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**The Myrmecological Society of Japan
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Additions to Knowledge of the Ant Fauna of Japan (Hymenoptera; Formicidae)

Mamoru Terayama

Abstract Ten species of ants belonging to 8 genera of 4 subfamilies are described as new to science: *Protanilla izanagi*, *Leptanilla okinawensis*, *Cardiocondyla kazanensis*, *Myrmica yezomonticola*, *Crematogaster izanami*, *C. miroku*, *Tapinoma sahoime*, *Paraparatrechina sakuya*, *Camponotus kunigamiensis*, *C. senkakuensis*.

This paper is a supplement to 'Taxonomic studies of the Japanese Formicidae' (Terayama, 1996, 1999a-e; Terayama & Hashimoto, 1996; Terayama & Kinomura, 1998). It concerns 10 new species of ants from Japan.

The following abbreviations and indices are used in this paper for descriptions.

HL, head length: maximum full face view length from the anteriormost margin of clypeus to the occipital margin of the head (when the occipital margin is concave, to a transverse line connecting its posteriormost extensions).

HW, head width: maximum dorsal view distance across head including eyes in full-face view.

HW-II, head width: maximum dorsal view distance across head excluding eyes in full-face view.

SL, scape length: length of scape excluding radicle.

CI, cephalic index: $HW/HL \times 100$.

CI-II, cephalic index II: $HW-II/HL \times 100$.

SI, scape index: $SL/HW \times 100$.

SI-II, scape index II: $SL/HW-II \times 100$.

WL, Weber's length of alitrunk: maximum diagonal distance from the base of anterior slope of pronotum to the propodeal lobe.

PL, petiole length: maximum length of petiole in lateral view, measured from ventral juncture with propodeum to juncture with postpetiole or gaster.

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PNL, petiolar node length: maximum diagonal length of the petiolar node in lateral view.
 PH, petiole height: maximum height of petiole in lateral view, measured perpendicularly from apex of petiolar node to venter of petiole.
 DPW, petiole width: maximum width of petiole in dorsal view.
 PPL, postpetiole length: maximum length of postpetiole in lateral view, measured from ventral juncture with propodeum or petiole to juncture with gaster.
 PPH, postpetiole height: maximum height of postpetiole in lateral view, measured perpendicularly from apex of postpetiolar node to venter of postpetiole.
 PPW, postpetiole width: maximum width of postpetiole in dorsal view.
 TL, total body length: outstretched length from the mandibular apex to the gastral apex.

Subfamily Leptanillinae

Protanilla izanagi sp. nov.

(Figs. 1-10)

Japanese name: Kiba-jyuzufusi-ari

Anomalomyrma sp. (Onoyama & Ogata, 1992)

Diagnosis. This species is easily separated from the other species in this genus by the mandible with a large longitudinal groove on outer surface (Figs. 6 and 10).

Description. Holotype worker. Structure: Head in full-face view long, 1.07 times as long as wide, with almost straight posterior margin and convex sides; posterior margin with a small notch at midlength. Mandible elongate; apical 1/3 of mandible curved in lateral view; outer surface with a large longitudinal groove running from the base to the terminal quarter of the jaw. Anterior margin of clypeus concave. Antenna with 12 segments; scape long, exceeding posterior margin of head; pedicel longer than wide; 3rd to 11th segments each almost as long as wide; terminal segment 1.7 times as long as wide. Eye absent.

Alitrunk long and slender; dorsum of pronotum in lateral view convex; mesonotal dorsum in lateral view flat dorsally, and lower than pronotal and propodeal dorsa; matanotal groove interrupted by several short striae; propodeum in lateral view with convex dorsal outline; posterodorsal corner not forming an angle. Fore coxa and femure flat and wide, almost twice as long as wide. Petiolar node in lateral view higher than long, with convex dorsal margin, almost straight anterior margin and weakly convex posterior margin; dorsal disc in dorsal view oval, 1.7 times as long as wide; subpetiolar process well developed as a lobe. Postpetiole in lateral view slightly higher than long, lower than petiole, with well convex dorsal and weakly convex ventral margins; dorsal disc in dorsal view round, slightly wider than long.

Gaster long, in dorsal view 1st gastral tergite with convex sides and dully angulate anterolateral corners, 0.51 mm in maximum width.

Sculpture: Head and pronotum largely smooth, weakly microreticulate; mesonotum and mesopleura microreticulate; microreticulum on pronotum weaker than that on the mesonotum; propodeum smooth and shining; pedicels and gaster largely smooth. Antenna microreticulate; mandible largely smooth and shining. Legs largely smooth.

