

1 **Integrative taxonomy reveals multiple lineages of the spider genus *Cybaeus***
2 **endemic to the Ryukyu Islands, Japan (Arachnida : Araneae : Cybaeidae)**

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16 Running title: Systematics of Ryukyu Islands *Cybaeus*

17

18 **Abstract.** The epigeal spiders of the genus *Cybaeus* L. Koch, 1868 are known to have
19 diversified in western North America and the Japanese Archipelago. To date, ca. 80
20 species of *Cybaeus* are known from Japan, but they have not previously been recorded
21 from the Ryukyu Islands that harbour a diversity of endemic species. Here we describe
22 eight new species of *Cybaeus* from the Ryukyu Islands, extending the range of *Cybaeus*
23 southward to the central Ryukyus. Both sexes of each of the new species are described,
24 and their phylogenetic relationships are estimated using nuclear and mitochondrial gene
25 markers. Although *Cybaeus okumurai*, sp. nov. and *C. kumadori*, sp. nov. possess
26 genital features that are common in the other Japanese congeners, the other six species
27 (*C. yakushimensis*, sp. nov., *C. kodama*, sp. nov., *C. amamiensis*, sp. nov., *C. aikana*,
28 sp. nov., *C. tokunoshimensis*, sp. nov., and *C. hikidai*, sp. nov.) are characterised by an
29 elongated embolus and tubular spermathecae. These unique genital characteristics and
30 the phylogeny recovered here suggest that these features evolved independently among
31 the Japanese and Ryukyu *Cybaeus* species. Phylogenetic analyses highlight an unusual
32 biogeographical pattern in which *C. yakushimensis* and *C. kodama* endemic to
33 Yakushima Island in the northern Ryukyus are related to species distributed in the
34 central Ryukyus. In contrast, our phylogeny suggests that *C. okumurai* from
35 Tanegashima Island in the northern Ryukyus is sister to *C. ashikitaensis* (Komatsu,
36 1968) distributed in Kyushu of the Japanese Archipelago. The retreat constructs and
37 sympatric distribution of *Cybaeus* found among the Ryukyus are also briefly discussed.

38

39 **Additional keywords:** island fauna, morphology, phylogenetics

40

41 **Introduction**

42

43 Spiders belonging to the genus *Cybaeus* L. Koch, 1868 are epigeal species inhabiting
44 moist woodlands in the Holarctic region (Bennett 2017). *Cybaeus* currently consists of
45 164 species with disjunct distributions from western Europe to the Caucasus, the
46 northern Far East, and the eastern and western Nearctic, and is highly diverse in western
47 North America and the Japanese Archipelago (World Spider Catalog, ver. 21.5, see
48 <https://wsc.nmbe.ch/>, accessed 10 September 2020). Molecular phylogenetic analyses
49 **have** revealed that *Cybaeus* spiders endemic to western North America comprise two
50 distinctive lineages, the ‘Holarctic’ and ‘Californian’ clades (Copley *et al.* 2009). The
51 Holarctic clade contains species widely distributed in North America and includes the
52 type species of *Cybaeus*, *C. tetricus* (C.L. Koch, 1839), which is endemic to Europe
53 (Bennett *et al.* 2016). By contrast, the species belonging to the Californian clade all
54 have restricted ranges within western North America (Bennett *et al.* 2019). To date, 46
55 species of *Cybaeus* are known from North America (World Spider Catalog, ver. 21.5).

56 Japanese *Cybaeus* currently comprises 83 species (World Spider Catalog, ver.
57 21.5) indicating a high species richness in contrast to other East-Asian regions where
58 only 14 and five species, respectively, are known from the Korean Peninsula, and the
59 Russian Far East and Kuril Islands (Marusik and Logunov 1991; Marusik and Kovblyuk
60 2011; Seo 2017). Although their phylogenetic relationships remain uncertain, the
61 Japanese *Cybaeus* have been classified by characteristics of the palp and female
62 genitalia (Ihara 2009a). Morphology of the patellar apophysis, the retrolateral tibial
63 apophysis, and the proximal arm of the conductor are crucial in male diagnoses. In
64 females, features of the spermathecae are key characters. Each spermatheca of *Cybaeus*
65 generally consists of three distinct parts: the head, stalk and base. The spermathecal
66 heads of *Cybaeus* are distinguished by the presence of primary pores on their surface
67 (Bennett 1992, 2006). Bennett’s gland (Ramírez 2014) is typically located between the
68 spermathecal stalk and the base (Bennett 1992). However, with the exception of
69 *Cybaeus daimonji* Matsuda, Ihara & Nakano, 2020, primary pores and Bennett’s gland
70 have not been documented in Japanese *Cybaeus* (Matsuda *et al.* 2020).

71 An interesting evolutionary phenomenon known in Japanese *Cybaeus* is the
72 sympatry between species of different-sized classes (see Ihara 2008). To help

73 understand their species-richness and sympatric distributions, Japanese *Cybaeus* have
74 been divided into three groups according to the body length of mature individuals as
75 defined by Roth (1993): ‘small-sized’, with body length less than 5 mm; ‘medium-
76 sized’, ranging from 5 to 10 mm; and ‘large-sized’, greater than 10 mm (Ihara 2004).

77 In addition to the genital and size-related features, ca. 42 of 83 of the Japanese
78 species of *Cybaeus* are known to construct tube-like silken retreats on undersides of
79 stones and woods (Y. Ihara, unpubl. data; see Ihara 2009b). The most common form of
80 retreat is ‘V-shaped’ with two openings, one at each end (Ihara 2006). A similar V-
81 shaped retreat is built by the Appalachian hahniid *Cicurina bryantae* Exline, 1936
82 (Bennett 1985). However, retreats of *Cybaeus* feature silk signal threads radiating from
83 the openings; no such signal threads are present in the retreats of *Cicurina bryantae* (see
84 Matsuda *et al.* 2020). In addition to the V-shaped form, three less common types of
85 retreats are constructed by the Japanese *Cybaeus*: V-shaped with three openings, ‘Y-
86 shaped’ with three openings, and hexagonal with three openings (Komatsu 1961, 1968;
87 Ihara 2003, 2009b). Retreats with three openings were known previously only from
88 troglobitic species inhabiting northern Honshu Island and Shikoku Island in the
89 Japanese Archipelago (Komatsu 1961, 1968), but recent studies have shown that
90 epigeal species distributed in western Honshu and northern Kyushu Island also
91 construct retreats with three openings (Ihara 2003, 2009b).

92 Prior to our work, the southern distributional limit of Japanese *Cybaeus* was
93 documented as Kyushu in the Japanese Archipelago (Ihara 2009a). To our knowledge
94 *Cybaeus* spiders have not previously been recorded from the Ryukyu Islands, which
95 form a continental island arc south of Kyushu between the Japanese Archipelago and
96 Taiwan. The Ryukyu Islands are known to harbour a unique biota with a wide variety of
97 endemic species, including various epigeal/ground-dwelling spiders (e.g. Shimojana
98 and Haupt 1998; Shimojana 2000; Tanikawa and Miyashita 2008; Xu *et al.* 2019). The
99 Ryukyu Islands are comprised of three major biogeographic divisions: Northern
100 Ryukyus (Tanegashima Island and Yakushima Island, and adjacent islets), Central
101 Ryukyus (Amamioshima Island, Tokunoshima Island, and Okinawa Islands, and
102 adjacent islets), and Southern Ryukyus (Miyako Islands and Yaeyama Islands). The
103 divisions are separated by two tectonic depressions, the Tokara and Kerama Gaps (e.g.
104 Ota 1998; Motokawa 2000). In the present study, *Cybaeus* spiders were collected from

105 several islands in the Northern and Central Ryukyus. Here we present their systematic
106 accounts including an assessment of their phylogenetic relationships based on nuclear
107 and mitochondrial gene markers.

108

109 **Materials and methods**

110 *Samples and morphological observation*

111 Previously undescribed species of *Cybaeus* spiders were collected from six islands in
112 the Ryukyu Islands, Japan. For comparative purposes for the molecular phylogenetic
113 analyses, specimens of a further nine Japanese species, including *C. ashikitaensis*
114 (Komatsu, 1968), *C. daimonji*, *C. fuujinensis* (Komatsu, 1968), *C. gotoensis*
115 (Yamaguchi & Yaginuma, 1971), *C. itsukiensis* Irie, 1998, *C. kompiraensis* (Komatsu,
116 1968), *C. kunisakiensis* Ihara, 2003, *C. striatipes* Bösenberg & Strand, 1906, and *C.*
117 *ishikawai* (Kishida in Komatsu, 1940), were also collected from or near their type
118 localities (Table 1). In addition, one male and two female specimens of *C. ashikitaensis*
119 were examined for morphological comparison: 1 #, 1 @ from the type locality (KUZ
120 Z3675, Z3677); 1 @ from Ebino, Miyazaki, Kyushu Island (KUZ Z3676). Where
121 possible, geographical coordinates for the collection sites were obtained using a GPS
122 unit (eTrex[®], Garmin, Olathe, KS, USA). Specimens were preserved in 70% ethanol;
123 legs of some specimens were removed and preserved in 99% ethanol for DNA
124 extraction.

125 Epigynes were dissected from various female specimens and cleared with
126 proteinase K (100 µg/mL) (see Matsuda *et al.* 2020), or with hot 10% KOH + 3% H₂O₂
127 (see Komatsu and Yaginuma 1968) to observe the internal structure. When more than
128 one female could be examined per species, several specimens were dissected.

129 Morphological examination of the specimens was conducted using a stereoscopic
130 microscope (models MZ-7.5 and M125C, Leica, Wetzlar, Germany). Images of
131 specimens and their dissected parts were captured with the aid of a digital microscope
132 (VHX-5000, KEYENCE, Osaka, Japan). Measurements were taken to the nearest 0.01
133 mm. Specimens examined in this study have been deposited in the Zoological
134 Collection of Kyoto University (KUZ).

135 Terminology of morphological characters follows Bennett (2005, 2017) and
136 Bennett *et al.* (2016, 2019), with the exception of one structure on the bulb, which was

137 referred to as the ‘tegular apophysis’ by these studies, but is referred to herein as a
138 ‘conductor’ (Matsuda *et al.* 2020). The chaetotaxy of leg macrosetae follows Komatsu
139 (1968); abbreviations for macrosetae are: p, prolateral; r, retrolateral; v, ventral. The
140 following abbreviations are also used in the text and figures: AER, anterior eye row;
141 AME, anterior median eyes; BG, Bennett’s gland; CD, copulatory duct; CL, carapace
142 length; CP, copulatory pore; CW, carapace width; EM, embolus; FD, fertilization duct;
143 PA, patellar apophysis; PCO, proximal arm of conductor; PER, posterior eye row;
144 PME, posterior margin of epigynal plate; PP, primary pore; RTA, retrolateral tibial
145 apophysis; SB, spermathecal base; SH, spermathecal head; SP, simple pore; SS,
146 spermathecal stalk; TibIL, length of leg I tibia.

147

148 *PCR and DNA sequencing*

149 The procedure for extraction of genomic DNA from leg muscle was modified from
150 Nakano (2012). Primer sets for the polymerase chain reactions (PCR) and the cycles
151 sequencing (CS) reactions used for nuclear histone H3 (H3), internal transcribed spacer
152 1 (ITS-1), mitochondrial cytochrome *c* oxidase subunit I (COI), and 16S ribosomal
153 RNA (16S) followed Nakano *et al.* (2017), and those for nuclear 28S ribosomal RNA
154 (28S) and mitochondrial 12S ribosomal RNA (12S) were as indicated in Matsuda *et al.*
155 (2020). In addition to the previously established primer set for COI, a new primer set,
156 COIARAF (5'-ACAAATCATAAAGATATTGC-3') and COIARAR (5'-
157 ATAGCATAAATTATTCCTAA-3'), was designed using Primer3 (ver. 0.4.0, see
158 <http://bioinfo.ut.ee/primer3-0.4.0/>; Koressaar and Remm 2007; Untergasser *et al.* 2012).

159 PCR reactions and DNA sequencing were performed using the method outlined
160 by Matsuda *et al.* (2020). All PCR reactions were performed using a GeneAmp PCR
161 System 9700 (Thermo Fisher Scientific, Waltham, MA, USA), or a GeneAtlas (ASTECC,
162 Shime, Fukuoka, Japan) using an Ex Taq Polymerase Kit (Takara Bio Inc., Kusatsu,
163 Shiga, Japan) The PCR mixtures were heated to 94°C for 6 min, followed by 35 cycles
164 at 94°C (10 s), 40°C for COI and 16S or 50°C for the other markers (20 s), and then
165 72°C (42 s), with a final extension at 72°C for 6 min. The amplified DNA fragments
166 were purified using polyethylene glycol (20% PEG 6000) precipitation.

167 All samples were sequenced in both directions. The CS reactions were
168 performed using a BigDye Terminator ver. 3.1 Cycle Sequencing Kit (Thermo Fisher

169 Scientific). Each CS reaction mixture was incubated at 96°C for 2 min, followed by 40
170 cycles of 96°C (10 s), 50°C (5 s), and 60°C (42 s). The products were collected by
171 ethanol precipitation and sequenced on an ABI 3130xl Genetic Analyzer (Thermo
172 Fisher Scientific). The obtained sequences were edited using DNA BASER (Heracle
173 Biosoft S.R.L., Pitești, Argeș, Romania). The DNA sequences obtained in this study
174 were deposited with the DNA Databank of Japan (DDBJ).

175

176 *Molecular phylogenetic analyses*

177 Phylogenetic relationships of the Ryukyu *Cybaeus* spiders were estimated based on the
178 dataset consisting of H3, ITS-1, 28S, COI, 12S and 16S sequences obtained from 24
179 samples (Table 1); *C. daimonji* and *C. striatipes* were treated *a priori* as the outgroup.
180 The alignments of H3 and COI were trivial, as no indels were observed. The 12S and
181 16S sequences were aligned using MAFFT L-INS-i (ver. 7.453, see
182 <https://mafft.cbrc.jp/alignment/software/>; Katoh and Standley 2013), ITS-1 sequences
183 were aligned using MAFFT FFT-NS-i, and 28S sequences were aligned by MAFFT G-
184 INS-i. The lengths of the H3, ITS-1, 28S, COI, 12S, and 16S were 328, 761, 793, 763,
185 335, and 441 bp, respectively. The concatenated sequences thus yielded 3421 bp of
186 aligned positions.

187 Phylogenetic trees were reconstructed using maximum likelihood (ML) and
188 Bayesian inference (BI). The best-fit partition scheme and models were identified based
189 on the corrected Akaike information criterion (AICc) using PartitionFinder (ver. 2.1.1,
190 see <http://www.robertlanfear.com/partitionfinder/>; Lanfear *et al.* 2017) with the ‘greedy’
191 algorithm (Lanfear *et al.* 2012). The selected partition scheme and models were as
192 follows: for H3 1st position, TRN+G (ML), or GTR+I (BI); for H3 2nd position, JC+I;
193 for H3 3rd position, HKY+G; for ITS-1, GTR+I+G; for 28S, K81UF+I (ML), or GTR+I
194 (BI); for COI 1st position, TVM+I+G (ML), or GTR+I+G (BI); for COI 2nd position,
195 GTR+I; for COI 3rd position, TIM+I+G (ML), or GTR+I+G (BI); and for 12S and 16S,
196 GTR+G. The ML phylogenetic tree was calculated using IQ-TREE (ver. 2.0-rc1, see
197 <http://www.iqtree.org/>; Minh *et al.* 2020) with non-parametric bootstrapping (BS)
198 conducted with 1000 replicates. BI tree and Bayesian posterior probabilities (PP) were
199 estimated using MrBayes (ver. 3.2.7a, see
200 <https://nbisweden.github.io/MrBayes/download.html>; Ronquist *et al.* 2012). Two

201 independent runs for four Markov chains were conducted for 15 million generations,
202 and the tree was sampled every 100 generations. The parameter estimates and
203 convergence were checked using Tracer (ver. 1.7.1, see
204 <http://tree.bio.ed.ac.uk/software/tracer/>; Rambaut *et al.* 2018), and the first 40001 trees
205 were discarded based on the results.

206

207 *Species recognition and taxonomic arrangement*

208 In this study, we define a full-species account for each operational taxonomic unit
209 (OTU) by an integrative approach based on results of both morphological examination
210 and molecular phylogenetic analyses. We preliminary recognised OTUs by
211 morphological distinctiveness taking into account their allopatric distributions in the
212 Ryukyu Islands. We then verified taxonomic status of each of the morphology-based
213 OTUs by our molecular phylogeny. The morphology-based OTU, which forms a
214 monophyletic lineage, is defined as a unique species. All new species described here are
215 arranged according to the results of our phylogeny and their distributions in the north-
216 south direction along the Ryukyu Islands.

217

218 **Results**

219 *Phylogenetic relationships*

220 The obtained BI (mean $\ln L = -10554.32$; Fig. 1) and ML ($\ln L = -10487.61$; not
221 shown) tree had almost identical topologies. Although our analyses failed to resolve
222 basal relationships of the in-group taxa, they demonstrated that the eight new species of
223 *Cybaeus* spiders from the Ryukyu Islands comprise five lineages (lineages A–E in Fig.
224 1). Lineage A, which was not supported in the ML analysis (BS < 50%, PP = 0.96),
225 consists of the three species distributed in Kyushu (*C. fuujinensis*, *C. kunisakiensis*, and
226 *C. ashikitaensis*) and the new species (*C. okumurai*, sp. nov.) from Tanegashima Island
227 in the Northern Ryukyus (Fig. 1, 2); the monophyly of a group containing *C.*
228 *ashikitaensis* and *C. okumurai*, sp. nov. was fully supported (BS = 100%, PP = 1.0).
229 Lineage B comprises only *C. kumadori*, sp. nov. from Kuroshima Island (Northern
230 Ryukyus) (Fig. 1, 2). Lineage C consists of a single specimen (*C. aikana*, sp. nov.) from
231 Amamioshima Island in the Central Ryukyus (Fig. 1, 2). Four species from the Ryukyu
232 Islands (*C. yakushimensis*, sp. nov., *C. amamiensis*, sp. nov., *C. tokunoshimensis*, sp.

233 nov., and *C. kodama*, sp. nov.) constitute the monophyletic lineage D (BS = 85%, PP =
234 0.99) (Fig. 1, 2): two of these (*C. yakushimensis*, sp. nov. and *C. kodama*, sp. nov.)
235 appear to be endemic to Yakushima Island but did not form a clade while the
236 monophyly of the species from Amamioshima Island (*C. amamiensis*, sp. nov.) with the
237 one from Tokunoshima Island (*C. tokunoshimensis*, sp. nov.) was fully supported (BS =
238 100%, PP = 1.0); the species from Yakushima Island (*C. yakushimensis*, sp. nov.) forms
239 a monophyletic lineage with the Amamioshima-Tokunoshima clade, although this
240 relationship was not fully supported (BS = 65%, PP < 0.70). The remaining lineage E
241 only contains the species from Okinawa Island (*C. hikidai*, sp. nov.) in the Central
242 Ryukyus (Fig. 1, 2).

243

244 Systematics

245

246 Family **Cybaeidae** Banks, 1892

247 Genus ***Cybaeus*** L. Koch, 1868

248

249 *Cybaeus* L. Koch, 1868: 46. Type species: *Amaurobius tetricus* C.L. Koch, 1839.

250

251 *Diagnosis*

252 As stated in Copley *et al.* (2009), a differential diagnosis of the genus *Cybaeus* remains
253 unclarified, but species of this genus can be distinguished from other genera of Cybaeidae
254 by the following combination of characters (see Copley *et al.* 2009; Bennett 2017;
255 Bennett *et al.* 2020): two or three complete pairs of linearly arranged ventral macrosetae
256 on tibia I (sometimes four or five pairs are present, but not arranged in a linear pattern),
257 the presence of a retrolateral PA with peg setae in the male palp (Japanese species rarely
258 lack a PA), the well-developed conductor on the male bulb but never with a flat and plate-
259 like proximal arm, and, in the female, each spermatheca with a large SB and Bennett's
260 gland.

261

262 ***Cybaeus okumurai***, sp. nov.

263 <http://zoobank.org/NomenclaturalActs/1676AFDB-F79C-490F-B8CE-4F1554855B78>

264 (Fig. 3, 4A–C, F, G, 5B, C)

265

266 *Material examined*

267 *Holotype. Japan: Ryukyu Islands: Tanegashima Island: #, Kunigami, 30°47'56.8"N,*
268 *130°02'58.6"E, 9.xii.2019, Y. Ihara (KUZ Z3019).*

269 *Paratypes. Japan: Ryukyu Islands: Tanegashima Island: 3 #, 4 @, collected*
270 *with holotype (KUZ Z2719, Z3021–Z3026); ditto, 1 #, T. Nakano (KUZ Z3020).*

271 *Additional specimens. Japan: Ryukyu Islands: Tanegashima Island: 2 #, 5 @,*
272 *collected with holotype (KUZ Z2720–Z2722, Z3027, Z3028); 1 #, 4 @, Kunigami,*
273 *Kishigazaki, 30°50'06.1"N, 131°03'32.1"E, 9.xii.2019 (KUZ Z3691, Z3692); 8 #, 17 @,*
274 *Nishino-omote, near Saikyo Dam, 30°45'55.8"N, 131°02'06.1"E, 9.xii.2019 (KUZ*
275 *Z3693–Z3696); 4 #, 6 @, Anno, 30°44'05.7"N, 131°02'52.9"E, 7.xii.2019 (KUZ*
276 *Z3697–Z3699); 6 #, 11 @, Furuta, 30°39'16.5"N, 131°00'50.0"E, 8.xii.2019 (KUZ*
277 *Z2725, Z2727, Z2729, Z2730, Z3700–Z3702); 1 @, Nokan, 30°35'01.7"N,*
278 *130°59'07.2"E, 8.xii.2019 (KUZ Z3703); 8 #, 3 @, Nakanokami, 30°26'01.3"N,*
279 *130°55'23.6"E, 8.xii.2019 (KUZ Z2728, Z3704–Z3706); 4 #, 7 @, Nakanoshimo,*
280 *30°23'19.1"N, 130°54'23.2"E, 8.xii.2019 (KUZ Z2723, Z2724, Z2726, Z3707, Z3708);*
281 *1 #, Anjo, 4.i.2013, Ken-ichi Okumura (KUZ Z3709); 2 @, Anno, Mt. Amamegakura,*
282 *4.i.2013, K. Okumura (KUZ Z2716, Z2717); 1 #, 1 @, Furuta, 3.i.2013, K. Okumura*
283 *(KUZ Z3710); 1 #, 1 @, ditto, 4.i.2013, K. Okumura (KUZ Z3711).*

284

285 *Diagnosis*

286 Small to medium-sized Japanese *Cybaeus*. Both sexes of *C. okumurai* most closely
287 resembles males and females of *C. ashikitaensis*. However, males of *C. okumurai* can
288 be distinguished by their relatively wider palpal patella and tibia, and slightly prolonged
289 PA > 0.25× as long as the patella (Fig. 4B, C); males of *C. ashikitaensis* have a
290 relatively slender patella and tibia, and slightly small PA ca. 0.2× as long as the patella
291 (Fig. 4D, E). Females of *C. okumurai* differ from those of *C. ashikitaensis* in the tightly
292 and simply curved posterior margin of epigynal plate, and spermathecae nearly as long
293 as wide (Fig. 5A, B) (loosely and compoundly curved posterior margin of epigynal
294 plate, and spermathecae ca. 2× wider than long in the latter; Fig. 5C, D).

