

***Erranticosa* gen. nov.: a New Genus of Wolf Spiders from East Asia with Notes on its Separation from *Lycosa* and *Hogna* (Araneae Lycosidae: Lycosinae)**

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The taxonomy and systematic position of the Eastern Asian wolf spider *Lycosa coelestis* L. Koch, 1878 are revised using an integrative approach. Our study highlights distinctive morphological and molecular differences that separate this species from the generotypes of *Lycosa* Sundevall, 1833 and *Hogna* Simon, 1885, to which *L. coelestis* was previously assigned. Based on these findings, we establish a new monotypic genus, *Erranticosa* gen. nov., to accommodate this species, namely *E. coelestis* comb. nov. We also discuss the results of a preliminary molecular phylogenetic analysis of the subfamily Lycosinae, including *Erranticosa* gen. nov. Additionally, based on morphological examination of the type material, we reject the synonymy of *Lycosa subcoelestis* Fox, 1935 with *E. coelestis* comb. nov., transferring it to *Trochosa* C.L. Koch, 1847 as a valid full species, and we establish the new combination, i.e., *T. subcoelestis* (Fox, 1935) comb. nov. At the same time, we synonymize *Foxicosa* Roewer, 1960 (type species: *Lycosa subcoelestis* Fox, 1935), previously considered a junior synonym of *Lycosa*, with *Trochosa*. Our findings highlight the need for an integrative taxonomic and systematic revision of Asian lycosid taxa, as many may be overlooked or misclassified.

Keywords: Aranei, Asia, *Hogna*, Integrative systematics, *Lycosa*

BACKGROUND

Lycosidae Sundevall, 1833, commonly known as wolf spiders, is the fifth-largest family for number of species within the order Araneae Clerck, 1757 (WSC 2026). This family exhibits a global distribution, spanning from Northernmost Greenland to the southernmost regions of South America. Among the megadiverse spider families, Lycosidae displays

remarkable somatic uniformity, ranking as the second least genus-diverse family, having a ratio of 18.0 species per genus in contrast to an average ratio of 13.2 in the entire order. Among the most speciose spider families, only Theridiidae Sundevall, 1833 and Pholcidae C. L. Koch, 1850 show a higher ratio with 19.5 and 21.1 species per genus, respectively (WSC 2026).

Lycosa Latreille, 1804 is the type genus of the family Lycosidae, and one of the most speciose,

currently comprising 217 accepted species with an almost global distribution (WSC 2026). This genus includes medium to large-sized spiders and charismatic species like the Southern-European “true tarantula” *Lycosa tarantula* (Linnaeus, 1758), the type species of the genus. Similarly, *Hogna* Simon, 1885 is another species-rich genus of large-sized lycosids with a near-worldwide distribution currently numbering 232 valid species (WSC 2026). The West-Palaeartic-distributed species *H. radiata* (Latreille, 1817) serves as the nominal species of this genus.

Both genera display their highest diversity in the Palaeartic and have long been considered paraphyletic by modern taxonomists, as they both involve species with clear differences in the morphology of copulatory organs. *Lycosa* in particular has often been used as a wastebasket taxon for large-sized lycosids whose systematic position within the family was unclear (Ballarin et al. 2026). Additionally, both the type species of *Lycosa* and *Hogna* have been affected by poor descriptions, lack of figures, and numerous synonyms representing potentially valid species, thus further confusing the classification of these genera. Only very recently has this issue been resolved for *L. tarantula* through a detailed redescription of the species and the designation of a neotype (Ballarin et al. 2026).

Recent analyses based on molecular data further supported the paraphyly of both *Lycosa* and *Hogna* (Murphy et al. 2006; Piacentini and Ramírez 2019; Crespo et al. 2022; Kulkarni et al. 2023). However, the phylogenetic positions of numerous species of these genera within the Lycosinae remain unclear. Although the taxonomic status of some *Hogna* species and the phylogeny of the Mediterranean *Lycosa* have been partially resolved using molecular data (Planas et al. 2013; Crespo et al. 2022), a comprehensive integrative taxonomic and systematic revision of both genera has yet to be conducted. As a result, the genus boundaries for both *Hogna* and *Lycosa* remain unclear, with several species worldwide still likely being misplaced (WSC 2026, Ballarin et al. 2026). Such a situation is not uncommon in Lycosidae, and it is also observed in other genera of Lycosinae (i.e., *Alopecosa* Simon, 1885) and in other subfamilies (i.e., *Arctosa* C.L. Koch, 1847 in Tricassinae Alderweireldt and Jocqué, 1993 or *Pardosa* C.L. Koch, 1847 in Pardosinae Simon, 1898) (see for example, Murphy et al. 2006 or Kulkarni et al. 2023). For instance, several species traditionally included in *Pardosa*, have been recently transferred into genera of different subfamilies (WSC 2026), and some species groups should probably be elevated to distinct genera (see for example, Marusik and Ballarin 2011).

Over time, several large-sized lycosid species discovered in Asia have been attributed either to

Lycosa or *Hogna* without properly comparing the diagnostic characters, particularly their copulatory organs (for *Lycosa* see for example, Ballarin et al. 2026). This is partly attributable to the conservative morphology of lycosids and the previous absence of published illustrations and detailed descriptions of the generotypes’ diagnostic characters in both *Lycosa* and *Hogna*. The inclusion of high-quality illustrations of dissected copulatory organs is a relatively recent addition to spider taxonomy and was often overlooked in old descriptions.

A notable case of taxonomic confusion can be observed in *Lycosa coelestis* L. Koch, 1878, a species widely distributed in Eastern Asia that has been progressively assigned to either *Lycosa* (see Koch 1878 and Tanaka 1990) or *Hogna* (see Roewer 1955). Roewer (1960) established the genus *Foxicosa* Roewer, 1960 to accommodate the species *L. subcoelestis* Fox, 1935 from China. This species was later synonymized with *L. coelestis* by Chen and Gao (1990), although they did not provide a reason for the synonymization. Consequently, *Foxicosa*, along with three other genera established by Roewer (e.g., *Allohogna* Roewer, 1955, *Ishicosa* Roewer, 1960, and *Mimohogna* Roewer, 1960, refer to WSC 2026) are regarded as junior synonyms of *Lycosa*. This classification has not been conclusively verified, nor has the phylogenetic relationship of *L. coelestis* with *Lycosa* or *Hogna* been tested.

During recent surveys in Japan and Taiwan, we had the opportunity to collect and check in detail several individuals of *L. coelestis*. Additional photos of samples from mainland China were also reviewed by us. A detailed examination of the copulatory organs of both sexes revealed deep differences with those of the generotypes of *Lycosa* or *Hogna*. A comparison with the original description of *L. subcoelestis* also revealed wide morphological differences that suggest the two species’ synonymization is likely invalid.

In this study, we use *L. coelestis* as a representative case of the numerous Asian lycosid taxa with confusing systematic in strong need of clarification. To address this issue, we propose an integrative approach combining morphological and molecular information. In particular, we aim to: (i) redefine the morphological diagnostic characters of *L. coelestis* based on specimens from different localities, including the type locality, and compare them with those of *L. tarantula* and *H. radiata* from Europe; ii) use molecular data to test the phylogenetic position of *L. coelestis* within Lycosinae and confirm its separation from *Lycosa* and *Hogna*, and (iii) establish a new genus to accommodate the species. Additionally, (iv) we reexamine the type material of *L. subcoelestis* to check the validity of its synonym with *L. coelestis*.

MATERIALS AND METHODS

Taxon sampling and morphology

Specimens of *L. coelestis* used in this study were collected during surveys in Japan and Taiwan. The samples were handpicked and subsequently preserved in 99% ethanol for future morphological and molecular analysis. Specimens of *H. radiata* and *L. tarantula* were obtained from museum collections. Morphological examinations were conducted using a Nikon SMZ1270 stereo microscope at the Tokyo Metropolitan University, Japan. Palps and epigynes were dissected using a sharp needle. A small dish with white sand on the bottom was used to facilitate their observation and photography. Epigynes were cleared by immersing them in a hot 20% KOH solution for several minutes until their internal structures became visible. High-resolution photographs were obtained using a Canon EOS Kiss X8i digital camera mounted on the same microscope setup. The final images were assembled using Helicon Focus v.7 image stacking software (<https://www.heliconsoft.com>) and edited with Adobe Photoshop CC v.20.0.6 (<https://www.photoshop.com/>). Additional photographs of individuals from mainland China, provided by Chinese colleagues, were also examined for comparison. Photos of *Lycosa subcoelestis* from USNM were taken using a Visionary Digital system and stacked using Helicon Focus software. Measurements of leg segments were obtained by observing them from the lateral side and are reported as follows: total length, femur, patella, tibia, metatarsus, and tarsus. All measurements in the text are given in millimeters. Spination and ventral views of leg I of male and female are provided since these legs are frequently involved in courtship behavior in Lycosidae. When variation in the number of spines between the right and left legs is present, this is reported in parentheses.

Molecular analysis

To confirm the separation of *L. coelestis* from *Lycosa*, *Hogna*, and other taxa with general similarities in copulatory organs, we conducted a phylogenetic analysis including 68 species from 15 genera as ingroups, all belonging to Lycosinae. We preferentially focused on species currently attributed to *Lycosa* or *Hogna*. Sequences were harvested from GenBank (<https://www.ncbi.nlm.nih.gov/genbank/>) and BOLD (<http://www.boldsystems.org/>) online databases. We included six gene fragments, previously extensively used in phylogenetic studies on wolf spiders (Murphy et al. 2006; Planas et al. 2013; Piacentini and Ramírez 2019; Crespo et al. 2022): cytochrome *c* oxidase subunit I (*COI*), 16S rRNA and NADH dehydrogenase subunit 1 (16S and NADH), 12S rRNA (12S), 28S rRNA (28S), and histone 3 (H3). The 16S and NADH gene fragments were assembled as a single continuous sequence and considered as a single partition. One multilocus individual obtained from GenBank and newly generated sequences of *COI* barcode (650 bp, the Folmer region) of *L. coelestis* specimens from Japan and Taiwan were also included in the dataset. DNA was extracted from the muscular tissue of a leg fragment, and the Folmer region was amplified using standard barcode primers LCO1490 and HCO2198 (Folmer et al. 1994). DNA extraction, amplification, and sequencing protocols follow Ballarin and Eguchi (2023). Sequences of each gene fragment were visually checked and aligned using the online version of MAFFT software v. 7 (<https://mafft.cbrc.jp/alignment/server/>) under the Q-INS-I method. Hypervariable sites of the ribosomal genes that did not allow for reliable alignment were preferentially trimmed. The tree was rooted using *Allocosa senex* (Mello-Leitão, 1945), belonging to the Allocosinae, sister clade to Lycosinae (Piacentini and Ramírez 2019). All sequence accession codes are reported in table 1.

