

Queens and males of the Japanese dolichoderine ants (Hymenoptera: Formicidae)

Самки и самцы японских муравьев-долиходерин (Hymenoptera: Formicidae)

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Abstract. In Japan eight species of dolichoderine ants have been known, of which two are very recently introduced tramp species. Descriptions/diagnoses of the queen and male are given for each of these species. Keys to genera and species are provided for the Japanese dolichoderines. Reproductives (winged ants) of *Dolichoderus sibiricus* (males only) and two *Technomyrmex* species (queens and males) are frequently attracted to light, while those of other genera have not yet been collected with light traps.

Резюме. В Японии известно восемь видов муравьев подсемейства Dolichoderinae, два из которых являются недавно завезенными инвазивными видами. Для каждого из этих видов даны описания и/или диагнозы самок и самцов. Приведены определительные ключи для японских муравьев-долиходерин. Репродуктивные особи (крылатые муравьи) *Dolichoderus sibiricus* (только самцы) и два вида из рода *Technomyrmex* (самки и самцы) часто привлекаются светом, в то время как представители других родов не были собраны с помощью световых ловушек.

Introduction

The dolichoderine (often called odor-ants) fauna of Japan is relatively poor, consisting of only eight species in six genera, of which five or six species can be alien [Terayama et al. 2014; Tatsuki, 2014; Terayama, Sunamura, 2019]. However, information on the queen and/or male is still insufficient for some species and no comprehensive taxonomic revision has been published. Although the female castes (worker and queen) of this subfamily are relatively easily distinguished from those of other subfamilies, there are few characteristics that separate males from those of the subfamily Formicinae [Boudinot, 2015]. The dolichoderine females have the apex of the gaster with a slit-like aperture, while formicine females usually have a distinct circular acido-

pore fringed with erect hairs around it [Bolton, 1994]. Yoshimura and Fisher [2011] showed the importance of the development of the basimere compared with the harpago (telomere) in recognizing the dolichoderine males. The serrate masticatory margin of the mandible may be a feature more easily observed in dolichoderine males (with some exceptions) when comparing with formicine males that have distinct teeth on the masticatory margin.

In this paper we give queen and male characters to separate dolichoderine species from other Japanese ants. We also try to find morphological features useful in identifying all the genera and species of the Japanese Dolichoderinae. Information about the mating season in each species is also given.

Materials and methods

Queens and males were collected from colonies or with light traps. The samples collected were point-mounted as dry specimens. Some fragile specimens (mainly males) were deformed after mounting, and could not be used for measurements.

Terminology principally follows that by Boudinot [2015]. Some characters of descriptive value are as follows:

Clypeus. The median portion of the clypeus is often convex dorsad, and termed *median disc* [see also Bolton, 1994]. Anterior margin of the disc often with a small emargination or impression. The lower lateral portion on each side extends as a narrow zone to the outer articulation of the mandible between the gena and mandible, and is termed *lateral lobe*. Occasionally, the clypeus anteriorly has a “narrow” lamellate belt that can be discerned by texture, thickness or color.

Mandible. The mandible in the dolichoderines is generally subtriangular or elongate triangular, with a distinct tooth apically on the masticatory margin. Remainder of the masticatory margin is equipped with additional teeth or partly serrate, but often entirely serrate. The *dentate* condition where the teeth/dents are relatively large and/or variable in size is more often encountered in the queen, while the denticles are sometimes very small, numerous, same or similar in shape and size, regularly arranged on the margin, the condition being called *serrate* and more often seen in the male. Although these two categories are not always clear-cut, we will use the terms keeping this ambiguity in mind.

Antenna. Consisting of the scape, pedicel and flagellum, the last being subdivided into 10 flagellomeres in the queen, and 11 in the male, but exceptions are rarely seen in *Tapinoma* [see Bolton, 2003]. The pedicel is generally similar to the first flagellomere in shape, but sometimes has a special feature of taxonomic importance, especially in males.

Scutoscutellar sulcus and axillae. With the mesosoma in dorsal view, a narrow (front to rear) zone exists between the mesoscutum and mesoscutellum of the mesonotum. In the queen and male of the Japanese dolichoderine this zone is clearly demarcated from the mesoscutum with a sharp and linear furrow called *transscutal line* [Boudinot, 2015]. The scutoscutellar sulcus lying immediately behind it is a distinct area between axillae in some ants. However, in the dolichoderines this is much reduced to a tiny area between well-developed axillae. Axilla is generally triangular but in some species quadrate with anterior and posterior margins are parallel.

Metapleural gland orifice. Metapleural glands are peculiar to the ants and are seen in workers and queens of a wide range of groups, but mostly absent in some arboreal groups such as *Camponotus*, *Polyrhachis* and parasitic genera [Yek, Mueller, 2010]. Although it is generally absent in males, many dolichoderine males have a metapleural gland orifice. This will help in recognizing dolichoderines among male samples being examined. In the Japanese species the orifice is not clearly observed only in dry-mounted *Technomyrmex sahoime* males.

Petiole. There is a mixture of petiole types in Dolichoderinae. In most genera it is node-like or scaly in both the female and male. Among the 28 world genera only two, *Tapinoma* and *Technomyrmex*, have dorsoventrally flattened petioles like strips [Bolton, 1994]. In this type of petiole the dorsal and ventral outlines are nearly parallel (in the queen ventral margin often roundly convex). Although this condition is almost constant in the female castes, the petiole seen in profile view is occasionally thickened anteriorly to form a low node strongly inclined anteriorly. In males the petiole can be more node-like in *Technomyrmex*.

Pilosity. In the Japanese species erect/suberect long hairs are very few on the body and appendages, especially on the dorsum of the body. This is another useful characteristic in recognizing dolichoderines among a mass of winged ants collected with traps.

Abbreviations are as follows:

HW: maximum head width excluding eyes in full-face view.

HWe: maximum head width including eyes in full-face view.

HL: maximum head length from anterior margin of clypeus to posterior margin of head (not necessarily along imaginary mid-cranial line).

SL: scape length without condylar bulb.

MW: maximum width of mesosoma, generally measured just in front of wing bases.

PtW: width of petiole in dorsal view.

PtH: height of petiole in profile view, from highest point of node to ventral margin of sternite.

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Taxonomy

QUEEN CHARACTERS

(APPLIED TO JAPANESE SPECIES ONLY)

The queens of the Japanese Dolichoderinae have the following characteristics that are useful in separating them from those of other subfamilies. 1) Body less than 6 mm in total length; 2) eye without erect hairs, or erect hairs, if any, minute, sparse and inconspicuous (*Technomyrmex*); 3) eye barely or only slightly breaking lateral margin of head; 4) antenna with 10 flagellomeres (12 antennomeres); 5) antennal scape without erect hairs except at apex; 6) notaulix absent and parapsidal line present; 7) scutoscutellar sulcus reduced, and axillae often nearly touching each other mesally; 8) outer face of tibiae (often almost entire tibiae) without erect hairs; 9) waist comprising only one segment (petiole); 10) petiole often dorsoventrally flattened (*Tapinoma* and *Technomyrmex*); 11) apex of gaster with slit-like aperture that is not encircled with conspicuous hairs; 12) sting absent.

KEY TO THE DOLICHODERINE GENERA AND SPECIES OF JAPAN BASED ON THE QUEEN

1. Petiole dorsoventrally flattened, often concealed under first gastral tergite 2
- Petiole with distinct node (in *Dolichoderus sibiricus* the node is low but still distinct) 5
2. Fifth gastral tergite reflected ventrally so that in dorsal view only four tergites can be seen. Mesosoma in profile view more or less flattened dorsoventrally, with dorsal outline flat. — Genus *Tapinoma* 3
- Fifth gastral tergite small but visible in dorsal view. Mesosoma in profile view more or less convex; propodeum distinctly lower than mesonotum. — Genus *Technomyrmex* 4
3. With head in full-face view antennal scape not reaching posterolateral corner of head. Third and fourth segments of maxillary palp only slightly widened, not distinctly flattened. Pronotum and mesoscutum with same color (dark brown) as head; mesoscutellum and propodeum pale brown to yellowish *Tapinoma sahoime*

- With head in full-face view antennal scape reaching posterolateral corner of head. Third and fourth segments of maxillary palp enormously widened and flattened. Head and gaster dark brown; mesosomal dorsum pale brown to yellowish *Tapinoma melanocephalum*
- 4. Body entirely dark brown to black. Mandible with longitudinal furrow. Malar space (space between mandibular base and anterior margin of eye) long, nearly as long as major diameter of eye *Technomyrmex brunneus*
- Body much paler, entirely pale brown to brown, or mesosoma much paler and yellowish. Mandible without furrow. Malar space much shorter, shorter than half eye length *Technomyrmex gibbosus*
- 5. Anterior clypeal margin with small projection medially .
..... *Iridomyrmex anceps*
- Anterior clypeal margin convex, entire or concave, never with median projection 6
- 6. Body stout with hard cuticle. Head and mesosoma extensively and coarsely macropunctate except for mesopleuron and mesoscutellum. Propodeum strongly macro-punctate; in profile view its posterior margin concave. Petiole elongate, distinctly longer than high in profile view *Dolichoderus sibiricus*
- Body more fragile, often deformed in dried specimens. Head and mesosoma minutely and superficially sculptured. Propodeum smooth or very superficially microsculptured; in profile view its posterior margin straight to weakly convex. Petiole scale-like, higher than long in profile view 7
- 7. Body entirely black. Antennal scape shorter, not reaching posterodorsal corner of head. Mesosoma not laterally compressed; its dorsum with many erect hairs. In profile view dorsum of propodeum longer than declivity. Gaster shiny *Ochetellus glaber*
- Head and mesosoma brown and gaster dark brown. Antennal scape surpassing posterolateral corner of head. Mesosoma strongly laterally compressed in dried specimens; its dorsum without erect hairs. In profile view dorsum of propodeum very short, almost continuous with declivity. Gaster matt *Linepithema humile*

MALE CHARACTERS

(APPLIED TO JAPANESE SPECIES ONLY)

Japanese dolichoderine males can be separated from those of the other subfamilies by the combination of the following character conditions. 1) Body less than 6 mm in total length; 2) antenna with 11 flagellomeres (13 antennomeres); 3) antennal scape without conspicuous hairs (but densely with relatively long decumbent to appressed hairs in *Technomyrmex gibbosus*); 4) antennal socket almost touching posterolateral border of clypeus (but clearly separated from clypeus in *Ochetellus glaber*); 5) masticatory margin of mandible serrate, or with small denticles/teeth, or serrate and partly dentate (generally number of denticles/teeth more than 10); 6) notaulix absent and parapsidal line present; 7) scutocutellar sulcus generally reduced and axillae often almost touching each other mesally; 8) dorsum of mesosoma generally without erect hairs and tibiae without erect hairs except at apex; 9) metapleural gland orifice usually present; 10) waist comprising only one segment (petiole), 11) petiole dorsoventrally flattened (*Tapinoma* and

Technomyrmex) or node/scale-like, 11) with genitalia in profile view harpago (telomere) generally smaller than basimere. For Further information, see also Yoshimura and Onoyama [2002].

KEY TO THE DOLICHODERINE GENERA AND SPECIES OF JAPAN BASED ON THE MALE

1. Masticatory margin of mandible nearly entire, i.e., without teeth and denticles except for apical tooth .. *Iridomyrmex*
- Masticatory margin of mandible serrate (i.e., with numerous minute denticles of similar sizes), or dentate 2
2. Antennal scape short, as long as broad, as long as pedicel; pedicel globular, broader than scape and first flagellomere, and shiny. Hind tibia strongly curved in apical half *Ochetellus glaber*
- Antennal scape longer, longer than broad, longer than pedicel; pedicel cylindrical, more slender, at most as broad as scape. Hind tibia straight throughout 3
3. Body larger, measuring 4.5–5 mm in total length. Petiole globular, in profile view broadly rounded apically. Scuto-scutellar sulcus longitudinally rugulose *Dolichoderus sibiricus*
- Body smaller, generally less than 3.5 mm in total length. Petiole scale-like or dorsoventrally flattened. Scuto-scutellar sulcus much reduced, not rugulose 4
4. Third flagellomere very long, 3 times as long as broad; apical flagellomere very short, shorter than antennal pedicel
..... *Linepithema humile*
- Third flagellomere shorter, at most twice as long as broad; apical flagellomere longer than antennal pedicel 5
5. Antennal scape long, longer than pedicel + first and second flagellomeres combined. Petiole strongly flattened dorsoventrally. Venter of petiole with a few erect hairs posteriorly. Genus *Tapinoma* 6
- Antennal scape short, as long as or shorter than pedicel + first and second flagellomeres combined. Petiole more scale-like. Venter of petiole with many long erect hairs. Genus *Technomyrmex* 7
6. Body smaller, measuring 1.03–1.25 mm in total length. Antennal scape not surpassing posterolateral corner of head. Third and fourth segments of maxillary palp normal. Legs light brown, not contrasting with brownish mesosoma ...
..... *Tapinoma sahohime*
- Body larger, measuring 1.95–2.65 mm in total length. Antennal scape distinctly surpassing posterolateral corner of head. Third and fourth segments of maxillary palp distinctly widened. Legs yellowish, more or less contrasting with brownish mesosoma *Tapinoma melanocephalum*
7. Body entirely blackish. Legs except for tarsi blackish. First flagellomere shorter than scape. Wings normal or missing *Technomyrmex brunneus*
- Body entirely brown to dark brown. Legs extensively yellowish. First flagellomere longer than scape. Fully-developed wings always present *Technomyrmex gibbosus*

Dolichoderus Lund, 1831

Queen diagnosis. Body strongly constructed with hard cuticle. Masticatory margin of mandible not serrate, with more than ten teeth. Antennal torulus almost touching lateral margin

of clypeus. Antenna with 10 flagellomeres (12 antennomeres). Petiole globular to scale-like, not distinctly flattened dorsoventrally; its venter without process or lobe. Gaster with 4 visible tergites in dorsal view; fifth tergite ventral. Always with fully developed wings. For further details, see Shattuck [1992].