295

296 *Description*

297 *Male (holotype, KUZ Z3019)*

298 *Measurements (mm)*. CL 2.96, CW 2.16; head 1.30 wide; abdomen 2.64 long,
299 1.94 wide. Ocular area 0.32 long, 0.76 wide. Sternum 1.34 long, 1.30 wide. Leg
300 formula, 4 > 1 > 2 > 3; length of legs (femur + patella + tibia + metatarsus + tarsus): leg
301 I 10.17 (2.64 + 0.96 + 2.53 + 2.44 + 1.60); leg II 9.70 (2.60 + 0.96 + 2.27 + 2.40 +
302 1.47); leg III 8.52 (2.34 + 0.86 + 1.81 + 2.26 + 1.25); leg IV 10.41 (2.75 + 0.89 + 2.40 +
303 2.88 + 1.49).

304 *Carapace* (Fig. 3A). Head narrow, 0.60× as wide as thoracic region; thoracic
305 region slightly higher than head. AER slightly procurved in frontal view; PER slightly
306 recurved in dorsal view; AME smallest, slightly > 1/2 diameter of other eyes; ocular
307 area relatively wide, ca. 2.4× wider than long. Clypeus shorter than median ocular area.

308 *Mouthparts*. Chelicera slightly geniculate, promargin of fang furrow with 3 teeth
309 (median one largest), retromargin with 3 teeth and 6 denticles, and basally with lateral
310 condyle. Labium wider than long.

311 *Leg macrosetae*. Leg I: tibia p2, r2, v2-2-2-2; metatarsus p3 (left) or 4 (right), r2,
312 v2-2-2. Leg II: tibia p4 (left) or 3 (right), r3 (left) or 2 (right), v2-2-1(r)-2; metatarsus
313 p4, r3, v2-2-3.

314 *Abdomen* (Fig. 3B). Oval; mid-posterior part widest (Fig. 3B). Colulus two
315 groups of 3 or 5 setae.

316 *Palp* (Fig. 4A–C, F, G). PA digitiform, extended anteriorly, slightly bent
317 dorsally, dorsolateral surface with 14 peg setae. Tibia shorter than patella; RTA plate-
318 like, occupying most of length of tibia. Cymbium slender, > 2.5× longer than wide,
319 expanded prolaterally. Genital bulb circular in ventral view. Conductor: distal part long,
320 curved; proximal arm short, expanded. Embolus simple, originating and terminating,
321 respectively, at ca. 10 o'clock and ca. 4 o'clock in ventral view.

322 *Colour* (Fig. 3A, B). Carapace: head yellowish brown, with reticulate olive black
323 markings; thoracic region bright yellowish-brown, with radiating olive black bands.
324 Chelicerae reddish brown, maxillary lobe and labium bright brown. Sternum bright
325 yellowish-brown, darker toward margins. Legs bright yellowish-brown, darker distally,
326 with olive black annulations. Abdomen: dorsally olive black with pale yellow chevron
327 pattern; ventrally pale yellow.

328 *Female (paratype, KUZ Z3023)*

329 *Measurements (mm)*. CL 2.71, CW 1.85; head 1.22 wide; abdomen 3.18 long,
330 2.34 wide. Ocular area 0.30 long, 0.74 wide. Sternum 1.26 long, 1.17 wide. Leg
331 formula, 4 > 1 > 2 > 3; length of legs (femur + patella + tibia + metatarsus + tarsus): leg
332 I 8.03 (2.20 + 0.86 + 2.00 + 1.88 + 1.09); leg II 7.71 (2.14 + 0.85 + 1.84 + 1.84 + 1.04);
333 leg III 6.70 (1.91 + 0.79 + 1.36 + 1.72 + 0.92); leg IV 8.55 (2.30 + 0.78 + 1.98 + 2.34 +
334 1.15).

335 *Carapace* (Fig. 3C). Head 0.66× as wide as thoracic region; thoracic region
336 almost as high as head. AER straight in frontal view; PER slightly recurved in dorsal
337 view; AME smallest, slightly < 1/2 diameter of other eyes; ocular area relatively wide,
338 ca. 2.5× wider than long. Clypeus shorter than median ocular area.

339 *Mouthparts*. Chelicera geniculate, promargin of fang furrow with 3 teeth
340 (median one largest), retromargin with 5 teeth and 5 denticles, and basally with lateral
341 condyle. Labium wider than long.

342 *Leg macrosetae*. Leg I: tibia p2, r0 (left) or 1 (right), v2-2-2-2; metatarsus p3,
343 v2-2-2. Leg II: tibia p3, v2-2-1(r)-1(p); metatarsus p4, r0 (left) or 1 (right), v2-2-3.

344 *Abdomen* (Fig. 3D). Oval; mid-posterior part widest. Colulus two groups of 4 or
345 5 setae.

346 *Genitalia* (Fig. 5A, B). Posterior margin of epigynal plate curved. Atrium
347 slightly concave, located posteromedially on epigynum. Copulatory pores separated on
348 either side of atrium; CD long, thick, widened laterally. Each of SH, SS, and SB distinct,
349 bulbous; SH with at least 1 detectable primary pore posteromedially; distal end of SS
350 with Bennett's gland medially; SB large, extended anterolaterally.

351 *Colour* (Fig. 3C, D). Carapace: head brown, with faint olive-black markings;
352 thoracic region bright yellowish-brown, with faint radiating black bands. Chelicerae
353 bright brown, maxillary lobe and labium yellowish brown, sternum bright yellowish-
354 brown. Legs bright yellowish-brown, with olive black annulations. Abdomen: dorsally
355 olive black with light yellow chevron pattern; ventrally pale yellow.

356

357 *Variation*

358 *Males* ($n = 12$). Measurements (mean, followed by ranges in parentheses): CL
359 2.82 (2.50–2.96), CW 2.03 (1.82–2.16); CW/CL 0.72 (0.69–0.74); TibIL 2.40 (2.14–
360 2.58); TibIL/CL 0.85 (0.82–0.87). Legs longer than those of females. Palp: dorsolateral

361 surface of PA with 10–14 peg setae.

362 *Females* ($n = 27$). Measurements (mean, followed by ranges in parentheses): CL
363 2.38 (1.72–3.06), CW 1.67 (1.18–2.14); CW/CL 0.70 (0.66–0.74); TibIL 1.70 (1.09–
364 2.28); TibIL/CL 0.71 (0.63–0.78).

365

366 *Distribution*

367 This species is endemic to forest habitats on Tanegashima Island (Fig. 2).

368

369 *Remarks*

370 *Cybaeus okumurai* constructs a V-shaped retreat (Fig. 22A).

371 The genital characters are consistent among the female specimens of *C.*
372 *okumurai*, but nonetheless, their body sizes could be grouped into two variants, small
373 (ca. 3.5–4 mm) and medium (ca. 6–7 mm) types. Both body-size types occur
374 syntopically at all collecting sites. The ITS-1 sequences, which yielded 697 bp pf
375 aligned positions, obtained from the six males (KUZ Z2719, Z2721, Z2724, Z2727–
376 Z2729; INSDC accession numbers: LC552282, LC574069–LC574073), three small
377 (KUZ Z2720, Z2726, Z2730; LC574074–LC574076) and three medium (KUZ Z2722,
378 Z2723, Z2725; LC552285, LC574077, LC574078) females were almost consistent with
379 each other; but 1 identical deletion was detected in six sequences of KUZ Z2721,
380 Z2722, Z2724, Z2725, Z2727, Z2728. These results corroborate that the males and the
381 variety-sized females all belong to the same species.

382

383 *Etymology*

384 The specific name is dedicated to Dr. Ken-ichi Okumura for providing valuable
385 specimens of this new species.

386

387 *Cybaeus kumadori*, sp. nov.

388 <http://zoobank.org/NomenclaturalActs/E220EE51-716C-410A-B733-3675BBBAC7FC>

389 (Fig. 6, 7)

390

391 *Material examined*

392 *Holotype*. **Japan**: Ryukyu Islands: Mishima Islands: #, Kuroshima Island, Mt.

393 Yaguradake, 30°49'52.8"N, 129°56'02.1"E, 13.xii.2012, N. Koike (KUZ Z3004).

394 *Paratypes. Japan: Ryukyu Islands: 3 #, 4 @, collected with holotype (KUZ*
395 *Z2143, Z2144, Z3005–Z3009).*

396 *Additional specimens. Japan: Ryukyu Islands: 3 @, collected with holotype*
397 *(KUZ Z3010).*

398

399 *Diagnosis*

400 Medium-sized Japanese *Cybaeus*. Males of *C. kumadori* most closely resemble males of
401 the medium-sized *C. hikidai* in lacking a PA, but the former differs from the latter in
402 having a slender cymbium and a bulb longer than wide (Fig. 7E) (cymbium relatively
403 broad and bulb wider than long in the latter; Fig. 19H). Among *Cybaeus* species
404 inhabiting the Ryukyu Islands, only females of *C. kumadori* and *C. okumurai* possess
405 distinctly bulbous SH and SS. The former can be distinguished from the latter by its SB
406 located laterally to the SH and SS (Fig. 7G) (SB posterior to SH and SB in *C. okumurai*;
407 Fig. 5B).

408

409 *Description*

410 *Male (holotype, KUZ Z3004)*

411 *Measurements (mm).* CL 3.32, CW 2.27; head 1.38 wide; abdomen 2.94 long,
412 2.00 wide. Ocular area 0.36 long, 0.87 wide. Sternum 1.50 long, 1.40 wide. Leg
413 formula, 4 > 1 > 2 > 3; length of legs (femur + patella + tibia + metatarsus + tarsus): leg
414 I 10.44 (2.93 + 1.01 + 2.44 + 2.48 + 1.58); leg II 9.74 (2.55 + 0.97 + 2.30 + 2.44 +
415 1.48); leg III 8.67 (2.32 + 0.96 + 1.81 + 2.38 + 1.20); leg IV 10.88 (2.78 + 0.97 + 2.49 +
416 3.18 + 1.46).

417 *Carapace* (Fig. 6A). Head narrow, 0.61× as wide as thoracic region; thoracic
418 region almost as high as head. AER almost straight in frontal view; PER slightly
419 recurved in dorsal view; AME smallest, > 1/2 diameter of other eyes; ocular area
420 relatively wide, ca. 2.4× wider than long. Clypeus shorter than median ocular area.

421 *Mouthparts.* Chelicera slightly geniculate, promargin of fang furrow with 3 teeth
422 (median one largest), retromargin with 5 teeth and 4 or 5 denticles, and basally with
423 lateral condyle. Labium wider than long.

424 *Leg macrosetae.* Leg I: tibia p3, r3 (left) or 2 (right), v2-2-2-2; metatarsus p4, r2,

425 v2-2-3. Leg II: tibia p4, r2 (left) or 3 (right), v2-2-1(r)-2; metatarsus p3, r3, v2-2-3.

426 *Abdomen* (Fig. 6B). Oval; mid-posterior part widest. Colulus two groups of 3 or
427 4 setae.

428 *Palp* (Fig. 7A–E). PA lacking. Tibia almost as long as patella; RTA plate-like,
429 occupying 1/2 of length of tibia. Cymbium slender, > 2× longer than wide, expanded
430 prolaterally. Genital bulb slightly longer than wide, oval in ventral view. Conductor:
431 distal part moderately long; proximal arm hooked. Embolus simple, originating and
432 terminating, respectively, at ca. 10 o'clock and ca. 5 o'clock in ventral view.

433 *Colour* (Fig. 6A, B). Carapace: head brown, black anteriorly and laterally, with
434 black markings on anterior to cervical groove; thoracic region yellowish brown, with
435 brownish black lateral sub-marginal bands. Chelicerae dark reddish-brown, maxillary
436 lobe and labium reddish brown. Sternum yellowish brown, darker toward margins. Legs
437 bright yellowish-brown with brownish black annulations. Abdomen: dorsally olive
438 black with dull yellow chevron pattern; laterally with mottled pattern of dark olive-
439 black and dull yellow; ventrally light yellow.

440 *Female* (paratype, KUZ Z3007)

441 *Measurements* (mm). CL 3.50, CW 2.35; head 1.60 wide; abdomen 4.55 long,
442 3.38 wide. Ocular area: 0.39 long, 0.95 wide. Sternum 1.55 long, 1.43 wide. Leg
443 formula, $4 > 1 > 2 > 3$; length of legs (femur + patella + tibia + metatarsus + tarsus): leg
444 I 9.68 (2.68 + 1.07 + 2.38 + 2.25 + 1.30); leg II 9.16 (2.50 + 1.04 + 2.17 + 2.22 + 1.23);
445 leg III 8.24 (2.30 + 1.03 + 1.70 + 2.12 + 1.09); leg IV 10.39 (2.78 + 1.04 + 2.36 + 2.90
446 + 1.31).

447 *Carapace* (Fig. 6C). Head 0.68× as wide as thoracic region; thoracic region
448 height slightly shorter than head. AER slightly procurved in frontal view; PER almost
449 straight in dorsal view. AME smallest, ca. 1/2 diameter of other eyes. Ocular area
450 relatively wide, ca. 2.4× wider than long. Clypeus shorter than median ocular area.

451 *Mouthparts*. Chelicera geniculate, promargin of fang furrow with 3 teeth
452 (median one largest), retromargin with 5 teeth and 5 denticles, and basally with lateral
453 condyle. Labium wider than long.

454 *Leg macrosetae*. Leg I: tibia p3, v2-2-2-2; metatarsus p1, r1, v2-2-3. Leg II: tibia
455 p4, v2-2-1(r)-2; metatarsus p4, r1, v2-2-3.

456 *Abdomen* (Fig. 6D). Oval; mid-posterior part widest. Colulus 2 groups of 3

457 setae.

458 *Genitalia* (Fig. 7F, G). Posterior margin of epigynal plate slightly curved.
459 Atrium slightly concave, posteromedially located on epigynum. Copulatory pores
460 separated on either side of atrium; CD conspicuously visible through epigynal plate in
461 ventral view. Each of SH, SS, and SB distinct, bulbous; SH with few primary pores
462 anteromedially; SB developed, extended anterolaterally; Bennett's gland undetectable in
463 dorsal and medial views.

464 *Colour* (Fig. 6C, D). Carapace: head reddish brown, brownish black anteriorly
465 and laterally, with brownish black marking anterior to cervical groove; thoracic region
466 bright yellowish-brown, with brownish black lateral sub-marginal bands. Chelicerae,
467 maxillary lobe and labium reddish brown, chelicerae darker than others. Sternum bright
468 yellowish-brown, darker toward margins. Legs yellowish brown with brownish black
469 annulations. Abdomen: dorsally dark greyish-yellow with greyish yellow chevron
470 pattern; laterally with mottled pattern of dark greyish-yellow and greyish-yellow;
471 ventrally light yellow ventrally.

472

473 *Variation*

474 *Males* ($n = 4$). Measurements (mean, followed by ranges in parentheses): CL
475 3.39 (3.16–3.78), CW 2.31 (2.14–2.60); CW/CL 0.68 (0.67–0.69); TibIL 2.52 (2.35–
476 2.82); TibIL/CL 0.74 (0.73–0.75). Legs longer than those of females.

477 *Females* ($n = 7$). Measurements (mean, followed by ranges in parentheses): CL
478 3.40 (2.76–3.94), CW 2.26 (1.80–2.63); CW/CL 0.66 (0.65–0.67); TibIL 2.25 (1.81–
479 2.63); TibIL/CL 0.66 (0.65–0.68).

480

481 *Distribution*

482 This species is endemic to forest habitats on Kuroshima Island in the Mishima Islands
483 (Fig. 2).

484

485 *Remarks*

486 The retreat of this species is V-shaped with two openings.

487 Bennett's gland of this species may be located at the ventral surface of the
488 connection between the spermathecal stalk and base, but the glands were not observable

489 in the examined specimen. The part of the spermathecae is difficult to observe because
490 it is masked by the epigynal plate ventrally and by the spermathecal stalk and head
491 medio-dorsally.

492

493 *Etymology*

494 The specific name is from a Japanese word kumadori (= kabuki make-up) referring to
495 the carapace colouration of this species.

496

497 *Cybaeus yakushimensis*, sp. nov.

498 <http://zoobank.org/NomenclaturalActs/E4EF5027-C1DD-411E-ADF3-15037170EFB7>

499 (Figs. 8, 9, 10A, D, G, 11E)

500

501 *Material examined*

502 *Holotype*. **Japan**: *Ryukyu Islands*: Yakushima Island: #, Shirataniunsuikyo Valley,
503 30°22'38.7"N, 130°34'21.1"E, 8.xii.2012, N. Koike (KUZ Z2998).

504 *Paratypes*. **Japan**: *Ryukyu Islands*: Yakushima Island: 2 #, 2 @, collected with
505 holotype (KUZ Z2138, Z2999–Z3001); 1 @, along Hanayama Trail, 30°19'13.2"N,
506 130°26'45.1"E, 9.xii.2012, N. Koike (KUZ Z2140).

507 *Additional specimens*. **Japan**: *Ryukyu Islands*: Yakushima Island: 1 @,
508 Shirataniunsuikyo Valley, 28.x.2011 (KUZ Z2163); 1 #, 4 @, along Hanayama Trail,
509 9.xii.2012 (KUZ Z3002, Z3003, Z3678).

510

511 *Diagnosis*

512 Medium-sized Japanese *Cybaeus*. *Cybaeus yakushimensis* most closely resembles *C.*
513 *amamiensis*. Males of *C. yakushimensis* can be differentiated from those of the latter by
514 the small and slender palp (Fig. 9A, 10A) (robust in *C. amamiensis*; Fig. 14A, 10B).
515 Additionally, the PA of *C. yakushimensis* (Fig. 10D) is shorter and less distally
516 extended than that of *C. amamiensis* (Fig. 10E). Females of *C. yakushimensis* are
517 distinguishable from those of *C. amamiensis* by the relatively short atrium and
518 ellipsoidal SB (Fig. 9D, E) (slightly longer atrium and globular SB in *C. amamiensis*;
519 Fig. 14D, E). The connection between the SH and SS of *C. yakushimensis* (Fig. 9E) is
520 less robust than the connection in *C. amamiensis* (Fig. 14E).

521

522 *Description*

523 *Male (holotype, KUZ Z2998)*

524 *Measurements (mm)*. CL 2.99, CW 2.13; head 1.25 wide; abdomen 2.25 long,
525 1.65 wide. Ocular area 0.37 long, 0.73 wide. Sternum 1.43 long, 1.36 wide. Leg
526 formula, 1 > 4 > 2 > 3; length of legs (femur + patella + tibia + metatarsus + tarsus): leg
527 I 10.02 (2.60 + 0.95 + 2.33 + 2.38 + 1.76); leg II 9.46 (2.43 + 0.91 + 2.12 + 2.22 +
528 1.78); leg III 7.83 (2.12 + 0.86 + 1.61 + 2.04 + 1.20); leg IV 9.87 (2.53 + 0.89 + 2.22 +
529 2.78 + 1.45).

530 *Carapace* (Fig. 8A). Head narrow, 0.59× as wide as thoracic region; thoracic
531 region almost as high as head. AER straight in frontal view; PER almost straight in
532 dorsal view; AME smallest, ca. 1/2 diameter of other eyes; ocular area ca. 2.0× wider
533 than long. Clypeus shorter than median ocular area.

534 *Mouthparts*. Chelicera slightly geniculate, promargin of fang furrow with 3 teeth
535 (median one largest), retromargin with 5 teeth and 4 denticles, and basally with lateral
536 condyle. Labium wider than long.

537 *Leg macrosetae*. Leg I: tibia I p2, r2, v2-2-2-2; metatarsus p3 (left) or 4 (right),
538 r2, v2-2-2. Leg II: tibia p3, r2 (left) or 3 (right), v2-2-1(r)-2; metatarsus p4, r2 (left) or 1
539 (right), v2-2-3.

540 *Abdomen* (Fig. 8B). Oval; mid-posterior part widest. Colulus two groups of 3
541 setae.

542 *Palp* (Fig. 9A–C, 10A, D, G). PA digitiform, directed anterolaterally,
543 dorsolateral surface with 8 (left) or 7 (right) peg setae. Tibia slightly shorter than
544 patella; RTA plate-like, occupying 3/4 of length of tibia. Cymbium prolaterally
545 expanded, > 2× longer than wide. Genital bulb slightly wider than long, oval in ventral
546 view. Conductor extended retrolaterally; distal part expanded, curved; proximal arm
547 sickle-shaped. Embolus simple, long, originating and terminating respectively, at ca. 9
548 o'clock and ca. 5 o'clock in ventral view.

549 *Colour* (Fig. 8A, B). Carapace: head brown, with reticulate brownish black
550 markings; thoracic region yellowish brown, with radiating brownish black bands.
551 Chelicerae reddish brown, maxillary lobe and labium bright brown. Sternum bright
552 yellowish-brown, darker toward margins. Legs yellowish brown to bright yellowish-

553 brown, with brownish black annulations. Abdomen: dorsally brownish black with light
554 yellowish brown chevron pattern; ventrally light yellow.

555 *Female (paratype, KUZ Z3001)*

556 *Measurements (mm)*. CL 3.20, CW 2.09; head 1.43 wide; abdomen 3.60 long,
557 2.68 wide. Ocular area 0.39 long, 0.88 wide. Sternum 1.47 long, 1.22 wide. Leg formula
558 $4 > 1 > 2 > 3$; length of legs (femur + patella + tibia + metatarsus + tarsus): leg I 8.48
559 (2.30 + 0.96 + 2.04 + 1.99 + 1.19); leg II 7.99 (2.24 + 0.94 + 1.84 + 1.87 + 1.10); leg III
560 7.07 (1.90 + 0.90 + 1.43 + 1.82 + 1.02); leg IV 9.14 (2.44 + 0.91 + 2.05 + 2.48 + 1.26).