The phylogenetic tree was reconstructed under a Maximum Likelihood analysis in the IQ-TREE web server (<http://iqtree.cibiv.univie.ac.at/>). The analysis

Table 1. List of gene fragments used in the phylogenetic analysis and related GenBank or BOLD accession codes. Missing sequences are reported as “na”. New sequences are indicated by an asterisk

Species	<i>COI</i>	NADH	16S	12S	28S	H3
<i>Allocosa senex</i>	MN544473	MF410712	na	MF410703	MF410705	MK524670
<i>Alopecosa albostrigata</i>	HQ975079	DQ019643	na	DQ019757	na	na
<i>Alopecosa kochi</i>	KM225089	DQ019645	na	DQ019755	DQ628662	DQ628635
<i>Alopecosa pulverulenta</i>	HM416920	DQ019648	na	DQ019756	DQ019711	MK524675
<i>Dingosa simsoni</i>	MK524716	MK524648	na	na	MK524612	MK524681

Table 1. (Continued)

Species	COI	NADH	16S	12S	28S	H3
<i>Erranticosa coelestis</i> _Lyc01	PQ585650*	na	na	na	na	na
<i>Erranticosa coelestis</i> _Lyc02	PQ585651*	na	na	na	na	na
<i>Erranticosa coelestis</i> _Lyc03	PQ585652*	na	na	na	na	na
<i>Erranticosa coelestis</i> -Taiwan	OQ780910	na	na	na	na	na
<i>Erranticosa coelestis</i>	AB564730	DQ019669	AF145264	AF145030	na	na
<i>Geolycosa insulata</i>	na	MK524656	na	MK524592	MK524620	MK524688
<i>Geolycosa missouriensis</i>	BBUSU615	DQ019662	na	DQ019775	DQ019727	na
<i>Geolycosa turricola</i>	MG436795	na	na	na	na	na
<i>Geolycosa wrighti</i>	JN308777	na	na	na	na	na
<i>Gladicosa pulchra</i>	na	MK524651	AF223232	MK524589	MK524614	na
<i>Hoggicosa bicolor</i>	na	DQ019668	na	DQ019777	DQ019713	na
<i>Hogna ammophila</i>	BBUSU757	na	na	na	na	na
<i>Hogna arborea</i>	ON931444	na	na	na	na	na
<i>Hogna baltimoriana</i>	KM824520	na	na	na	na	na
<i>Hogna blackwalli</i>	OL415053	OL416117	na	na	OL415749	na
<i>Hogna carolinensis</i> (= <i>H</i> cf. <i>frondicola</i>)	BBUSE1006, KY017782	na	na	na	KY017166	KY018283
<i>Hogna crispipes</i>	DQ295871	DQ019664	na	DQ019778	DQ019715	na
<i>Hogna ericeticola</i>	BBUSU688	na	na	na	na	na
<i>Hogna espanola</i>	GU394964	na	na	na	GU395040	KF533273
<i>Hogna ferox</i>	na	na	na	na	OL415746	OL416114
<i>Hogna galapagoensis</i>	GU394981	na	na	na	GU395049	KF533242
<i>Hogna heeri</i>	OL415023	OL416118	na	na	OL415748	na
<i>Hogna hendrickxi</i>	GU394984	na	na	na	GU395052	KF533265
<i>Hogna ingens</i>	OL415025	na	na	na	OL415753	na
<i>Hogna insularum</i>	OL415037	na	na	na	OL415750	OL416116
<i>Hogna isambertoi</i>	OL415075	na	na	na	OL415752	OL416115
<i>Hogna junco</i>	HM171117	na	na	na	HM171117	KF533230
<i>Hogna kuyani</i>	DQ295870	EU109472	na	na	na	na
<i>Hogna maderiana</i>	OL415063	na	na	na	OL415747	na
<i>Hogna maruana</i>	KMPLU1373	na	na	na	na	na
<i>Hogna nonannulata</i>	OL415052	na	na	na	OL415751	OL416113
<i>Hogna osceola</i>	BBUSU676	na	na	na	na	na
<i>Hogna pseudoceratiola</i>	BBUSU681	na	na	na	na	na
<i>Hogna radiata</i>	KC550817	KC551092	KC551092	KC551016	KC550823	MK524686
<i>Hogna radiata</i> -Italy	KC550816	na	na	na	na	na
<i>Hogna radiata</i> -Romania	SPIEU1410	na	na	na	na	na
<i>Hogna radiata</i> -Spain	KC550817	na	na	na	na	na

Table 1. (Continued)

Species	COI	NADH	16S	12S	28S	H3
<i>Hogna_radiata</i> -Turkey	MW363652	na	na	na	na	na
<i>Hogna_snodgrassi</i>	GU394994	na	na	na	GU395056	KF533253
<i>Hogna_tigana</i>	BBUSU763	na	na	na	na	na
<i>Hogna_timuqua</i>	BBUSE3372	na	na	na	na	na
<i>Lycosa_baulnyi</i>	KC550803	KC551162	KC551162	KC550936	KC550848	na
<i>Lycosa_bedeli</i>	KC550714	KC551197	KC551197	KC551053	KC550831	na
<i>Lycosa_erythrognatha</i>	OM314002	DQ019670	na	DQ019782	DQ019729	MK524689
<i>Lycosa_fasciventris</i>	KC550742	na	KC551109	KC551066	KC550820	na
<i>Lycosa_grahami</i>	NC070013	NC070013	NC070013	NC070013	na	na
<i>Lycosa_hispanica</i>	KC550662	KC551211	KC551211	KC551072	KC550916	MK524690
<i>Lycosa_ishikariana</i>	GACS5654	na	na	na	na	na
<i>Lycosa_munieri</i>	KC550751	KC551118	KC551118	KC550986	KC550836	na
<i>Lycosa_nigricans</i>	KY587546	na	na	na	na	na
<i>Lycosa_oculata</i>	KC550676	KC551222	KC551222	KC550994	KC550869	na
<i>Lycosa_poonaensis</i>	MK154030	na	na	na	na	na
<i>Lycosa_praegrandis</i>	MH763772	na	na	na	MH758544	MH763793
<i>Lycosa_shansia</i>	OK032619	NC065747	NC065747	NC065747	na	na
<i>Lycosa_singoriensis</i>	OK032620	OK032620	OK032620	OK032620	na	na
<i>Lycosa_suboculata</i>	KC550696	KC551183	KC551183	KC551000	KC550862	na
<i>Lycosa_suzukii</i>	na	DQ019674	na	DQ019786	na	na
<i>Lycosa_tarantula</i>	KC550663	DQ019666	KC551203	KC551028	KC550915	na
<i>Lycosa_tarantula</i> -France	KC550664	na	na	na	na	na
<i>Lycosa_tarantula</i> -Italy	KC550669	KC551206	KC551206	KC551085	KC550842	na
<i>Lycosa_terrestris</i>	MK154756	na	na	na	na	na
<i>Lycosa_yachoni</i>	KC550780	KC551143	KC551143	KC550962	KC550912	na
<i>Pavocosa_gallopavo</i>	OP034390	DQ019695	na	DQ019800	DQ019735	na
<i>Rabidosa_punctulata</i>	DQ151817	DQ019700	na	DQ019806	DQ019736	na
<i>Rabidosa_rabida</i>	KP648534	DQ019701	na	DQ019807	DQ019737	MK524699
<i>Schizocosa_bilineata</i>	KM828836	AF223238	AF223238	na	na	na
<i>Schizocosa_malitiosa</i>	KY190307	KY199543	KY190243	na	na	KY190277
<i>Schizocosa_ocreata</i>	KY017784	AF223242	KY015946	KY015465	KY017172	na
<i>Tasmanicosa_godeffroyi</i>	DQ151819	DQ019671	na	DQ019809	DQ019716	na
<i>Tasmanicosa_leuckarti</i>	na	DQ019672	na	DQ019810	DQ019717	na
<i>Tigrosa_helluo</i>	KP647275	na	na	na	na	na
<i>Tropicosa_moesta</i>	CUSCO036	MK524641	na	na	MK524608	MK524674
<i>Varacosa_avara</i>	HQ924408	DQ019707	na	AF380500	DQ019740	MK524706
<i>Venatrix_konei</i>	na	DQ019708	na	AF380496	DQ019742	na

was partitioned by gene. Additionally, the 3rd codons of the protein-coding genes (*COI*, *H3*) were partitioned separately due to their different mutation rate. The suitable substitution models for each partition were selected using the automatic function provided by the IQ-TREE software under a Bayesian Information Criterion (BIC). They were subsequently employed in the phylogenetic analysis as follows: *COI* (1st and 2nd codon): GTR+F+I+G4; *COI* (3rd codon): TVM+F+I+G4; 16S+NADH and 28S: TIM3+F+I+G4; 12S: TIM3+F+G4; *H3* (1st and 2nd codon): TNe+G4; *H3* (3rd codon): JC. An ultrarapid bootstrap analysis of 1000 interactions was run twice under standard parameters. The resulting trees were displayed using FigTree software v. 1.4.3 (<http://tree.bio.ed.ac.uk/software/figtree/>).

Specimens used in this study are preserved in the following institutes and collections: FBPC, Personal collection F. Ballarin; MNHAH, Museum of Nature and Human Activities, Hyogo, Japan; MSNB, Museo Civico di Storia Naturale di Bergamo, Italy; MSNVR, Museo Civico di Storia Naturale of Verona, Italy; NSMT, National Museum of Nature and Science, Tsukuba, Japan; TARI, Taiwan Agricultural Research Institute, Taiwan; USNM, National Museum of Natural History, Washington, USA.

RESULTS

TAXONOMY

Class Arachnida Cuvier, 1812

Order Araneae Clerck, 1757

Lycosidae Sundevall, 1833

Genus *Erranticosa* Ballarin and Marusik, gen. nov.

(Figs. 1A–E; 2A–I; 3A–I; 4A–E; 5A–D)

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Type species: Lycosa coelestis L. Koch, 1878 from Japan.

Etymology: The genus name is derived from the composition of the prefix *errantis*, meaning “wandering” in Latin, and the suffix *-cosa* commonly used for wolf spiders. It refers to the wandering habits of *E. coelestis*, which can be observed hunting freely on the ground at night.

Diagnosis (comparison of generotypes): Males can be easily distinguished from those of *Lycosa tarantula* and other *Lycosa sensu stricto* by the different shape of the palp having a symmetric cymbium when

observed ventrally, by the shape of the triangular tegular apophysis (Tg), flattened antero-posteriorly, with two tips headed ventrally and retrolaterally (vs. asymmetric cymbium and dorso-ventrally flattened tegular apophysis with only one tip headed ventro-retrolaterally) (cf. figs. 1D; 3A–C; 4A, 4B vs. figs. 8C–E, see also figs. 2B–E in Armiaich Steinpress et al. 2022). The shape of the synembolus is also different in the two genera (cf. figs. 3D; 3E; 4E vs. figs. 4G; 8C). Males of *Erranticosa* gen. nov. can be distinguished from those of *Hogna radiata* and other *Hogna sensu stricto* by the strongly bent synembolus with a ~90° angle and/or by the shorter and tougher tegular apophysis (Tg) with a shorter (vs. straighter or more gently rounded Se and longer and sharper Tg) (cf. figs. 1F; 3A–E; 4A, B; 4E vs. figs. 4F; 8A, B, and figs. 1–5 in Logunov 2022, see also figs. 6A–C; 15A–F; 18A–C; 21A–D; 24A–C; 28A, B in Crespo et al. 2022).

Females of *Erranticosa* gen. nov. can be easily separated from those of *Lycosa* and *Hogna sensu stricto* by the shorter epigyne, almost as long as wide, by the septal stalk (Ss) suddenly narrowing in the middle (vs. epigynes longer than wide, with an arrow-like Ss gradually narrowing in *Lycosa sensu stricto*, and thin Ss with parallel edges in *Hogna sensu stricto*, and by the presence of a pair of wide and deep atria (At) (vs. no clear atria in *Lycosa sensu stricto* or two smaller and less deep atria in *Hogna sensu stricto*) (cf. figs. 2A–C; 4C, D vs. figs. 7G–I vs. fig. 8F, see also figs. 9A–M; 10A–M in Armiaich Steinpress et al. 2022 and figs. 6D, E; 9A, B; 12A, B; 16A–H; 18D, E; 21E, F; 28A–D in Crespo et al. 2022).