In at least Asian species total body length generally more than 4 mm (at least 3.5 mm). Anterior clypeal margin almost straight to broadly and very shallowly emarginate. Posterodorsal corner of propodeum round to angled, rarely with spines. Body sculpture and pilosity greatly vary among species groups and species. Antennal scape and tibiae almost completely without erect hairs, or with long erect hairs densely.

Male diagnosis. Body strongly constructed with hard cuticle, often as large as or larger than the worker caste. Inner

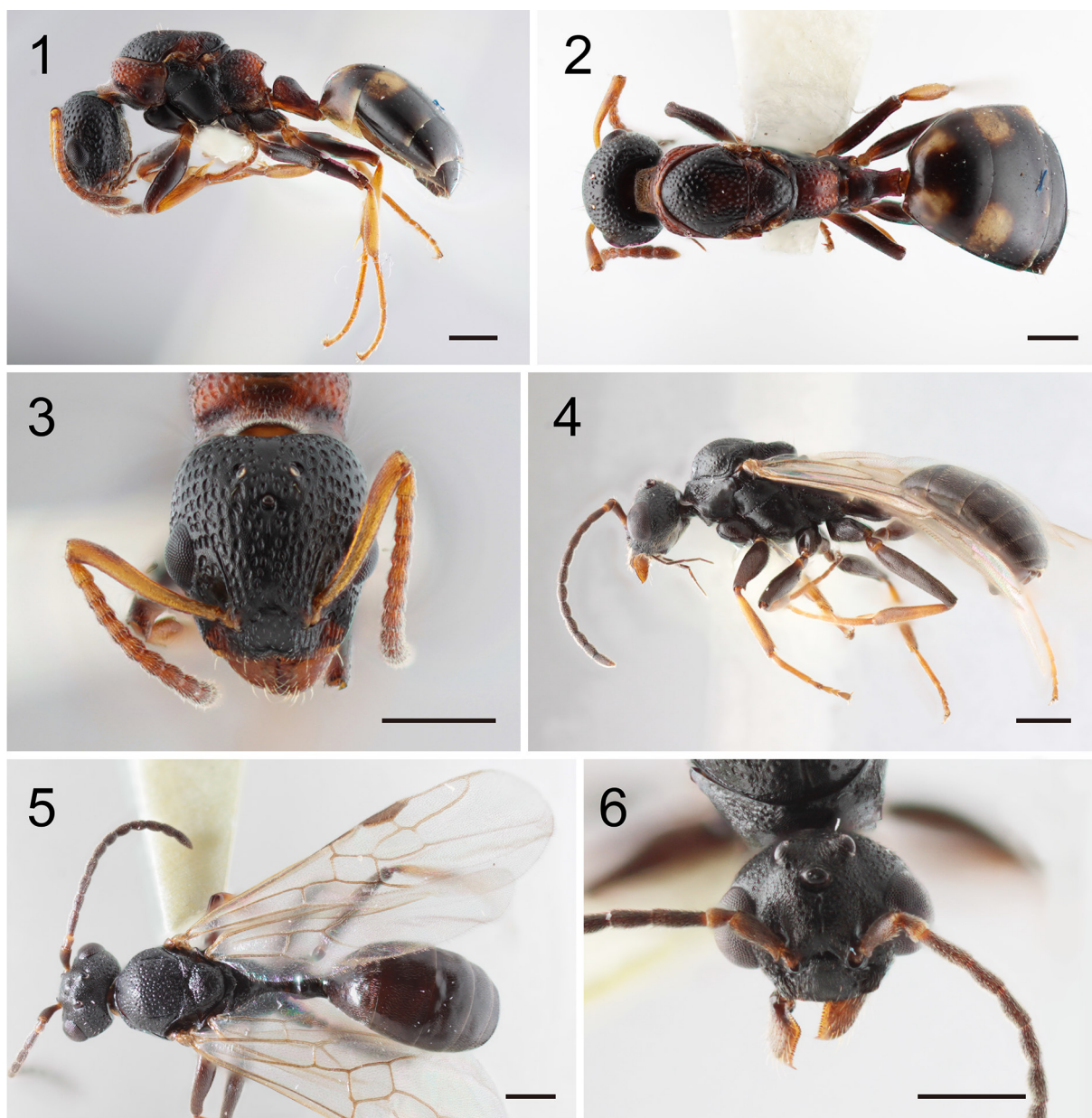
margin of eye emarginate. Masticatory margin of mandible serrate, consisting of numerous minute dents (sometimes teeth distinct). Antenna with 11 flagellomeres; scape short, only approaching level of posterior margin of eye. Petiolar scale vertical, generally node-like. Gaster with six visible tergites in dorsal view, of which sixth is very short, occasionally invisible. For further details, see Shattuck [1992].

Dolichoderus sibiricus Emery, 1889

Figs 1–6.

Dolichoderus quadripunctatus subsp. *sibiricus* Emery, 1889: 442 (worker).

Dolichoderus sibiricus: Yasumatsu, 1962: 96 (raised to species status); Kupyanskaya, 1990: 155 (male and queen descriptions).



Figs 1–6. *Dolichoderus sibiricus* Emery, dealate queen (1–3), male (4–6). 1 — body in profile view; 2 — body in dorsal view; 3 — head in full-face view; 4 — body in profile view; 5 — body in dorsal view; 6 — head in full-face view. Scale bars: 0.5 mm.

Рис. 1–6. *Dolichoderus sibiricus* Emery, бескрылая самка (1–3); самец (4–6). 1 — общий вид в профиль; 2 — общий вид сверху; 3 — голова анфас; 4 — общий вид в профиль; 5 — общий вид сверху; 6 — голова анфас. Масштаб: 0.5 mm.

Material examined. *Hokkaido*: 1♂, Sapporo-shi, Hakken-zan, 25.VIII.2020, light trap (18:40–23:30), K. Kawamura leg.; 2♂♂, same loc., 7.IX.2020, light trap (18:00–23:00), K. Kawamura leg. *Kyushu*: 1dq, Nagasaki-ken, Tsushima, Izuhara-machi, Tatera-yama, 23.IX.2015, Y. Hisasue leg.; 1aq, Ōita-ken, Kokonoe-machi, Chōjabaru, 11.IX.2022, daytime, Sk. Yamane leg. *Ōsumi Islands* (Kagoshima-ken): 1♂, Yakushima, foot of Aiko-dake, 11.VIII.2001, light trap, Goto leg. (IBOY); 3♂♂, same loc., 24.X.2001, light trap, Goto leg. (IBOY); 1♂♂, same loc. & date, light trap, A. Shimono leg. (IBOY).

Queen diagnosis. Body 3.8–4.1 mm long, strongly constructed. Anterior clypeal margin medially indented. Antennal scape barely surpassing posterolateral corner of head. Petiole distinctly inclined anteriorly. Head, pro-mesonotum, propodeum and petiole strongly punctate. Erect hairs mainly confined to clypeus, mouthparts, and gastral tip and venter. Body black, with mandible, pronotum, part of propodeum and petiole orange to reddish brown; antennal scape, flagellum basally and legs yellowish to reddish brown (femora can be darker). First and second gastral tergites with yellow maculae.

Queen description (Figs 1–3). Measurements in mm ($n = 2$). HW 0.83, 0.90; HL 0.97, 1.00; SL 0.73, 0.77; EL, 0.30, 0.31; MW 0.77, 0.75. CI 90.0, 85.6; SI: 85.6, 88.0. Body 3.8–4.1 mm in total length. Head in full-face view distinctly longer than broad, broader posteriorly than anteriorly, with posterior margin weakly convex and medially very shallowly emarginate, and round posterolateral corner. Ocelli small and inconspicuous, arranged in low triangle; anterior ocellus slightly larger than posterior ocelli. Eye located slightly in front of midlength of head, large, breaking lateral margin of head; inner margin entire. Frontal lobe ill developed; frontal carinae widely separated from each other, divergent posteriorly, becoming evanescent around level of posterior margin of eye. Malar space (space between posterior margin of lateral clypeus and anterior eye margin) shorter than major diameter of eye. Clypeus transverse, with posteromedian portion deeply inserted between frontal carinae; separation of frons from clypeus indistinct; anterior clypeal margin shallowly indented/concave medially. Mandible subtriangular; masticatory margin with large acute apical tooth, followed by smaller subapical tooth and eight low teeth with blunt apices. Antennal torulus almost touching dorsal margin of lateral clypeus. Antennal scape slightly surpassing posterolateral corner of head; pedicel longer than broad, longer than first flagellomere (third antennomere); flagellomeres each as long as or slightly shorter than broad except for apical flagellomere, which is clearly longer than broad.

With mesosoma in dorsal view, pronotum narrower than head, with roundly convex anterior margin and deeply concave posterior margin; anterior pronotal lobe (neck) parallel-sided. Mesoscutum nearly as long as broad, slightly narrower than pronotum; median line of mesoscutum obsolete, only recognized on its anterior one-fourth; notaulix absent; parapsidal line distinct; parascutal sulcus sharp; transscutal line sharp and deep, laterally touching parapsidal line; scutoscuteellar sulcus apparently absent; axillae large, almost touching each other; mesoscutellum round, broader than long. Metanotum nearly as broad as mesoscutellum, very short from front to rear (“narrow” zone), distinctly defined anteriorly and posteriorly with deep sutures. Propodeum broader than metanotum; its dorsum broader than long, roundly merging with posterior declivity. With mesosoma in profile view, pronotum posteriorly shallowly concave, ventrally margined with distinct furrow. Mesopleuron divided into upper and lower sections with distinct furrow consisting of chain of punctures. Metapleuron separated from mesopleuron with indistinct furrow, posteriorly deeply concave, differentiated from lateral face of propodeum with chain of punctures; metapleural gland bulla large, touching propodeum. Lateral face of propodeum roundly merging

with dorsal face, posteriorly concave; posterodorsal corner weakly angled.

Petiole in dorsal view with dorsal face broader than long, connected with propodeum by short pedicel; posterior slope long, weakly convergent posteriorly. Petiole in profile view longer than high, with steep anterior slope, apically round dorsum and gently sloping posterior face; ventral outline straight. With gaster in dorsal view, first tergite with medially straight anterior margin and rounded anterolateral corner; second tergite longer than first tergite; fourth tergite strongly narrowed posteriorly, with round apical margin. Second and third gastral sternites almost entirely hidden with ventrally extending tergites.

Head and mesosoma almost entirely punctate and matte. Punctures on head, pronotal dorsum, mesoscutum, entire propodeum, and upper area of petiole large and coarse; those on median portion of frons, clypeus, mesoscutellum and remaining part of petiole smaller; lateral face of pronotum partly and mesopleuron with dense microscopic punctures. Gaster essentially smooth with microscopic sculpture and shiny.

Pilosity poor on dorsa of head, mesosoma and petiole; few erect hairs present on clypeus, frons and mesosoma; anterior area of clypeus and mandible with slanting to decumbent hairs; Eye without erect hairs; venter of head with rather dense erect hairs; petiole with bundle of short erect hairs on venter of its anterior pedicel; gaster with few erect hairs on dorsum, more hairs on venter especially near apex. Ground color of body black, with following portion reddish brown: mandible, antenna (apical half darker), pronotum, posteromedian portion of mesonotum, axillae, mesoscutellum, dorsum of propodeum, petiole, tibiae and tarsi of all legs. Gaster black, usually with pair of yellow spots on each of first and second tergites. Wings hyaline with green and purple reflection; forewing 3.8 mm long, with seven closed cells; pterostigma developed, strongly pigmented, 2.5 times as long as broad.

Male diagnosis. Body 4.4–4.8 mm long, larger than queen. Inner margin of eye emarginate. Anterior clypeal margin straight. Masticatory margin of mandible serrate. Antennal scape short, only approaching level of posterior margin of eye. Propodeal dorsum not differentiated from declivity. Petiole node in profile view nearly vertical, rounded apically. Vertex and gena, mesosomal dorsum, and petiole punctate to irregularly sculptured. Pilosity poor except on mouth parts and gastral venter. Head, mesosoma and petiole black; gaster slightly paler; mandible brown; antenna and legs brownish to blackish, often with yellowish tinge.

Male description (Figs 4–6). Measurements in mm ($n = 3$). HW 0.92–0.93, HWc: 1.02–1.05, HL 0.77–0.83, SL 0.28–0.33, EL 0.42–0.43, MW 0.97, 0.99, PtW, 0.31–0.33, PtH 0.31–0.38. CI 110.8–120.8, SI 30.1–35.9. Head in full-face view broader than long; posterior and lateral margins continuous; in profile view temple+gena very thick, narrowed anteriorly. Occipital carina weakly developed, not elevated, seen only on dorsal area of head. Area just in front of anterior ocellus concave; posterior ocellus facing laterad. Eye very large, distinctly breaking outer margin of head when seen in full-face view; inner margin with shallow emargination. Clypeus with posterior margin roundly convex between antennal sockets; anterior margin straight. Mandible broad, with basal corner angulate to differentiate masticatory and basal margins; masticatory margin almost straight, serrate except for large apical tooth. Antenna strongly constructed; scape weakly flattened dorsoventrally, relatively long, when laid back reaching level of posterior margin of eye; pedicel as long as broad, widened apically; all flagellomeres longer than broad; first flagellomere as long as scape; other flagellomeres gradually diminishing their length distally, but apical flagellomere nearly as long as first flagellomere.