561 *Carapace* (Fig. 8C, 11E). Head 0.68× as wide as thoracic region; thoracic region
562 height slightly shorter than head. AER almost straight in frontal view; PER almost
563 straight in dorsal view; AME smallest, ca. 1/2 diameter of other eyes; ocular area > 2.0×
564 as wide as length. Clypeus shorter than median ocular area.

565 *Mouthparts*. Chelicera geniculate, promargin of fang furrow with 3 teeth
566 (median one largest), retromargin with 5 teeth and 4 or 5 denticles, and basally with
567 lateral condyle. Labium wider than long.

568 *Leg macrosetae*. Leg I: tibia with p2, v2-2-2-1(p); metatarsus p2 (left) or 1
569 (right), r1, v2-2-2. Leg II: tibia p3, v2-2-1(r)-1(p); metatarsus p3 (left) or 4 (right), r1,
570 v2-2-3.

571 *Abdomen* (Fig. 8D, 11E). Oval; mid-posterior part widest. Colulus two groups of
572 6 setae.

573 *Genitalia* (Fig. 9D, E). Posterior margin of epigynal plate slightly curved.
574 Atrium slightly concave, located posteromedially on epigynum. Copulatory pores
575 separated on both sides of atrium; CD long, widened laterally. Each spermatheca
576 forming S-shaped; SH almost tubular, located medially on vulva, with few primary
577 pores posteriorly; connection between SH and SS expanded laterally; SS tubular; SB
578 ellipsoid, extended and bent anterolaterally; Bennett's gland well-developed, located
579 anteriorly at proximal end of SB.

580 *Colour* (Fig. 8C, D, 11E). Carapace: head dull reddish-brown, with reticulate
581 brownish black markings; thoracic region yellowish brown, with radiating brownish
582 black bands. Chelicerae dark reddish-brown, maxillary lobe and labium brown. Sternum
583 bright brown, darker toward margins. Legs yellowish brown, with brownish black
584 annulations. Abdomen: dorsally olive black with light yellow chevron pattern; ventrally

585 light yellow.

586

587 *Variation*

588 *Males* ($n = 4$). Measurements (mean, followed by ranges in parentheses): CL
589 3.12 (2.92–3.32), CW 2.15 (2.00–2.26); CW/CL 0.69 (0.68–0.71); TibIL 2.38 (2.16–
590 2.53); TibIL/CL 0.76 (0.74–0.78). Legs longer than those of females. Palp: dorsolateral
591 surface of PA with 7–8 peg setae.

592 *Females* ($n = 8$). Measurements (mean, followed by ranges in parentheses): CL
593 3.32 (2.65–3.62), CW 2.19 (1.74–2.70); CW/CL 0.66 (0.64–0.71); TibIL 2.20 (1.68–
594 2.60); TibIL/CL 0.66 (0.63–0.68).

595

596 *Distribution*

597 This species is endemic to the montane forest on Yakushima Island (Fig. 2).

598

599 *Remarks*

600 No retreat has been observed for *C. yakushimensis*. This species co-occurs with the
601 small-sized *C. kodama* on Yakushima Island (Fig. 11E, F).

602

603 *Etymology*

604 The specific name is an adjective derived from Yakushima Island.

605

606 *Cybaeus kodama*, sp. nov.

607 <http://zoobank.org/NomenclaturalActs/D629626F-0C4B-43B0-A372-54FB6CF29374>

608 (Figs. 11A–D, F, 12)

609

610 *Material examined*

611 *Holotype*. **Japan**: *Ryukyu Islands*: Yakushima Island: #, along Hanayama Trail,
612 30°19'13.2"N, 130°26'45.1"E, 9.xii.2012, N. Koike (KUZ Z3011).

613 *Paratypes*. **Japan**: *Ryukyu Islands*: Yakushima Island: 2 #, 4 @, collected with
614 holotype (KUZ Z2141, Z2142, Z3012–Z3015).

615 *Additional specimens*. **Japan**: *Ryukyu Islands*: Yakushima Island: 1 @,
616 Shirataniunsuikyo Valley, 30°22'30.2"N, 130°34'07.8"E, 8.xii.2012 (KUZ Z2139); 6

617 @, collected with holotype (KUZ Z3016).

618

619 *Diagnosis*

620 Small-sized Japanese *Cybaeus*. Males of *Cybaeus kodama* are only likely to be
621 confused with those of *C. aikana*, the only other ‘small-sized’ species endemic to the
622 Ryukyu Islands. The two species are clearly distinguishable by the presence of a small
623 PA in *C. kodama* (Fig. 12B, C) (lacking PA in *C. aikana*; Fig. 16B). In addition, the
624 elliptically shaped bulb of *C. kodama* (Fig. 12E) is also unique among Japanese
625 *Cybaeus* species. Females of *C. kodama* can be easily distinguished from those of all
626 other Ryukyu *Cybaeus* species by the long CDs running adjacent to the SSs (Fig. 12G).

627

628 *Description*

629 *Male (holotype, KUZ Z3011)*

630 *Measurements (mm)*. CL 1.68, CW 1.15; head 0.73 wide; abdomen 1.92 long,
631 1.56 wide. Ocular area 0.24 long, 0.46 wide. Sternum 0.84 long, 0.80 wide. Leg
632 formula, 4 > 1 > 2 > 3; length of legs (femur + patella + tibia + metatarsus + tarsus): leg
633 I 4.45 (1.24 + 0.50 + 1.09 + 0.96 + 0.66); leg II 4.16 (1.16 + 0.48 + 0.94 + 0.93 + 0.65);
634 leg III 3.59 (1.00 + 0.43 + 0.73 + 0.86 + 0.57); leg IV 4.50 (1.23 + 0.45 + 1.06 + 1.14 +
635 0.62).

636 *Carapace* (Fig. 11A). Head narrow, 0.63× as wide as thoracic region. Thoracic
637 region almost as high as head. AER straight in frontal view; PER almost straight in
638 dorsal view; AME smallest, < 1/2 diameter of other eyes; ocular area ca. 2× wider than
639 long. Clypeus shorter than median ocular area.

640 *Mouthparts*. Chelicera slightly geniculate, promargin of fang furrow with 3 teeth
641 (median one largest), retromargin with 3 (left) or 2 (right) teeth and 4 denticles, and
642 basally with lateral condyle. Labium wider than long.

643 *Leg macrosetae*. Leg I: tibia p2, r0 (left) or 2 (right), v2-2-2-0; metatarsus p1,
644 v2-2-2. Leg II: tibia p2, v2-1(r)-1(r)-0; metatarsus p2, v2-2-3.

645 *Abdomen* (Fig. 11B). Oval; mid-posterior part widest. Colulus two groups of 3
646 or 4 setae.

647 *Palp* (Fig. 12A–E). Palp relatively short. PA small, on retrolateral anterior
648 margin of patella, semicircular in lateral view, lateral surface with 4 peg setae. Tibia

649 short, slightly shorter than patella; RTA plate-like, occupying most of length of tibia.
650 Cymbium slightly expanded prolaterally. Genital bulb elliptic in ventral view, major
651 axis ca. 2× longer than minor axis. Conductor: distal part well developed, elongate
652 distally; proximal arm small, strongly undulating. Embolus simple, long, originating
653 and terminating, respectively, at ca. 7 o'clock and ca. 5 o'clock in ventral view.

654 *Colour* (Fig. 11A, B). Carapace: head yellowish brown, with reticulate brownish
655 black markings; thoracic region bright yellowish-brown, with radiating brownish black
656 bands. Chelicerae bright brown, maxillary lobe and labium orange, sternum bright
657 yellowish-brown. Legs bright yellowish-brown, without annulations. Abdomen:
658 dorsally olive black with light yellow chevron pattern; ventrally light yellow.

659 *Female* (paratype, KUZ Z3013)

660 *Measurements* (mm). CL 1.54, CW 1.06; head 0.72 wide; abdomen 1.76 long,
661 1.32 wide. Ocular area 0.25 long, 0.49 wide. Sternum 0.76 long, 0.76 wide. Leg
662 formula, 4 > 1 > 2 > 3; length of legs (femur + patella + tibia + metatarsus + tarsus): leg
663 I 3.69 (1.06 + 0.47 + 0.87 + 0.76 + 0.53); leg II 3.52 (1.01 + 0.46 + 0.75 + 0.78 + 0.52);
664 leg III 3.00 (0.84 + 0.40 + 0.57 + 0.70 + 0.49); leg IV 3.82 (1.06 + 0.41 + 0.85 + 0.92 +
665 0.58).

666 *Carapace* (Fig. 11C). Head 0.68× as wide as thoracic region. Thoracic region
667 almost as high as head. AER straight in frontal view; PER almost straight in dorsal
668 view; AME smallest, < 1/2 diameter of other eyes; ocular area ca. 2× wider than long.
669 Clypeus shorter than median ocular area.

670 *Mouthparts*. Chelicera moderate geniculate, promargin of fang furrow with 3
671 teeth (median one largest), retromargin with 4 teeth and 4 denticles, and basally with
672 lateral condyle. Labium wider than long.

673 *Leg macrosetae*. Leg I: tibia I p2, v2-2-2-0; metatarsus p1, v2-2-2. Leg II: tibia
674 p1, v2-1(r)-1(r)-0; metatarsus p2, v2-2-3.

675 *Abdomen* (Fig. 11D). Oval; mid-posterior part widest. Colulus 2 groups of 3 or 4
676 setae.

677 *Genitalia* (Fig. 12F, G). Posterior margin of epigynal plate loosely curved.
678 Atrium located posteromedially on epigynum. CD long, running along SS. SH and SS
679 continuously tubular, forming spermathecal duct; SH located medially on vulva, SHs
680 contiguous with each other, primary pore inconspicuous in dorsal view; SB ellipsoidal,

681 extending anterolaterally; Bennett's gland located anteriorly at basal part of SB.

682 *Colour* (Fig. 11C, D, F). Carapace: head brown, with reticulate dull brownish-
683 black markings; thoracic region bright yellowish-brown, with radiating dark olive-
684 brown. Chelicerae bright brown, maxillary lobe and labium orange, sternum bright
685 yellowish-brown. Legs yellowish brown without annulations. Abdomen: dorsally dark
686 olive-brown with dull yellow chevron pattern; ventrally pale yellow.

687

688 *Variation*

689 *Males* ($n = 2$). Measurements (ranges): CL 1.46–1.68, CW 1.00–1.15; CW/CL
690 0.68; TibIL 0.97–1.09; TibIL/CL 0.65–0.66. Legs slightly longer than those of females.

691 *Females* ($n = 9$). Measurements (mean, followed by ranges in parentheses): CL
692 1.49 (1.40–1.61), CW 1.03 (0.93–1.09); CW/CL 0.69 (0.66–0.73); TibIL 0.85 (0.77–
693 0.92); TibIL/CL 0.57 (0.55–0.59).

694

695 *Distribution*

696 This species is endemic to the montane forests on Yakushima Island (Fig. 2).

697

698 *Remarks*

699 No retreat has been observed for this species. This species is found sympatrically with
700 the medium-sized species *C. yakushimensis* (Fig. 11E, F).

701

702 *Etymology*

703 The specific name is from a Japanese word kodama (= the name of a tree-inhabiting
704 spirit), and thus treated as indeclinable.

705

706 *Cybaeus amamiensis*, sp. nov.

707 <http://zoobank.org/NomenclaturalActs/FB195659-51B4-4C27-9B4D-DF3EA707C7D3>

708 (Figs. 10B, E, H, 13, 14)

709

710 *Material examined*

711 *Holotype*. **Japan**: Ryukyu Islands: Amamioshima Island: #, Mt. Yuwandake,

712 28°17'21.5"N, 129°18'52.5"E, 15.xii.2012, N. Koike (KUZ Z2987).

713 *Paratypes. Japan: Ryukyu Islands: Amamioshima Island: 2 #, 4 @, collected*
714 *with holotype (KUZ Z2120, Z2121, Z2988, Z2990–Z2992).*

715 *Additional specimens. Japan: Ryukyu Islands: Amamioshima Island: 6 #, 22 @,*
716 *collected with holotype (KUZ Z2989, Z2993); 7 @, Mt. Yuwandake, 28°17'46.5"N,*
717 *129°19'15.9"E, 12.iii.2009 (KUZ Z2133); 4 #, 28 @, ditto, 28°17'21.5"N,*
718 *129°18'52.5"E, 16.xii.2012 (KUZ Z2117, Z2118); 1 @, near Sumiyo Dam [28°17'N,*
719 *129°22'E], 12.iii.2009 (KUZ Z2130); 4 @, ditto, 14.iii.2009 (KUZ Z2131); 1 @, ditto,*
720 *26.iv.2010 (KUZ Z2125); 3 @, Kinsakubaru Forest, 28°20'49"N, 129°26'26"E,*
721 *14.iii.2009 (KUZ Z2135, Z2136); 4 @, ditto, 28°20'12.4"N, 129°26'55.0"E, 15.xii.2012*
722 *(KUZ Z2119); 6 @, near Kinsakubaru Forest, 28°21'39.5"N, 129°28'45.8"E, 19.i.2011*
723 *(KUZ Z2129); 4 @, Mt. Takinohanayama, 28°16'04.8"N, 129°26'54.2"E, 19.i.2011*
724 *(KUZ Z2126–Z2128); 1 #, 8 @, Naze-koshuku, 28°21'46.8"N, 129°28'49.9"E,*
725 *15.xii.2012 (KUZ Z2116, Z2124); 1 #, Sumiyocho-yakugachi, 28°14'47.3"N,*
726 *129°23'02.2"E, 16.xii.2012 (KUZ Z2122); 1 #, 3 @, Setouchicho-agina, 28°11'15.1"N,*
727 *129°19'35.2"E, 16.xii.2012 (KUZ Z2123).*

728

729 *Diagnosis*

730 *Medium- to large-sized Japanese Cybaeus. Cybaeus amamiensis is most likely to be*
731 *confused C. yakushimensis. See the Diagnosis of C. yakushimensis for details of*
732 *differentiating these two species.*

733

734 *Description*

735 *Male (holotype, KUZ Z2987)*

736 *Measurements (mm). CL 3.85, CW 2.63; head 1.65 wide; abdomen 3.13 long,*
737 *2.43 wide. Ocular area 0.46 long, 1.00 wide. Sternum 1.70 long, 1.50 wide. Leg*
738 *formula, 4 > 1 > 2 > 3; length of legs (femur + patella + tibia + metatarsus + tarsus): leg*
739 *I 12.02 (3.10 + 1.18 + 2.94 + 2.94 + 1.86); leg II 11.57 (3.08 + 1.20 + 2.70 + 2.84 +*
740 *1.75); leg III 10.08 (2.78 + 1.05 + 2.14 + 2.68 + 1.43); leg IV 12.43 (3.30 + 1.14 + 2.84*
741 *+ 3.48 + 1.67).*

742 *Carapace (Fig. 13A). Head narrow, 0.63× as wide as thoracic region; thoracic*
743 *region slightly higher than head. AER slightly procurved in frontal view; PER almost*
744 *straight in dorsal view; AME smallest, slightly > 1/2 diameters of other eyes; ocular*

745 area 2.2× wider than long. Clypeus slightly shorter than median ocular area.

746 *Mouthparts.* Chelicera slightly geniculate, promargin of fang furrow with 3 teeth
747 (median one largest), retromargin with 4 teeth and 4 or 5 denticles, and basally with
748 lateral condyle. Labium wider than long.

749 *Leg macrosetae.* Leg I: tibia p2, r2, v2-2-2-2; metatarsus p4 (left) or 3 (right), r1,
750 v2-2-3. Leg II: tibia p2, r2, v2-2-1(r)-2; metatarsus p4, r1, v2-2-3.

751 *Abdomen* (Fig. 13B). Oval; mid-posterior part widest. Colulus two groups of 5
752 or 6 setae.

753 *Palp* (Fig. 10B, E, H, 14A–C). PA digitiform, directed distally, dorsolateral
754 surface with 7 (left) or 8 (right) peg setae. Tibia convex in lateral view, almost as long
755 as patella; RTA plate-like, occupying most of length of tibia. Cymbium expanded
756 prolaterally, > 2× longer than wide; distal part slender, long. Genital bulb slightly wider
757 than long, oval in ventral view. Conductor extended retrolaterally; distal part expanded,
758 slightly curved; proximal arm sickle-shaped. Embolus simple, long, originating and
759 terminating, respectively, at ca. 9 o'clock and ca. 5 o'clock in ventral view.

760 *Colour* (Fig. 13A, B). Carapace: head dark reddish-brown, with reticulate black
761 markings; thoracic region brownish black, with yellowish brown marginal bands;
762 yellowish brown markings mid-dorsally. Chelicerae, maxillary lobe and labium dark
763 reddish-brown, chelicera darker than other parts. Sternum bright brown, darker toward
764 margins. Legs yellowish brown, with olive black annulations. Abdomen: dorsally olive
765 black with dull yellow chevron pattern; ventrally bright yellowish-brown.

766 *Female* (paratype, KUZ Z2990)

767 *Measurements* (mm). CL 4.23, CW 2.76; head 1.90 wide; abdomen 4.15 long,
768 2.90 wide. Ocular area 0.46 long, 1.10 wide. Sternum 1.82 long, 1.64 wide. Leg
769 formula, 4 > 1 > 2 > 3; length of legs (femur + patella + tibia + metatarsus + tarsus): leg
770 I 11.26 (3.10 + 1.32 + 2.76 + 2.60 + 1.48); leg II 10.72 (3.05 + 1.26 + 2.50 + 2.51 +
771 1.40); leg III 9.35 (2.70 + 1.18 + 1.92 + 2.36 + 1.19); leg IV 11.58 (3.20 + 1.14 + 2.70 +
772 3.11 + 1.43).

773 *Carapace* (Fig. 13C). Head narrow, 0.69× as wide as thoracic region; thoracic
774 region almost as high as head. AER straight in frontal view; PER slightly recurved in
775 dorsal view; AME smallest, slightly ca. 1/2 diameter of other eyes; ocular area
776 relatively wide, 2.4× wider than long. Clypeus slightly shorter than median ocular area.

777 *Mouthparts.* Chelicera geniculate, promargin of fang furrow with 3 teeth
778 (median one largest), retromargin with 4 teeth and 4 denticles, and basally with lateral
779 condyle. Labium wider than long.

780 *Leg macrosetae.* Leg I: tibia p2, v2-2-2-2; metatarsus p1, r1, v2-2-2. Leg II: tibia
781 p2 (left) or 3 (right), v2-2-1(r)-2; metatarsus p4, r3, v2-2-3.

782 *Abdomen* (Fig. 13D). Oval; mid-posterior part widest. Colulus two groups of 4
783 or 5 setae.

784 *Genitalia* (Fig. 14D, E). Posterior margin of epigynal plate slightly curved.
785 Atrium slightly concave, located posteromedially on epigynum. Copulatory pores
786 separated on either side of atrium; CD located along atrial margin to medially. Each
787 spermatheca forming S-shaped; SH medially located on vulva, undifferentiated except
788 for presence of a few primary pores anteromedially; connection between SH and SS
789 expanded laterally; SS tubular; SB large, globular; Bennett's gland well-developed,
790 located anteriorly at basal part of SB.

791 *Colour* (Fig. 13C, D). Carapace: head deeply-dark reddish-brown, with
792 reticulate black markings; thoracic region orange along margins, with radiating black
793 bands; yellowish brown markings mid-dorsally. Chelicerae dark reddish-brown,
794 maxillary lobe and labium reddish brown. Sternum reddish brown, darker toward
795 margins. Legs bright brown, with brownish black annulations. Abdomen: dorsally olive
796 black with bright yellowish-brown chevron pattern; laterally with mottled pattern of
797 dark brown and yellowish brown laterally; ventrally bright yellowish-brown.

798

799 *Variation*

800 *Males* ($n = 9$). Measurements (mean, followed by ranges in parentheses): CL
801 3.64 (3.06–3.94), CW 2.45 (2.10–2.74); CW/CL 0.67 (0.66–0.70); TibIL 2.73 (2.28–
802 2.94); TibIL/CL 0.75 (0.74–0.76). Legs longer than those of females. Palp: dorsolateral
803 surface of PA with 6–10 peg setae.

804 *Females* ($n = 26$). Measurements (mean, followed by ranges in parentheses): CL
805 4.00 (2.89–4.80), 2.67 (1.91–3.16); CW/CL 0.67 (0.65–0.70); TibIL 2.63 (1.88–3.28);
806 TibIL/CL 0.66 (0.64–0.68).

807

808 *Distribution*

809 This species is endemic to the montane forests on Amamioshima Island (Fig. 2).

810

811 *Remarks*

812 No retreat has been observed for this species.

813 Females of *C. amamiensis* share well-developed Bennett's glands in their

814 spermathecae with those of *C. yakushimensis*, *C. tokunoshimensis*, and *C. hikidai*.

815

816 *Etymology*

817 The specific name is an adjective from Amamioshima Island.

818

819 *Cybaeus aikana*, sp. nov.

820 <http://zoobank.org/NomenclaturalActs/F378CB1A-AFF8-4944-90BB-7D2863522BCC>

821 (Figs. 15–17)

822

823 *Material examined*

824 *Holotype. Japan: Ryukyu Islands: Amamioshima Island: #, Mt. Yuwandake,*

825 *28°17'21.5"N, 129°18'52.5"E, 15.xii.2012, N. Koike (KUZ Z3017).*

826 *Paratypes. Japan: Ryukyu Islands: Amamioshima Island: 2 @, collected with*

827 *holotype (KUZ Z2137, Z3018).*

828

829 *Diagnosis*

830 Small-sized Japanese *Cybaeus*. Males of *C. aikana*, *C. kumadori* and *C. hikidai* all lack

831 a PA in the palp (Fig. 7B, 16B, 19F). However, males of *C. aikana* can be

832 unquestionably distinguished from those of the other two congeners by its small size,

833 short and robust palp (Fig. 16B), and arcuate proximal arm of conductor (Fig. 16A, D,

834 E). Females of *C. aikana*, *C. hikidai*, and *C. ishikawai* are characterised by their CDs,

835 SHs and SSs all being of similar diameter. However, females of *C. aikana* clearly differ

836 from those of the other two species in their SBs which are located medially on the vulva

837 and are contiguous with each other (Fig. 17B) (SBs are well separated in *C. hikidai* and

838 *C. ishikawai*; Fig. 19J for *C. hikidai* and see fig. 2-2-30-217 in Ihara 2009a for *C.*

839 *ishikawai*).