Male and female of *Erranticosa* gen. nov. share some general similarities with other “hognoid” genera, i.e., *Hoggicosa* Roewer, 1960 from Australia. However, it can be distinguished by a combination of the shape of copulatory organs and somatic characters, including the general dorsal and ventral pattern, the shape and length of the male palp tegular apophysis and synembolus, and the shape and proportions of the septal stalk and internal ducts (e.g., cf. figures of *Erranticosa coelestis* with those in Langlands and Framenau 2010).

Description: Medium size: body length 7–15 mm. Both sexes similar in general shape and coloration, males darker in color than females. Carapace oval, dark brown with wide longitudinal stripe at center and broken stripes on borders. Fovea clearly visible (Fig. 2D–G). Chelicera robust. Promargin of paturon with two teeth of same size and one small denticle, retromargin with three teeth of same size (Fig. 3I). PME/AME ratio 1.55–1.92. Sternum ovoid, uniformly black in both sexes. Leg formula: IV-I-II-III. Male legs I with dorsal side of tibiae and tarsi covered with whitish setae (Fig. 3H). Dorsal opisthosoma with central lanceolate cardiac

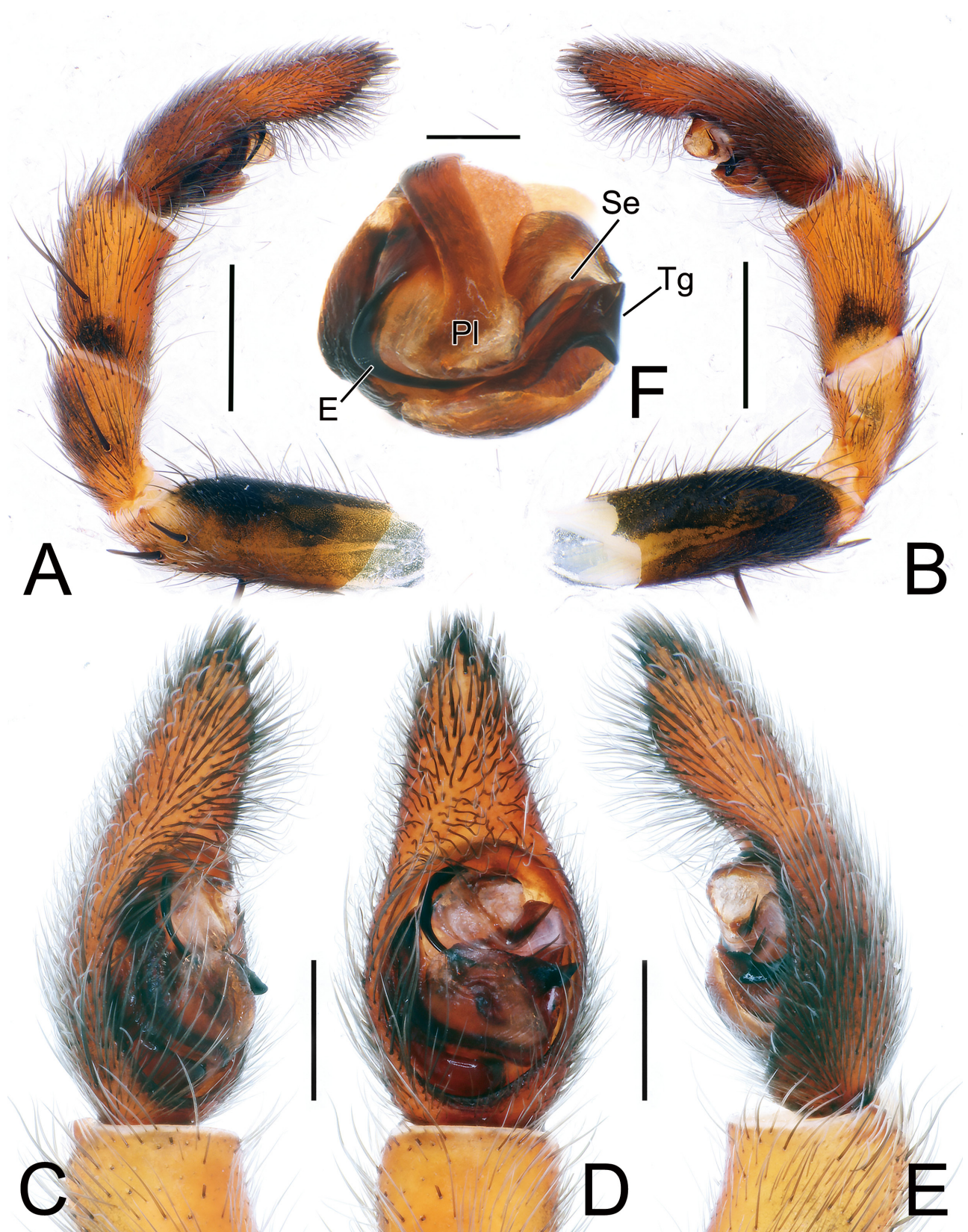


Fig. 1. Male palp of *Erranticosa coelestis* from Tokyo area, Japan. A, whole palp, prolateral; B, ditto, retrolateral; C, tip of palp, ventro-prolateral; D, ditto, ventral; E, ditto, ventro-retrolateral; F, bulb of palp, anterior. Scale bars: A, B = 1 mm; C–E = 0.5 mm; F, G = 0.2 mm. Abbreviations: E: embolus; Pl: palea; Se: synembolus; Tg: tegular apophysis.

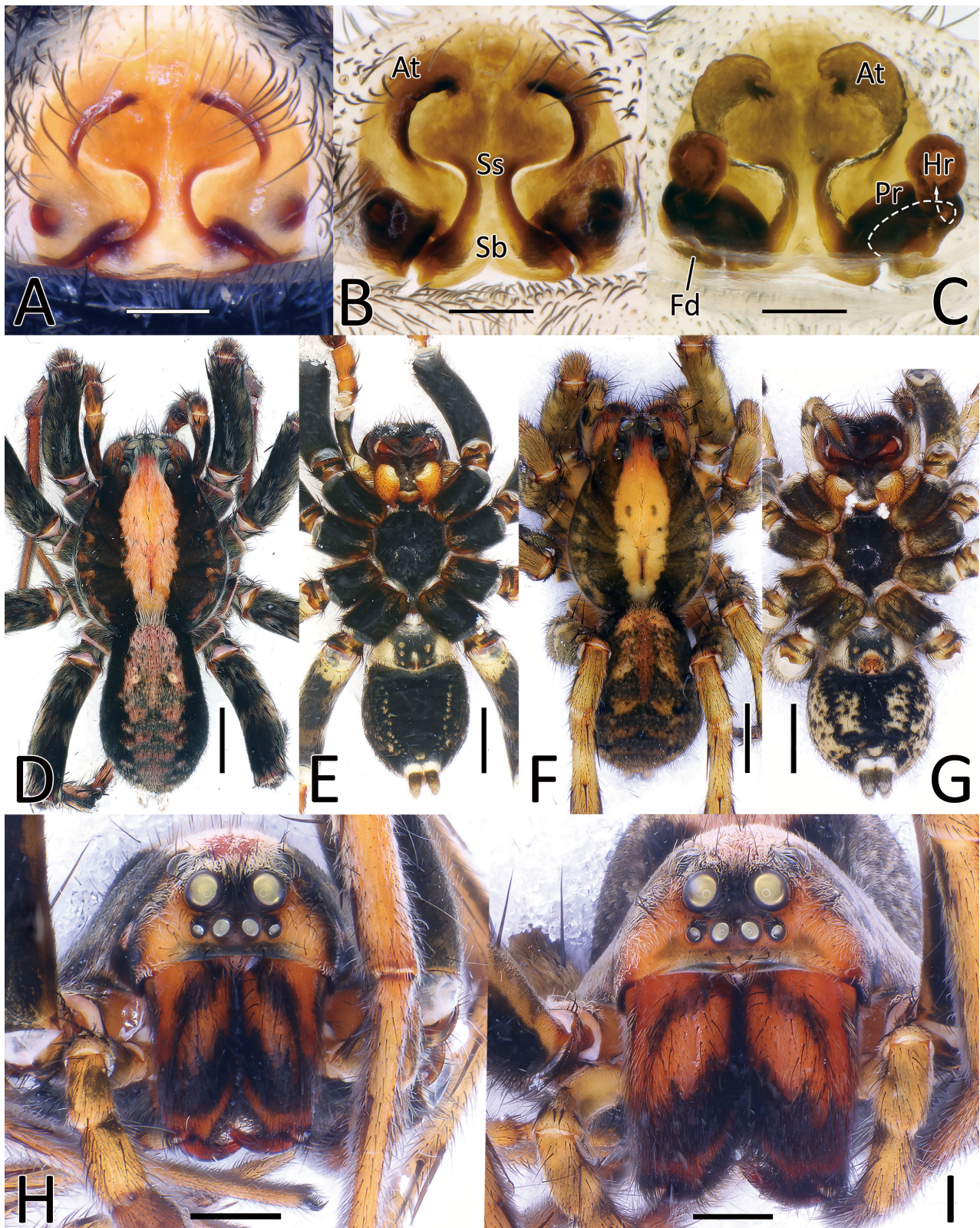


Fig. 2. Epigyne and habitus of *Erranticosa coelestis* from Hachijo-jima, Japan. A, epigyne, ventral; B, ditto, after dissection; C, ditto, dorsal; D, habitus of male, dorsal; E, ditto, ventral; F, habitus of female, dorsal; G, ditto, ventral; H, male cephalic area, frontal; I, female cephalic area, frontal. Scale bars: A–C = 0.2 mm; D–G = 2 mm; H, I = 1 mm. Abbreviations: At: atrium; Fd: fertilization duct; Hr: head of receptacle; Pr: primary receptacle; Sb: septal base; Ss: stalk of septum. The white dotted line shows the course of the insemination ducts.

mark and pairs of rounded marks. Ventral opisthosoma uniformly black or black with large lighter patches (Fig. 2D–G).