Mesosoma in dorsal view, slightly broader than head. Pronotum linear, extending to forewing base posteriad. Mesoscutum very large with roundly convex anterior and lateral margins and straight posterior margin; notaulix absent; parapsidal line distinct, weakly curved; transscutal line complete; scutoscuteellar sulcus apparently absent; axilla laterally triangular, linear mesially; mesoscutellum narrower than axillae combined, narrowed and rounded posteriad, separated from axillae with chain of large punctures. Metanotum anteriorly with V-shaped keel, posteriorly demarcated from propodeum with straight, weak furrow. Propodeum slightly longer than broad, broader than scutoscuteellar zone, with shallowly and evenly convex lateral margin. With mesosoma in profile view, its anterior slope moderately steep and dorsal outline weakly convex. Pronotum rather large, broadened posteriad; its posterior one-third sloping toward mesopleuron. Mesonotum with short anterior slope that is roundly continuous to dorsal margin; mesopleuron divided into upper and lower sections with straight furrow, latter much larger than former; mesoscutellum as high as mesoscutum and much higher than metanotum. Metapleuron divided into upper small and lower larger sections with deep invagination where it is constricted; metapleural gland orifice present. Propodeum separated from metapleuron with indistinct furrow; declivity with shallowly convex posterior margin; spiracle small, slightly elevated from cuticle, located at mid-height of propodeal side between dorsal margin and anterior margin of propodeum.

Petiole in dorsal view broader than long, with short dorsal face; in profile view its node slightly longer than high, dorsally roundly convex, demarcated from sternite with distinct keel; ventral margin of sternite shallowly convex. With gaster in dorsal view, first tergite gradually narrowed posteriad; following tergites gradually and feebly narrowed posteriad; terminal tergite distinctly narrower than preceding ones, with posterior margin straight; terminal sternite with posterior margin roundly convex.

Entire head minutely punctate and matte; in addition to this ground sculpture vertex behind ocelli, temple and gena with larger punctures. Mesosoma entirely minutely punctate; mesoscutum also with larger punctures and propodeal declivity with ill-defined larger punctures; lateral face of propodeum irregularly sculptured. Petiole entirely minutely punctate and weakly shiny. Gaster entirely microscopically punctate and shiny. Erect hairs nearly confined to clypeus, mandible, venter of petiole, gastral tip and venter, and coxae of all legs. Eye essentially without erect hairs. Head, mesosoma and petiole black; antenna, mandible, gaster, and coxae and femora of all legs reddish brown to dark brown; tibiae and tarsi light brown. Wings hyaline with bluish, greenish and purple iridescence; forewing 4.2–4.5 mm long; venation nearly complete, with seven closed cells; pterostigma large and strongly dark-pigmented.

Distribution in Japan. Hokkaido, Okushiri-tô, Honshu, Taka-shima, Izu Is. (Ô-shima, Shikine-jima), Shikoku, Kyushu, Tsushima, Ôsumi Is. (Yaku-shima).

Taxonomic remarks. The worker is similar to the queen in sculpture, size and color, except for caste-specific characters. It differs from the latter in the following respects: pronotum more developed, in dorsal view much broader than mesonotum, as long as mesonotum; propodeum in dorsal view slender, longer than broad; in profile view its posterior margin more deeply concave; larger part of second and third sternites of gaster exposed. It is not sure that the almost hidden second and third sternites in the queen represent a stable state or not.

Biology. This species nests in dead twigs on trees or in decayed wood. Mating flights occur during mid-August to October [Terayama et al., 2014; present study]. Terayama et

al. [2014] mentioned that males and alate queens depart from natal nests in the afternoon up to evening. The dealate queen collected on Tsushima on 23rd September, 2015 was walking on tree trunk around 12:35 and supposed to have already copulated (Hisasue, personal observation). If mating occurs before sunset, males attracted to light may be either of those that have finished mating or those that could not have found virgin queens.

Iridomyrmex Mayr, 1862

Recently the tramp *Iridomyrmex anceps* (Roger, 1863) was found in port areas of Yokohama, Honshu, and might have established itself around there [Terayama, Sunamura, 2019; Terayama et al., 2025]. Although we have not yet got the queen and male of the genus *Iridomyrmex*, their diagnostic character states are cited from Forel [1901; referred to as *Iridomyrmex meinerti*], Shattuck [1992] and Grokipedia v0.2 [2025].

Queen diagnosis. Clypeus with small projection on its anterior margin medially. Mandible with 7–9 teeth and 4–7 denticles. Mesoscutum with erect hairs. Petiole with angular dorsum. In *I. anceps*, queen notably larger than worker, measuring 8–10 mm in body length (3–5 mm in worker), and 7–8 mm in wing length.

Male diagnosis. Inner margin of eye entire. Mandible without distinct basal angle; masticatory margin essentially without teeth/denticles except for distinct apical tooth. Axilla parallel and entire. Petiolar scale present. In *I. anceps* body 4–6 mm long and forewing 5–6 mm long.

Linepithema Mayr, 1866

We have only one Japanese species in this genus, *L. humile*, which has recently been introduced and established itself outside port areas, spread to disturbed areas of Honshu, Shikoku and Kyushu [Tatsuki, 2014; Yamane et al., 2025]. For the character states distinguishing this genus from other dolichoderine genera in the queen and male, see Shattuck [1992b].

Linepithema humile (Mayr, 1868)

Figs 7–12.

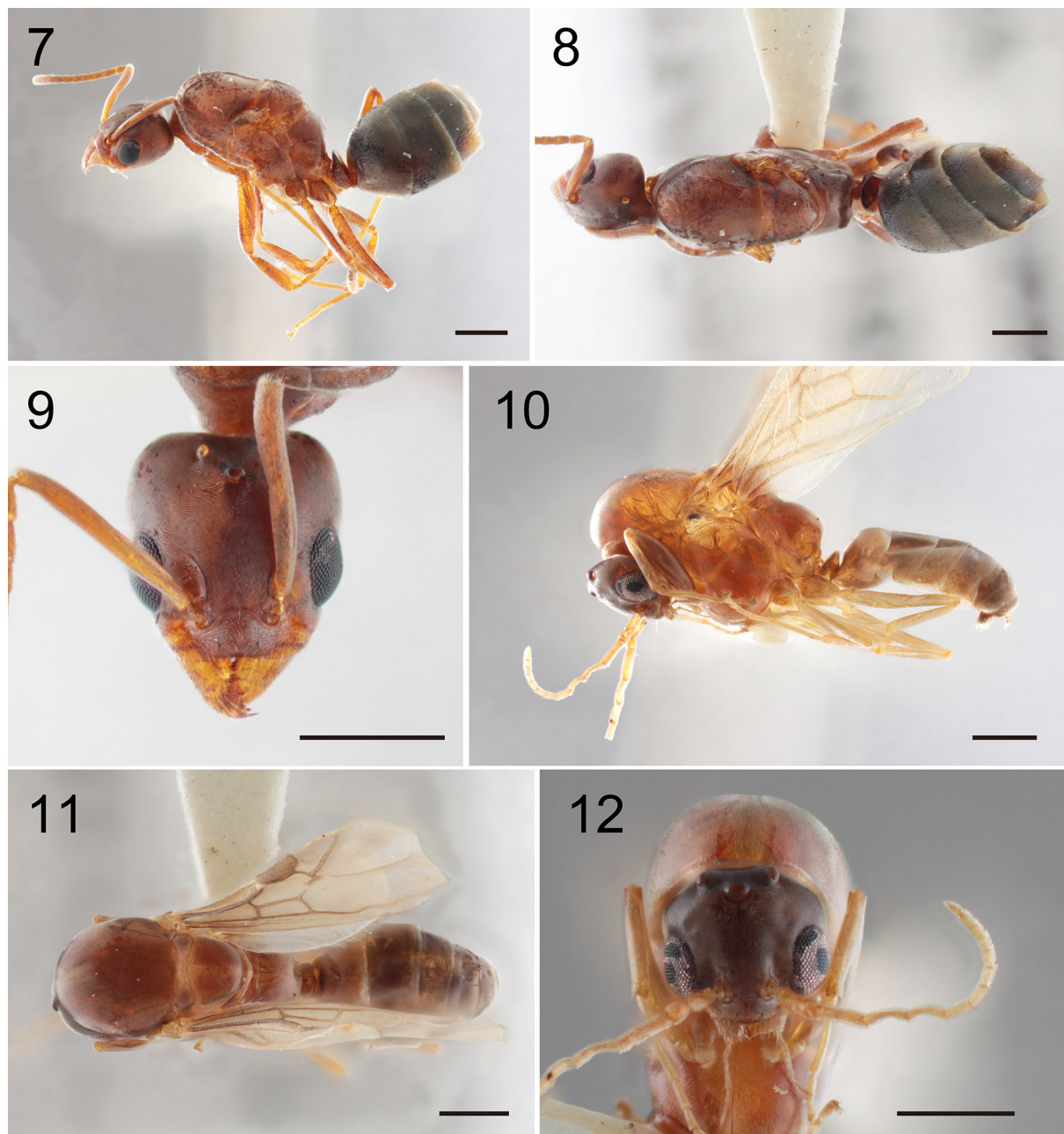
Hypoclynea humilis Mayr, 1868: Argentina (worker).

Linepithema humile: Shattuck, 1992a: 16 (combination in *Linepithema*), 1992b: 115 (queen and male descriptions); Wild, 2007: 61 (descriptions of worker, queen and male), figs 48, 50, 54, 74 (male); Tatsuki, 2014: 331 pp. (all aspects of natural history).

Material examined. Honshu: 8dq, 6♂♂, Hyôgo-ken, Kôbe-shi, Port Island, 18.IX.2016, K. Murakami leg. (KMsky16-03); 5♂♂, same loc., 16.V.2017, K. Murakami leg. *Shikoku*: 1dq, Tokushima-ken, Aimizu-chô, Shôzui, 8.VI.2016, K. Ohara leg.; 5dq, 5♂♂, same loc., 13.VI.2016, K. Ohara leg.; 5♂♂, Tokushima-ken, Naruto-shi, Ôasa-chô, Ichiba, 16.VI.2023, K. Ohara leg. *Kyushu*: 2m, Kagoshima-ken, Shibushi-shi, Itchôda, 23.IV.2024, K. Kubo leg.

Queen diagnosis. 4.6–4.7 mm in total body length. Head 0.82–0.87 mm wide. Eye large, located close to mandibular base. Antenna with 10 flagellomeres; scape long, extending beyond posterolateral corner of head. Palpal formula: 6 maxillary and 4 labial. Mesosoma massive, larger than gaster; pronotum with vertical anterior slope; dorsal outline of mesonotum nearly flat. Propodeal dorsum essentially absent; declivity vertical. Petiole in profile view low, cuneiform, with acute apex. Entire body covered with long appressed pubescence; erect hairs very sparse except on entire venter of gaster. Wings hyaline with brown veins. Entire body reddish brown, but gaster and legs somewhat blackish.

Male diagnosis. 3.0–3.2 mm in total body length. Head 0.61–0.64 mm wide, dorsoventrally strongly flattened. Eye large, located close to mandibular base, much longer than



Figs 7–12. *Linepithema humile* (Mayr), dealate queen (7–9), male (10–12). 7 — body in profile view; 8 — body in dorsal view; 9 — head in full-face view; 10 — body in profile view; 11 — body in dorsal view; 12 — head in full-face view. Scale bars: 0.5 mm.

Рис. 7–12. *Linepithema humile* (Mayr), бескрылая самка (7–9); самец (10–12). 7 — общий вид в профиль; 8 — общий вид сверху; 9 — голова анфас; 10 — общий вид в профиль; 11 — общий вид сверху; 12 — голова анфас. Масштаб: 0.5 mm.

half-length of head in profile view. Antennal scape short, much shorter than first flagellomere, which is three times as long as broad. With mesosoma in profile view, mesoscutum huge, convex anteriorly, overhanging pronotum; propodeum roundly produced posteriad. Eye essentially without erect hairs. Entire body yellowish brown to brown; gaster darker and legs paler. Wings hyaline with brown veins, often with golden, purple, blue or green reflection; forewing 2.9–3.1 mm long, with complete venation and large pterostigma.

More detailed descriptions of the queen and male are available in Shattuck [1992a], Wild [2007] and Terayama [2014].

Distribution in Japan (introduced). Honshu, Shikoku, Kyushu.

Biology. Biology of this species is reviewed in AntWiki [2026; *Linepithema humile*] and Tatsuki [2014]. In Japan this species is spreading in urban environment from Honshu to Kyushu [Tatsuki, 2014; National Institute for Environmental Studies, Japan Website, 2022]. Both new queens and males have fully-developed wings, but copulation generally occurs in the natal nest [Markin, 1970]. Inseminated queens shed the wings and become egg-layers. Males are often seen in moving columns together with workers during early summer (Kenji Ohara, personal communication).