840

841 *Description*

842 *Male (holotype, KUZ Z3017)*

843 *Measurements (mm)*. CL 1.78, CW 1.13; head 0.76 wide; abdomen 1.50 long,
844 1.36 wide. Ocular area 0.23 long, 0.45 wide. Sternum 0.84 long, 0.76 wide. Leg
845 formula, $4 > 1 > 2 > 3$; length of legs (femur + patella + tibia + metatarsus + tarsus): leg
846 I 4.49 (1.26 + 0.48 + 1.07 + 0.98 + 0.70); leg II 4.11 (1.15 + 0.48 + 0.92 + 0.93 + 0.63);
847 leg III 3.56 (0.99 + 0.46 + 0.68 + 0.88 + 0.55); leg IV 4.68 (1.23 + 0.48 + 1.06 + 1.18 +
848 0.73).

849 *Carapace* (Fig. 15A). Head narrow, $0.67\times$ as wide as thoracic region; thoracic
850 region as high as head. AER slightly procurved in frontal view; PER almost straight in
851 dorsal view; AME smallest, ca. $1/2$ diameter of other eyes; ocular area ca. $2\times$ wider than
852 long. Clypeus shorter than median ocular area.

853 *Mouthparts*. Chelicera slightly geniculate, promargin of fang furrow with 3 teeth
854 (median one largest), retromargin with 3 teeth and 4 or 5 denticles, and basally with
855 lateral condyle. Labium wider than long.

856 *Leg macrosetae*. Leg I: tibia p2, v2-2-2-0; metatarsus p1, v2-2-2. Leg II: tibia
857 p2, v1(r)-1(r)-1(r)-0; metatarsus p2, v2-2-3.

858 *Abdomen* (Fig. 15B). Oval; mid-posterior part widest. Colulus two groups of 3
859 or 4 setae.

860 *Palp* (Fig. 16). PA lacking. Tibia almost as long as patella; RTA plate-like,
861 occupying $2/3$ of length of tibia. Cymbium relatively short, slightly expanded
862 prolaterally. Genital bulb wider than long, oval in ventral view. Conductor strongly
863 undulating in lateral view; distal part well developed, extended distally; tip of proximal
864 arm undulating, arcuate. Embolus simple, long, originating and terminating,
865 respectively, at ca. 9 o'clock and ca. 7 o'clock in ventral view.

866 *Colour* (Fig. 15A, B). Carapace: head yellowish brown, with reticulate brownish
867 black markings; thoracic region light yellow, with radiating brownish black bands.
868 Chelicerae bright brown, maxillary lobe and labium bright brown to yellowish brown.
869 Sternum light yellow, darker toward margins. Legs bright yellowish-brown to light
870 yellow with slight olive black annulations. Abdomen: dorsally olive black with light
871 yellow chevron pattern; ventrally light yellow.

872 *Female (paratype, KUZ Z3018)*

873 *Measurements (mm)*. CL 1.64, CW 1.05; head 0.80 wide; abdomen 1.88 long,
874 1.42 wide. Ocular area 0.22 long, 0.46 wide. Sternum 0.82 long, 0.74 wide. Leg
875 formula, 4 > 1 > 2 > 3; length of legs (femur + patella + tibia + metatarsus + tarsus): leg
876 I 3.67 (1.08 + 0.48 + 0.84 + 0.74 + 0.53); leg II 3.42 (1.03 + 0.47 + 0.72 + 0.72 + 0.48);
877 leg III 2.96 (0.84 + 0.44 + 0.56 + 0.66 + 0.46); leg IV 3.69 (1.06 + 0.45 + 0.88 + 0.87 +
878 0.43).

879 *Carapace* (Fig. 15C). Head 0.76× as wide as thoracic region; thoracic region
880 height slightly shorter than head. AER slightly procurved in frontal view; PER almost
881 straight in dorsal view; AME smallest, ca. 1/2 diameter of other eyes; ocular area
882 slightly > 2× wider than long. Clypeus shorter than median ocular area.

883 *Mouthparts*. Chelicera moderate geniculate, promargin of fang furrow with 3
884 teeth (median one largest), retromargin with 4 teeth and 4 denticles, and basally with
885 lateral condyle. Labium wider than long.

886 *Leg macrosetae*. Leg I: tibia p2, v 2-2-2-0; metatarsus p1, r1 (left) or 0 (right),
887 v2-2-2. Leg II: tibia p2, v1(r)-1(r)-1(r)-0; metatarsus p2, v2-2-3.

888 *Abdomen* (Fig. 15C). Oval; mid-posterior part widest. Colulus two groups of 4
889 setae.

890 *Genitalia* (Fig. 17). Posterior margin of epigynal plate slightly concave
891 anteriorly. Atrium located posteriorly on epigynum. Copulatory pores separated on
892 either side of atrium; CD conspicuously visible through epigynal plate in ventral view.
893 CD, SH and SS tubular and of similar diameter from copulatory pore to SB; SH with a
894 few primary pores in dorsal view; SB large, pear-shaped, located medially, contiguous
895 with each other; Bennett's gland not detected.

896 *Colour* (Fig. 15C). Carapace: head brown, with reticulate brownish black
897 markings; thoracic region bright yellowish-brown, with radiating brownish black bands.
898 Chelicerae, maxillary lobe and labium bright brown. Sternum bright yellowish brown,
899 darker toward margins. Legs yellowish brown, with slight olive black annulations.
900 Abdomen: dorsally brownish black with light yellow chevron pattern; ventrally light
901 yellow.

902

903 *Distribution*

904 This species is known only from the type locality on Mt. Yuwandake on Amamioshima

905 Island (Fig. 2).

906

907 *Remarks*

908 This species constructs a Y-shaped retreat (Fig. 22B). *Cybaeus aikana* is found
909 sympatrically with *C. amamiensis* at Mt. Yuwandake.

910

911 *Etymology*

912 The specific name is dedicated to the name of a historical figure, a woman who lived in
913 Amamioshima Island. The specific name is derived directly from her name, and thus
914 treated as indeclinable.

915

916 *Cybaeus tokunoshimensis*, sp. nov.

917 [http://zoobank.org/NomenclaturalActs/F0CEA7EC-D32E-4BE9-A51C-](http://zoobank.org/NomenclaturalActs/F0CEA7EC-D32E-4BE9-A51C-ED7357991B3A)
918 [ED7357991B3A](http://zoobank.org/NomenclaturalActs/F0CEA7EC-D32E-4BE9-A51C-ED7357991B3A)

919 (Figs. 10C, F, 18)

920

921 *Material examined*

922 *Holotype. Japan: Ryukyu Islands: Tokunoshima Island: #, Mt. Inokawadake,*
923 *27°45'53.1"N, 128°58'43.1"E, 17.xii.2012, N. Koike (KUZ Z2113).*

924 *Paratypes. Japan: Ryukyu Islands: Tokunoshima Island: 4 @, collected with*
925 *holotype (KUZ Z2112, Z2994–Z2996).*

926 *Additional specimens. Japan: Ryukyu Islands: Tokunoshima Island: 2 @, Mt.*
927 *Inokawadake, 27°46'07.6"N, 128°59'38.4"E, 27.i.2011 (KUZ Z2111); 6 @, ditto,*
928 *27°45'51.9"N, 128°58'37.8"E, 27.i.2011 (KUZ Z2114, Z2115); 4 @, collected with*
929 *holotype (KUZ Z2997).*

930

931 *Diagnosis*

932 Medium-sized Japanese *Cybaeus*. *Cybaeus tokunoshimensis* most closely resembles *C.*
933 *yakushimensis* and *C. amamiensis*. However, males of *C. tokunoshimensis* can be
934 distinguished from those of the other two species by the laterally extended palpal PA,
935 the relatively short, broad cymbium, and the broad, wider than long genital bulb (Fig.
936 10C, F, 18H) (directed anterolaterally PAs, relatively slender cymbia, and as long as

937 wide genital bulbs in *C. yakushimensis* and *C. amamiensis*; Fig. 10A, B, D, E, G, H).
938 Females of *C. tokunoshimensis* are distinguishable from those of *C. yakushimensis* and
939 *C. amamiensis* by the slightly longer epigynum and, especially, by each SS forming a
940 double coil around each CD (Fig. 18I, J) (short epigyna and each SS not a double coiled
941 around each CD in *C. yakushimensis* and *C. amamiensis*; Fig. 9D, E, 14D, E).
942 Additionally, Bennett's gland in *C. tokunoshimensis* is set apart from the bulbous SB on
943 the posterior portion of the SH (the glands in *C. yakushimensis* and *C. amamiensis* are
944 located basally on each SB; Fig. 9E, 14E).

945

946 *Description*

947 *Male (holotype, KUZ Z2113)*

948 *Measurements (mm)*. CL 3.12, CW 2.18; head 1.35 wide; abdomen 2.68 long,
949 2.04 wide. Ocular area 0.34 long, 0.81 wide. Sternum 1.44 long, 1.32 wide. Leg
950 formula, 4 > 1 > 2 > 3; length of legs (femur + patella + tibia + metatarsus + tarsus): leg
951 I 9.60 (2.53 + 0.95 + 2.30 + 2.36 + 1.46); leg II 9.21 (2.44 + 0.96 + 2.13 + 2.28 + 1.40);
952 leg III 8.09 (2.20 + 0.91 + 1.72 + 2.08 + 1.18); leg IV 9.85 (2.63 + 0.91 + 2.28 + 2.59 +
953 1.44).

954 *Carapace* (Fig. 18A, B). Head narrow, 0.62× as wide as thoracic region; thoracic
955 region higher than head. AER almost straight in frontal view; PER almost straight in
956 dorsal view; AME smallest, slightly > 1/2 diameter of other eyes. Ocular area relatively
957 wide, 2.4× wider than long. Clypeus shorter than median ocular area.

958 *Mouthparts*. Chelicera slightly geniculate, promargin of fang furrow with 3 teeth
959 (median one largest), retromargin with 5 teeth and 6 denticles, and basally with lateral
960 condyle. Labium wider than long.

961 *Leg macrosetae*. Leg I: tibia p2, r2, v2-2-2-2; metatarsus p4, r1, v2-2-3. Leg II:
962 tibia p3, r2, v2-2-1(r)-2; metatarsus p4, r2, v2-2-3.

963 *Abdomen* (Fig. 18B). Oval; mid-posterior part widest. Colulus two groups of 4
964 or 5 setae.

965 *Palp* (Fig. 10C, F, 18E–H). PA digitiform, extended anterolaterally, dorsal
966 surface with 9 (left) or 8 (right) peg setae. Tibia convex in lateral view, almost as long
967 as patella; RTA plate-like, occupying most of length of tibia. Cymbium relatively wide,
968 ca. 2× longer than wide, expanded prolaterally. Genital bulb wider than long, oval in

969 ventral view. Conductor: distal part large, well developed; proximal arm strongly
970 undulating, sickle-shaped. Embolus long, undulating along conductor, originating and
971 terminating respectively, at ca. 9 o'clock and ca. 7 o'clock in ventral view.

972 *Colour* (Fig. 18A, B). Carapace: head smoky black; thoracic region bright
973 yellowish-brown, with radiating black bands; bright yellowish-brown markings mid-
974 dorsally. Chelicerae deep dark reddish-brown, maxillary lobe and labium brown.
975 Sternum yellowish brown, darker toward margins. Legs light yellowish-brown with
976 brownish black annulations. Abdomen: dorsally olive black with light yellow chevron
977 pattern; ventrally bright yellowish-brown.

978 *Female (paratype, KUZ Z2994)*

979 *Measurements (mm)*. CL 3.23, CW 2.15; head 1.48 wide; abdomen 3.35 long,
980 2.50 wide. Ocular area 0.37 long, 0.90 wide. Sternum 1.45 long, 1.30 wide. Leg
981 formula, 4 > 1 > 2 > 3; length of legs (femur + patella + tibia + metatarsus + tarsus): leg
982 I 8.54 (2.38 + 0.96 + 2.06 + 1.96 + 1.18); leg II 8.13 (2.28 + 0.94 + 1.89 + 1.88 + 1.14);
983 leg III 7.18 (2.05 + 0.90 + 1.48 + 1.83 + 0.92); leg IV 9.01 (2.42 + 0.91 + 2.08 + 2.44 +
984 1.16).

985 *Carapace* (Fig. 18C). Head 0.69× as wide as thoracic region; thoracic region
986 almost as high as head. AER almost straight in frontal view; PER almost straight in
987 dorsal view; AME smallest, > 1/2 diameter of other eyes. Ocular area relatively wide,
988 2.4× wider than long. Clypeus shorter than median ocular area.

989 *Mouthparts*. Chelicera geniculate, promargin of fang furrow with 3 teeth
990 (median one largest), retromargin with 4 teeth and 4 denticles, and basally with lateral
991 condyle. Labium wider than long.

992 *Leg macrosetae*. Leg I: tibia p2, v2-2-2-2; metatarsus p1, r1, v2-2-3. Leg II: tibia
993 p3, v2-2-1(r)-2; metatarsus p4, r1, v2-2-3.

994 *Abdomen* (Fig. 18D). Oval; mid-posterior part widest. Colulus two groups of 4
995 or 5 setae.

996 *Genitalia* (Fig. 18I, J). Posterior margin of epigynal plate loosely curved.
997 Atrium concave, located posteromedially on epigynum. Copulatory pores separated on
998 either side of atrium; CD not visible beneath epigynal plate in ventral view. SH and SS
999 continuously tubular; SH with a few primary pores medially; SS forming double coil
1000 around CD; SB globular, extended anterolaterally; Bennett's gland well-developed,

1001 located medially at connection between SS and SB.

1002 *Colour* (Fig. 18C, D). Carapace: head dark reddish-brown, with reticulate black
1003 markings; thoracic region bright yellowish-brown, with radiating black bands.
1004 Chelicerae dark reddish-brown, maxillary lobe and labium reddish brown. Sternum
1005 bright yellowish-brown, darker toward margins. Legs bright yellowish-brown, with
1006 olive black annulations. Abdomen: dorsally olive black with bright yellowish-brown
1007 chevron pattern; laterally with mottled pattern of olive black and bright yellowish-
1008 brown; ventrally light yellow.

1009

1010 *Variation*

1011 *Females* ($n = 8$). Measurements (mean, followed by ranges in parentheses): CL 3.04
1012 (2.34–3.28); CW 2.00 (1.55–2.15); CW/CL 0.66 (0.65–0.67); TibIL 1.93 (1.45–2.10);
1013 TibIL/CL 0.63 (0.62–0.66).

1014

1015 *Distribution*

1016 This species is endemic to the montane forest around Mt. Inokawadake on
1017 Tokunoshima Island (Fig. 2).

1018

1019 *Remarks*

1020 Not retreat has been observed for *C. tokunoshimensis*.

1021

1022 *Etymology*

1023 The specific name is an adjective from Tokunoshima Island.

1024

1025 *Cybaeus hikidai*, sp. nov.

1026 <http://zoobank.org/NomenclaturalActs/ECA1F9A2-61E8-4383-8E63-49EC9C3513F9>
1027 (Figs. 19–21)

1028

1029 *Material examined*

1030 *Holotype*. **Japan**: *Ryukyu Islands*: Okinawa Island: #, near Hiji Waterfall,
1031 26°42'44.1"N, 128°11'06.3"E, 22.xii.2012, N. Koike (KUZ Z2982).

1032 *Paratypes*. **Japan**: *Ryukyu Islands*: Okinawa Island: 2 @, collected with

1033 holotype (KUZ Z2107, Z2983); 1 #, 1 @, Mt. Nagodake, 26°35'12.2"N, 128°00'22.2"E,
1034 21.xii.2012, N. Koike (KUZ Z2106, Z2984).

1035 *Additional specimens. Japan: Ryukyu Islands: Okinawa Island: 1 #, 8 @, Mt.*
1036 *Nishimedake, 26°48'27.4"N, 128°16'08.6"E, 22.i.2011 (KUZ Z2100–Z2102); 2 @,*
1037 *ditto, 25.i.2011 (KUZ Z2104); 7 @, Mt. Yonahadake, 26°43'50.5"N, 128°12'36.2"E,*
1038 *20.xii.2012 (KUZ Z2105); 3 @, 1 juvenile, Mt. Nagodake, 21.xii.2012 (KUZ Z2985,*
1039 *Z2986, Z3679); 3 @, 1 juvenile, Mt. Fuenjichidake, 26°45'17.0"N, 128°14'31.1"E,*
1040 *22.xii.2012 (KUZ Z2108); 1 #, Mt. Onishidake, 26°49'02.8"N, 128°17'52.7"E,*
1041 *22.xii.2012 (KUZ Z2109); 2 @, Mt. Nishimedake, 26°48'27.1"N, 128°16'04.7"E,*
1042 *22.xii.2012 (KUZ Z2110); 1 @, near Taiho Dam, 26°39'04.3"N, 128°09'34.7"E,*
1043 *24.xii.2012 (KUZ Z2103).*

1044

1045 *Diagnosis*

1046 Medium-sized Japanese *Cybaeus*. Males of *C. hikidai* differ from those of the other six
1047 Ryukyu-endemic congeners (*C. okumurai*, *C. yakushimensis*, *C. kodama*, *C.*
1048 *amamiensis* and *C. tokunoshimensis*) by the combination of lacking a PA and having an
1049 egg-shaped large genital bulb that is wider than long (Fig. 19F, H). Males of *C.*
1050 *kumadori* and *C. aikana* also lack a PA; differentiating them from the male *C. hikidai* is
1051 discussed in the Diagnoses of those species. Females of *C. hikidai* share with those of
1052 the small-sized *C. aikana* very long tubular CD, SH and SS of similar diameter
1053 throughout. But, the former can be distinguished from the latter by its well separated
1054 SBs located laterally on the vulva (Fig. 19J) (contiguous and medially located in the
1055 vulva of *C. aikana*; Fig. 17B). Females of *C. hikidai* are also similar to those of *C.*
1056 *ishikawai* the former can be distinguished from the latter by the SBs that are directed
1057 antero-laterally (Fig. 19J) (SBs directed laterally in *C. ishikawai*; fig. 2-2-30-217 in
1058 Ihara 2009a).

1059

1060 *Description*

1061 *Male (holotype, KUZ Z2982)*

1062 *Measurements (mm).* CL 3.20, CW 2.33; head 1.40 wide; abdomen 3.10 long,
1063 2.43 wide. Ocular area 0.37 long, 0.80 wide. Sternum 1.52 long, 1.38 wide. Leg
1064 formula, 4 > 1 > 2 > 3; length of legs (femur + patella + tibia + metatarsus + tarsus): leg

1065 I 10.90 (2.89 + 1.03 + 2.62 + 2.60 + 1.76); leg II 10.47 (2.83 + 1.01 + 2.50 + 2.52 +
1066 1.61); leg III 9.49 (2.58 + 0.94 + 2.06 + 2.48 + 1.43); leg IV 11.85 (3.05 + 0.99 + 2.79 +
1067 3.28 + 1.74).

1068 *Carapace* (Fig. 19A, B). Head narrow, 0.60× as wide as thoracic region; thoracic
1069 region slightly higher than head. AER almost straight in frontal view; PER straight in
1070 dorsal view; AME smallest, > 1/2 diameter of other eyes; ocular area ca. 2.2× wider
1071 than long. Clypeus shorter than median ocular area.

1072 *Mouthparts*. Chelicera slightly geniculate, promargin of fang furrow with 3 teeth
1073 (median one largest), retromargin with 4 teeth and 6 or 7 denticles, and basally with
1074 lateral condyle. Labium wider than long.

1075 *Leg macrosetae*. Leg I: tibia p3, r2, v2-2-2-2; metatarsus p4, r2, v2-2-3. Leg II:
1076 tibia p3, r2 (left) or 3 (right), v2-2-1(r)-2; metatarsus p4, r3, v2-2-3.

1077 *Abdomen* (Fig. 19B). Oval; mid-posterior part widest. Colulus two groups of 5
1078 setae.

1079 *Palp* (Fig. 19E–H). PA lacking. Tibia almost as long as patella; RTA plate-like,
1080 occupying half of length of tibia. Cymbium relatively wide, ca. 2× longer than wide,
1081 expanded prolaterally. Genital bulb wider than long, egg-shaped in ventral view.
1082 Conductor: distal part large, expanded antero-medially; proximal arm small, undulating,
1083 tip twisted. Embolus simple, long, originating and terminating, respectively, at ca. 9
1084 o'clock and ca. 6 o'clock in ventral view.

1085 *Colour* (Fig. 19A, B). Carapace: head dark brown with reticulate brownish black
1086 markings; thoracic region bright yellowish-brown along lateral and posterior margins,
1087 with radiating brownish black bands; yellowish brown spot on middle part. Chelicerae
1088 dark reddish-brown, maxillary lobe and labium brown. Sternum yellowish brown,
1089 darker toward margins. Legs: femur bright yellowish-brown; other segments yellowish
1090 brown with slight olive black annulations. Abdomen: dorsally olive black with bright
1091 yellowish brown chevron pattern; ventrally bright yellowish brown.

1092 *Female* (paratype, KUZ Z2985)

1093 *Measurements* (mm). CL 2.63, CW 1.82; head 1.24 wide; abdomen 3.15 long,
1094 2.40 wide. Ocular area 0.34 long, 0.76 wide. Sternum 1.18 long, 1.14 wide. Leg
1095 formula, 4 > 1 > 2 > 3; length of legs (femur + patella + tibia + metatarsus + tarsus): leg
1096 I 6.95 (1.96 + 0.78 + 1.70 + 1.56 + 0.95); leg II 6.70 (1.92 + 0.81 + 1.57 + 1.49 + 0.91);

1097 leg III 5.93 (1.70 + 0.74 + 1.25 + 1.44 + 0.80); leg IV 7.50 (2.04 + 0.70 + 1.78 + 1.98 +
1098 1.00).

1099 *Carapace* (Fig. 19C). Head narrow, 0.68× as wide as thoracic region; thoracic
1100 region slightly higher than head. AER almost straight in frontal view; PER straight in
1101 dorsal view; AME smallest, > 1/2 diameter of other eyes; ocular area ca. 2.2× wider
1102 than long. Clypeus shorter than median ocular area.

1103 *Mouthparts*. Chelicera more geniculate than that of male, promargin of fang
1104 furrow with 3 teeth (median one largest), retromargin with 4 teeth and 5 or 6 denticles,
1105 and basal with lateral condyle. Labium wider than long.

1106 *Leg macrosetae*. Leg I: tibia p2, v2-2-2-1(p); metatarsus r1, v2-2-2. Leg II: tibia
1107 p4 (left) or 3 (right), v2-2-1(r)-0; metatarsus p4, r1, v2-2-3.