Male palp with patella + tibia slightly longer than

femur (Fig. 1A, B), symmetric elongate cymbium with short, thick setae at tip, tegular apophysis (Tg) wide, almost triangular, with short, blunt arms (Figs. 1C–F; 3A–C; 4A, B). Embolus (E) bordered by pars pendula

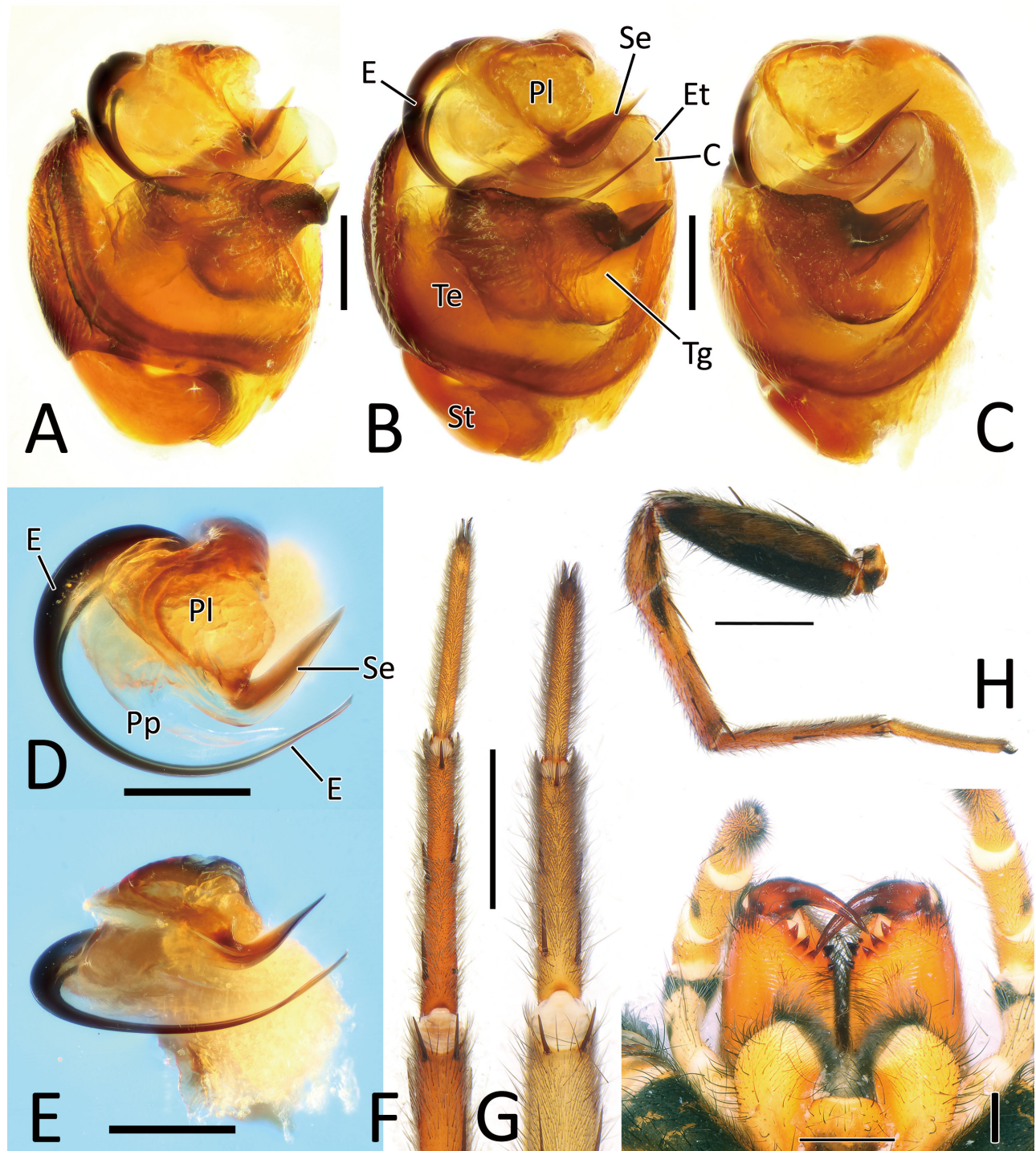


Fig. 3. Details of *Erranticosa coelestis* from Tokyo area, Japan. A, Bulb of male palp, ventro-prolateral; B, ditto, ventral; C, ditto, ventro-retrolateral; D, embolic division, anterior; E, ditto, ventral; F, tarsus and metatarsus I of male, ventral; G, ditto of female; H, leg I of male, retrolateral; I, chelicera of female, ventral. Scale bars: A–E = 0.2 mm; F–H = 2 mm; I = 1 mm. Abbreviations: C: conductor; E: embolus; Et: tip of embolus; Pl: palea; Pp: pars pendula; Se: synembolus; St: subtegulum; Te: tegulum; Tg: tegular apophysis.

(Pp) by 4/5 of length. Synembolus (Se) strongly bent (Figs. 3D, E; 4E).

Epigyne with hourglass-shaped septum (Figs. 2A; 4C), apical and distal part wider abruptly narrowing at center of stalk (Ss). Atria (At) well developed, insemination ducts relatively short enlarging into a wide primary receptacle (Pr), and a rounded head of receptacle (Hr) (Figs. 2B, C; 4D).

Refer also to redescription of *E. coelestis*.

Distribution: East Asia (south and eastern part of mainland China, Taiwan, Korea, Japan (except Hokkaido). Refer also to the distribution of *E. coelestis*.

Composition: Currently, only *E. coelestis* from East Asia. See also the discussion.

***Erranticosa coelestis* (L. Koch, 1878) comb. nov.**
(Figs. 1A–E; 2A–I; 3A–I; 4A–E; 5A–D)

Lycosa coelestis L. Koch, 1878: p. 772, pl. 16, figs. 35, 36 (♂ ♀).

Tarentula coelestis: Bösenberg and Strand, 1906: p. 321, pl. 13, fig. 325 (♂ ♀).

Tarentula sepia Dönitz and Strand, in Bösenberg and Strand, 1906: p. 391, pl. 8, fig. 108 (D ♂ ♀).

Lycosa auribrachialis Schenkel 1936: p. 194, fig. 64 (D ♂).

Geolycosa sepia: Roewer 1955: p. 241 (T from *Tarentula*).

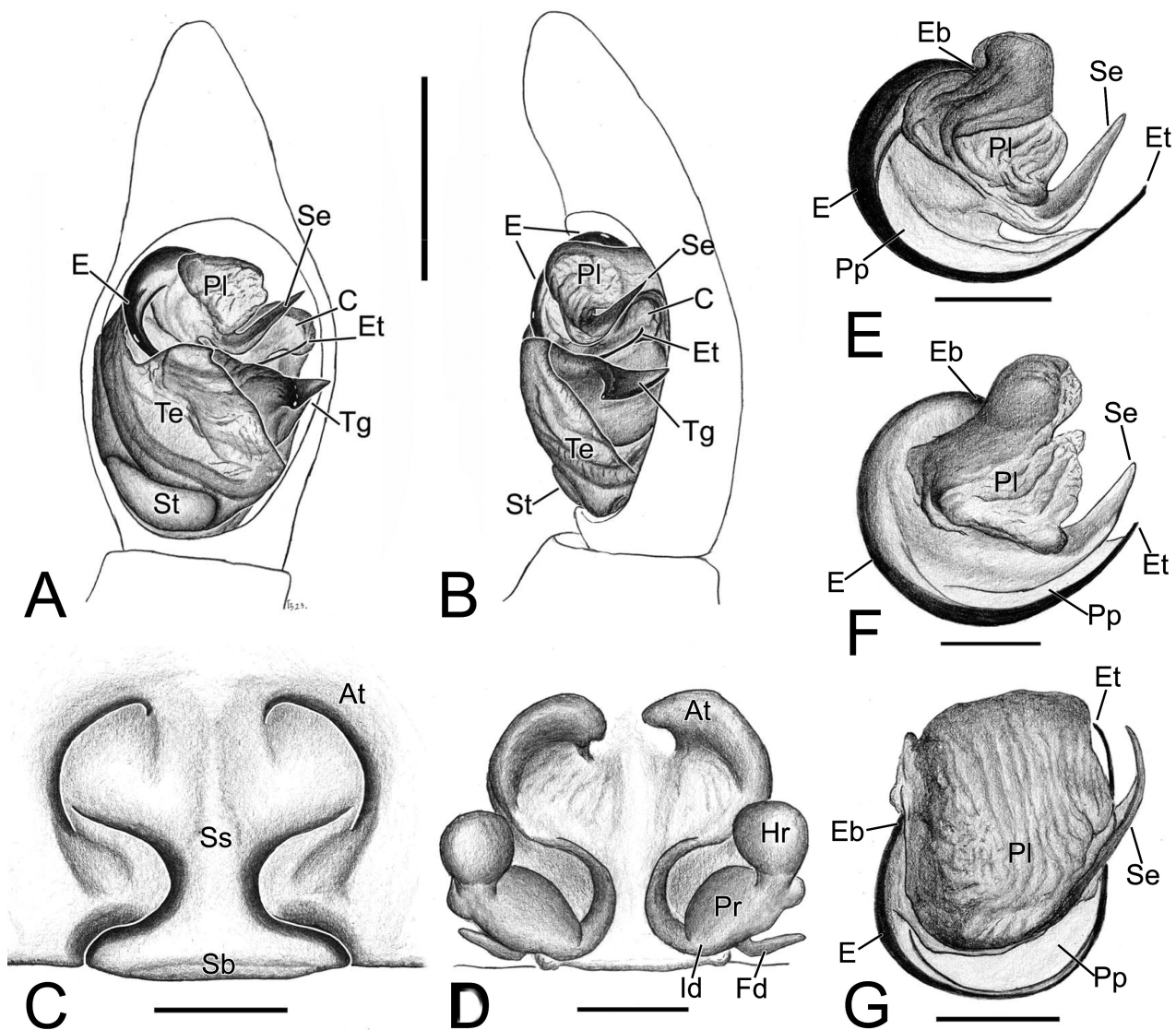


Fig. 4. Copulatory organs of *Erranticosa* gen. nov., *Hogna*, and *Lycosa*. A, *E. coelestis* from Japan, palp, ventral; B, ditto, ventro-retrolateral; C, epigyne, ventral; D, vulva, dorsal; E, embolic division, anterior; F, ditto of *H. radiata* from North Italy; G, ditto of *L. tarantula* from South Italy. Scale bars: A, B = 0.5 mm; C–G = 0.2 mm; E. Abbreviations: At: atrium; C: conductor; E: embolus; Et: tip of embolus; Fd: fertilization duct; Hr: head of receptacle; Id: insemination duct; Pl: palea; Pp: pars pendula; Pr: primary receptacle; Sb: septal base; Se: synembolus; Ss: stalk of septum; St: subtegulum; Te: tegulum; Tg: tegular apophysis.

Hogna auribrachialis: Roewer 1955: p. 247 (T from *Lycosa*).

Hogna coelestis: Roewer 1955: 248 (T from *Lycosa*).

Tetrarctosa subcoelestis: Roewer 1955: p. 296 (T from *Lycosa*).

Lycosa coelestis: Yaginuma 1960: p. 83, fig. 75.1 (T back from *Hogna*).

Lycosa coelestis: Chen and Gao 1990: 124.

For the complete list of references see the WSC (2026). It is worth noticing that, to date, *E. coelestis* has been assigned to six different genera spanning two different currently recognized subfamilies.

Material examined: JAPAN: Tokyo Pref.: 1 ♂, Hachioji, Minami-Osawa, Tokyo Metropolitan University (Minami-Osawa Campus), litter, 35.62026°N, 139.38693°E, 24.II.2021, F. Ballarin leg. (MNHAH) • 1 ♂, same locality, 5.V.2021, F. Ballarin leg. (NSMT) • 1 ♂, same locality, 10.V.2023, F. Ballarin leg. (FBPC) • 1 ♀, Hachijo-jima Is. Nakanogo, under stones, 33.06362°N, 139.81692°E, 01.V.2021, F. Ballarin leg. (NSMT) • 1 ♂, 1 ♀, Mitsune, meadow,

night collection, 33.11515°N, 139.80465°E, 02.V.2021, F. Ballarin leg. (FBPC) • KAGOSHIMA Pref.: 1 ♀, Yakushima Is., Miyanoura, Elev: 52 m, along the road, night collection, 30.43088°N, 130.55995°E, 26.IX.2021, F. Ballarin leg. (FBPC) • TAIWAN: Nantou Co.: 3 ♂, 4 ♀, Ren'ai Township, Nantou County, Huisun Forest Area, in a meadow, night collection, 24.08140°N, 121.01071°E, elev: 520 m, 13.VII.2023, F. Ballarin leg. (1 ♂, 2 ♀, TARI; 2 ♂, 2 ♀, FBPC). Additional photos of specimens from mainland China were also examined for reference.

Syntype: preserved in the zoological collections of the Senckenberg Museum, Frankfurt am Main, Germany, consisting of a microscopic slide of a male palp (cat. no. 13491-138, not examined because on loan and not available).

Type locality: Japan, the exact locality is unknown but probably Central Honshu (see L. Koch 1878).