Ochetellus Shattuck, 1992

Queen diagnosis. The queens were available for us only for *Ochetellus glaber* from Japan and *O. sp.* from Papua prov., Indonesia (Irian Jaya). The description below is partly based on Shattuck [1992]. Body somewhat weakly constructed, when dry-mounted cuticle partly deformed. Anterior clypeal margin with lateral shoulder, without median projection. Mandible with 7–9 teeth and 0–3 denticles; basal angle distinct. Antenna 12-merous (with 10 flagellomeres). Palpal formula 6:4. Propodeal declivity weakly convex to flat; posterodorsal corner of propodeum ill-defined. Petiole in profile view scale-like, moderately inclined anteriorly, apically tapered, with anterior and posterior slopes of nearly same length. First gastral segment with groove or indentation for receiving entire height of petiole, but not concealing petiole in dorsal view.

Male diagnosis. We examined the males of two species, *Ochetellus glaber* from Japan and *O. sp.* from Papua province of Indonesia. They are very fragile and easily deformed in dry-mounted specimens so that measuring some body parts was impossible. Body very small, 1.7–2.1 mm long in total length. Antenna 13-merous. These two species have the following character states in common that should be noted: 1) clypeus with elevated round median disc, behind which an impressed transverse area exists between antennal sockets; 2) antennal scape very short, at most only slightly longer than broad; 3) antennal pedicel globular, thickened, broader than each of scape and first flagellomere, and shiny; 4) masticatory margin of mandible not serrate, with several distinct teeth or denticles (observation difficult); 5) basal margin of mandible not serrate; 6) petiole seen from back almost rectangular, broadly attached to first gastral segment, its dorsal margin straight or shallowly emarginate often with lateral extremities slightly producing; 7) dorsal face of petiole forming sharp transverse ridge; in profile view petiole strongly tapering apicad, with posterior slope steep; 8) hind tibia strongly curved in apical half. For further details, see Shattuck [1992b], Yoshimura [2002] and Yoshimura and Fisher [2011].

Ochetellus glaber (Mayr, 1862)

Figs 13–18.

Hypoelinea glabra Mayr, 1862: 705 (w, ♂), Australia.*Iridomyrmex itoi* Forel, 1900:269 (w), Japan.*Iridomyrmex itoi abbotti* Wheeler, 1906: 318 (w), Japan.*Ochetellus glaber* (Mayr, 1862): Shattuck, 1992a: 17; Terayama et al., 2014: 177.

Material examined. *Kyushu*: 6♂♂, Kagoshima-shi, Haruyama-chô, 31.V.2006, in house, Sk. Yamane leg. (JP06-SKY-02); 2q, Kagoshima-ken, Sakurajima, Kurokami, 19.V.2007, dead stem, Sk. Yamane leg.; 6aq, 1♂, Sakura-jima, Supermagma road., 21.VI.2021, dead twig on tree, Sk. Yamane leg. (JP21-SKY-084). *Ôsumi Islands* (Kagoshima-ken): 3aq, Tanega-shima, Makigawa, 4.V.1984, Sk. Yamane, Y. Harada & M. Yano leg. *Kerama Islands* (Okinawa-ken): 1aq, Tokashiki-jima, Aharen-misaki, 26.V.2022, Sk. Yamane leg.

Queen diagnosis. Body relatively large, elongate, measuring 3.8–5.1 mm in total length. Mid-cranial line deep in front of anterior ocellus. Anterior margin of clypeus shallowly emarginate medially. Mandible triangular with apical tooth largest, followed by preapical tooth; remainder of masticatory margin serrate. Antennal scape not surpassing posterolateral corner of head. Dorsal face of head, mesosoma and gaster with erect hairs. Propodeum in profile view with dorsum longer than declivity; posterodorsal corner angulate. Petiole cuneiform. Gaster much larger than mesosoma. Entire body black and rather shiny; tarsi of all legs yellowish.

Queen description (Figs 13–15). Measurements (n = 3–5). HW 0.67–0.78, HL 0.80–0.90, SL 0.52–0.65, EL 0.27–0.30,

MW 0.73–0.87, PW 0.27–0.33, PH 0.39–0.43. CI 83.8–91.8, SI 77.3–83.3. Body not very strongly sclerotized (head harder), 3.8–5.1 mm in total length. Head in full-face view longer than broad, with posterior margin weakly emarginate and lateral margin shallowly convex; posterolateral corner rounded, not distinctly defined. Occipital carina poorly developed; vertex rounded onto occiput. Mid-cranial line present, deep in front of anterior ocellus. Ocelli arranged in very flat triangle. Eye moderate in size, measuring ca. 1/3 of head length in lateral view. Frontal carinae short, ill-developed, not raised from cuticle, widely separated from each other, curved inwardly; frontal lobe almost absent; antennal socket exposed; frons ill-defined. Clypeus dorsally demarcated from frons with fine furrow, with anterior margin shallowly emarginate; main disc higher than anterior transverse zone. Mandible triangular; apical tooth largest, followed by preapical tooth; remaining part of masticatory margin serrate. Antennal scape short, not attaining posterolateral corner of head, twice as long as eye length; pedicel and flagellomeres broader than long except for terminal one.

Mesosoma in dorsal view broader than head (in intact samples), broadest just in front of forewing base. Pronotum visible, much narrower than mesoscutum, distinctly narrowed anteriorly. Mesoscutum massive, strongly convex anteriorly; notaulix absent; parapsidal lines sharp, diverging anteriorly, attaining ca. 2/5 length of scutum; transscutal line complete; scutoscuteellar sulcus apparently absent; axilla large, with parallel anterior and posterior margins; mesoscutellum distinctly narrower than mesoscutum, broader than long. Metanotum well defined, short (“narrow band”), convex posteriorly. Propodeum slightly broader than mesoscutum, broader than long; its dorsum small, separated from declivity with rounded angle. With mesosoma in profile view, pronotum with parallel dorsal and ventral margins. Mesoscutum weakly domed; its anterior slope as long as pronotal slope; mesopleuron broadened ventrad, divided into small upper section and larger lower section with fine furrows that are often indistinct; mesoscutellum dorsally at same level as mesoscutum. Metanotum lower than mesoscutellum; metapleuron distinctly demarcated from mesopleuron; its upper section distinctly narrowed ventrally, demarcated from propodeal side with depression; lower section separated from propodeal side with feeble line. Propodeum with dorsum long and sloping; posterodorsal corner angled; declivity slightly shorter than dorsum.

Petiole scale-like; seen from back dorsal margin shallowly convex, without any incision; in profile view tapered apicad, with posterior slope straight. Gaster much larger than mesosoma; in dorsal view first segment anteriorly narrowed and fourth segment posteriorly narrowed; second and third segments parallel-sided; first and fourth tergites about equal in length.

Head and mesosoma extensively with minute punctures and rather shiny; area around eye and mandible basally more distinctly punctate and matte; gaster microscopically punctate (essentially smooth) and shiny. Antenna and legs minutely punctate and matte (partly weakly shiny).

Entire body covered with short decumbent to appressed pubescence. Erect hairs sparse except on mesoscutum and venter of gaster. Antenna and legs without erect hairs except on coxae and trochanters. Eye with very sparse short erect hairs. Wings hyaline, with blue, green and purple iridescence; forewing 3.8–4.3 mm long, with almost complete venation, and seven closed cells; pterostigma large and distinct; hind wings with four closed cells, without jugal lobe.

Male diagnosis. Body very small measuring only 1.7–2.1 mm in total length and fragile. Posterior ocellus located



Figs 13–18. *Ochetellus glaber* (Mayr), alate queen (13–15); male (16–18). 13 — body in profile view; 14 — body in dorsal view; 15 — head in full-face view; 16 — body in profile view; 17 — body in dorsal view; 18 — head in full-face view. Scale bars: 0.5 mm.

Рис. 13–18. *Ochetellus glaber* (Маур), крылатая самка (13–15); самец (16–18). 13 — общий вид в профиль; 14 — общий вид сверху; 15 — голова анфас; 16 — общий вид в профиль; 17 — общий вид сверху; 18 — голова анфас. Масштаб: 0.5 mm.

posteriorly at each extreme of transverse flattened area. Eye large, distinctly breaking lateral margin of head when seen in frontal view, without emargination on inner margin. Mandible elongate-triangular; masticatory margin differentiated, with a series of several small teeth. Antenna short; scape short, only slightly longer than broad; pedicel globular, much broader than scape; all flagellomeres as long as or shorter than long except for terminal one. Metapleural gland orifice small and circular. Tibia of hindleg strongly curved in apical half. Petiole anterodorsally flattened, in profile view distinctly shorter than high, in dorsal view transversely linear, broader than anterior portion of first gastral tergite, in posterior view transverse-rectangular. Body with superficial sculpture and shiny, almost lacking erect hairs. Entire body dark reddish brown; antenna and legs paler. Forewing 2.0–2.6 mm long.

Male description (Figs 16–18). Measurements (n=1). HW 0.41, HWc 0.47, HL 0.40, SL 0.06, EL 0.21, MW 0.53, PtW

0.21, Pth 0.21. Total body length 1.7–2.1 mm; cuticle soft so that it can be easily collapsed when dry-mounted, making measurement difficult. In full-face view, head including eyes broader than long, with posterior margin straight and lateral margin roundly convex. Head seen from “above” (not in dorsal view) with median flattened area on vertex, the area being rather distinctly margined (but without marginal carinae); posterior ocellus located at each extreme of posterior margin of this flattened area and anterior ocellus inside it far from its anterior margin. Eye large, distinctly breaking lateral margin of head, without emargination on inner margin. Frontal carina essentially absent. Clypeus transverse, dorsally well differentiated from frons; median disc distinctly elevated from level of frons; lateral lobe much lower, strongly narrowed around mandibular base and seemingly terminating there; anterior margin broadly convex, with its median portion more or less straight. Mandible elongate-triangular; masticatory margin

differentiated, with a series of several small teeth (observation difficult). Antenna short; scape only slightly longer than broad; pedicel globular, much broader than scape; all flagellomeres as long as or shorter than broad except for terminal one.

With mesosoma in dorsal view, pronotum almost invisible; mesoscutum convex dorsad and laterally, forming large dome; axilla transverse, “narrowed” mesially, margined anteriorly and posteriorly with sharp furrows; mesoscutellum broader than long, much narrower than mesoscutum, distinctly narrowed posteriad. Metanotum low, strongly transverse, demarcated anteriorly and posteriorly with sharp deep furrow. Propodeal dorsum long. With mesosoma in profile view, mesopleuron divided into upper and lower sections of similar sizes with sharp horizontal furrow. Metapleural gland orifice small and circular. Tibia of hindleg strongly curved in apical half.

Petiole anterodorsally flattened, in profile view short (“thin”), distinctly shorter than high, ventrally convex, in dorsal view transversely linear, broader than anterior portion of first gastral tergite, in posterior view transvers-rectangular. Gaster as long as mesosoma, with six visible tergites, but apical two often invisible in deformed dried specimens.

Entire body minutely and superficially punctate and rather shiny, almost lacking erect hairs; petiole ventrally often with a few erect hairs; eye with extremely tiny hairs sparsely, or hairs essentially absent; antennal flagellum with dense short suberect hairs. Wings as in queens; forewing 2.05–2.60 mm long.

Distribution in Japan. Honshu (Pacific side), Shikoku, Kyushu, Tsushima, Ryukyu Islands, Daitō Islands, Senkaku Islands, Ogasawara Islands, etc. [for further details, see Terayama et al., 2014]. It is highly possible that this species is a tramp, but clear evidence is unavailable.

Taxonomic remarks. In this species the size difference is remarkable between the queen and male; forewing is 3.8–4.3 mm in the queen, 2.0–2.6 mm in the male. Males are so fragile that detailed observation was impossible. This species is easily recognized among the dolichoderines in Japan by the almost entirely black and shiny body (queen, male), scaly petiole (queen, male), vertexial flat area on which the ocelli are located (male), and curved apical portion of hind-tibia (male).

Biology. This species nests in dead twigs on live trees or ground, dead plant stems and other dry spaces in the field, and nests can be found even in houses. Winged ants are found in nests during May and June in Kagoshima. Mating flights occur from late May to July, and queens and males depart from natal nests during morning [Terayama et al., 2014; current study]. Winged ants have not yet been captured with light traps.

Tapinoma Förster, 1850

The following descriptions are based on two Japanese species. For further details of the queen and male characters of the genus, see Shattuck [1992].

Queen diagnosis. Body cuticle relatively fragile; mesosoma and gaster often partly deformed in dried specimens. Head as long as or slightly longer than broad, with posterior margin straight to very shallowly emarginate. Eye located rather anteriorly. Anterior margin of clypeus straight or feebly emarginate medially. Masticatory margin of mandible with small teeth of similar sizes, rather than serrate. Antenna 12-merous; antennal scrobe present but small. Mesosoma relatively flattened dorsoventrally, longer than head but much shorter than gaster, narrower than head and gaster in dorsal view. Petiole flat, essentially without node, seen from above completely hidden by first gastral tergite. With gaster in dorsal view, only four tergites visible; first tergite longest, anteriorly gradually narrowed. Body with fine sculpture over all surface, partly weakly shiny. Body covered with short decumbent to

appressed pubescence; long erect/suberect hairs confined to clypeus, mandible and venter of gaster.