1108 *Genitalia* (Fig. 19I, J, 20, 21). Posterior margin of epigynal plate slightly
1109 curved. Atrium located posteriorly on epigynum. Copulatory pores separated on both
1110 sides of atrium; CD long, conspicuous through epigynal plate. CD, SH and SS
1111 continuously tubular, of similar diameter throughout; SH with a few primary pores
1112 laterally; SB large, globular, directed antero-laterally; Bennett's gland well-developed,
1113 located anteriorly at connection between SS and SB.

1114 *Colour* (Fig. 19C, D). Carapace: head dark brown, with reticulate black
1115 markings; thoracic region yellowish brown along lateral to posterior margins, with
1116 radiating brownish black bands; bright yellowish-brown marking mid-dorsally.
1117 Chelicerae, maxillary lobe and labium brown, chelicerae darker than other parts.
1118 Sternum bright yellowish-brown. Legs: femur bright yellowish-brown; other segments
1119 yellowish brown with slight olive black annulations. Abdomen: dorsally olive black
1120 with light yellow chevron pattern; ventrally light yellow.

1121

1122 *Variation*

1123 *Male* ($n = 3$). Measurements (mean, followed by ranges in parentheses). CL 3.05
1124 (2.82–3.20), CW 2.19 (2.00–2.33); CW/CL 0.72 (0.71–0.73); TibIL 2.45 (2.21–2.62);
1125 TibIL/CL 0.80 (0.78–0.82).

1126 *Female* ($n = 12$). Measurements (mean, followed by ranges in parentheses). CL
1127 2.88 (2.31–3.76), CW 1.91 (1.54–2.50); CW/CL 0.66 (0.64–0.69); TibIL 1.86 (1.47–
1128 2.45); TibIL/CL 0.64 (0.62–0.66).

1129

1130 *Distribution*

1131 This species is endemic to the montane region in the northern part of Okinawa Island
1132 (Fig. 2).

1133

1134 *Remarks*

1135 This species constructs a Y-shaped retreat with three openings (Fig. 22C).

1136

1137 *Etymology*

1138 The specific name is dedicated to herpetologist Professor Emeritus Tsutomu Hikida at
1139 Kyoto University who has encouraged our arachnological research.

1140

1141 **Discussion**

1142

1143 *Phylogenetic relationships and genital morphology of the Ryukyu Cybaeus*

1144

1145 Our study extends the distribution of the genus *Cybaeus* south to Okinawa Island in the
1146 Central Ryukyus and, moreover, reveals that the eight species of the Ryukyu *Cybaeus*
1147 are composed of five lineages. However, we failed to resolve the basal nodes and
1148 phylogenetic relationships among these species, especially among lineages C–E and *C.*
1149 *gotoensis* (Fig. 1). The use of a broader taxonomic sample and additional genetic
1150 markers should help resolve phylogenetic relationships among the Japanese *Cybaeus*
1151 spiders, including the Ryukyu species.

1152 The eight species of the Ryukyu *Cybaeus* can be grouped into two types based
1153 on characteristics of the embolus and spermathecae. The first (type 1) includes two
1154 species, *C. okumurai* (lineage A) and *C. kumadori* (lineage B), which possess an
1155 embolus that is not elongated and spermathecae consisting of distinct relatively bulbous
1156 SH, SS and SB. The other six species (lineages C–E) share an elongated embolus in
1157 their males, and a pair of elongate tubular spermathecal ducts composed of SH and SS
1158 as well as a bulbous SB in their females (type 2). The type 1 genital characters seem to
1159 be most common in the Japanese *Cybaeus* species, while the type 2 characters have only
1160 been documented in a few species known from Honshu and Shikoku in Japan

1161 (Kobayashi 2006; Ihara 2009a). To our knowledge, the type 2 spermatheca has never
1162 been reported from other Far Eastern regions or North America. The elongated CD has
1163 been described in several Korean and American species, but their SHs are distinct from
1164 their CDs (Seo 2016; Bennett *et al.* 2016); tubular SSs of the North American *C.*
1165 *somesbar* Bennett in Copley *et al.*, 2009 are continuous with its respective CD, but its
1166 SHs are lobate and diverge from the respective duct (Copley *et al.* 2009).

1167 The genital characteristics and phylogenetic position unquestionably show that
1168 *C. okumurai*, endemic to Tanegashima Island, is a close congener of *C. ashikitaensis*;
1169 both species belong to lineage A, with the other two species in this lineage known from
1170 Kyushu. *Cybaeus ashikitaensis* is known from western Honshu, and northern to central
1171 regions of Kyushu in Japan, exhibiting a disjunct distribution (Ihara 2003, 2009a);
1172 spiders identified as *C. ashikitaensis* also occur on the southern tip of Kyushu (Y. Ihara,
1173 unpubl. data). The present phylogeny revealed that *C. okumurai* is sister to *C.*
1174 *ashikitaensis* from central Kyushu (near the type locality of the latter), but, nonetheless,
1175 it is possible that the southern population of “*C. ashikitaensis*” is the closest congener
1176 of, or conspecific with *C. okumurai*.

1177 The phylogenetic position of the other type 1 species, *C. kumadori*, remains
1178 uncertain, because this species forms a unique clade (lineage B) among the species
1179 included in the phylogenetic analyses. The characteristics of the male palp and female
1180 spermathecae do not suggest any candidates for close congeners of *C. kumadori*.
1181 Among the Ryukyu *Cybaeus* species, *C. kumadori* lacks a PA in the male palp, a feature
1182 which it shares with *C. aikana* in Amamioshima Island and *C. hikidai* on Okinawa
1183 Island. However, the other characteristics of the palp and the female spermathecae are
1184 completely different between *C. kumadori* and the other two species. The precise
1185 phylogenetic position and close congeners of *C. kumadori* should be elucidated by a
1186 future study.

1187 The four species categorized as type 2, *C. yakushimensis*, *C. kodama*, *C.*
1188 *amamiensis*, and *C. tokunoshimensis*, formed a well-supported clade (lineage D) among
1189 the Ryukyu *Cybaeus*. It is noteworthy that the two species endemic to Yakushima
1190 Island, *C. yakushimensis* and *C. kodama*, were not monophyletic in our analyses, but *C.*
1191 *yakushimensis*, *C. amamiensis* and *C. tokunoshimensis* formed a monophyletic lineage
1192 within this clade. Although this relationship was not fully supported, these three species

1193 share the following genital characters: digitiform PA, elongated embolus originating at
1194 the ca. 9 o'clock position in ventral view, a pair of laterally expanded SS, and a well-
1195 developed Bennett's gland. By contrast, males of *C. kodama* have a small PA, an
1196 embolus originating at the ca. 7 o'clock position in ventral view, and its females possess
1197 spermathecal ducts that are coiled at the anterior part of vulva. The morphological
1198 features of these four species therefore corroborate their phylogenetic relationships as
1199 suggested by the analyses of the present study.

1200 Our analyses were unable to determine the phylogenetic positions of *C. aikana*
1201 and *C. hikidai*. Although both species possess the type 2 genital characters, these two
1202 species differ from the other four type 2 species, *C. yakushimensis*, *C. kodama*, *C.*
1203 *amamiensis* and *C. tokunoshimensis*, in lacking the PA in the male palp. In addition, *C.*
1204 *aikana* and *C. hikidai* are distinguished from those four species by the tubular SH that is
1205 continuous with the tubular CD and is indistinguishable from the latter except for the
1206 presence of primary pores that indicate the position of the SH in the four species. Our
1207 field observations of *C. aikana* and *C. hikidai* clarified that these two species both
1208 construct Y-shaped retreats. *Cybaeus ishikawai* and *C. kompiraensis*, which are
1209 endemic to Shikoku, are also known to construct Y-shaped retreats (Komatsu 1940,
1210 1968), and *C. ishikawai* also possesses an elongated embolus in the male palp without a
1211 PA, and tubular spermathecal ducts in females (Ihara 2009a, fig. 2-2-30-216–219; as
1212 *Cybaeus* sp.). However, the present phylogeny did not reveal a close relationship among
1213 *C. aikana*, *C. hikidai*, and *C. ishikawai* as well as *C. kompiraensis* suggesting that both
1214 the genital characteristics and the Y-shaped retreat are not synapomorphies of a clade
1215 containing these species, but probably homoplastic.

1216 It remains uncertain whether the type 2 genital features (the elongated embolus
1217 and tubular formation of the spermathecae) have evolved multiple times in lineages C–
1218 E, because the present phylogenies failed to estimate a robust relationship in these
1219 lineages. However, the phylogenetic position of *C. ishikawai* suggests that these genital
1220 characteristics have arisen independently at least between *C. ishikawai* and the six
1221 species endemic to the Ryukyu Islands. *Cybaeus melanoparvus* Kobayashi, 2006, which
1222 was described from central Honshu, also possesses the type 2 embolus and
1223 spermathecae (Kobayashi 2006). Further systematic studies should be carried out to
1224 clarify the evolutionary history of the genital characters of *Cybaeus* spiders inhabiting

1225 Japan and adjacent regions.

1226

1227 *Implications for biogeography, distribution and natural history*

1228

1229 This study demonstrated that the Northern Ryukyus include distinctive biogeographical
1230 elements of the genus *Cybaeus*. *Cybaeus okumurai* from Tanegashima Island is
1231 unquestionably related to the species endemic to Kyushu, while the two species, *C.*
1232 *yakushimensis* and *C. kodama*, inhabiting Yakushima Island belong to the clade that
1233 includes the species endemic to Amamioshima Island and Tokunoshima Island in the
1234 Central Ryukyus. Therefore, the range of the members of the monophyletic lineage D
1235 encompasses both the Northern and Central Ryukyus across the Tokara Gap. This
1236 biogeographic pattern of the Ryukyu *Cybaeus* is incongruent with that of other
1237 epigean/ground-dwelling spiders inhabiting the Ryukyu Islands. It was shown that a
1238 species of the liphistiid *Heptathela* Kishida, 1923 in Yakushima Island is
1239 phylogenetically close to the species endemic to Kyushu, and that *Heptathela* species
1240 endemic to the Central Ryukyus do not occur north of the Tokara Gap (Xu *et al.* 2016,
1241 2019). Because the present study did not estimate the divergence time of the Ryukyu
1242 *Cybaeus*, their biogeographical history should be further elucidated using a robust, time-
1243 calibrated phylogeny in a future study. It is evident from the deep divergences among
1244 the four species of lineage D that the wide distribution of these species has not been
1245 formed by recent range expansion across the Tokara Gap.

1246 Sympatric distributions of different-sized species of *Cybaeus* (see Ihara 2008)
1247 were also documented in the Ryukyu *Cybaeus*. Our study revealed that the medium-
1248 sized *C. yakushimensis* and small-sized *C. kodama* were distributed sympatrically in
1249 Yakushima Island, and that the medium-sized *C. amamiensis* and small-sized *C. aikana*
1250 occurred together in Amamioshima Island. Given the deep divergence between *C.*
1251 *amamiensis* and *C. aikana* and the fact that *C. amamiensis* is sister to *C.*
1252 *tokunoshimensis*, the sympatric distribution of *C. amamiensis* and *C. aikana* in
1253 Amamioshima Island may have been formed by secondary contact between these two
1254 species, or their ancestors. Although our phylogenetic analyses failed to determine the
1255 precise relationships between *C. yakushimensis* and *C. kodama*, these two species were
1256 also genetically highly divergent from each other, indicating that the sympatric

1257 occurrence of *C. yakushimensis* and *C. kodama* may also be explained by secondary
1258 contact between these two species in Yakushima Island.

1259 Our study also revealed the occurrence of the different-sized mature individuals
1260 within a single Ryukyu *Cybaeus* species. Our finding of size dimorphism in females of
1261 *C. okumurai* suggests that females of *C. okumurai* undergo at least two types of life
1262 cycle. *Cybaeus* species distributed in western Japan appear to exhibit a life cycle of two
1263 or more years (Ihara 2006, 2009a); spiders may overwinter as juveniles and then mature
1264 in the following autumn. Given the occurrence of small-sized mature females in *C.*
1265 *okumurai*, a number of its females may mature in the autumn and winter immediately
1266 after hatching. Additional field surveys and systematic studies are essential to
1267 understand the sympatric distribution of the different-sized species, and of different-
1268 sized individuals of the same species, and the broader natural histories in the Ryukyu
1269 *Cybaeus* species.

1270

1271 **Conflicts of interest**

1272 The authors declare no conflicts of interest.

1273

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1278

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1286

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1423 **FIGURE LEGENDS AND TABLE CAPTIONS**

1424

1425 **Fig. 1.** Bayesian inference tree (mean $\ln L = -10554.32$) for 3421 bp of nuclear histone
1426 H3, internal transcribed spacer 1, 28S rRNA, mitochondrial COI, 12S rRNA, and 16S
1427 rRNA markers. Numbers on nodes represent bootstrap values for maximum likelihood
1428 and Bayesian posterior probabilities.

1429

1430 **Fig. 2.** Map showing the distributions of the lineages that contain *Cybaeus* species in
1431 the Ryukyu Islands. Inset phylogeny is identical with that in Fig. 1. The map and
1432 lineages are colour-shaded to indicate the species collection localities. The map is based
1433 on Wessel and Smith (1996).

1434

1435 **Fig. 3.** *Cybaeus okumurai*, sp. nov., male holotype (KUZ Z3019: *A, B*) and female
1436 paratype (KUZ Z3024: *C, D*). (*A, C*) prosoma, dorsal; (*B, D*) abdomen, dorsal. Scale
1437 bars: 1 mm.

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1439 **Fig. 4.** *Cybaeus okumurai*, sp. nov., male holotype (KUZ Z3019: *A–C, F, G*); *Cybaeus*
1440 *ashikitaensis* (Komatsu), male from Ashikita, Kyushu Island (KUZ Z3675: *D, E*). (*A*)
1441 left palp, retrolateral; (*B, D*) tibia and patella (left palp), retrolateral; (*C, E*) tibia and
1442 patella (left palp), retro-dorsolateral; (*F*) cymbium (left palp), dorsal; (*G*) cymbium (left
1443 palp), ventral. Scale bars: (*A*) 500 μm ; (*B–G*) 200 μm .

1444

1445 **Fig. 5.** *Cybaeus okumurai*, sp. nov., female paratypes (KUZ Z3023: *A*; KUZ Z3025: *B*);
1446 *Cybaeus ashikitaensis* (Komatsu), females from Ebino (KUZ Z3676: *C*) and Ashikita
1447 (KUZ Z3677: *D*), Kyushu Island. (*A, C*) epigyne, ventral; (*B, D*) spermathecae, dorsal.
1448 Scale bars: 200 μm .

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1450 **Fig. 6.** *Cybaeus kumadori*, sp. nov., male holotype (KUZ Z3004: *A, B*) and female
1451 paratype (KUZ Z3007: *C, D*). (*A, C*) prosoma, dorsal; (*B, D*) abdomen, dorsal. Scale
1452 bars: 1 mm.

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1454 **Fig. 7.** *Cybaeus kumadori*, sp. nov., male holotype (KUZ Z3004: *A–E*) and female

1455 paratypes (KUZ Z2144: *G*; KUZ Z3007: *F*). (*A*) left palp, retrolateral; (*B*) tibia and
1456 patella (left palp), dorsal; (*C*) cymbium (left palp), dorsal; (*D*) cymbium and bulb (left
1457 palp), retrolateral; (*D*) bulb (left palp), ventral; (*H*) epigyne, ventral; (*I*) spermathecae,
1458 dorsal. Scale bars: (*A*) 500 μm ; (*B*) 250 μm ; (*C*–*G*) 200 μm .

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1460 **Fig. 8.** *Cybaeus yakushimensis*, sp. nov., male holotype (KUZ Z2998: *A, B*) and female
1461 paratype (KUZ Z3001: *C, D*). (*A, C*) prosoma, dorsal; (*B, D*) abdomen, dorsal. Scale
1462 bars: 1 mm.

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1464 **Fig. 9.** *Cybaeus yakushimensis*, sp. nov., male holotype (KUZ Z2998: *A–C*) and female
1465 paratypes (KUZ Z2138: *E*; KUZ Z3001: *D*). (*A*) left palp, retrolateral; (*B*) tibia and
1466 patella (left palp), dorsal; (*C*) tibia and patella (left palp), retrolateral; (*D*) epigyne,
1467 ventral; (*E*) spermathecae, dorsal. Scale bars: (*A*) 500 μm ; (*B–E*) 200 μm .

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1469 **Fig. 10.** *Cybaeus yakushimensis*, sp. nov., male holotype (KUZ Z2998: *A, D, G*);
1470 *Cybaeus amamiensis*, sp. nov., male holotype (KUZ Z2987: *B, E, H*); *Cybaeus*
1471 *tokunoshimensis* (KUZ Z2113: *C, F*). (*A–C*) cymbium (left palp), dorsal; (*D–F*) tibia
1472 (left palp), retro-dorsolateral; (*G, H*) bulb (left palp), ventral. Scale bars: (*A–C*) 250 μm ;
1473 (*D–H*) 200 μm .

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1475 **Fig. 11.** *Cybaeus kodama*, sp. nov., male holotype (KUZ Z3011: *A, B*) and female
1476 paratype (KUZ Z3013: *C, D, F*); *Cybaeus yakushimensis*, sp. nov., female from
1477 Hanayama Trail, Yakushima Island (KUZ Z3003; *E*) (*A, C*) prosoma, dorsal; (*B, D*)
1478 abdomen, dorsal; (*E, F*) habitus, dorsal. Scale bars: (*A–D*) 500 μm ; (*E, F*) 1 mm.

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1480 **Fig. 12.** *Cybaeus kodama*, sp. nov., male holotype (KUZ Z3011: *A–E*) and female
1481 paratypes (KUZ Z2142: *G*; KUZ Z3014: *F*). (*A*) left palp, retrolateral; (*B*) tibia and
1482 patella (left palp), dorsal; (*C*) tibia and patella (left palp), retrolateral; (*D*) cymbium (left
1483 palp), dorsal; (*E*) bulb (left palp), ventral; (*F*) epigyne, ventral; (*G*) spermathecae,
1484 dorsal. Scale bars: (*A, D, E*) 200 μm ; (*B, C, F, G*) 100 μm .

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1486 **Fig. 13.** *Cybaeus amamiensis*, sp. nov., male holotype (KUZ Z2987: *A, B*) and female

1487 paratype (KUZ Z2991: *C, D*). (*A, C*) prosoma, dorsal; (*B, D*) abdomen, dorsal. Scale
1488 bars: 1 mm.

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1490 **Fig. 14.** *Cybaeus amamiensis*, sp. nov., male holotype (KUZ Z2987: *A–C*) and female
1491 paratypes (KUZ Z2121: *E*; KUZ Z2991: *D*). (*A*) left palp, retrolateral; (*B*) tibia and
1492 patella (left palp), dorsal; (*C*) tibia and patella (left palp), retrolateral; (*D*) epigyne,
1493 ventral; (*E*) spermathecae, dorsal. Scale bars: (*A*) 500 μm ; (*B–E*) 200 μm .

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1495 **Fig. 15.** *Cybaeus aikana*, sp. nov., male holotype (KUZ Z3017: *A, B*) and female
1496 paratype (KUZ Z3018: *C*). (*A*) prosoma, dorsal; (*B*) abdomen, dorsal; (*C*) habitus,
1497 dorsal. Scale bars: (*A, B*) 500 μm ; (*C*) 1 mm.

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1499 **Fig. 16.** *Cybaeus aikana*, sp. nov., male holotype (KUZ Z3017). (*A*) left palp,
1500 retrolateral; (*B*) tibia and patella (left palp), dorsal; (*C*) cymbium (left palp), dorsal; (*D*)
1501 bulb (left palp), ventral; (*E*) conductor (left palp), proximal end, posteroventral. Scale
1502 bars: (*A, C*) 200 μm ; (*B, D, E*) 100 μm .

1503

1504 **Fig. 17.** *Cybaeus aikana*, sp. nov., female paratypes (KUZ Z2137: *B*; KUZ Z3018: *A*).
1505 (*A*) epigyne, ventral; (*B*) spermathecae, dorsal. Scale bars: 200 μm .

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1507 **Fig. 18.** *Cybaeus tokunoshimensis*, sp. nov., male holotype (KUZ Z2113: *A, B, E–H*)
1508 and female paratypes (KUZ Z2112: *J*; KUZ Z2994: *C, D*; KUZ Z2995: *I*). (*A, C*)
1509 prosoma, dorsal; (*B, D*) abdomen, dorsal; (*E*) left palp, retrolateral; (*F*) tibia and patella
1510 (left palp), dorsal; (*G*) tibia and patella (left palp), retrolateral; (*H*) bulb (left palp),
1511 ventral; (*I*) epigyne, ventral; (*J*) spermathecae, dorsal. Scale bars: (*A–D*) 1 mm; (*E*) 500
1512 μm ; (*F–J*) 200 μm .

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1514 **Fig. 19.** *Cybaeus hikidai*, sp. nov., male holotype (KUZ Z2982: *A, B, E–H*) and female
1515 paratypes (KUZ Z2107: *I, J*; KUZ Z2984: *C, D*). (*A, C*) prosoma, dorsal; (*B, D*)
1516 abdomen, dorsal; (*E*) left palp, retrolateral; (*F*) tibia and patella (left palp), dorsal; (*G*)
1517 cymbium (left palp), dorsal; (*H*) bulb (left palp), ventral; (*I*) epigyne, ventral; (*J*)
1518 spermathecae, dorsal. Scale bars: (*A–D*) 1 mm; (*E*) 500 μm ; (*F, H–J*) 200 μm ; (*G*) 250

1519 μm .

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1521 **Fig. 20.** *Cybaeus hikidai*, sp. nov., schematic drawing of epigyne and spermathecae.

1522 ventral (left) and dorsal (right), based on female paratype (KUZ Z2107).

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1524 **Fig. 21.** *Cybaeus hikidai*, sp. nov., epigyne, ventral. (A) paratype (KUZ Z2984); (B)

1525 female from Mt. Nagodake, Okinawa Island (KUZ Z2985); (C) paratype (KUZ Z2983).