Pilosity: Head and alitrunk with moderately dense pubescence. Petiolar node and postpetiola with suberect hairs. Gaster with moderately dense pubescence and scattered short suberect hairs; the longest hair ca. 0.05 mm.

Color: Body reddish brown; antenna and legs somewhat yellowish.

Measurements (mm): HL 0.60, HW 0.56, SL 0.53, CI 93, SI 95, WL 1.08, PNL 0.26, PH 0.30, DPW 0.27, PPL 0.23, PPH 0.31, PPW 0.30, TL 3.5.

Paratype female. Structure: General shape of head, mandibles and antennae as in worker; Compound eye large, 0.11 mm in maximum diameter; ocelli small, forming obtuse triangle.

Dorsal outline of alitrunk convex, sloping from anterior portion of pronotum to posterior end of propodeum. Petiolar node in lateral view higher than long, with convex dorsal margin, almost straight anterior margin and weakly convex posterior margin; dorsal disc in dorsal view oval, wider than long; subpetiolar process low, lobe-like. Postpetiole in lateral view slightly higher than long, lower than petiole, with well convex dorsal and weakly convex ventral margins; dorsal disc in dorsal view round, almost as long as wide.

Gaster long; 1st gastral tergite in dorsal view with straight anterior margin and dully angulate anterolateral corners, 0.58 mm in maximum width.

Sculpture: As in the holotype worker.

Pilosity: Head and alitrunk with moderately dense pubescence. Petiolar node and postpetiole with suberect hairs. Gaster with moderately dense pubescence and scattered short suberect hairs.

Color: Body reddish brown; antenna and legs somewhat yellowish.

Measurements (mm): HL 0.58, HW 0.58, SL 0.43, CI 100, SI 74, WL 0.95, PNL 0.22, PH 0.25, DPW 0.21, PPL 0.20, PPH 0.25, PPW 0.26, TL 3.9.

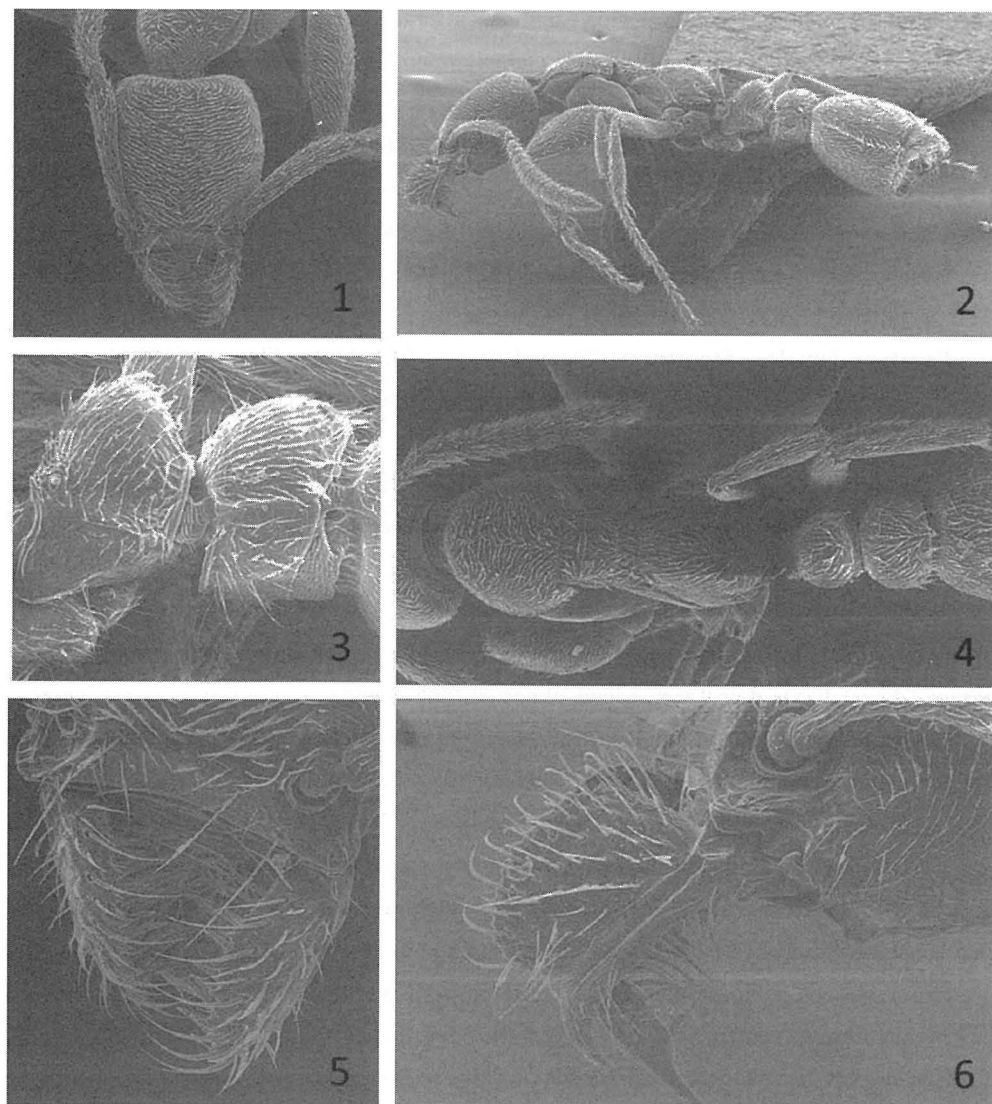
Holotype. Worker, Nishibora (830 m asl.), Takasu-cho, Gifu-shi, Gifu Pref., 11. x. 2011, K. Kinomura & N. Ogawa leg.