Male diagnosis. Body cuticle relatively fragile, often deformed (cuticle partly sinking) in dry-mounted specimens. Head, excluding eyes, as long as broad, with roundly convex dorsal margin that is smoothly continuous to lateral margin. Eye located rather anteriorly. Anterior margin of clypeus straight to shallowly emarginate. Masticatory margin of mandible serrate; masticatory and basal margins not differentiated. Antenna 13-merous. Mesosoma relatively flattened dorsoventrally, longer than head but much shorter than gaster, in dorsal view narrower than head and gaster. Transscutellar line complete; axillae widened laterally, linear mesially, almost touching each other. Petiole in profile view dorsoventrally flat, slightly “thicker” (higher) anteriorly, in dorsal view completely hidden under first gastral tergite. Gaster with five visible tergites. Body entirely covered with short appressed pubescence; erect/suberect long hairs confined to clypeus, mandible and venter of gaster.

Tapinoma melanocephalum (Fabricius, 1793)

Figs 19–24.

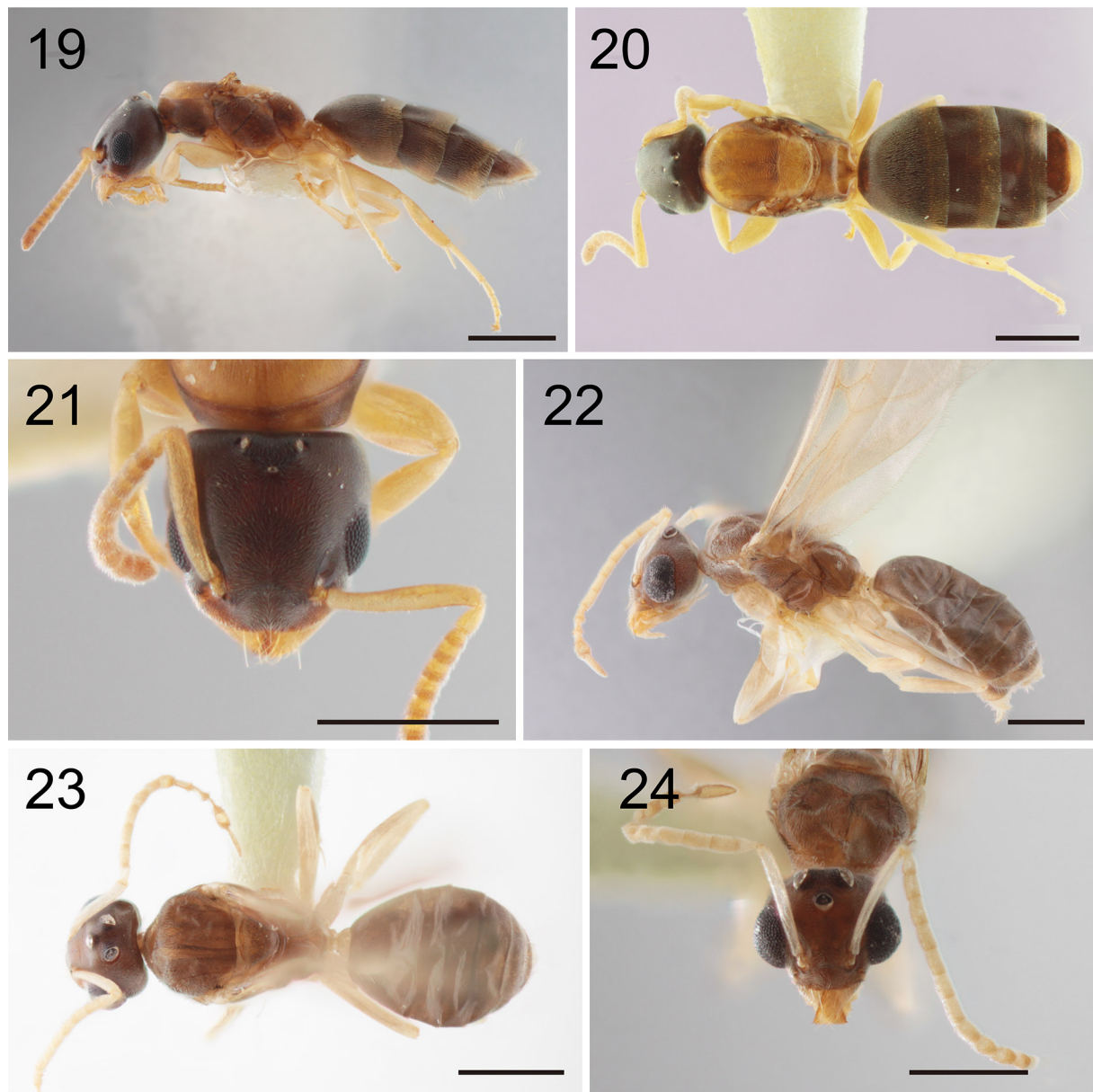
Formica melanocephala Fabricius, 1793: 353 (worker).

Tapinoma melanocephalum: Santschi, 1928: 475; Terayama et al., 2014: 178.

Material examined. *Amami Islands* (Kagoshima-ken): 1dq, Amami-ōshima, Setouchi-chō, Yui-dake, 9.X.2022, dead twig on tree, Sk. Yamane leg. (JP22-SKY-145); 2dq, Kakeroma-jima, Takahachi-yama, 24.XII.2015, dead twig on ground, Sk. Yamane leg. (JP15-SKY-78). *Okinawa Islands* (Okinawa-ken): 1dq, Okinawa-jima, Ōgimi-son, 27.IV.2021, nest under stone, Sk. Yamane leg. (JP21-SKY-10). *Kerama Islands* (Okinawa-ken): 1dq, Tokashiki-jima, Teruyama Forest Park, 25.V.2022, dead standing tree, Sk. Yamane leg. (JP22-SKY-48). *Yaeyama Islands* (Okinawa-ken): 4♂♂, Ishigaki-jima, Hirae, 12.XI.2024 (ex lab colony), F. Ito leg. (FI 23-116).

Queen diagnosis. Measurements ($n = 4$). HW 0.54–0.56, HL 0.52–0.56, SL 0.45–0.46, EL 0.19–0.21, MW 0.57–0.59. Body 2.3–2.9 mm in total length. Frontal carina strongly curved outwardly, attaining level of midlength of eye, defining antennal scrobe dorsally. Ocelli small; posterior ocelli located close to posterior margin of head, broadly separated from each other. Eye large; in profile view its maximum length as long as or only slightly shorter than distance between posterior margin of eye and posterior margin of head; outer and inner margins of eye entire. Anterior clypeal margin emarginate medially. Masticatory margin of mandible with apical tooth largest, second slightly smaller, others very small. Antennal scape surpassing posterolateral corner of head by length of antennal pedicel. Third and fourth segments of maxillary palp distinctly widened. With mesosoma in dorsal view, pronotum nearly invisible; propodeum without distinct dorsal face. Body extensively microscopically sculptured and dull, but propodeal declivity smooth and shiny; occasionally mesosomal dorsum also somewhat shiny. Head dark reddish brown on dorsum, yellowish brown on venter; mesosoma yellowish to brownish; gaster slightly paler than head dorsum; legs yellow; antenna yellow to pale brown. Pterostigma of forewing narrow, more than 5 times as long as broad. For detailed description, see AntWiki [2026].

Male diagnosis. Measurements ($n = 3$). HW 0.48–0.51, HWe 0.52, HL 0.46–0.48, SL 0.45–0.46, MW 0.56–0.60. 2.0–2.7 mm in total body length. Ocelli relatively large; distance between anterior and posterior ocelli as long as or slightly shorter than ocellar diameter; with head in full-face view posterior ocelli located slightly in front of posterior margin of head. Eye huge, in full-face view distinctly produced laterally beyond lateral margin of head, in profile view occupying more than 2/3 of temple+gena in length; inner margin entire



Figs 19–24. *Tapinoma melanocephalum* (Fabricius), dealate queen (19–21), male (22–24). 19 — body in profile view; 20 — body in dorsal view; 21 — head in full-face view; 22 — body in profile view; 23 — body in dorsal view; 24 — head in full-face view. Scale bars: 0.5 mm.

Рис. 19–24. *Tapinoma melanocephalum* (Fabricius), бескрылая самка (19–21); самец (22–24). 19 — общий вид в профиль; 20 — общий вид сверху; 21 — голова анфас; 22 — общий вид в профиль; 23 — общий вид сверху; 24 — голова анфас. Масштаб: 0.5 mm.

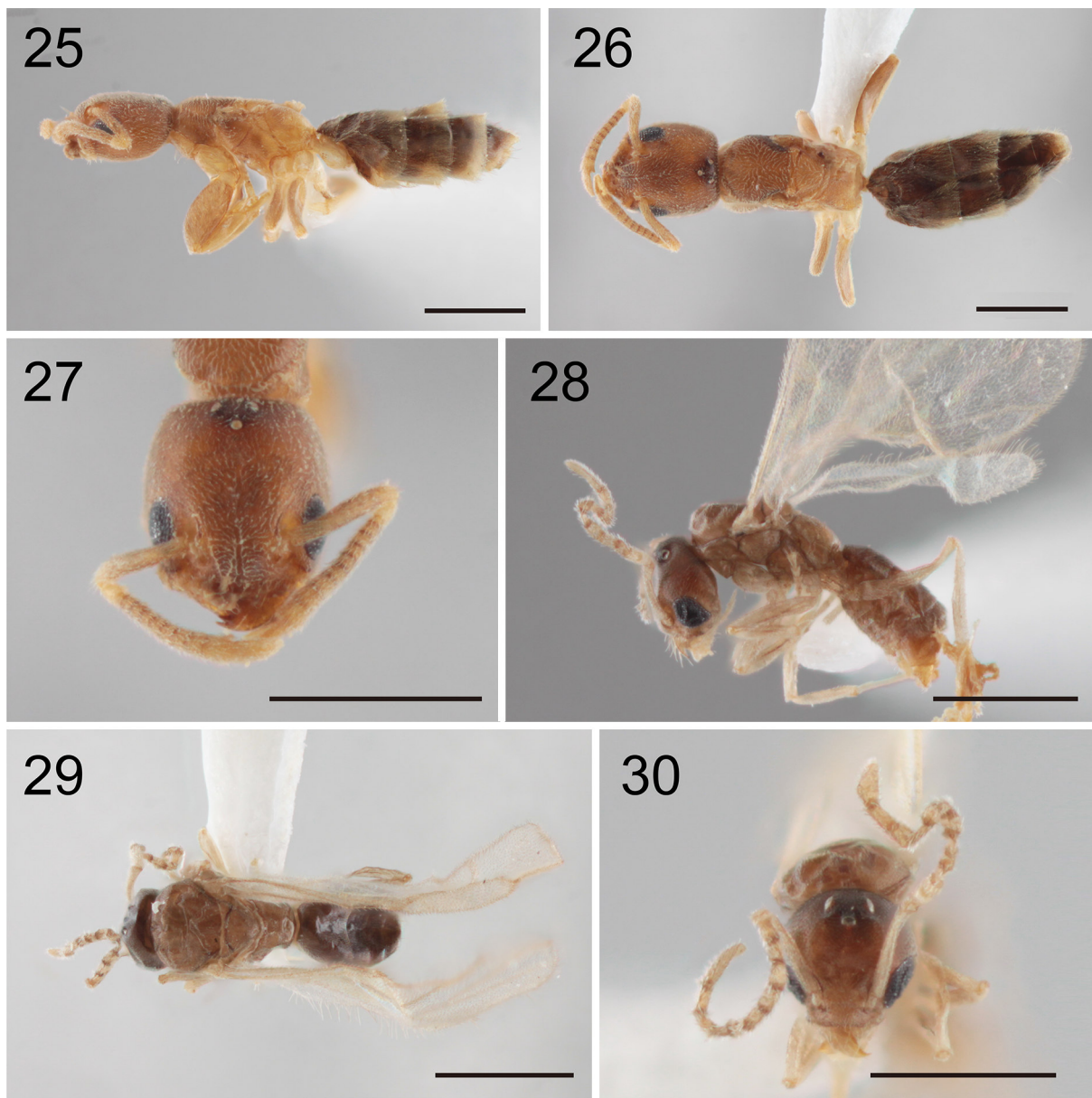
but outer margin very shallowly emarginate. Third and fourth segments of maxillary palp distinctly widened. Mesosoma structurally similar to that of queen. Body with superficial sculpture and dull, but mesosomal dorsum often rather shiny. Eye with short erect hairs. Entire body brown to dark brown, but mesosoma paler than head and gaster, often with yellowish areas; mandible, antenna, petiole and legs yellow. For detailed description, see AntWiki [2026].

Distribution in Japan. Honshu, Shikoku, Kyushu, Ryukyu Islands, Daitō Islands, Ogasawara Islands, Kazan Islands. For further details, see Terayama et al. [2014].

Taxonomic remarks. A morphologically discrete series of specimens was found from a single colony (S. Ryukyus, Yaeyama Is., Kuro-shima, 14.XII.2021, F. Ito leg, FI 21-186). It contains 1 worker, 1 alate queen and 2 males. The samples tend

to be larger than all the other samples that have been identified as *T. melanocephalum* in the worker, queen and male. In the worker and queen, the anterior margin of the clypeus is entire (with small median incision in *T. melanocephalum*); in the queen the eye is larger than in the latter; in the male the ocelli are located on a slightly elevated surface of the vertex (located on flat surface in the latter). The following is measurements for this series. Queen: HW 0.60, HL 0.58, SL 0.48, EL 0.22, MW 0.64; Male: HW 0.51–0.56, HWe 0.65–0.67, HL 0.53–0.56, SL 0.5, EL 0.30–0.31, MW 0.56–0.64. Although this series can represent a different species, we will wait for further material to confirm the identity.

