I suggest that two *Ancyronyx*

species and other elmidae collected together are resistant to soil muddiness but are probably sensitive to pollution by agricultural chemicals including surfactants.

Distribution

The distribution map of *Ancyronyx* in Indochina is shown in Fig. 3. The genus is widely distributed in China, Vietnam, and Laos. The altitudes of the collecting localities were in the range 200–1,400 m, with most of the specimens collected in the range 700–1,000 m. It is probably difficult to find new distributional localities of the genus in lower altitude areas of Indochina, because the river and stream environments in lower lying areas are completely damaged by human activities (for example, direct envelopment, medical pollution, and construction of big dams) except for some protected areas. Two species (*A. acaroides* + *A. yunju* or *A. acaroides* + *A. procerus*) are distributed sympatrically in three localities.

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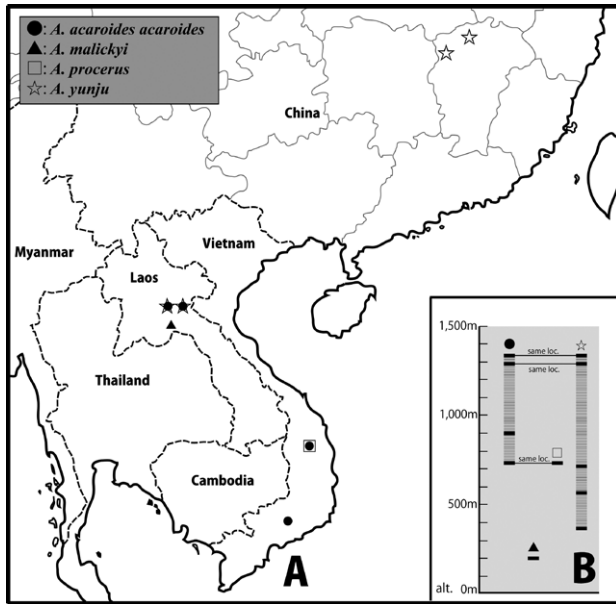


Fig. 3. Distribution map of *Ancyronyx* spp. in Indochina (A) and altitude (B). Symbols are indicated in A.

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Appendix 1: Key to species of the genus *Ancyronyx* of Indochina

1. Coloration of pronotum fully dark brown; hind wing brachypterous. *A. yunju*
 - Coloration of pronotum yellowish, with black spot(s); hind wing macropterous. 2
2. Body strongly shiny; elytra oval (EL/EW = ca 1.3), with lateral black maculations distinct; median lobe projecting laterally in apical 1/3; parameres short, curved intero-ventrally. *A. acaroides acaroides*
 - Body weakly shiny, elytra oblong (EL/EW = ca 1.6–1.7), with lateral maculations obscure; median lobe evenly tapered apically; parameres relatively long, straightly projecting. 3
3. Body larger (2.4–2.8 mm); posterior part of pronotum lacking black maculation; femur evenly yellowish, except for black apices. *A. procerus*
 - Body smaller (2.0–2.3 mm); posterior part of pronotum with black maculation; femur with black bands in middle parts, yellowish in apices. *A. malickyi*