Diagnosis: See the diagnosis of the genus.



Fig. 5. *Erranticosa coelestis* in life. A, habitus of male from the Tokyo area, Japan; B, ditto, from Taiwan; C, habitus of female from Taiwan; D, ditto, female with spiderling. All photos by F. Ballarin.

Redescription of male (based on a specimen from Hachioji): Habitus as in figures 2D, E; 5A. Specimens in life with more greyish appearance (see Fig. 5A–B). Total length 10.88. Carapace 6.10 long, 4.57 wide. Carapace dark brown, dorsal cephalic area with tufts of white setae. Wide longitudinal dorsal dark yellowish stripe, broken stripes along external borders formed by lighter small marks (Figs. 2D; 5A, B). Cephalic area as in figure 2H. Eyes sizes and interdistances: AME 0.25, ALE 0.21, PME 0.48, PLE 0.36, AME–AME 0.11, PME–PME 0.37, AME–ALE 0.10, ALE–PLE 0.74. Paturon dark yellow with dark brown diagonal stripe and distal half (Fig. 2H). Labium dark brown with lighter distal part. Maxillae dark yellow, sternum uniformly dark brown (Fig. 2E). Coxae and trochanters black. Ventral femora uniformly black, dorsal femora dark brown with faint annulation. Patellae brownish, tibiae, metatarsi, and tarsi uniformly dark yellow. Tibiae and tarsi I covered with whitish setae on dorsal side (Figs. 3H; 5A, B). Leg I as in figure 3H, scopulae of tarsus and metatarsus I as in figure 3F.

Leg I spination:

Fe	Pa	Ti	Me
p2, r3, d3	p1, r1	p2, r2, v2-2-2	p3, r3, v2-2-3

Legs measurements:

	Total	Fe	Pa	Ti	Me	Ta
I	17.06	4.46	2.03	3.71	4.12	2.74
II	15.01	4.22	2.08	3.04	3.40	2.27
III	14.14	3.87	1.80	2.80	3.53	2.14
IV	18.98	5.02	1.96	3.85	5.32	2.83

Dorsal side of opisthosoma dark brown, with 1 lanceolate mark followed by five pairs of rounded marks gradually merging each other (Fig. 2D). Ventral side of opisthosoma uniformly black with pair of parallel rows of small light spots (Fig. 2E). Spinnerets black in proximal part, distal part yellowish. See also Tanaka (1990, pp. 196–197) and JSC (2025).

Male palp as in figures 1A–E; 4A, B. Femur relatively short, three times longer than wide, uniformly dark brown with sparse lighter yellow areas, patella + tibia slightly longer than femur, uniformly dark yellow with dark marks on the sides (Fig. 1A, B). Cymbium symmetrically elongated, slightly shorter than femur, 1.2 times wider than tibia; proximally dark brown distally lighter with dense whitish setae on dorsal side (Fig. 1C–E). Few stronger setae on distal tip, barely visible. In lateral view cymbium + bulb thinner than tibia. Bulb egg-shaped ~1.2 times longer than wide (Fig. 3A–C). Subtegulum large, located prolaterally but extending to retrolateral half. Sperm duct not meandering, running

along margin of tegulum in ventral view. Tegular apophysis (Tg) almost triangular, anterior margin almost or exactly perpendicular to cymbium, with wide basal part flattened dorsal-ventrally, distal part flattened antero-posteriorly, 1 horizontal arm relatively short and blunt, headed antero-retrolaterally, one ventral arm sharp headed ventrally. Embolic division as in figures 3D, E; 4E. Embolus (E) filamentous, starting from prolateral side of palea (Pl), early part wide, gradually thinning, final part long and thin, ending with cut tip, making altogether a 270° turn (3/4 of circle). Pars pendula (Pp) bordering embolus except for last part. Synembolus (Se) hook-like, bent ~ 90°, ending with a triangular sharp tip (Figs. 3D, E; 4E).

Redescription of female (based on a specimen from Hachijo-jima Is.): Habitus as in figures 2F–G; 5C, D. Total length. 11.87, Carapace 6.41 long, 4.61 wide. General coloration and other details as in male except for the followings: habitus generally lighter, prosoma and opisthosoma with clearer dorsal pattern. Cephalic area as in figure 2I. Eyes sizes and interdistances: AME 0.27, ALE 0.20, PME 0.58, PLE 0.42, AME–AME 0.12, PME–PME 0.42, AME–ALE 0.11, ALE–PLE 0.78. Labium, maxillae and chelicera as in figure 3I. Legs brownish, lighter colored, tarsus with clear annulation. Scopulae of tarsus and metatarsus I as in figure 3G.

Leg I spination:

Fe	Pa	Ti	Me
p2, r3, d3	p1(0)	p2, v2-2-2	v2-2-3

Legs measurements:

	Total	Fe	Pa	Ti	Me	Ta
I	14.87	4.51	2.25	3.02	3.03	2.06
II	14.61	4.20	2.45	2.76	3.06	2.14
III	13.58	3.68	1.99	2.47	3.47	1.97
IV	18.51	4.90	2.19	3.68	5.08	2.66

Dorsal pattern of opisthosoma more marked than in male, ventral side of opisthosoma black with large lighter patches (Figs. 2F, G; 5C, D). For a detailed somatic description see also Tanaka (1990, p. 196).

Epigyne as in figures 2A–C; 3C, D, with 2 wide, anteriorly elongated, apical atria (At) curved interiorly toward each other. Septum ~ as long as wide, stalk of septum (Ss); strongly narrowing in the middle with a ~90° angle, anterior part of stalk wider of base width. Septal base (Sb) with flat, transverse part (Figs. 2A, B; 4C). Fertilization ducts (Fd) short and thin. Insemination ducts (Id) very short enlarging in primary receptacle (Pr), then thinning before reaching head of receptacle. primary receptacles (Pr) spaced each other by about 1 of their width Head of receptacle (Hr) relatively small and

globular (Figs. 2C; 4D).

Size variation: Male ($n = 8$ from Japan and Taiwan and data from Tanaka 1990): total length: 7.24–11.75, carapace length: 4.35–6.44, width: 3.16–4.90. Female ($n = 10$ from Japan and Taiwan and data from Tanaka 1990): total length: 10.62–15.75, carapace length: 5.50–7.10; width: 4.05–5.40. See also Tanaka (1990, p. 197).

Ecology: Species inhabiting uncultivated fields, meadows, and other open areas. Active primarily during the night hours. See also Tanaka (1990, p. 198).

Distribution: Eastern Asia: mainland China (South and central-eastern regions), Taiwan, Korea (Jeju Island), Japan (Iriomote-jima Island of southern Ryukyus, northern Ryukyus, Ogasawara Islands, and the whole mainland Japan except Hokkaido) (Fig. 10) (WSC 2026, see also JSC 2025 for a detailed distribution in Japan).

Genus *Trochosa* C. L. Koch, 1847

Type species: *Aranea lupus ruricola* De Geer, 1778 (= *Trochosa ruricola*).

Trochosa subcoelestis (Fox, 1935) comb. nov. (Fig. 6A–I)

Lycosa subcoelestis Fox, 1935: 455, fig. 1 (♀).

Tetrarctosa subcoelestis: Roewer, 1955: p. 296.

Foxicosa subcoelestis: Roewer 1960: p. 949 (T from *Tetrarctosa* = *Arctosa*).

Lycosa coelestis: Chen and Gao, 1990: p. 124, (S with *L. coelestis*).

Material examined: CHINA: Sichuan Province: 2 ♀ (holotype and one paratype), Yibin (labeled as Szechuan Province, Suifu), date and collector unknown (USNM, n°1142).

Description of female: See Fox (1935), pp. 455–456. Male unknown.

Type locality: Yibin, Sichuan Province, China.

Remarks: Fox (1935) described *Lycosa subcoelestis* based on female specimens collected in different localities in Sichuan Province in China: Yibin (labeled as Suifu), Ya'an (labeled as Yachow), Mount Emei (= Omei), and an unspecified locality near the border with Yunnan Province (Fox 1935, p. 456). The male remained unknown. In the text, the author reported a close morphological similarity of this species with *L. coelestis* from which the specific name was derived, albeit highlighting several differences in pattern and coloration of both the prosoma and opisthosoma, as well as a smaller size (8.5–11.5 mm vs. 11–15 mm). Roewer (1955) transferred this species to *Tetrarctosa* Roewer, 1955 (later synonymized with *Arctosa* C.L. Koch, 1847 by Lugetti and Tongiorgi 1965) and, a few years later, he established the monotypic genus *Foxicosa* Roewer,

1960 to accommodate this species (Roewer 1960). Chen and Gao (1990) subsequently synonymized *F. subcoelestis* with *L. coelestis* without discussing the reason nor reporting the examination of any sample of this species.

We had the opportunity to examine detailed photos of the holotype and one of the paratypes of *L. subcoelestis* preserved in the collections of the National Museum of Natural History, USA. Based on our comparison we confirm several morphological differences between this species and *E. coelestis*. In particular, we note that: i) the dorsal pattern of the carapace shows a longitudinal stripe only in the anterior part bearing two large comma-like darker marks, a radiated pattern in the posterior part, and two continuous lateral bands (vs. continuous longitudinal stripe along the whole dorsal carapace lacking any clear internal marks and fragmented lateral bands); ii) the ventral opisthosoma and sternum are uniformly light yellow lacking any pattern (vs. uniformly black or with wide black marks); iii) the color of ventral coxae and femora is uniformly light yellow (vs. black); the epigyne appears shorter with shorter septum and more rounded atria (vs. longer and less rounded At). These characters suggest *L. subcoelestis* as belonging to a different genus than *Erranticosa* gen. nov. or *Lycosa*. Additionally, the presence of a medial band on the carapace bearing two comma-like marks, eye proportions, and the general shape of the epigyne resemble those found in the genus *Trochosa*.

Based on the abovementioned considerations, we consider the synonymization of *L. subcoelestis* with *E. coelestis* by Chen and Gao (1990) as invalid and propose transferring this species to the genus *Trochosa*. The discovery of the currently unknown male of this species and the use of molecular data based on freshly collected specimens will further elucidate the taxonomy and systematic position of this species in the future.

Other comparative material examined *Hogna radiata* (Latreille, 1817) (Figs. 4F; 7A–I; 8A–B)

Material examined: ITALY: Veneto Region: 1 ♂, 1 ♀, Verona, S. Zeno di Montagna, between S. Zeno and Prada villages, 45.648°N, 10.758°E, 22.VII.2007, A. Scupola leg. (MSNVR) • Toscana Region: 1 ♀, Grosseto, south of Scansano Vill., Ripacci, uncultivated meadow, night collection, elev.: 10 m, 42.6558°N, 11.3471°E, 22.VIII.2018, F. Ballarin and D. Avesani leg. (MSNVR).

Type locality: France.

***Lycosa tarantula* (Linnaeus, 1758)**

(Fig. 8C–F)

Material examined: ITALY: Puglia Region: 1 ♂, 1 ♀, Taranto, 2.XI.2021, leg. P. Rizzo (♂ collected as juv., reached adulthood 11.VII.2022) (MSNB).

Type locality: Taranto area, Southern Italy.