Biology. *Tapinoma melanocephalum*, a famous tramp-species, is commonly found in disturbed areas of southwestern Japan. The biology of this ant has not been studied in detail in



Figs 25–30. *Tapinoma sahoime* Terayama, dealate queen (25–27), male (28–30). 25 — body in profile view; 26 — body in dorsal view; 27 — head in full-face view; 28 — body in profile view; 29 — body in dorsal view; 30 — head in full-face view. Scale bars: 0.5 mm.

Рис. 25–30. *Tapinoma sahoime* Тераюма, бескрылая самка (25–27); самец (28–30). 25 — общий вид в профиль; 26 — общий вид сверху; 27 — голова в анфас; 28 — общий вид в профиль; 29 — общий вид сверху; 30 — голова анфас. Масштаб: 0.5 мм.

Japan. It nests in dead wood and dead twigs, under stones, and in any spaces in the field and house. The exact season when reproductives appear has not been recorded in Japan.

Tapinoma sahoime Terayama, 2013

Figs 25–30.

Tapinoma indicum Forel, var.: Teranishi, 1940: 78 (worker & queen descriptions).

Tapinoma sahoime Terayama, 2013: 14 (worker).

Tapinoma saohime [sic]: Terayama et al., 2014: 178.

Material examined. *Shikoku*: 2♂♂, Kagawa-ken, Marugame-shi, Marugame-jō, 12.VII.2019, F. Ito leg. (2019-7/12-5). *Kyushu*: 1dq, 3♂♂, Nagasaki-ken, Tsushima, Kamitsushima, Hitakatsu, Konpirajinja, 12.IX.2021, dead tree twig, S. Hosoishi leg. (SH21-Tsu-28); 1dq, Kagoshima-ken, Satsuma Pen., Bōnotsu, 19.XI.2009, Y. Shimonodan

leg. *Ōsumi Islands* (Kagoshima-ken): 1dq, Yaku-shima, Miyanaoura, 3.III.2012, W. Jaitrong (JP12-WJT-08); 1dq, Kuchinoerabu-jima, Maeda, 19.X.2016, dead branch on tree, Sk. Yamane leg. (JP16-SKY-117). *Mishima Islands* (Kagoshima-ken): 1dq, Iwō-jima, 30.IV.2012, W. Jaitrong leg. (WJT12-IW-08). *Amami Islands* (Kagoshima-ken): 2dq, Kakeroma-jima, Takahachi-yama, 24.XII.2015, dead twig on ground, Sk. Yamane leg. (JP15-SKY-78).

Queen diagnosis. Smallest among the queens of Japanese dolichoderine species, measuring only 2.1–2.4 mm in total body length. Masticatory margin of mandible with distinct teeth of different sizes. Antennal scape short, not attaining posterolateral corner of head. Petiole dorsoventrally flattened, completely concealed under first gastral tergite. Head, pronotum, mesoscutum and gaster brown to dark brown; remainder of mesosoma and petiole yellowish.

Queen description (Figs 25–27). Measurements ($n = 5$). HW 0.41–0.43, HL 0.46–0.47, SL 0.31–0.34, EL 0.14–0.16 mm. Body 2.1–2.4 mm in total length. Head slightly longer than broad, square in shape, with lateral margin very shallowly convex; posterolateral corner rounded. Frontal carina weak, curved outwardly, attaining level of 2/3 length of eye, defining posterior margin of antennal scrobe. Ocelli small; distance between anterior and posterior ocelli as long as ocellar diameter. With head in full-face view, outer margin of eye barely attaining lateral margin of head; in profile view, eye located anteriorly with its posterior margin anterior to mid length of cranium; outer and inner margin of eye entire; malar space short, shorter than antennal pedicel. Median disc of clypeus clearly defined by its shiny sculpture, broader than long, convex dorsad, with posterior margin broadly roundly convex and anterior margin straight; clypeus anteriorly with short (“narrow”) lamellate zone. Mandible broad, subtriangular; masticatory margin differentiated from basal margin with rounded angle; masticatory margin with apical two to four teeth much larger than others, latter being very small and several to ten in number. Antennal scape short, not attaining posterior margin of head.

Mesosoma in dorsal view distinctly narrower than head and gaster, broadest at its mid-length. Pronotum visible, with its anterior margin broadly roundly convex; posterior margin deeply concave. Mesoscutum slightly longer than broad; transscutal line complete and straight; axillae widened laterally and becoming linear mesially; mesoscutellum narrower than mesoscutum, anteriorly broadly roundly convex, posteriorly roundly convex. Metanotum deeply impressed, posteriorly straight. Propodeum slightly narrower than mesothorax, nearly parallel-sided but anteriorly faintly constricted; posterior margin straight. Mesosoma in profile view somewhat flattened dorsoventrally, with dorsal outline straight. Pronotum with anterior slope rather steep; lateral face large, demarcated from mesopleuron with nearly vertical suture. Mesopleuron divided into upper and lower sections with oblique furrow, demarcated from metapleuron with distinct suture. Metapleuron differentiated from lateral face of propodeum only in upper portion; metapleural gland orifice large. Posterodorsal corner of propodeum roundly angled; dorsum as long as declivity; propodeal spiracle small, circular, located just below posterodorsal corner.

Petiole in profile view flat without node, short, with distinct anterodorsal angle, almost entirely hidden by first gastral segment. Gaster seen in dorsal view much broader than mesosoma, elongate, parallel-sided except first segment distinctly narrowed anteriorly; four tergites visible; tergites large, wrapping most part of underside of gaster so that only small portion of sternites visible.

Body extensively with weak, superficial sculpture and more or less shiny; dorsum and declivity of propodeum smooth and strongly shiny. Body extensively covered with short appressed to decumbent pubescence; erect/suberect hairs confined to clypeus, mandible, and apical gastral tergite and venter of gaster. Eye essentially without erect hairs. Head, pronotum, mesoscutum and gaster brown to dark brown. Mandible, posterior mesosoma, antenna, legs yellow to yellowish brown.

Male diagnosis. Smallest among Japanese dolichoderines; total body length only 1.0–1.3 mm. Body very fragile, deformed in dry-mounted specimens. Masticatory margin of mandible serrate for most of its length. Antennal scape short, not surpassing posterolateral margin of head; pedicel slightly longer than first flagellomere. Petiole dorsoventrally flattened, completely overhung by first gastral tergite.

Male description (Figs 28–30). Detailed observation was impossible due to deformation of cuticle. Measurements

($n = 2–4$). HW 0.30–0.31, HWe 0.32, HL 0.30–0.33, SL 0.21–0.22, EL 0.13–0.14. Body 1.0–1.3 mm in total length. Head nearly as long as broad. Frontal carina short, as long as antennal pedicel, forming inner margin of antennal scrobe. Ocelli relatively small; distance between posterior ocelli twice as long as ocellar diameter; distance between anterior and posterior ocelli slightly longer than ocellar diameter when head is seen from “above” (not dorsally); anterior ocellus ill-defined, dull. Eye in full-face view slightly breaking lateral margin of head, in profile view measuring half length of cranium; malar space short, shorter than antennal pedicel. Area between frontal carinae broad, slightly broader than main disc of clypeus. Clypeus roughly divided into main disc and sloping lateral lobes; main disc with roundly convex dorsal margin that is well defined; anterior margin straight. Mandible elongate-triangular; masticatory margin serrate, i.e., with numerous minute denticles except for distinctly larger apical tooth. Antenna 13-merous; scape short, not attaining posterolateral corner of head; pedicel and all flagellomeres as long as or slightly longer than broad except for apical flagellomere longest, twice as long as preapical.

Mesosoma in dorsal view slightly narrower than head; pronotum barely recognized as “narrow” arch; mesoscutum large occupying most of mesosomal dorsum, without notaulix; axilla linear, only slightly widened laterally. With mesosoma in profile view, pronotum widened posteriorly; mesopleuron divided into upper and lower sections with straight suture; metapleuron demarcated from mesopleuron and propodeum; metapleural gland orifice difficult to recognize; propodeal dorsum ill defined from declivity (dorsal outline continuous); propodeal spiracle circular, positioned at mid-height of propodeal side.

Petiole dorsoventrally flattened, without node. Gaster short, almost as long as mesosoma, with five visible tergites; paramere in profile view very large, convex dorsally.

Body with superficial sculpture, not dull, partly shiny. Body including antennal scape and legs extensively covered with short decumbent to suberect hairs; antennal flagellum densely with thicker short hairs; long erect/suberect hairs confined to clypeus and mouthparts. Eye without erect hairs. Body entirely brown to dark brown; frons, clypeus and mandible pale brown; antenna and legs pale yellowish brown to ivory white. Wings hyaline with golden and bluish iridescence; forewing with five closed cells; hindwing lacking jugal lobe.

Distribution in Japan. Honshu, Izu Islands, Shikoku, Kyushu, Ryukyu Islands, Ogasawara Islands. For further details, see Terayama et al. [2014].

Taxonomic remarks. The queen of *Tapinoma sahoime* is easily distinguished from *T. melanocephalum* by the following character conditions: 1) Body much smaller with total length 2.1–2.4 mm (2.3–2.9 mm in the latter) and head width 0.41–0.43 mm (0.54–0.56 mm in the latter), 2) antennal scape not attaining posterolateral corner of head (surpassing posterolateral corner of head in the latter), and 3) peculiar color pattern with clypeus, head dorsum, anterior half of mesosoma and gaster brown to dark brown, and posterior half of mesosoma and petiole yellowish (head and gaster dark brown, and mesosoma extensively yellowish in the latter). In the male, this species is also distinguished from *T. melanocephalum* by the small size (body length 1.1–1.3 mm vs. 2–2.7 mm) and short antennal scape not attaining posterolateral corner of head (surpassing posterolateral corner of head in the latter). The metapleural gland orifice is vestigial (or absent) in *T. sahoime*, while it is clearly recognized in *T. melanocephalum*. The short antennal scape in the male may be an exception for this genus [see, Shattuck, 1992].

Biology. Nests of this species are found from dead twigs on trees or fallen dead twigs on the ground, but a few cases of subterranean nesting are known [Terayama et al., 2014]. Colonies are founded by a single or multiple queens, and frequently polygynous [Terayama et al., 2014]. Winged ants have not yet been collected with light traps.

Technomyrmex Mayr, 1872

Only two species occur in Japan. The following genus diagnosis is mainly based on these two species and descriptions in Jaitrong and Yamane [2024].

Queen diagnosis. Eye located at or anterior to midlength of head; with head in full-face view outer margin of eye reaching lateral margin of head or breaking it but not so much. Anterior margin of clypeus entire or concave medially. Mandible elongate-triangular; masticatory margin with 2–3 apical large teeth and remainder with many small denticles of nearly same size or entirely serrate. Scutoscuteellar sulcus generally reduced; axilla often very large; dorsum of propodeum small. Petiole in profile view dorsoventrally flattened, “thickened” (higher) anteriorly, without distinct node, at most anterodorsal margin sharply to roundly angulate. Gaster with five visible tergites, but fifth tergite very small and often hidden under fourth tergite, so invisible from above.

Male diagnosis. Eye large, seen in full-face view breaking lateral margin of head, seen in profile view located at or anterior to midlength of cranium. Antennal scape short, as long as pedicel+first flagellomere or shorter than first flagellomere; flagellomeres each generally longer than broad, at least as long as broad. Masticatory margin of mandible generally serrate (apical tooth large), but sometimes with distinct small teeth. Petiole in profile view always higher anteriorly than posteriorly, generally more scale-like or node-like than in queens. Erect/suberect hairs sparse, generally confined to clypeus, mouth parts, and gastral tip and venter. Yoshimura and Fisher [2011] mentioned that the harpago in *Technomyrmex* is in ventral view uniquely expanded mesally to form a distinct ventral face.

Technomyrmex brunneus Forel, 1895

Figs 31–36.

Technomyrmex albipes r. *brunneus* Forel, 1895: 467.

Technomyrmex albipes (F. Smith) Emery: Teranishi, 1940: 37 (worker; Aoshima, Miyazaki).

Technomyrmex brunneus: Bolton, 2007: 73 (raised to species status); Terayama et al., 2014: 180.

Material examined. *Kyushu*: 2aq, 2♂♂, Kagoshima-ken, Kagoshima-shi, Kōrimoto, Kagoshima Univ. Campus, 9.VII.2009, Ky. Nakamura & Y. Shimana leg.; 1aq, 2♂♂, Kagoshima-shi, Sakurajima, Kyōryū-kōen, 30.VI.2021, dead cherry tree, Sk. Yamane leg. (JP21-SKY-93); 1dq, Kagoshima-ken, Minamikyushu-shi, Ei-chō, 22.VII.2009, H. Suenaga leg. *Ōsumi Islands*: 1aq, 3dq, Tanega-shima, Nakatane-chō, 26.VII.2004, Y. Enokido leg. *Amami Islands* (Kagoshima-ken): 1aq, Amami-ōshima, Kinsakubaru, Anengachi-rindō, 29.VII.2021, light-attracted, Sk. Yamane leg.; 1aq, Amami-ōshima, Yui-dake, 27.VI–8.VIII.2000, Malaise trap, T. Muroi & Y. Maeda leg.; 1dq, Yoro-jima, Takabaru, 1.VII.2015, beating, Sk. Yamane leg.; 1aq, Okinoerabu-jima, Ōyama, 23.VI.2016, Y. Maeda leg. *Okinawa Islands* (Okinawa-ken): 2aq, 1♂♂, Okinawa-jima, Nago-dake, 27.VII.2022, dead bamboo, Sk. Yamane leg. (JP22-SKY-71). *Yaeyama Islands* (Okinawa-ken): 1dq, 1♂, Ishigaki-jima, Ōura-dam, 26.V.2021, light trap, K. Kawamura; 1♂, Ishigaki-jima, Miyara, Sokobaru-dam, 11.V.2021, K. Kawamura leg.