1526 Scale bars: 200 μm .

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1528 **Fig. 22.** Retreats of *Cybaeus* spiders from the Ryukyu Islands. (A) *Cybaeus okumurai*,

1529 sp. nov., from Nishino-omote, Tanegashima Island; (B) *Cybaeus aikana*, sp. nov. from

1530 Mt. Yuwandake, Amamioshima Island; (C) *Cybaeus hikidai*, sp. nov. from Mt.

1531 Yonahadake, Okinawa Island.

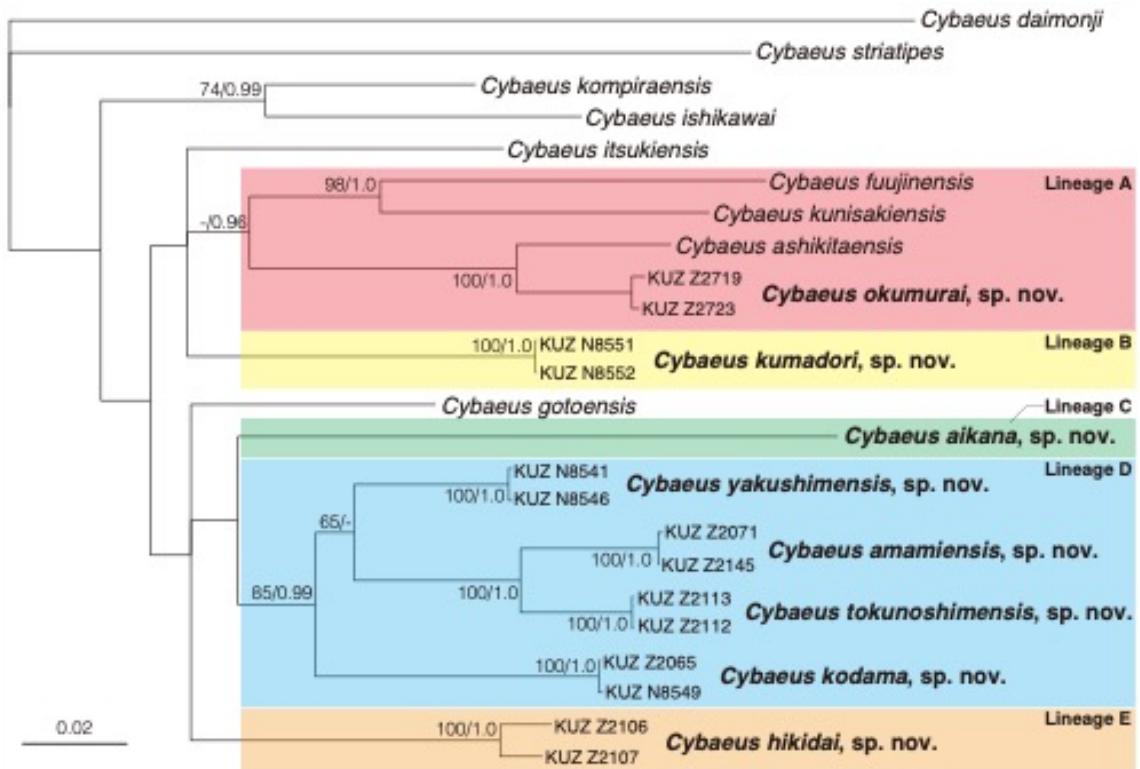
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1533 **Table 1. Samples with voucher numbers, collection locality and DDBJ accession**
1534 **numbers used for molecular analyses**

1535 Sequences marked with an asterisk (*) were obtained for the first time in the present

1536 study; KUZ, Zoological Collection of Kyoto University

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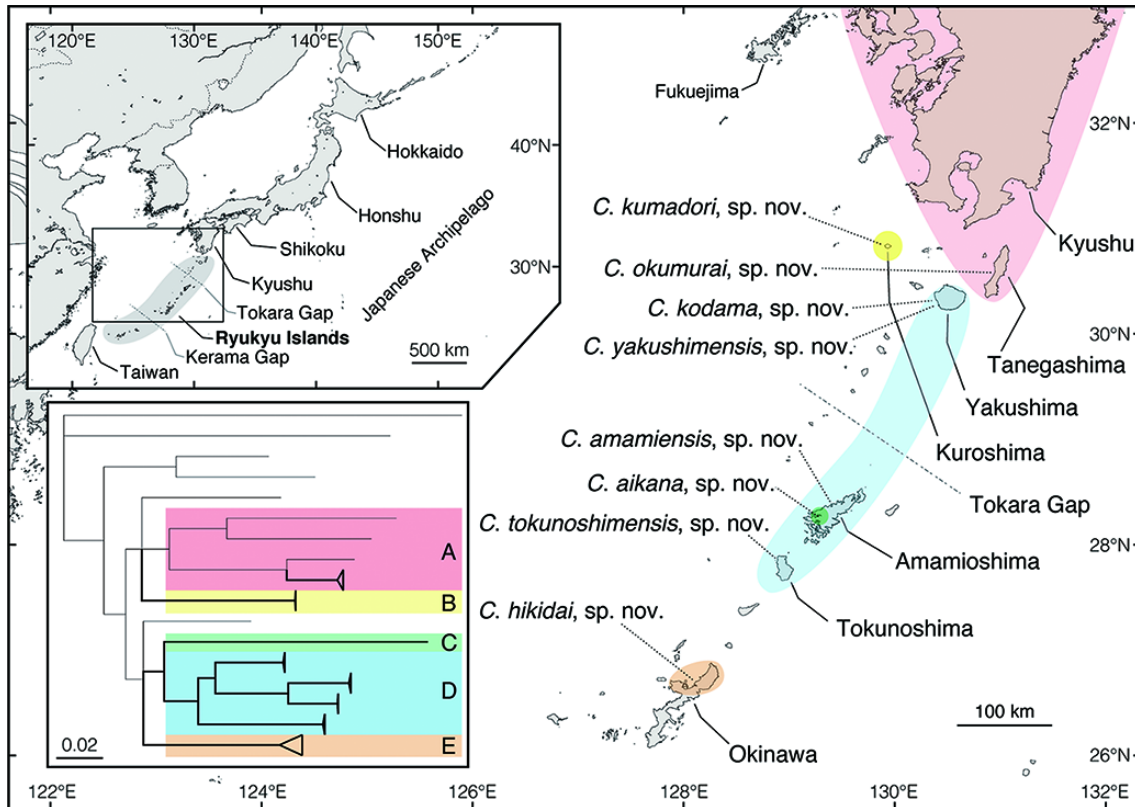
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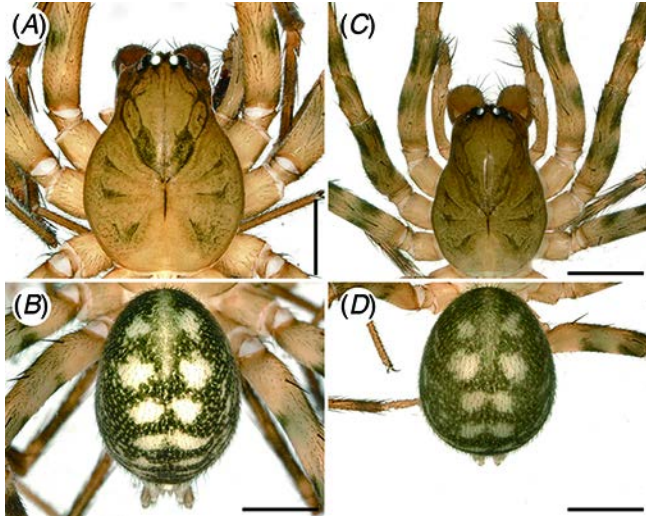
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Fig. 1. Bayesian inference tree (mean $\ln L = -10554.32$) for 3421 bp of nuclear histone H3, internal transcribed spacer 1, 28S rRNA, mitochondrial COI, 12S rRNA, and 16S rRNA markers. Numbers on nodes represent bootstrap values for maximum likelihood and Bayesian posterior probabilities.



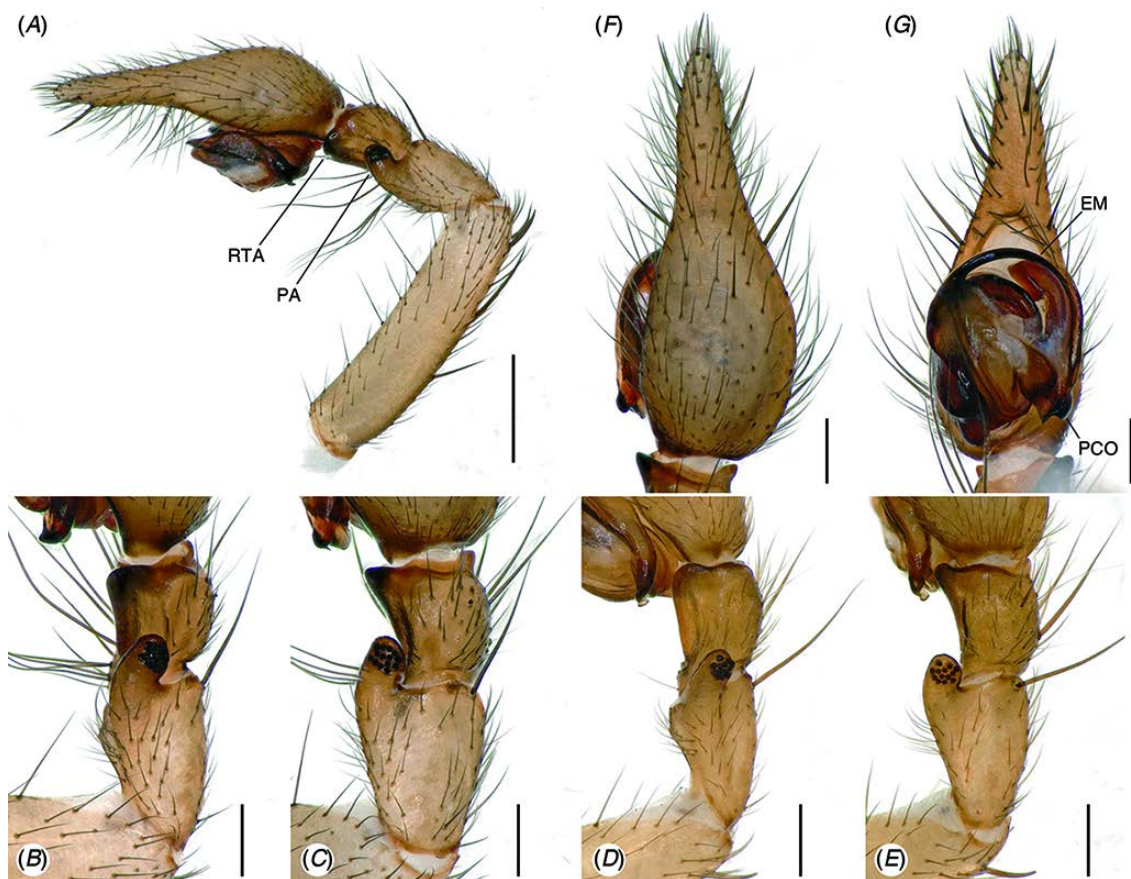
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Fig. 2. Map showing the distributions of the lineages that contain *Cybaeus* species in the Ryukyu Islands. Inset phylogeny is identical with that in Fig. 1. The map and lineages are colour-shaded to indicate the species collection localities. The map is based on Wessel and Smith (1996).



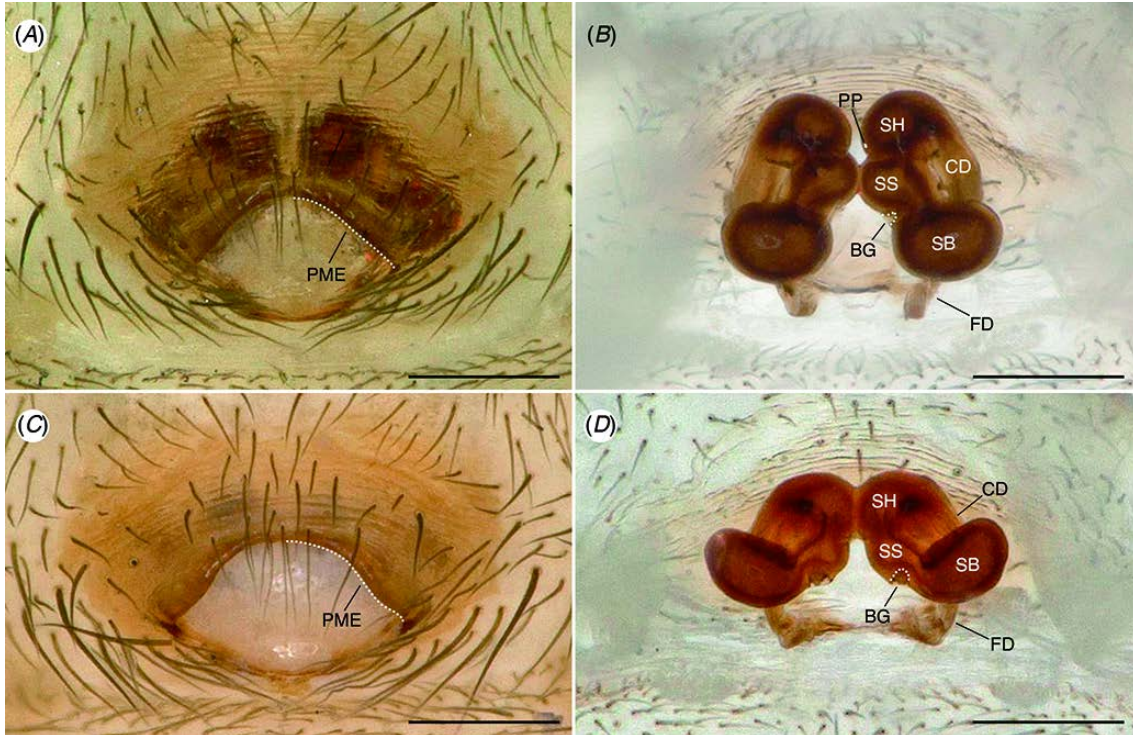
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Fig. 3. *Cybaeus okumurai*, sp. nov., male holotype (KUZ Z3019: A, B) and female paratype (KUZ Z3024: C, D). (A, C) prosoma, dorsal; (B, D) abdomen, dorsal. Scale bars: 1 mm.



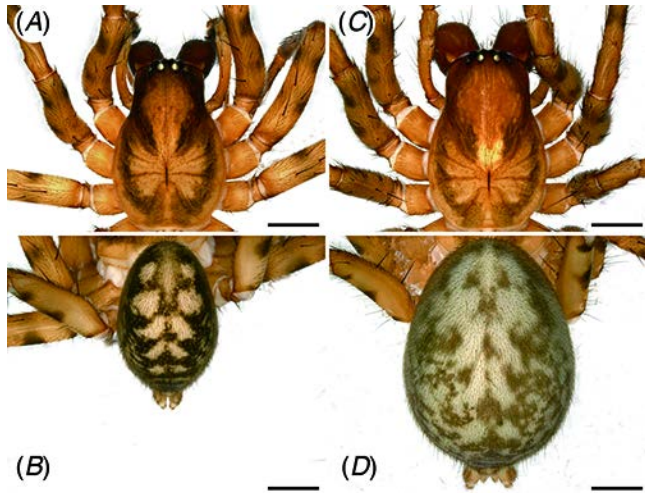
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Fig. 4. *Cybaeus okumurai*, sp. nov., male holotype (KUZ Z3019: A–C, F, G); *Cybaeus ashikitaensis* (Komatsu), male from Ashikita, Kyushu Island (KUZ Z3675: D, E). (A) left palp, retrolateral; (B, D) tibia and patella (left palp), retrolateral; (C, E) tibia and patella (left palp), retro-dorsolateral; (F) cymbium (left palp), dorsal; (G) cymbium (left palp), ventral. Scale bars: (A) 500 μm ; (B–G) 200 μm .



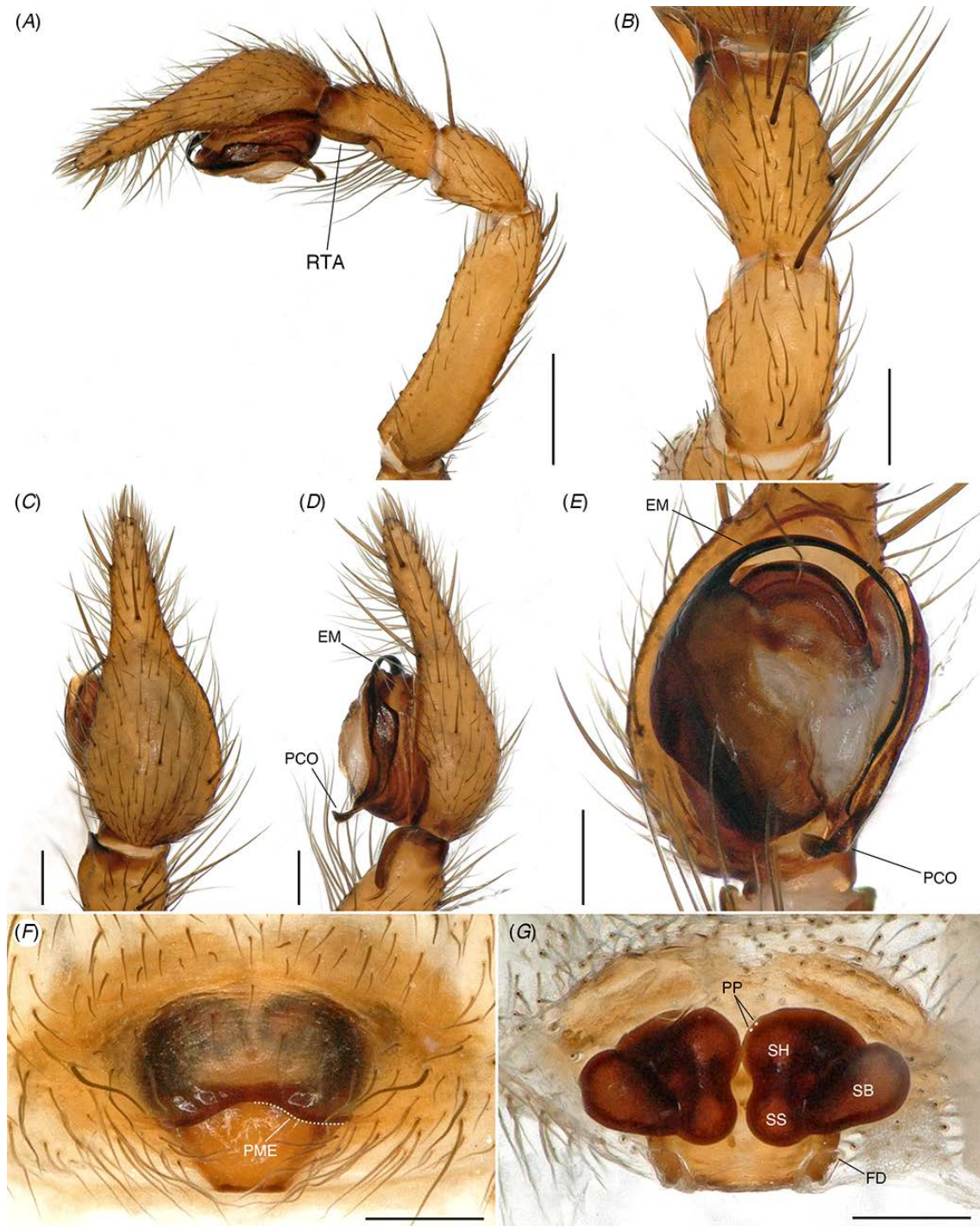
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Fig. 5. *Cybaeus okumurai*, sp. nov., female paratypes (KUZ Z3023: A; KUZ Z3025: B); *Cybaeus ashikitaensis* (Komatsu), females from Ebino (KUZ Z3676: C) and Ashikita (KUZ Z3677: D), Kyushu Island. (A, C) epigyne, ventral; (B, D) spermathecae, dorsal. Scale bars: 200 μ m.



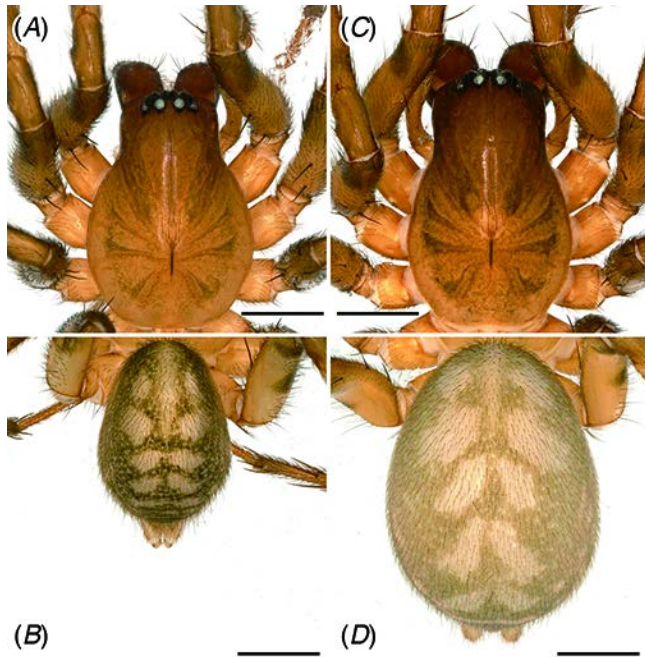
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Fig. 6. *Cybaeus kumadori*, sp. nov., male holotype (KUZ Z3004: A, B) and female paratype (KUZ Z3007: C, D). (A, C) prosoma, dorsal; (B, D) abdomen, dorsal. Scale bars: 1 mm.