Molecular analysis

The final dataset used for the analysis included 79 terminals (69 species) and 3,790 bp subdivided as follows: *COI* = 1,200 bp, 16S and *NADH* = 1,186 bp, 12S = 302 bp, 28S = 799 bp, and *H3* = 303 bp. The

resulting phylogenetic tree of Lycosinae is illustrated in figure 9. The low support observed in most nodes is likely derived from the heterogeneity of the species available, coupled with missing data and non-uniformity in the gene fragments across most of the species used. Additionally, we cannot exclude the possibility of misidentifications among the taxa harvested from GenBank. It is worth noticing that a generally low node support was also obtained in previous phylogenetic studies on Lycosidae, suggesting the difficulties in reconstructing a reliable phylogeny of the family with limited data. Nevertheless, although the intermediate nodes generally lack strong support, the overall structure of our tree and the relationships among the

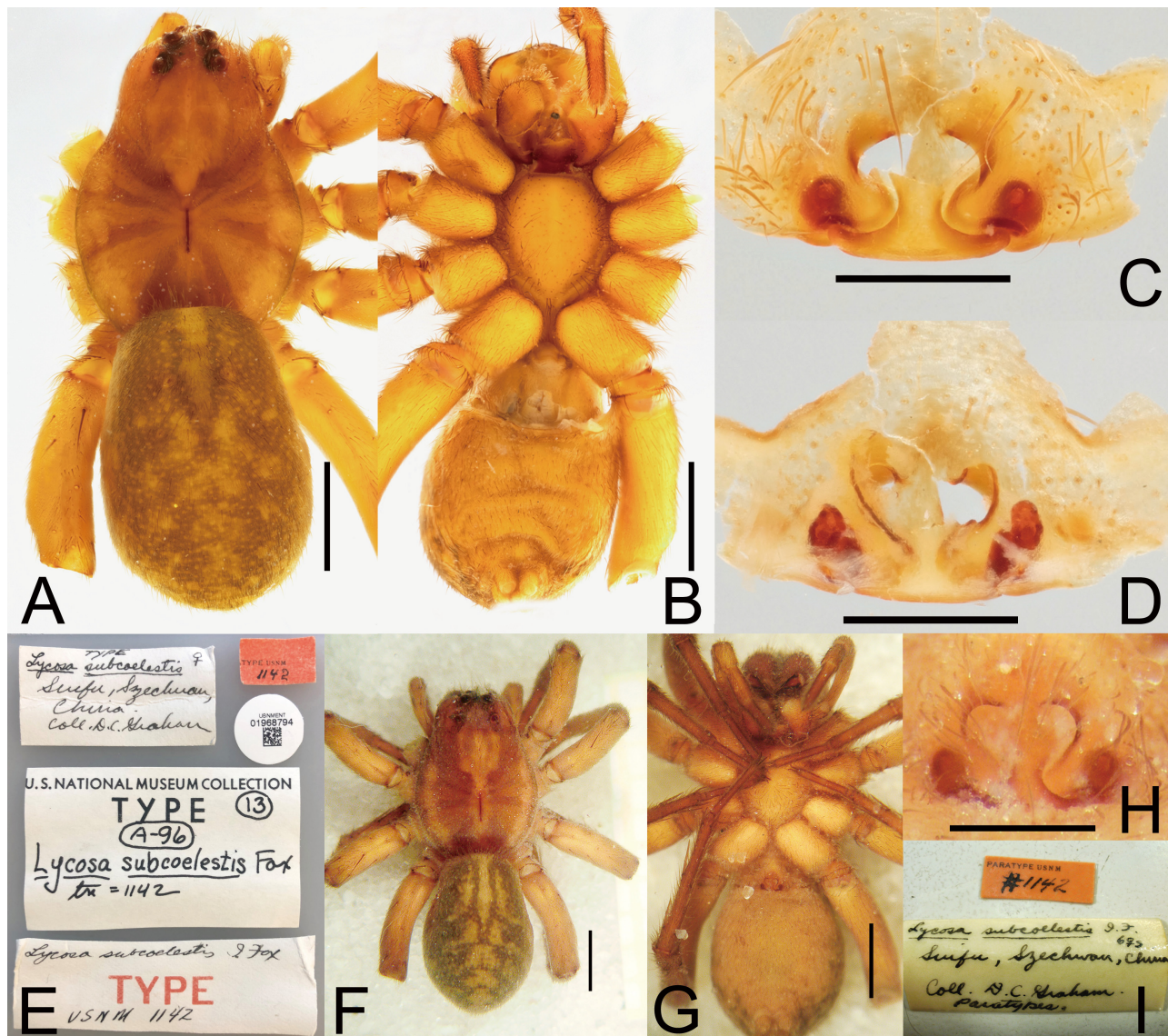


Fig. 6. Habitus and epigyne of *Trochosa subcoelestis* (USNM n°1142) preserved in the National Museum of Natural History, U.S.A. A, habitus of holotype; dorsal; B, ditto, ventral; C, epigyne after dissection, ventral; D, ditto, dorsal; F, habitus of one of the paratypes, dorsal; G, ditto, ventral; H, epigyne before dissection, ventral; E, I, labels. Scale bars: A, B, F, G = 2 mm; C, D, H = 0.5 mm. Photos A–E by T. Nguyen; F–I by L. N. Piacentini.

species reflect those inferred in recent studies based on molecular data only (e.g., Piacentini and Ramírez 2019; Crespo et al. 2022; Kulkarni et al. 2023). Furthermore, the long branches obtained enable a suitable separation

of the main clades.

In our phylogenetic analysis, *E. coelestis* is reconstructed as a monophyletic clade with a long basal branch. The species *Hogna maruana* (Roewer,

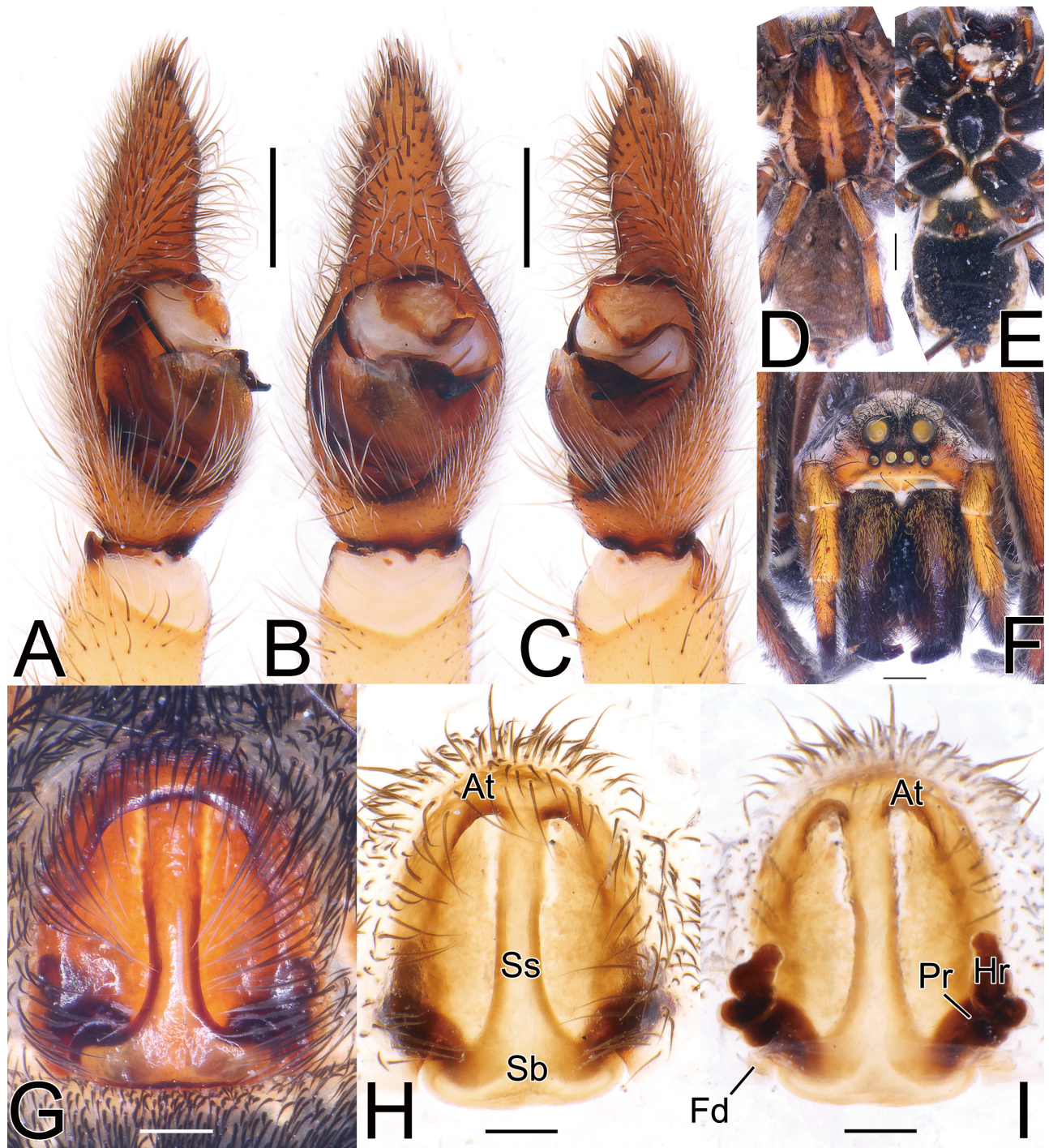


Fig. 7. Copulatory organs of *Hogna radiata* from North Italy. A, tip of male palp, ventro-prolateral; B, ditto, ventral; C, ditto, ventro-retrolateral; D, habitus of female, dorsal; E, ditto, ventral; F, female cephalic area, frontal; G, epigyne of female, ventral; H, ditto, after dissection; I, vulva, dorsal. Scale bars: A–C = 0.5 mm; D, E = 2 mm; F = 1 mm; G–I = 0.2 mm. Abbreviations: At: atrium; Fd: fertilization duct; Hr: head of receptacle; Pr: primary receptacle; Sb: septal base; Ss: stalk of septum.

1960) from Cameroon is inferred as its sister species. Similarly, *Erranticosa* gen. nov. and *H. maruana* form a larger clade together with the South America clade (*sensu* Piacentini and Ramírez 2019), including *Geolycosa insulata* (Mello-Leitão, 1944); *Lycosa erythrognatha* Lucas, 1836; *Schizocosa malitiosa* (Tullgren, 1905); *Tropicosa moesta* (Holmberg, 1876) and the “*Hogna*” species from Galápagos Islands (*H. espanola* Baert and Maelfait, 2008; *H. galapagoensis*, (Banks, 1902); *H. hendrickxi* Baert and Maelfait, 2008; *H. junco* Baert and Maelfait, 2008; and *H. snodgrassi* Banks, 1902). These latter species share a general similarity in copulatory organs with *Erranticosa* gen. nov. (see Baert et al. 2008).

The type species of *Lycosa* and *Hogna*, as well as their close congeners, are reconstructed as belonging to distinct monophyletic clades, all clearly separated

from *E. coelestis*. This supports the separation of *Erranticosa* gen. nov. from *Lycosa* or *Hogna sensu stricto*, as suggested by the morphological analysis. However, consistent with other studies on Lycosidae, our phylogenetic tree does not support the monophyly of either *Lycosa* and *Hogna sensu lato*. Even in our analysis, based on a limited sampling and genetic data, species of *Lycosa* and *Hogna sensu lato* are scattered throughout the phylogenetic tree, with some forming distinct, long-branched taxa. Some monophyletic “*Hogna*” and “*Lycosa*” lineages (e.g., the “*Hogna*” species from Galápagos, the “*Hogna*” species from North America, and the clade formed by the eastern Asian *Lycosa ishikariana* (Saito, 1934) and *L. shansia* (Hogg, 1912)) contain multiple taxa and diverge so significantly from others that they may be considered as potential independent genera (Fig. 9).