Alate queen diagnosis. 3.5–3.7 mm in total body length. Head 0.82–0.87 mm broad, as long as broad. Anterior margin of clypeus entire. Mandible subtriangular; masticatory margin with relatively distinct apical and preapical teeth followed by

3–4 smaller teeth; remainder of margin serrate. Antennal scape extending beyond posterolateral corner of head by length of apical flagellomere. Propodeal dorsum very short. Petiole dorsoventrally flattened, without node, completely overhung by first gastral tergite. Gaster with five visible tergites, but fifth tergite small and often hidden under fourth. Entire body including propodeal declivity densely minutely punctate; punctures on gaster more superficial. Erect long hairs sparse, on head confined to anterior half of its dorsum; mesosoma without erect hairs except for a few on mesoscutellum and propodeal declivity. Almost entire body black; mandible yellowish brown; maxillary and labial palpi, and tibiae and tarsi of all legs pale yellow to ivory white. Wings hyaline with weak metallic luster; forewing 2.9–3.1 mm long with six closed cells; pterostigma narrow, more than 3 times as long as broad.

Alate male diagnosis. Total body length 27–28 mm. Head broader than long when including eyes. Ocelli relatively large; posterior ocelli located close to posterior margin of head. Eye large, distinctly breaking lateral margin of head, in lateral view occupying half of head length. Clypeus strongly transverse, with anterior margin straight. Masticatory margin of mandible almost entirely serrate with numerous minute denticles. With mesosoma in dorsal view, pronotum invisible; mesoscutum with pair of vague furrows that are parallel and close to each other. Metapleural gland orifice large. Petiole in profile view dorsoventrally flattened, but anteriorly thickened with distinct anterodorsal corner. Gaster with six visible tergites; genitalia huge, largely exposed in dry-mounted specimens. Body sculpture and coloration as in queens. Entire dorsum of body almost lacking erect hairs; very long hairs present on ventral gaster. Wings as in queens; forewing 25–27 mm long.

Distribution in Japan. Honshu (Tokyo, not established in the field), Izu Islands (Hachijō-jima, recently established), South Kyushu and Ryukyus. For more information, see Yamane and Fukumoto [2017], Terayama et al. [2022] and Terayama [2023].

Taxonomic remarks. The alate queen of this species can be easily recognized among the queens of the Asian species of *Technomyrmex* by its black body and the presence of a longitudinal groove on the outer surface of the mandible. The mandibular groove is also unique among the queens of the Japanese dolichoderine species.

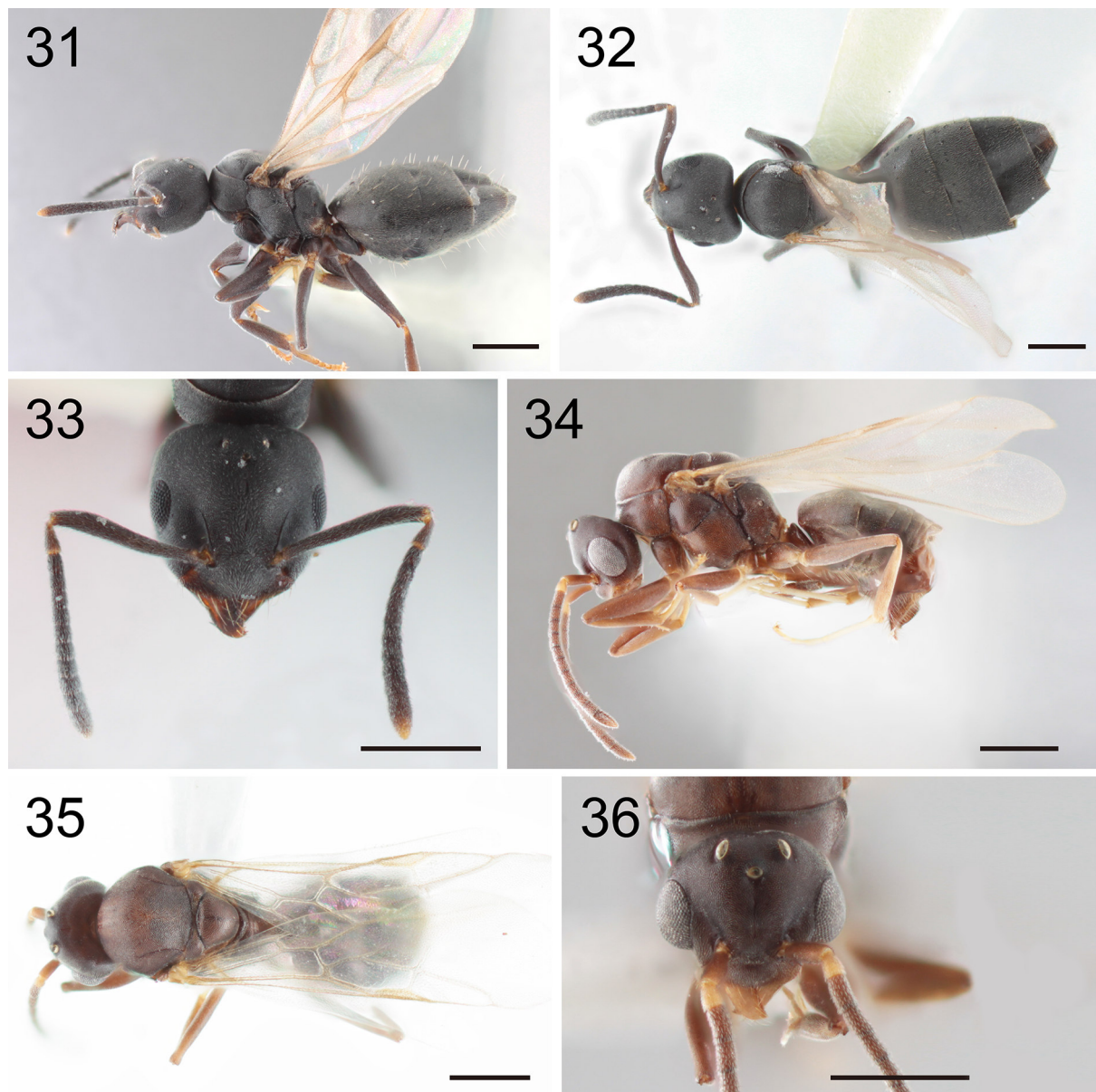
Biology. This species has a complicated reproductive strategy, in which winged (alate) queens independently found new colonies after mating with winged males and subsequently disperse, while multiple (often numerous) wingless intercastes remain in a mother colony, mate with wingless brothers, and become principal egg-layers (functional queens) [Tsuji et al., 1991; Yamauchi et al., 1991]. All types of reproductive females and dimorphic males are described by Ogata et al. [1996] and Yamane et al. [2018]. In this paper diagnoses are given only for the alate queen and alate male. Alate reproductives are seen from May to August in colonies and frequently attracted to light.

Technomyrmex gibbosus Wheeler, 1906

Figs 37–42.

Technomyrmex gibbosus Wheeler, 1906: 319, pl. 41, fig. 4 (Yamanaka, Suruga [Shizuoka]); Teranishi, 1927: 88 (two size forms of queen and ergatoid); Bolton, 2007: 81, fig. 57; Terayama et al., 2014: 180.

Material examined. *Hokkaido*: 2aq, 2♂♂, Sapporo-shi, Hakken-zan, 26.VIII.2020, light trap, K. Kawamura leg.; 2aq, 8♂♂, same loc., 27.VIII.2020, light trap, K. Kawamura leg.; 1aq, 2♂♂, same loc., 7.IX.2022, light trap, K. Kawamura leg.; 1♂, Sapporo-shi, Heiwa,



Figs 31–36. *Technomyrmex brunneus* Forel, alate queen (31–33); male (34–36). 31 — body in profile view; 32 — body in dorsal view; 33 — head in full-face view; 34 — body in profile view; 35 — body in dorsal view; 36 — head in full-face view. Scale bars: 0.5 mm.

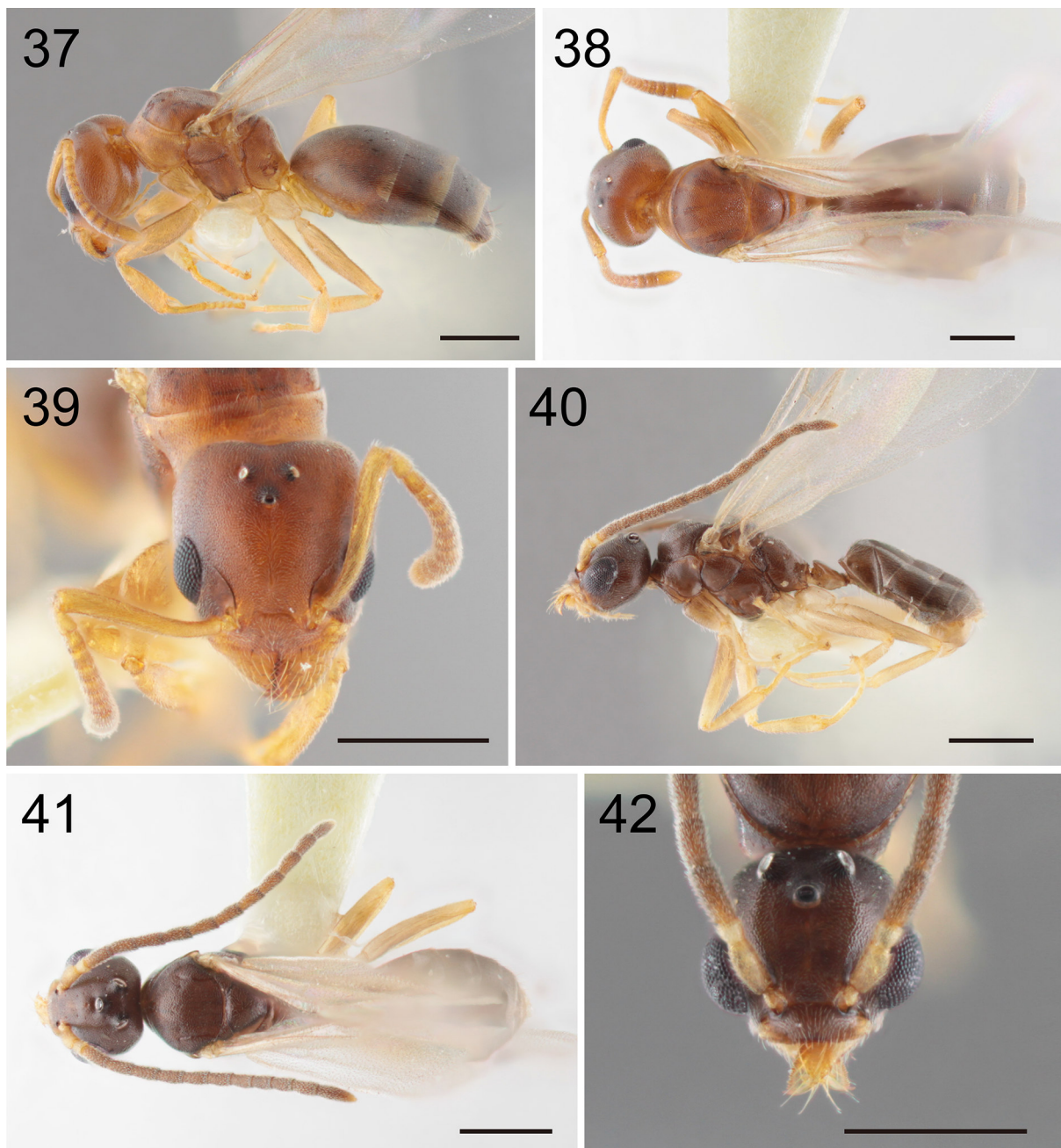
Рис. 31–36. *Technomyrmex brunneus* Forel, крылатая самка (31–33); самец (34–36). 31 — общий вид в профиль; 32 — общий вид сверху; 33 — голова анфас; 34 — общий вид в профиль; 35 — общий вид сверху; 36 — голова анфас. Масштаб: 0.5 mm.

Miyanosawa, 26.VIII.2020, light trap, K. Kawamura leg. *Shikoku*: 4♂♂, Kagawa-ken, Miki-chō, Ikenobe, Kagawa Univ. Campus, 5.VII.2016, ex lab colony, F. Ito leg. (FI 15-100). *Kyushu*: 2aq, 2♂♂, Saga-ken, Saga-shi, Mitsuse (424 m alt.), 25.IX.2021, light trap, Sk. Yamane leg.; 1aq, Miyazaki-ken, Hinokage-chō, Kusubaru, 29.IX.1995, A. Nagai leg.; 1aq, Miyazaki-ken, Miyazaki-shi, Kashiwaru, 6.X.1996, A. Nagai leg.; 1aq, Kagoshima-ken, Kagoshima-shi, Haruyama-chō, 22.X.2012, light trap, Sk. Yamane leg.; 3♂♂, Kagoshima-shi, Terayama, 16.X.2017, light trap, Sk. Yamane leg.; 2♂♂, Kagoshima-shi, Yoshino-chō, 13.XI.2024, light trap, T. Tsukada leg. *Ōsumi Islands*: 42aq, 40♂♂, Yaku-shima, foot of Aiko-dake, 24–26.X.2001, light trap, T. Yumoto, Sk. Yamane et al. leg. *Amami Islands*: 1aq, Amami-ōshima, Yui-dake, 6.IX–13.X.2000, Malaise trap, T. Muroi & Y. Maeda leg.