Appendix 2: World check list of the genus *Ancyronyx* with ZooBank LSID

- Ancyronyx* Erichson, 1847
urn:lsid:zoobank.org:act:D45AFD16-080C-4FFD-BFF7-F2E37EB0BFA3
- Ancyronyx acaroides acaroides* Grouvelle, 1896 (Myanmar; Vietnam; Laos, Malaysia: Peninsula, Borneo; Brunei; Indonesia: Sumatra, Java)
urn:lsid:zoobank.org:act:336BF698-FEAF-47C8-A8BD-F2D610933922
- Ancyronyx acaroides cursor* Jäch, 1994 (Indonesia: Bali)
urn:lsid:zoobank.org:act:21333C5A-7EA6-45AF-A937-A0CDAF4FC1A
- Ancyronyx buhid* Freitag, 2013 (Philippines: Mindoro)
urn:lsid:zoobank.org:act:C731192C-EF06-4BDD-A387-9AB967DC9FED
- Ancyronyx helgeschneideri* Freitag & Jäch, 2007 (Philippines: Palawan, Busuanga)
urn:lsid:zoobank.org:act:BECA2458-DBF9-42E7-A42C-EAE45784D8C8
- Ancyronyx hjarnei* Jäch, 2003 (Indonesia: Sulawesi)
urn:lsid:zoobank.org:act:B9E01970-2111-450E-ADE7-D0A80D55FBE4
- Ancyronyx jaechi* Freitag, 2012 (Sri Lanka)
urn:lsid:zoobank.org:act:6A7F92B8-6298-4892-8783-6CFD565399F2
- Ancyronyx johanni* Jäch, 1994 (Indonesia: Siberut)
urn:lsid:zoobank.org:act:F852DE7D-C795-4451-838B-E9CEDCB5900C
- Ancyronyx malickyi* Jäch, 1994 (Laos; southern Thailand; Malaysia: Peninsula, Borneo; Indonesia: Sumatra)
urn:lsid:zoobank.org:act:F2338DB6-2BD0-4BF7-9309-10D74749FD37
- Ancyronyx minerva* Freitag & Jäch, 2007 (Philippines: Palawan, Mindoro)
urn:lsid:zoobank.org:act:757C1AD8-6DD5-4057-B031-FD04824C67C5
- Ancyronyx minutulus* Freitag & Jäch, 2007 (Philippines: Palawan)

- urn:lsid:zoobank.org:act:F84835DC-D96D-4A08-A65F-9BDF597B8C09
- Ancyronyx montanus* Freitag & Balke, 2011 (Philippines: Palawan)
urn:lsid:zoobank.org:act:A0935C7F-E1D7-4211-8B4F-CDE0A020869A
- Ancyronyx patrolus* Freitag & Jäch, 2007 (Philippines: Palawan, Busuanga)
urn:lsid:zoobank.org:act:29C66E33-532F-43D1-A121-B7F645E02C62
- Ancyronyx procerus* Jäch, 1994 (Vietnam; Malaysia: Borneo; Brunei; Philippines: Busuanga)
urn:lsid:zoobank.org:act:DA5DCE64-545E-4A79-9ECC-D7F3D018412C
- Ancyronyx pseudopatrolus* Freitag & Jäch, 2007 (Philippines: Palawan)
urn:lsid:zoobank.org:act:86C5107A-A81E-4D58-95FB-88AA498FF81C
- Ancyronyx pulcherrimus* Kodada, Jäch & Čiampor, 2014
urn:lsid:zoobank.org:act:3BFF0B03-A3C1-4160-80E8-874DE2BBE8B2
- Ancyronyx punkti* Freitag & Jäch, 2007 (Philippines: Palawan)
urn:lsid:zoobank.org:act:FDD186FF-0168-42B5-9354-F0925F3A7B5A
- Ancyronyx raffaelacatharina* Jäch, 2004 (Indonesia: Sulawesi)
urn:lsid:zoobank.org:act:B7C63BD8-ED4C-4FE9-99D1-8C2F6BF90DD7
- Ancyronyx reticulatus* Kodada, Jäch & Čiampor, 2014
urn:lsid:zoobank.org:act:8027BB8E-1F02-4413-BDCA-01DF915BC778
- Ancyronyx sarawacensis* Jäch, 1994 (Malaysia: Borneo)
urn:lsid:zoobank.org:act:754CE7FA-2B05-450C-91B8-E7C0A9100CD4
- Ancyronyx schillhammeri* Jäch, 1994 (Philippines: Mindoro)
urn:lsid:zoobank.org:act:DBE1EEE8-12F9-426A-9426-2530437E2B3E
- Ancyronyx sophermarie* Jäch, 2004 (Philippines: Sibuyan)
urn:lsid:zoobank.org:act:884A7F05-5783-4D8B-8F32-DE0A5F1C3B2A
- Ancyronyx tamaraw* Freitag, 2013 (Philippines: Mindoro)
urn:lsid:zoobank.org:act:9D03899B-56E5-4E7C-9C0E-A5154E30B2FC
- Ancyronyx variegatus* (Germar, 1824) (Canada, USA)
urn:lsid:zoobank.org:act:8F8D48E9-B76E-4A58-9D12-23935524329B
- Ancyronyx yunju* Bian, Guo & Ji, 2012 (China, Laos)
urn:lsid:zoobank.org:act:23D76E8B-9633-47A2-88C7-7DAB4C2F03CF