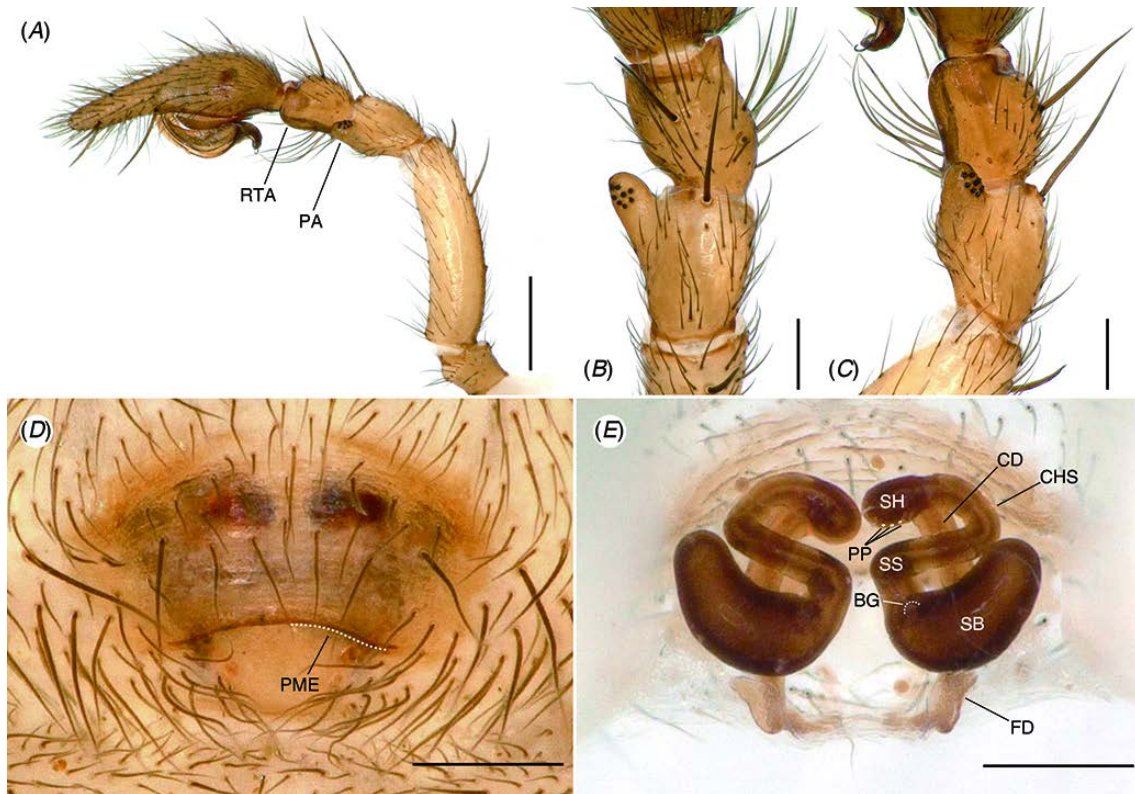
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Fig. 7. *Cybaeus kumadori*, sp. nov., male holotype (KUZ Z3004: A–E) and female paratypes (KUZ Z2144: G; KUZ Z3007: F). (A) left palp, retrolateral; (B) tibia and patella (left palp), dorsal; (C) cymbium (left palp), dorsal; (D) cymbium and bulb (left palp), retrolateral; (E) bulb (left palp), ventral; (F) epigyne, ventral; (G) spermathecae, dorsal. Scale bars: (A) 500 μ m; (B) 250 μ m; (C–G) 200 μ m.



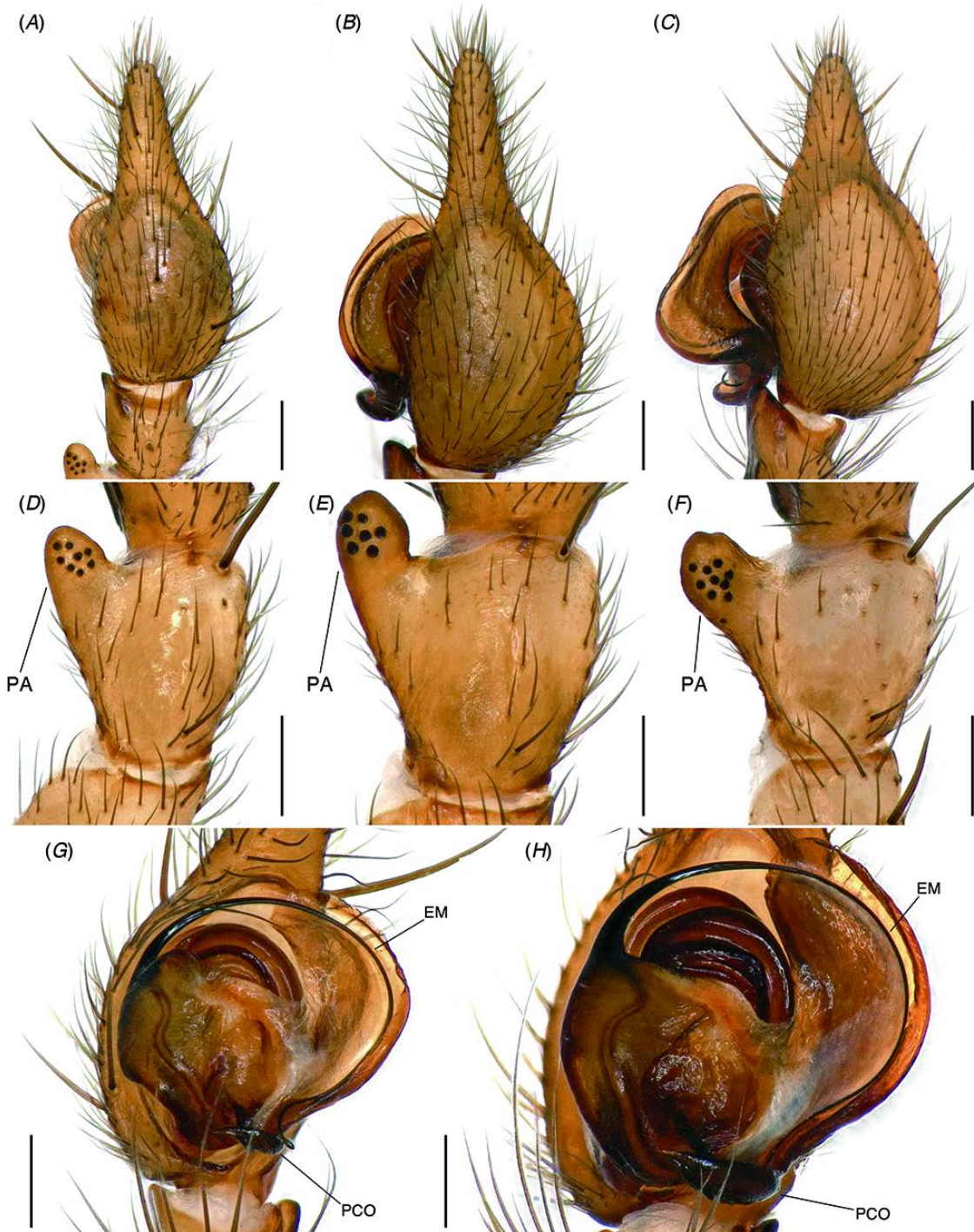
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Fig. 8. *Cybaeus yakushimensis*, sp. nov., male holotype (KUZ Z2998: A, B) and female paratype (KUZ Z3001: C, D). (A, C) prosoma, dorsal; (B, D) abdomen, dorsal. Scale bars: 1 mm.

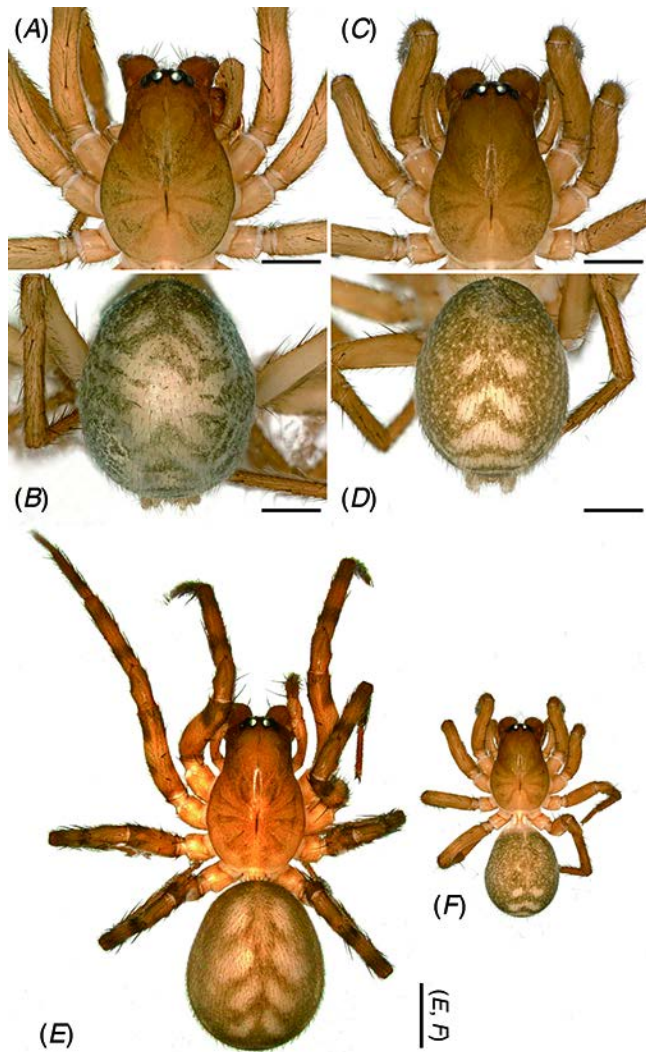


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Fig. 9. *Cybaeus yakushimensis*, sp. nov., male holotype (KUZ Z2998: A–C) and female paratypes (KUZ Z2138: E; KUZ Z3001: D). (A) left palp, retrolateral; (B) tibia and patella (left palp), dorsal; (C) tibia and patella (left palp), retrolateral; (D) epigyne, ventral; (E) spermathecae, dorsal. Scale bars: (A) 500 μ m; (B–E) 200 μ m.

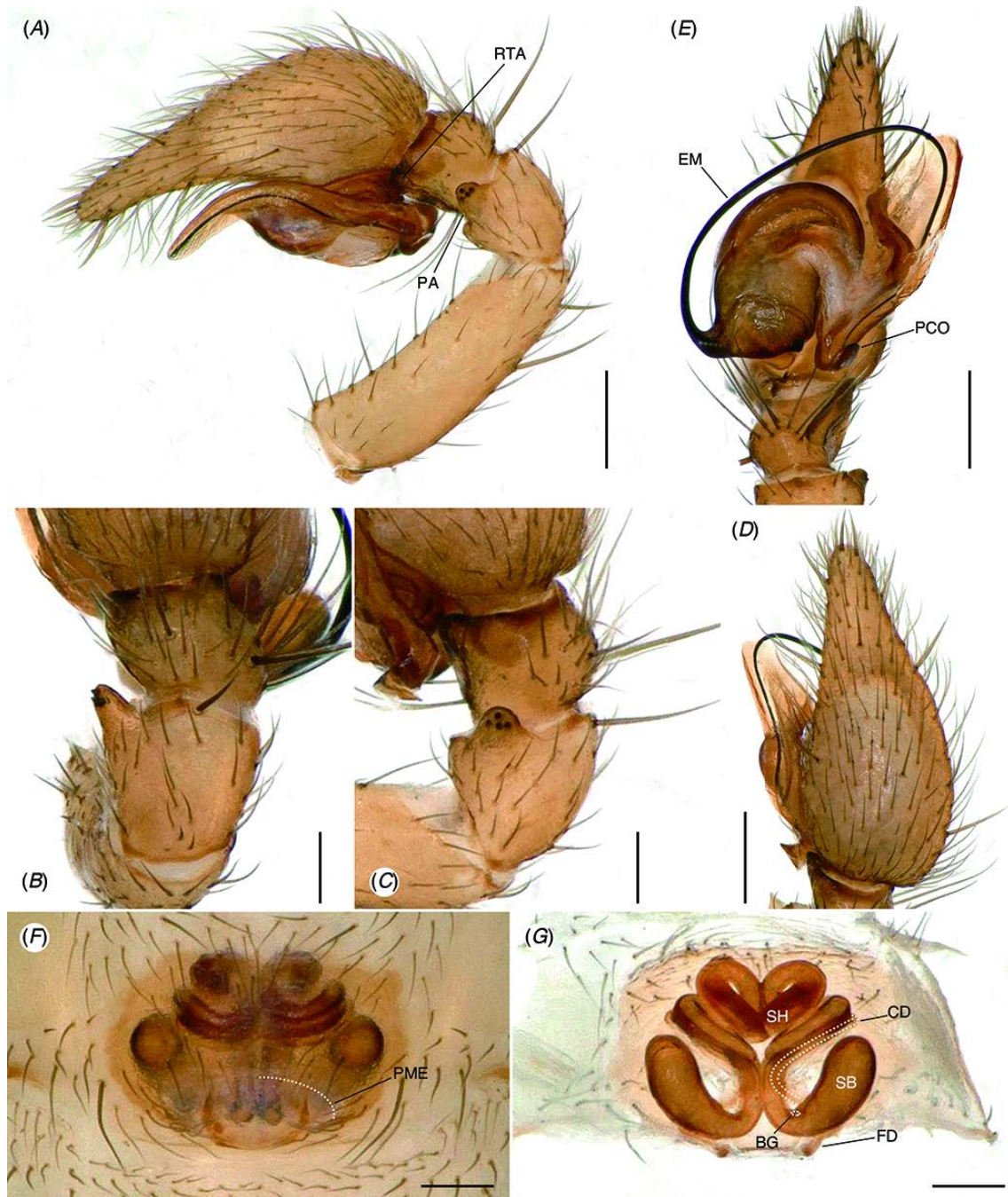


1591 **Fig. 10.** *Cybaeus yakushimensis*, sp. nov., male holotype (KUZ Z2998: A, D, G);
 1592 *Cybaeus amamiensis*, sp. nov., male holotype (KUZ Z2987: B, E, H); *Cybaeus*
 1593 *tokunoshimensis* (KUZ Z2113: C, F). (A–C) cymbium (left palp), dorsal; (D–F) tibia
 1594 (left palp), retro-dorsolateral; (G, H) bulb (left palp), ventral. Scale bars: (A–C) 250 μ m;
 1595 (D–H) 200 μ m.
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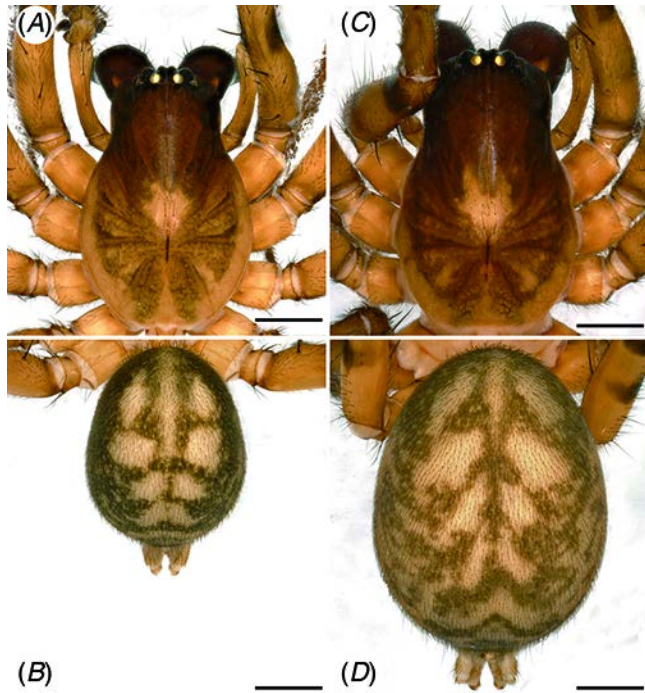


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Fig. 11. *Cybaeus kodama*, sp. nov., male holotype (KUZ Z3011: *A, B*) and female paratype (KUZ Z3013: *C, D, F*); *Cybaeus yakushimensis*, sp. nov., female from Hanayama Trail, Yakushima Island (KUZ Z3003; *E*) (*A, C*) prosoma, dorsal; (*B, D*) abdomen, dorsal; (*E, F*) habitus, dorsal. Scale bars: (*A–D*) 500 μ m; (*E, F*) 1 mm.

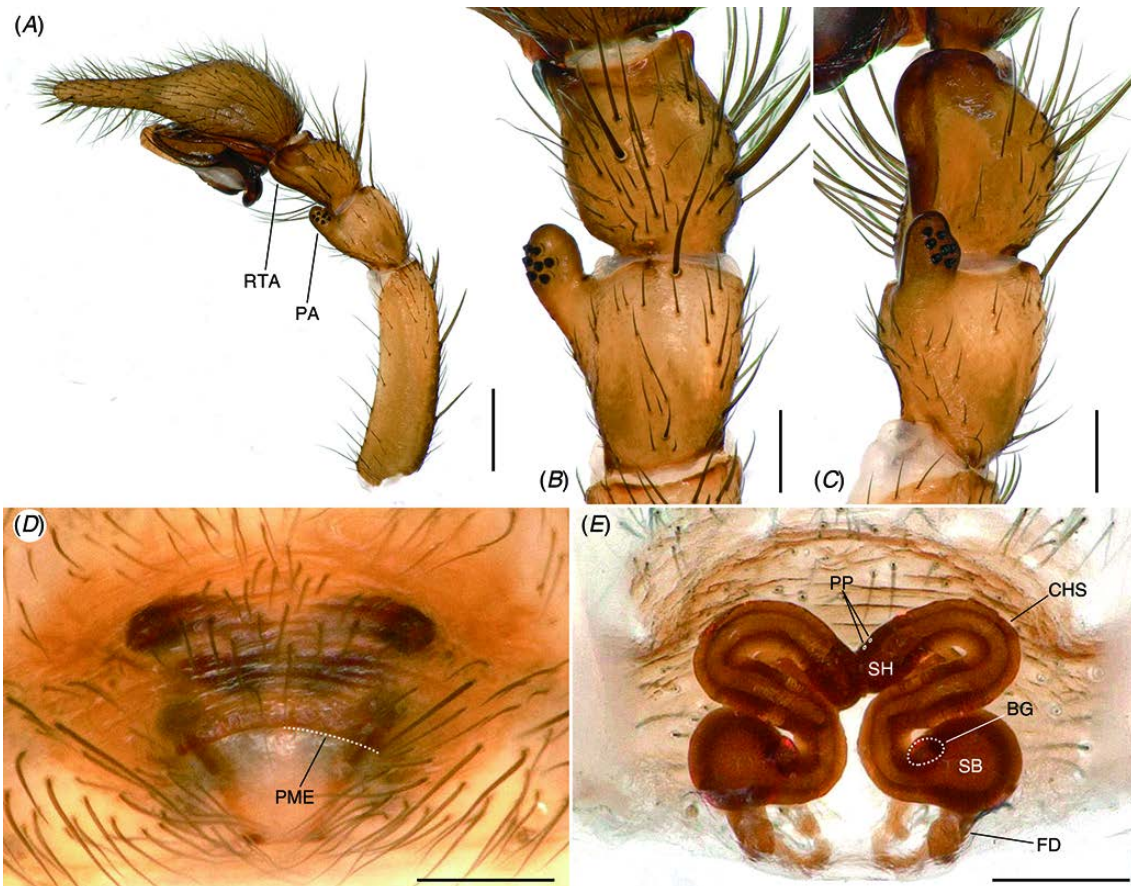


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 1605 **Fig. 12.** *Cybaeus kodama*, sp. nov., male holotype (KUZ Z3011: A–E) and female
 1606 paratypes (KUZ Z2142: G; KUZ Z3014: F). (A) left palp, retrolateral; (B) tibia and
 1607 patella (left palp), dorsal; (C) tibia and patella (left palp), retrolateral; (D) cymbium (left
 1608 palp), dorsal; (E) bulb (left palp), ventral; (F) epigyne, ventral; (G) spermathecae,
 1609 dorsal. Scale bars: (A, D, E) 200 μ m; (B, C, F, G) 100 μ m.
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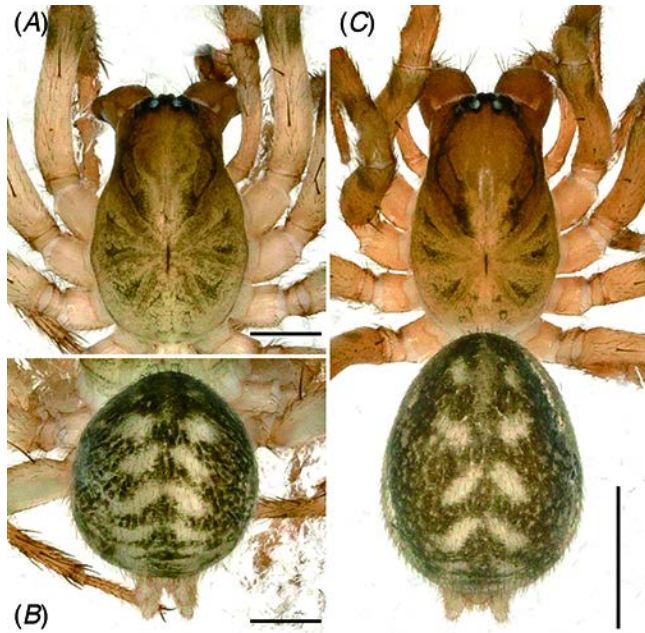


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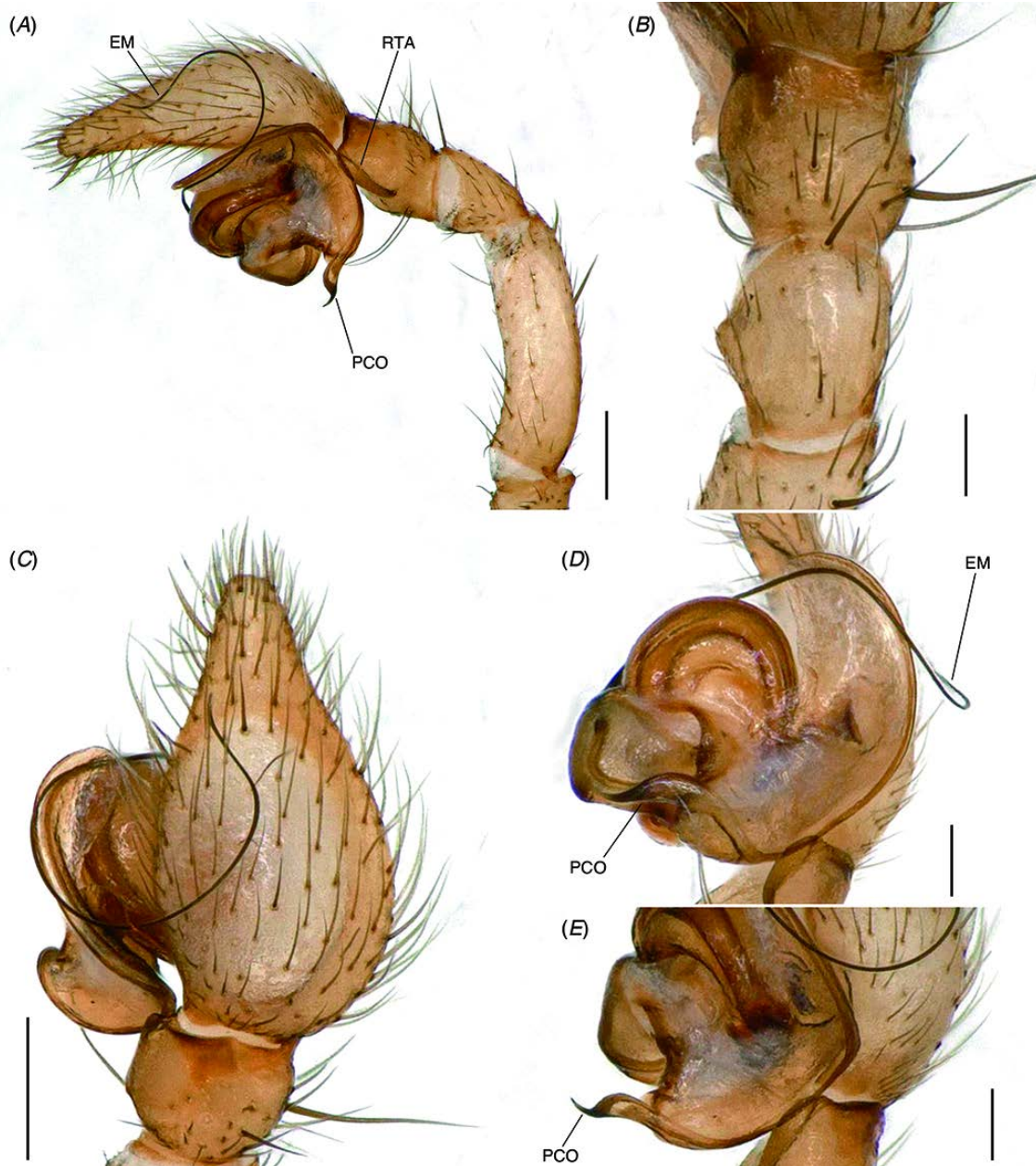
Fig. 13. *Cybaeus amamiensis*, sp. nov., male holotype (KUZ Z2987: A, B) and female paratype (KUZ Z2991: C, D). (A, C) prosoma, dorsal; (B, D) abdomen, dorsal. Scale bars: 1 mm.