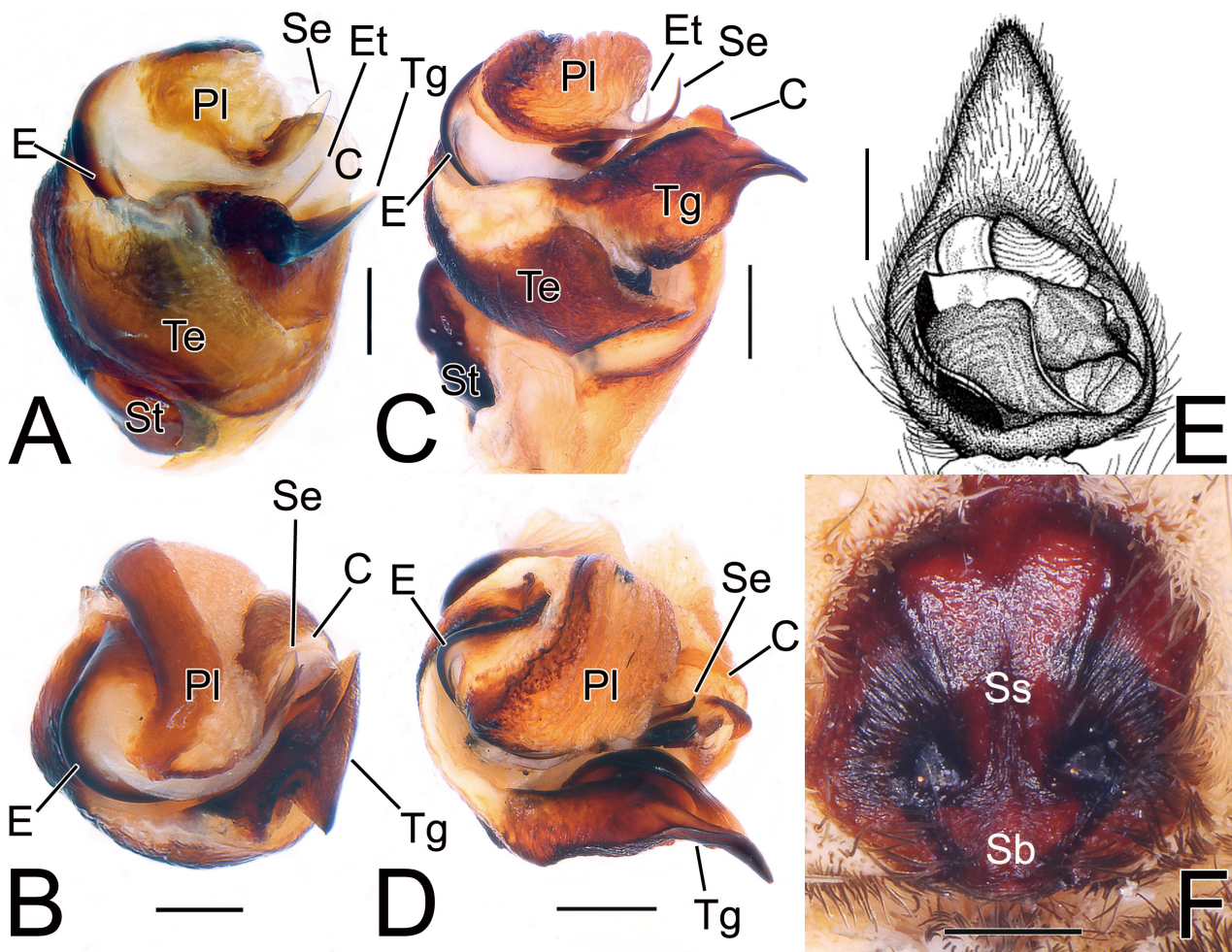


Fig. 8. Copulatory organs of *Hogna radiata* and *Lycosa tarantula*. A, bulb of palp of *H. radiata* from North Italy, ventral; B, ditto, apical; C, bulb of palp of *L. tarantula* from South Italy, ventral; D, ditto, apical; E, male palp, ventral (adapted from Pepe 2005); F, epigyne of female, ventral. Scale bars: A, B = 0.2 mm; C, D, F = 0.5 mm; E = 1 mm. Abbreviations: C: conductor; E: embolus; Et: tip of embolus; PI: palea; Sb: septal base; Se: senyembolus; Ss: stalk of septum; St: subtegulum; Te: tegulum; Tg: tegular apophysis.

DISCUSSION

Our observations of specimens of *E. coelestis* comb. nov. from Japan and Taiwan, along with images of individuals from mainland China, reveal somatic similarities in size, habitus, and the shape of copulatory organs, suggesting that these populations all belong to the same species. However, clear differences are observed when compared to the types of *L. subcoelestis*,

indicating that the two species should not be considered synonyms. We further confirm significant morphological differences in the copulatory organs between *E. coelestis* and the type species of *Lycosa* and *Hogna*, as well as their close congeners. Molecular evidence also supports *E. coelestis* as belonging to a distinct clade (Fig. 9). Consequently, we propose the establishment of the new monotypic genus *Erranticosa* gen. nov. to accommodate this species. However, the true diversity of the genus

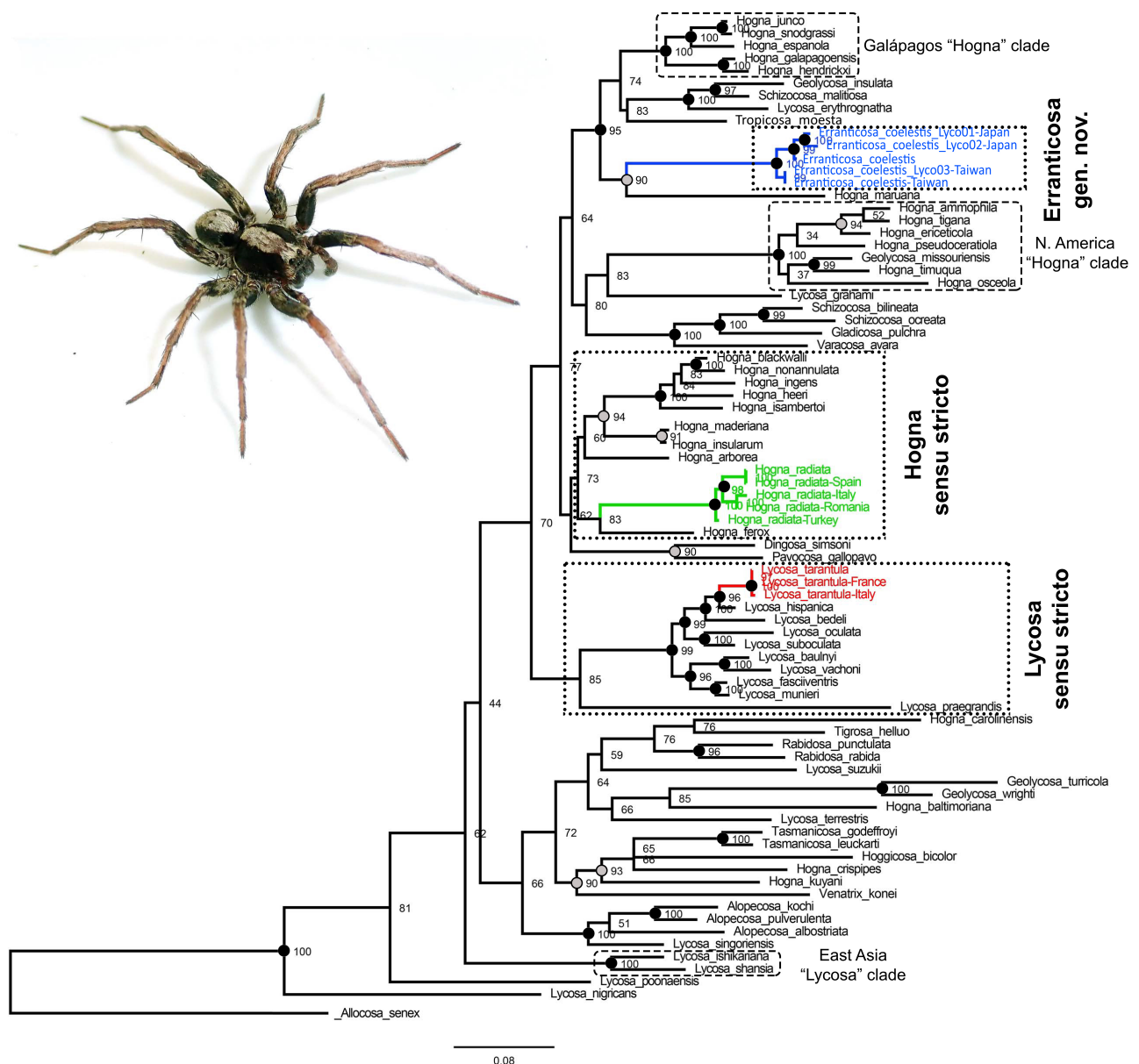


Fig. 9. Maximum likelihood tree of the subfamily Lycosinae as inferred by IQ-TREE. Branch lengths were scaled concerning the number of substitutions per site. Values near nodes represent the related bootstrap support values. Black dots at nodes refer to highly supported nodes (bootstrap support $\geq 95\%$), while grey dots refer to middle supported nodes ($\geq 90\%$). Different colors indicate the type species of the genera *Lycosa* (red), *Hogna* (green), and *Erranticosa* gen. nov. (blue). Dotted squares represent tentative boundaries of the genera *Lycosa*, *Hogna*, and *Erranticosa* gen. nov. *sensu stricto* based on the molecular results only. Dashed squares represent distinct monophyletic clades including multiple species of *Hogna* and *Lycosa sensu lato*. The tree is rooted using the Allocosinae species *Allocosa senex*.

remains unclear and requires further studies.

Based on published drawings, other Asian “*Lycosa*” species may align with the morphological definition of *Erranticosa* gen. nov. (e.g., *Lycosa nigrotibialis* Simon, 1884; *Lycosa kemp*i Gravely, 1924). However, due to the conservative nature of the copulatory organs among “hognoid” genera and the lack of available specimens for direct comparison, we could not confirm the affiliation of these species with *Erranticosa* gen. nov. Additional not-illustrated lycosid species from Southeast Asia, known only from their original description, may also belong to this genus and should be considered in future studies when specimens become available. Some “*Hogna*” species from the Galápagos also exhibit an epigyne similar in shape to that observed in *Erranticosa* gen. nov. (e.g., *H. espanola*

Baert and Maelfait, 2008; *H. galapagoensis* (Banks, 1902); *H. snodgrassi* Banks, 1902; etc.; see Baert et al. 2008). Given the significant geographic distance from the known range of *E. coelestis*, it is unclear whether such similarities might be attributed to convergent evolution rather than an ancient common ancestor; however, our preliminary molecular results suggest a possible relationship between these taxa. Such a topic could be an interesting subject for future phylogenetic studies involving Asian and South American lycosids.

Despite being locally abundant and relatively easy to collect, wolf spiders remain strongly underrepresented in taxonomic and molecular studies, especially in Asia. Similarly, the systematics of Lycosinae and other lycosid subfamilies remain confusing and in urgent need of thorough revision.