Queen diagnosis. Body 3.0–3.3 mm in total length. Head quadrate. Anterior clypeal margin straight to very shallowly concave medially. Masticatory margin of mandible with ca.

15 teeth that gradually decrease in size towards basal angle. Eye slightly breaking lateral margin of head. With mesosoma in dorsal view pronotum visible; propodeal dorsum very small. Petiole in profile view dorsoventrally flattened, with parallel dorsal and ventral margins, completely hidden under first gastral tergite. Gaster with five visible tergites. Head and mesosoma with minute to microscopic punctation densely; mandible shiny; gaster with superficial punctation and weakly shiny. Pilosity poor; long hairs confined to clypeus, mouthparts and gastral tip and venter. Body brown to dark brown; head and gaster much darker than mesosoma and petiole; mandible and legs yellow to light brown.

Queen description (Figs 37–39). Measurements. HW 0.67–0.76, HL 0.73–0.78, SL 0.56–0.61, EL 0.23–0.26, MS 0.61–0.67. Body 3.0–3.3 mm in total length. Head slightly



Figs 37–42. *Technomyrmex gibbosus* Wheeler, alate queen (37–39); male (40–42). 37 — body in profile view; 38 — body in dorsal view; 39 — head in full-face view; 40 — body in profile view; 41 — body in dorsal view; 42 — head in full-face view. Scale bars: 0.5 mm.

Рис. 37–42. *Technomyrmex gibbosus* Wheeler, крылатая самка (37–39); самец (40–42). 37 — общий вид в профиль; 38 — общий вид сверху; 39 — голова анфас; 40 — общий вид в профиль; 41 — общий вид сверху; 42 — голова анфас. Масштаб: 0.5 mm.

longer than broad, with posterior margin feebly emarginate medially and rounded posterolateral corner. Ocelli moderate in size, arranged in low triangle; with head in full-face view posterior ocellus separated from posterior margin of head by its diameter. Eye large, slightly breaking lateral margin of head, located anteriorly, when seen in profile, occupying slightly more than one-third of lateral head in length. Frontal carina short, reaching level of mid length of eye, curved outwardly. Antennal sockets widely separated; distance between them nearly equal to width of main disc of clypeus; antennal scrobe small but deep,

marginated dorsally with frontal carina. Clypeus roughly divided into median disc, lateral arms and anterior transverse zone; median disc posteriorly weakly margined from frons; anterior zone lying low compared with median disc, with its anterior margin faintly emarginate medially. Mandible subtriangular; masticatory margin with ca. 15 teeth that gradually decrease in size toward basal angle; basal margin minutely serrate throughout. Antennal scape slightly surpassing posterolateral corner of head; pedicel as long as broad; flagellomeres as long as or shorter than broad except for apical flagellomere that is longer than broad.

Mesosoma in dorsal view slightly narrower than head, broadest around wing bases. Pronotum visible as “narrow” zone, anteriorly broadly roundly convex. Mesoscutum broadly roundly convex anteriorly; notaulix absent; parapsidal lines clear, posteriorly parallel but anteriorly slightly curved outwardly; transscutal line sharp; axillae not touching each other; scutoscuteellar sulcus essentially absent; mesoscutellum demarcated anteriorly by distinct furrow composed of chain of punctures, distinctly narrowed posteriad. Metanotum at lower level than mesoscutellum, strongly transverse (“narrow” zone), demarcated anteriorly and posteriorly with sharp furrow. Propodeum much broader than mesoscutellum. With mesosoma in profile view, pronotum widened posteriorly; its dorsal margin and posterior half of ventral margin parallel. Mesonotum convex dorsad with anterodorsal corner broadly rounded; mesopleuron divided into upper and lower sections with down-curved furrow, clearly separated from pronotum and metapleuron. Upper section of metapleuron sharply demarcated from lower section and propodeum with deep furrows; lower section separated from propodeum with fine line, with distinct metapleural gland orifice. Propodeum with dorsum and declivity undifferentiated; spiracle small, located at mid-height near declivity.

Petiole dorsoventrally flattened but with low “node”, not overhung by first gastral tergite; “node” strongly inclined anteriorly, with anterior slope much shorter than posterior slope; ventral margin weakly convex. Gaster dorsoventrally flattened, with six visible tergites, apical being short and lamellate.

Body extensively with dense minute punctures and matte; apical half of mandible and petiole much more finely and sparsely punctate and shiny; antennal scape and pedicel sparsely punctate and somewhat shiny; flagellomeres with different type of dense sculpture and completely matte; sculpture on legs microscopic. Erect/suberect long hairs confined to clypeus, mouthparts, venter of petiole, apex and venter of gaster; erect hairs on coxae and femora of all legs much shorter than those on other parts of body; eye without erect hairs. Body brown to dark brown; head and gaster much darker than mesosoma and petiole; antennal flagellum blackish brown, much darker than scape and pedicel; mandible and legs yellow to light brown. Wings hyaline, with golden, greenish and purple reflection; forewing 3.2 mm long, with six closed cells; pterostigma weakly pigmented, 3 times as long as broad; hindwing with one incompletely closed cell.

Male diagnosis. Frontal carina absent. Masticatory margin of mandible serrate. Antennal scape short, only as long as distance between lateral ocelli. With mesosoma in dorsal view, pronotum clearly visible; mesoscutum lacking pair of short anterior furrows. Furrow dividing mesopleuron into upper and lower sections horizontal and straight. Petiole with low node that is strongly inclined anteriorly, not hidden by first gastral tergite. Entire body dark reddish brown, but never black; all legs yellowish, with coxae ivory white.

Male description (Figs 40–42). Measurements. Large form: HW 0.62–0.71, HWe 0.71–0.77, HL 0.62–0.67, SL 0.19–0.21, EL 0.27–0.34, MW 0.69–0.74. Small form: HW 0.49–0.56, HWe 0.57–0.61, HL 0.50–0.52, SL 0.14–0.17, EL 0.24–0.26, MS 0.51–0.59. Body 3.0–3.4 mm in large form, 2.0–2.3 mm in small form in total length. Head broader than long, with straight posterior margin and round posterolateral corner. Ocelli oblong; posterior ocelli located close to posterior margin of head when head is seen in full-face view; distance between posterior ocelli ca. twice as long as major diameter of ocellus; distance between anterior and posterior ocelli more than ocellar major diameter. Eye located close to posterior mar-

gin of lateral arm of clypeus (malar space shorter than length of antennal pedicel), occupying half-length of lateral head, with inner margin very shallowly emarginate and outer margin entire; with head in full-face view eye distinctly breaking lateral margin of head. Frontal carina essentially absent; frons vaguely defined. Clypeus roughly divided into main disc and triangular lateral lobe; main disc dorsally separated from frons with furrow, sloping laterad, with anterior margin minutely emarginate medially. Mandible elongate-subtriangular, with basal angle; masticatory margin serrate with ca. 30 minute dents but apical tooth large. Antenna 13-merous; scape short, only as long as length of clypeus main disc; pedicel short and cylindrical, as long as broad; first flagellomere as long as scape and apical flagellomere; all flagellomeres longer than broad, at least 1.5 times as long as broad.

Mesosoma in dorsal view broader than head, broadest just in front of forewing base. Pronotum visible, anteriorly roundly convex and posteriorly deeply and broadly concave. Mesoscutum large, roundly convex dorsad, posteriorly shallowly convex; notaulix absent; parapsidal lines distinct, parallel in basal half, diverging in apical half; transscutellar line deep and sharp; axillae not touching each other in mesal area, small scutoscuteellar sulcus lying between them; mesoscutellum much narrower than mesoscutum, anteriorly shallowly convex, distinctly narrowed posteriad, roundly convex posteriorly; axillulae posteriorly margined with sharp carina. Metanotum short and narrow, demarcated from mesoscutellum and propodeum with deep furrows, higher than propodeal dorsum. Propodeum much broader than mesoscutellum, without well-defined dorsum. With mesosoma in profile view, pronotum widened posteriorly, clearly demarcated from mesonotum and mesopleuron with deep sutures. Mesonotum with anterior slope steep, dorsal outline flat; mesopleuron divided into larger upper and smaller lower sections with oblique furrow; both upper and lower sections of metapleuron clearly demarcated from each other and from mesopleuron and propodeum; metapleural gland orifice relatively large. Propodeum without distinct dorsum; spiracle positioned at mid-height of propodeum, close to declivity.

Petiole in dorsal view narrow, only slightly broader than 1/2 propodeal width, in profile view as long as high, with low node strongly inclined anteriorly, in posterior view with broad and roundly convex apex. Gaster as long as mesosoma, with five visible tergites (apical tergite very short, less sclerotized than others).

Head and mesosoma densely punctate and matte; petiole and gaster more superficially punctate and weakly shiny. Erect/suberect hairs confined to clypeus, mandible, venter of petiole, and apex and venter of gaster; suberect hairs on mandible thicker and stronger than those on other parts; eye without erect hairs; antenna with dense, minute hairs over surface; mesosoma, especially its dorsum, and gastral tergites with dense appressed pubescence. Body extensively dark reddish brown; mandible, antennal scape and pedicel, legs yellowish. Wings as in female; forewing 29–34 mm long in the large form, 23–24 mm in the small form.

Distribution in Japan. Hokkaido, Honshu, Shikoku, Kyushu, Gotô Islands (Fukue-jima) (new record), Yaku-shima, Amami Islands (Amami-ôshima) (new record).

Taxonomic remarks. Teranishi [1927] suggested that there are two size forms in the male of this species. In our male collection are also recognized two series without overlapping in size. They do not differ in structure, sculpture and coloration. Both were collected in Hokkaido, Kyushu and Yaku-shima with light traps. At present it is not sure if they have different mating strategies or not.

Biology. This species is generally found in forested areas, nesting in dead twigs and dead bamboo stems. Colonies are principally monogynous and monodomous, with several hundred workers per colony. In Kyushu this species occurs mainly higher elevation above 200 m in altitude. Both queens and males are attracted to light during late August to November (generally in October in Kyushu and Yaku-shima).

Discussion

The queens and males of all the Japanese genera and species of the subfamily Dolichoderinae are relatively easily keyed out using morphological characters. Features characterizing the Japanese species are the serrate masticatory margin of the mandible (exceptions present), short antennal scape not reaching the posterolateral corner of head in the male (except in *Tapinoma melanocephalum*), ill-developed frontal lobe, paucity of long erect hairs on the dorsum of the body, developed axillae and reduced scutoscuteellar sulcus, hairless tibiae etc. The forewing venation is always well-developed in the alate forms, with a developed pterostigma, and the hind wing always lacks a jugal lobe. In the Malagasy dolichoderines males constantly lack the media on the hindwing [Yoshimura, Fisher, 2011]. This also applies to the Japanese species. In most species the metapleural gland orifice is seen not only in queens but also in males; in males it is less developed than in queens and apparently absent in one species, *Tapinoma sahoime*. In the worker of *Tapinoma* and *Technomyrmex* the petiole is reduced, dorsoventrally flattened, lacking a distinct node. However, the queen and male of these genera often have thickened petioles, and even distinct nodes. Basimere of the male genitalia is strongly developed, contrasting with smaller telomere in all Dolichoderinae [Yoshimura, Fisher, 2014; Boudinot, 2015].

Male ants are generally more difficult to identify than queens. However, males of some Japanese species are immediately identified with single characteristics. Males of *Dolichoderus sibiricus* have black hard cuticle and a globular petiole. *Ochetellus glaber* males have a strongly curved metatibia, which can be even unique among all the Japanese ant species. Although this condition has been known in only two species of *Ochetellus* (present study), it might be found in most of the congeners. Long antennal scape exceeding the posterodorsal corner of the head is found only in *Tapinoma melanocephalum* among the Japanese dolichoderine males. Shattuck [1992b] mentioned that this condition is seen in all the *Tapinoma* species, but in the other Japanese species, *T. sahoime*, males have shorter scapes that do not reach the posterodorsal corner of the head. The widened third and fourth segments of the maxillary palp is also peculiar to *T. melanocephalum* males [Guerrero, 2018]. Males of other species are also relatively easily identified using the key.

In this study reproductives (new queens and males) were collected directly from colonies or caught with light and Malaise traps. Their occurrence in colonies do not always indicate the time of mating flights (often swarming) because in some Japanese ants they stay in

their natal nests for a long time, in some cases even overwintering there [Terayama et al., 2014; Yamane et al., 2025]. Reproductives of at least three species, *Ochetellus glaber*, *Tapinoma sahoime* and *Technomyrmex brunneus*, appear relatively earlier (May to June) than other species, although no case of overwintering in the natal nest has been observed (in one case males of *T. sahoime* was collected from a colony in September). Reproductives of other species appear in the nest in different seasons from early July to late autumn depending on species. Mating flights (or activity outside nests) have been observed for all the Japanese dolichoderine species other than recently introduced tramps, i. e., *Linepithema humile* and *Iridomyrmex anceps*. Attraction of reproductives to light traps strongly indicates the occurrence of mating flights therearound. According to light trap data, mating flights of *Technomyrmex brunneus* occurs during late spring to early summer, while those of *Dolichoderus sibiricus* and *Technomyrmex gibbosus* are seen in late autumn (generally October to November, but earlier in Hokkaido). For *Ochetellus glaber* and two *Tapinoma* species, reproductives have not yet been captured with light traps.

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