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 1617 **Fig. 14.** *Cybaeus amamiensis*, sp. nov., male holotype (KUZ Z2987: A–C) and female
 1618 paratypes (KUZ Z2121: E; KUZ Z2991: D). (A) left palp, retrolateral; (B) tibia and
 1619 patella (left palp), dorsal; (C) tibia and patella (left palp), retrolateral; (D) epigyne,
 1620 ventral; (E) spermathecae, dorsal. Scale bars: (A) 500 μm ; (B–E) 200 μm .
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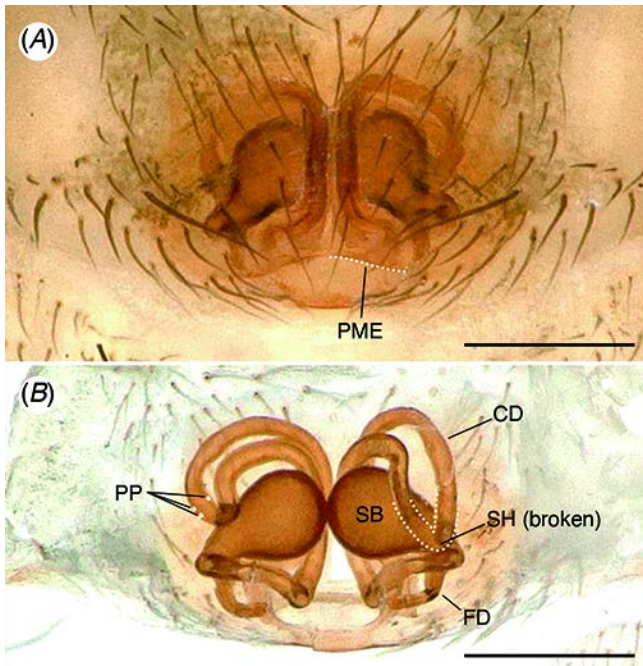


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1623 **Fig. 15.** *Cybaeus aikana*, sp. nov., male holotype (KUZ Z3017: *A*, *B*) and female
1624 paratype (KUZ Z3018: *C*). (*A*) prosoma, dorsal; (*B*) abdomen, dorsal; (*C*) habitus,
1625 dorsal. Scale bars: (*A*, *B*) 500 μ m; (*C*) 1 mm.
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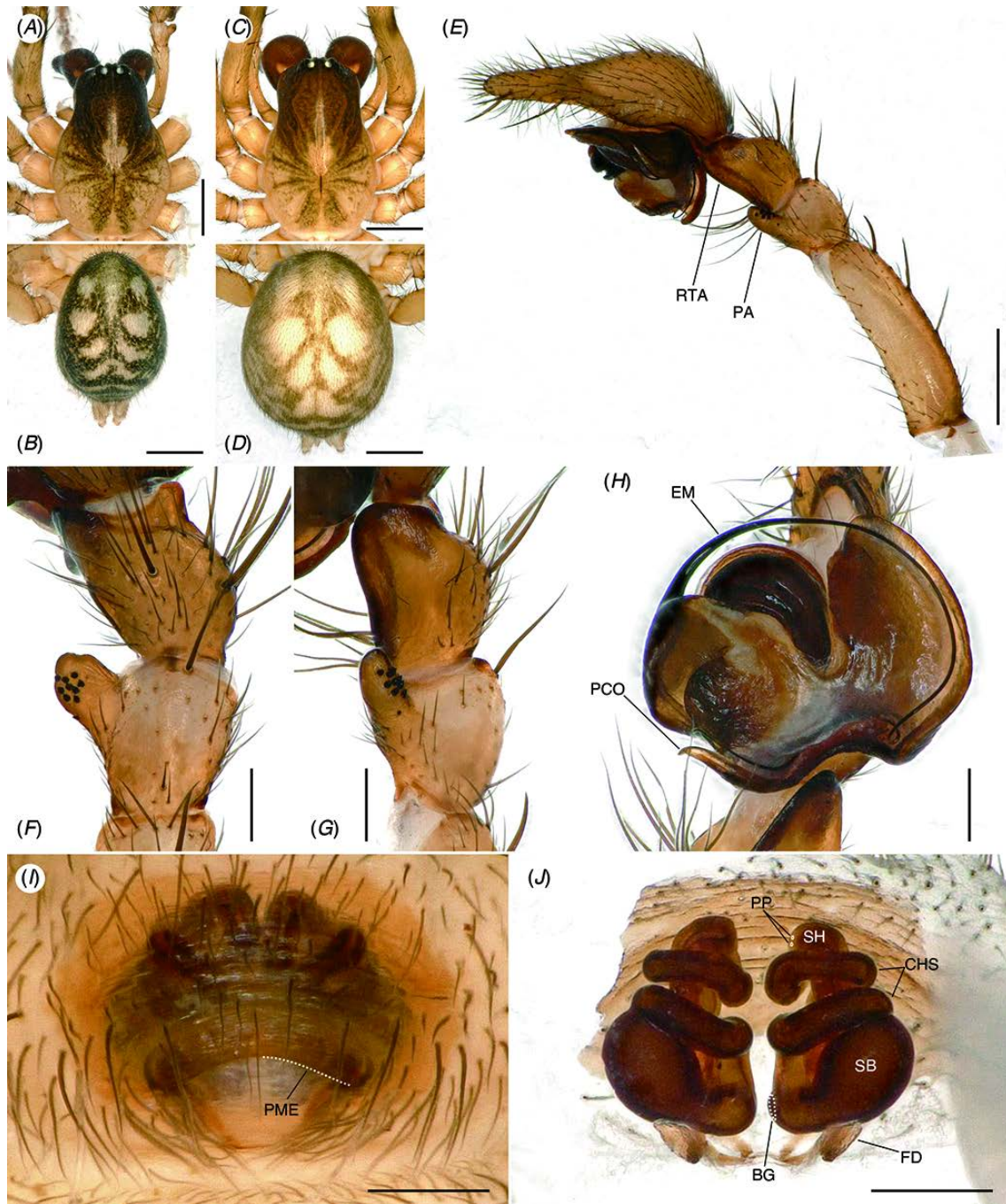
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Fig. 16. *Cybaeus aikana*, sp. nov., male holotype (KUZ Z3017). (A) left palp, retrolateral; (B) tibia and patella (left palp), dorsal; (C) cymbium (left palp), dorsal; (D) bulb (left palp), ventral; (E) conductor (left palp), proximal end, posteroventral. Scale bars: (A, C) 200 μ m; (B, D, E) 100 μ m.



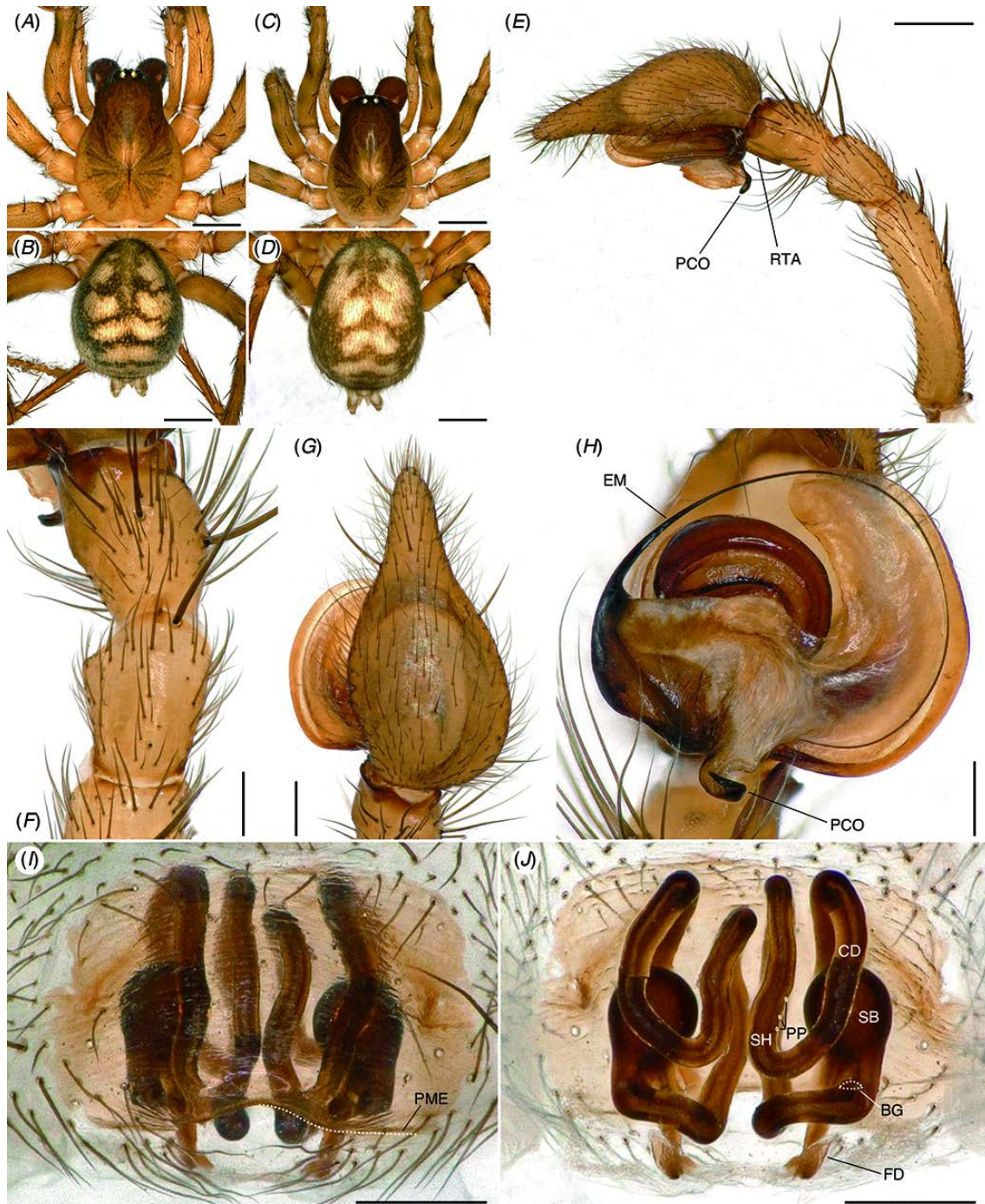
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Fig. 17. *Cybaeus aikana*, sp. nov., female paratypes (KUZ Z2137: B; KUZ Z3018: A). (A) epigyne, ventral; (B) spermathecae, dorsal. Scale bars: 200 μm .



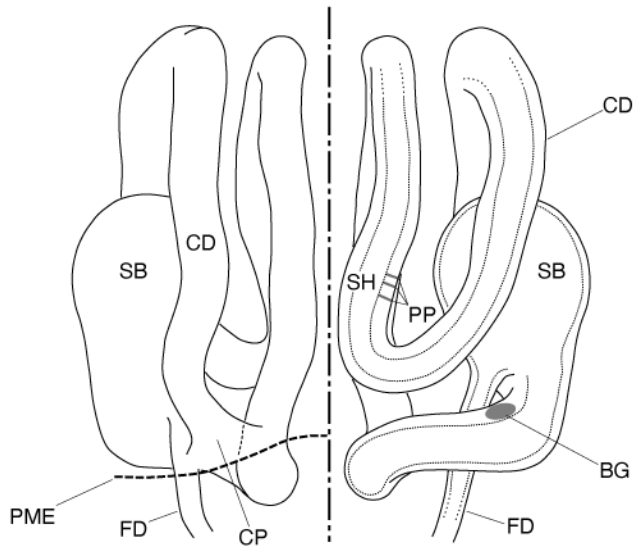
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Fig. 18. *Cybaeus tokunoshimensis*, sp. nov., male holotype (KUZ Z2113: A, B, E–H) and female paratypes (KUZ Z2112: J; KUZ Z2994: C, D; KUZ Z2995: I). (A, C) prosoma, dorsal; (B, D) abdomen, dorsal; (E) left palp, retrolateral; (F) tibia and patella (left palp), dorsal; (G) tibia and patella (left palp), retrolateral; (H) bulb (left palp), ventral; (I) epigyne, ventral; (J) spermathecae, dorsal. Scale bars: (A–D) 1 mm; (E) 500 μ m; (F–J) 200 μ m.



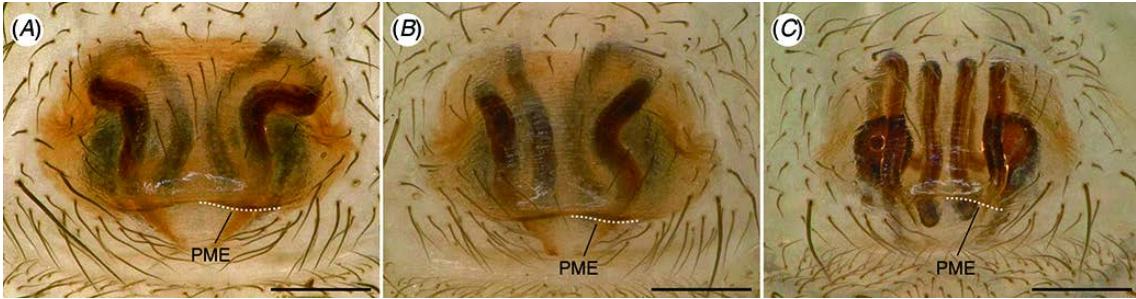
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Fig. 19. *Cybaeus hikidai*, sp. nov., male holotype (KUZ Z2982: A, B, E–H) and female paratypes (KUZ Z2107: I, J; KUZ Z2984: C, D). (A, C) prosoma, dorsal; (B, D) abdomen, dorsal; (E) left palp, retrolateral; (F) tibia and patella (left palp), dorsal; (G) cymbium (left palp), dorsal; (H) bulb (left palp), ventral; (I) epigyne, ventral; (J) spermathecae, dorsal. Scale bars: (A–D) 1 mm; (E) 500 μ m; (F, H–J) 200 μ m; (G) 250 μ m.



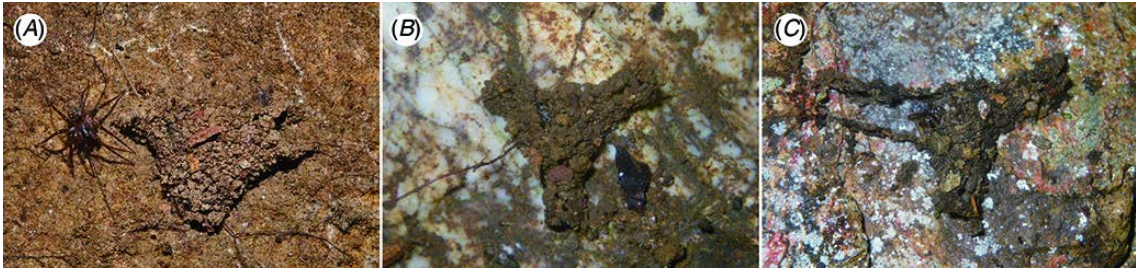
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Fig. 20. *Cybaeus hikidai*, sp. nov., schematic drawing of epigyne and spermathecae. ventral (left) and dorsal (right), based on female paratype (KUZ Z2107).



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Fig. 21. *Cybaeus hikidai*, sp. nov., epigyne, ventral. (A) paratype (KUZ Z2984); (B) female from Mt. Nagodake, Okinawa Island (KUZ Z2985); (C) paratype (KUZ Z2983). Scale bars: 200 μ m.



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Fig. 22. Retreats of *Cybaeus* spiders from the Ryukyu Islands. (A) *Cybaeus okumurai*, sp. nov., from Nishino-omote, Tanegashima Island; (B) *Cybaeus aikana*, sp. nov. from Mt. Yuwandake, Amamioshima Island; (C) *Cybaeus hikidai*, sp. nov. from Mt. Yonahadake, Okinawa Island.

1667 **Table 1. Samples with voucher numbers, collection locality and DDBJ accession numbers used for molecular analyses**
 1668 Sequences marked with an asterisk (*) were obtained for the first time in the present study; KUZ, Zoological Collection of Kyoto
 1669 University

Taxa	Voucher #	Locality	28S rRNA	ITS1	Histone H3	COI	12S rRNA	16S rRNA
<i>Cybaeus okumurai</i> , sp. nov.	KUZ Z2719	Kunigami, Nishinoomote, Tanegashima Island	LC552280*	LC552282*	LC552281*		LC552279*	
<i>Cybaeus okumurai</i> , sp. nov.	KUZ Z2723	Nakanoshimo, Minamitane, Tanegashima Island	LC552283*	LC552285*	LC552284*			
<i>Cybaeus yakushimensis</i> , sp. nov.	KUZ Z2138	Shiratani-unsuiyko Valley, Yakushima Island	LC552207*	LC552209*	LC552208*		LC552205*	LC552206*
<i>Cybaeus yakushimensis</i> , sp. nov.	KUZ Z2140	Hanayama Trail, Kurio, Yakushima Island	LC552212*	LC552214*	LC552213*		LC552210*	LC552211*
<i>Cybaeus kodama</i> , sp. nov.	KUZ Z2141	Hanayama Trail, Kurio, Yakushima Island	LC552215*	LC552218*	LC552217*	LC552216*		
<i>Cybaeus kodama</i> , sp. nov.	KUZ Z2142	Hanayama Trail, Kurio, Yakushima Island	LC552219*	LC552222*	LC552221*	LC552220*		
<i>Cybaeus kumadori</i> , sp. nov.	KUZ Z2143	Mt. Yaguradake, Kuroshima Island, Mishima Islands	LC552225*	LC552228*	LC552227*	LC552226*	LC552223*	LC552224*
<i>Cybaeus kumadori</i> , sp. nov.	KUZ Z2144	Mt. Yaguradake, Kuroshima Island, Mishima Islands	LC552230*	LC552233*	LC552232*	LC552231*	LC552229*	
<i>Cybaeus amamiensis</i> , sp. nov.	KUZ Z2120	Mt. Yuwandake, Amamioshima Island	LC552236*	LC552239*	LC552238*	LC552237*	LC552234*	LC552235*
<i>Cybaeus amamiensis</i> , sp. nov.	KUZ Z2121	Mt. Yuwandake, Amamioshima Island	LC552242*	LC552245*	LC552244*	LC552243*	LC552240*	LC552241*
<i>Cybaeus aikana</i> , sp. nov.	KUZ Z2137	Mt. Yuwandake, Amamioshima Island	LC552248*		LC552250*	LC552249*	LC552246*	LC552247*
<i>Cybaeus tokunoshimensis</i> , sp. nov.	KUZ Z2112	Mt. Inokawadake, Tokunoshima Island	LC552258*	LC552261*	LC552260*	LC552259*	LC552257*	
<i>Cybaeus tokunoshimensis</i> , sp. nov.	KUZ Z2113	Mt. Inokawadake, Tokunoshima Island	LC552253*	LC552256*	LC552255*	LC552254*	LC552251*	LC552252*
<i>Cybaeus hikidai</i> , sp. nov.	KUZ Z2106	Mt. Nagodake, Nago, Okinawajima Island	LC552264*	LC552267*	LC552266*	LC552265*	LC552262*	LC552263*
<i>Cybaeus hikidai</i> , sp. nov.	KUZ Z2107	Hiji-otaki Fall, Kunigami, Okinawajima Island	LC552270*	LC552273*	LC552272*	LC552271*	LC552268*	LC552269*
<i>Cybaeus ashikitaensis</i>	KUZ Z2213	Itsuki, Kumamoto, Kyushu	LC552192*	LC552195*	LC552194*	LC552193*	LC552191*	
<i>Cybaeus daimonji</i>	KUZ Z2755	Mt. Daimonjiyama, Kyoto, Honshu	LC529207	LC529208	LC529206	LC529209	LC529211	LC529210
<i>Cybaeus fuujinensis</i>	KUZ Z2199	Fujindo Cave, Kumamoto, Kyushu	LC552187*	LC552190*	LC552189*	LC552188*	LC552186*	
<i>Cybaeus gotoensis</i>	KUZ Z2251	Iana Cave, Fukuejima Island, Goto Islands	LC552201*	LC552204*	LC552203*	LC552202*		
<i>Cybaeus ishikawai</i>	KUZ Z2715	near Ryugado Cave, Kochi, Shikoku	LC552276*	LC552278*	LC552277*		LC552274*	LC552275*

<i>Cybaeus itsukiensis</i>	KUZ Z2184	Tsuzurasedo Cave, Kumamoto, Kyushu	LC552182*	LC552185*	LC552184*	LC552183*	
<i>Cybaeus kompiraensis</i>	KUZ Z2317	Kompirado Cave, Kochi, Shikoku	LC552179*	LC552181*	LC552180*	LC552178*	
<i>Cybaeus kunisakiensis</i>	KUZ Z2303	Mt. Futagosan, Oita, Kyushu	LC552197*	LC552200*	LC552199*	LC552198*	LC552196*
<i>Cybaeus striatipes</i>	KUZ Z2718	Mt. Rausudake, Shari, Hokkaido	LC552174*	LC552177*	LC552176*	LC552175*	

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