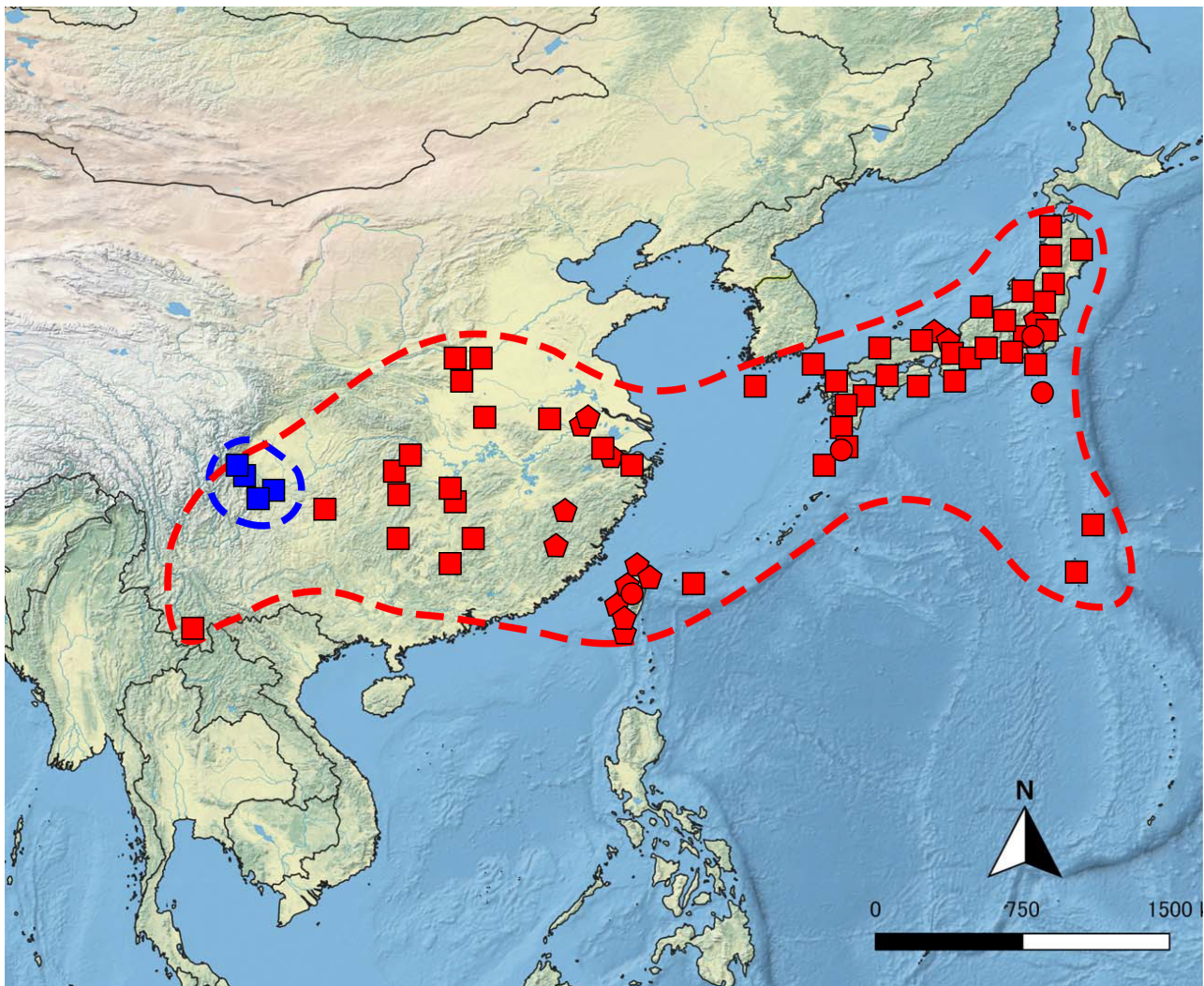


Fig. 10. Known distribution of *Erranticosa coelestis* (in red) and *Trochosa subcoelestis* (in blue). Squares represent localities reported in the literature (WSC 2026; JSC 2025), pentagons represent records from iNaturalist (<https://www.inaturalist.org/>) and confirmed based on photographs, circles denote newly obtained specimens directly examined in this work. The dashed lines outline the approximate known distribution area of the two species.

CONCLUSIONS

Lycosidae are notorious character-poor spiders with several species and sometimes genera sharing a similar general appearance in the shape of the copulatory organs. Thus, the use of molecular data can greatly aid in providing new and significant insights into their phylogeny. We emphasize the need for more extensive research involving Asian and South American wolf spiders, ideally using integrative approaches that encompass morphological, molecular, ecological, biogeographic, and ethological methods. New and comprehensive collections and studies could help identify yet-undescribed taxa and further contribute to filling current knowledge gaps in the systematics and taxonomy of these intriguing spiders.

List of abbreviations

Eyes

ALE, anterior lateral eye.
AME, anterior median eye.
PLE, posterior lateral eye.
PME, posterior median eye.

Copulatory organs

At, atrium.
C, conductor.
E, embolus.
Eb, embolic base.
Et, tip of embolus.
Fd, fertilization duct.
Hr, head of receptacle.
Id, insemination duct.
Pl, palea.
Pp, pars pendula.
Pr, primary receptacle.
Sb, septal base.
Se, synembolus.
Ss, stalk of septum.
St, subtegulum.
Te, tegulum.
Tg, tegular apophysis.

Legs and spination

Fe, femur.
Pa, patella.
Ti, tibia.
Mt, metatarsus.
Ta, tarsus.
d, dorsal.
p, prolateral.
r, retrolateral.
v, ventral.

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REFERENCES

- Armiach Steinpress I, Cohen M, Pétillon J, Chipman AD, Gavish-Regev E. 2022. *Lycosa* Latreille, 1804 (Araneae, Lycosidae) of Israel, with a note on *Geolycosa* Montgomery, 1904. *Eur J Taxon* **832**:1–54. doi:10.5852/ejt.2022.832.1877.
- Ballarin F, Eguchi K. 2023. Integrative taxonomic revision of the genera *Nesticella* and *Howaia* in Japan with the description of five new species (Araneae, Nesticidae, Nesticellini). *ZooKeys* **1174**:219–272. doi:10.3897/zookeys.1174.101251.
- Ballarin F, Marusik YM, Pantini P, Nadolny AA. 2026. From folkloric origins to scientific systematics: the first detailed redescription of the type species of *Lycosa* Latreille, 1804 with insight into the genus (Araneae: Lycosidae). *Eur J Taxon* **1043**:244–286. doi:10.5852/ejt.2026.1043.3221.
- Baert L, Maelfait JP, Hendrickx F. 2008. The wolf spiders (Araneae, Lycosidae) from the Galápagos Archipelago. *Bull Inst R Sci Nat Belg Entomol* **78**:5–37.
- Bösenberg W, Strand E. 1906. Japanische Spinnen. Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft **30**:93–422.
- Chen XE, Gao JC. 1990. The Sichuan farmland spiders in China. Sichuan Science and Technology Publishing House, Chengdu, 226 pp.
- Crespo LC, Silva I, Enguídanos A, Cardoso P, Arnedo M. 2022. Island hoppers: Integrative taxonomic revision of *Hogna* wolf spiders (Araneae, Lycosidae) endemic to the Madeira islands with description of a new species. *ZooKeys* **1086**:84–135. doi:10.3897/zookeys.1086.68015.
- Folmer O, Black M, Hoeh W, Lutz R, Vrijenhoek R. 1994. DNA primers for amplification of mitochondrial cytochrome *c* oxidase subunit I from diverse metazoan invertebrates. *Mol Mar Biol Biotechnol* **3**:294–299.
- Fox I. 1935. Chinese spiders of the family Lycosidae. *J Wash Acad Sci* **25**:451–456.
- JSC. 2025. Japan Spider Catalog v. 2025 R1. Available at: <https://lookerstudio.google.com/reporting/affa70b1-2b26-4da6-b0ba-12c8cb5873b5>. (Accessed 10 Feb. 2026).
- Koch L. 1878. Japanesische Arachniden und Myriapoden. *Verh KK Zool-Bot Ges Wien* **27**:735–798, pl. 15–16.
- Kulkarni S, Wood HM, Hormiga G. 2023. Advances in the reconstruction of the Spider Tree of Life: a roadmap for spider systematics and comparative studies. *Cladistics* **39**:479–532. doi:10.1111/cla.12557.
- Langlands PR, Framenau VW. 2010. Systematic revision of *Hoggicosa* Roewer, 1960, the Australian ‘bicolor’ group of wolf spiders (Araneae: Lycosidae). *Zool J Linn Soc* **158**:83–123. doi:10.1111/j.1096-3642.2009.00545.x.
- Logunov DV. 2022. On the synonymy of *Orinocosa guentheri* (Pocock, 1899) with *Hogna radiata* (Latreille, 1817) (Aranei: Lycosidae). *Arthropoda Sel* **31**:493–495. doi:10.1093/aesa/3.3.161.
- Lugetti G, Tongiorgi P. 1965. Revisione delle specie italiane dei generi *Arctosa* C. L. Koch e *Tricca* Simon con note su una *Acantholycosa* delle Alpi Giulie (Araneae-Lycosidae). *Redia* **49**:165–229.
- Marusik YM, Ballarin F. 2011. Redescription of the Himalayan *Pardosa flavisterna* Caporiacco, 1935 (Aranei: Lycosidae) with notes of the *Pardosa nebulosa* species-group. *Proc Zool Inst Russ Acad Sci* **315**:63–69. doi:10.31610/trudyzin/2011.315.1.63.
- Murphy NP, Framenau VW, Donnellan SC, Harvey MS, Park YC et al. 2006. Phylogenetic reconstruction of the wolf spiders (Araneae: Lycosidae) using sequences from the *12S rRNA*, *28S rRNA*, and *NADH1* genes: implications for classification, biogeography, and the evolution of web building behavior. *Mol Phylogenetics Evol* **38**:583–602. doi:10.1016/j.ympev.2005.09.004.
- Pepe R. 2005. Basi zoologiche-naturalistiche del tarantismo nel Salento. *Thalassia Salentina* **27**:47–62.
- Piacentini LN, Ramírez MJ. 2019. Hunting the wolf: A molecular phylogeny of the wolf spiders (Araneae, Lycosidae). *Mol Phylogenetics Evol* **136**:227–240. doi:10.1016/j.ympev.2019.04.004.
- Planas E, Fernández-Montraveta C, Ribera C. 2013. Molecular systematics of the wolf spider genus *Lycosa* (Araneae: Lycosidae) in the western Mediterranean basin. *Mol Phylogenetics Evol* **67**:414–428. doi:10.1016/j.ympev.2013.02.006.
- Roewer CF. 1955. Katalog der Araneae von 1758 bis 1940, bzw. 1954. 2. Band, Abt. a (Lycosaeformia, Dionycha [excl. Salticiformia]). 2. Band, Abt. b (Salticiformia, Cribellata) (Synonyma-Verzeichnis, Gesamtindex). Institut royal des Sciences naturelles de Belgique, Bruxelles, 1751 pp.
- Roewer CF. 1960. Araneae Lycosaeformia II (Lycosidae) (Fortsetzung und Schluss). *Exploration du Parc National de l’Upemba, Mission G.F. de Witte* **55**:519–1040.
- Schenkel E. 1936. Schwedisch-chinesische wissenschaftliche Expedition nach den nordwestlichen Provinzen Chinas, unter Leitung von Dr. Sven Hedin und Prof. Sü Ping-chang. Araneae gesammelt vom schwedischen Arzt der Expedition Dr. David Hummel 1927–1930. *Arkiv för Zoologi* **29(A1)**:1–314.
- Tanaka H. 1990. Lycosid spiders of Japan III. The genus *Lycosa* Latreille. *Sonoda Women’s College Studies* **24**:193–213.
- WSC 2026. World Spider Catalog 2026 v. 27. Natural History Museum Bern. Available at: <http://wsc.nmbe.ch>. (Accessed 10 Feb. 2026). doi:10.24436/2.
- Yaginuma T. 1960. Spiders of Japan in colour. Hoikusha, 186 pp.