Paratypes. 1 female, 3 workers, same data as holotype; 1 worker, Mt. Hiba-san, Hiroshima Pref., 5. v. 1992, B.-M. Choi leg.

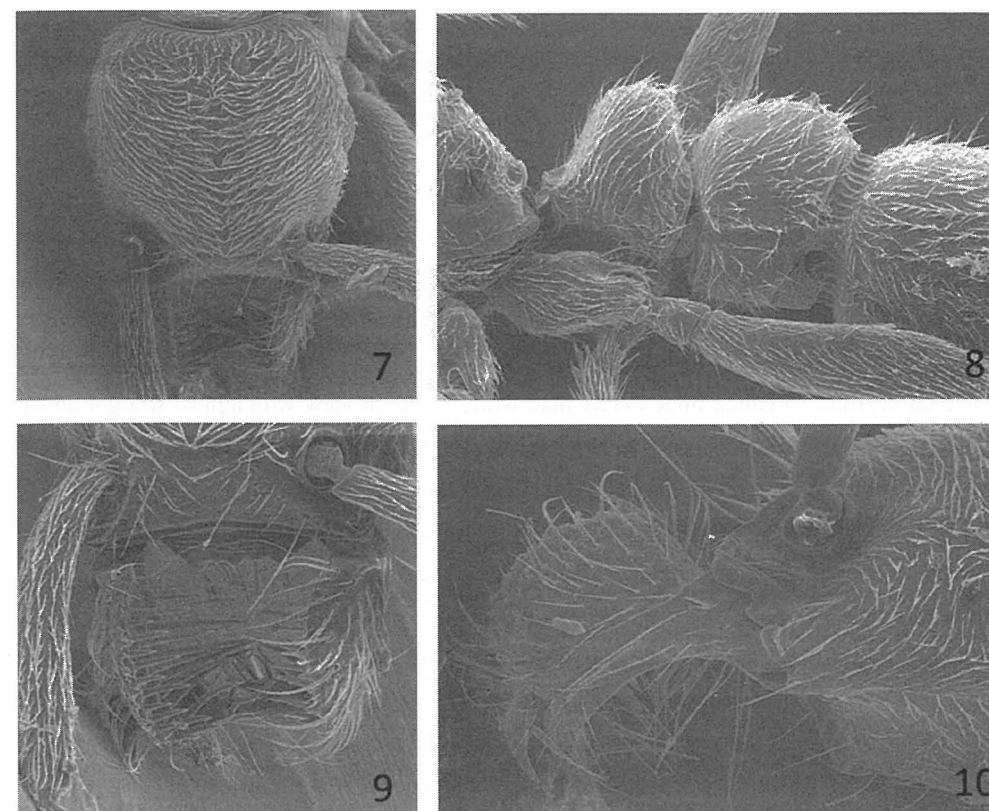
Type depository. Holotype and some paratypes: the National Institute of Agro-Environmental Sciences, Tsukuba. Other paratypes: the National Museum of Nature and

Science, Tsukuba.

Etymology. The specific epithet is the Japanese noun Izanagi, which is the name of a Japanese god.



Figs. 1-6. *Pronanilla izanagi* sp. nov., worker. --- 1, Head, full-face view; 2, body, lateral view; 3, petiole and postpetiole, lateral view; 4, alitrunk, petiole and postpetiole, dorsal view; 5, mandibles, frontal view; 6, mandible, lateral view.



Figs. 7-10. *Pronanilla izanagi* sp. nov., female. --- 7, Head, full-face view; 8, petiole and postpetiole, lateral view; 9, mandibles, frontal view; 10, mandible, lateral view.

***Leptanilla okinawensis* sp. nov.**

(Figs. 11-15)

Japanese name: Okinawa-mukashi-ari

Leptanilla sp. (Onoyama, 1976); *Leptanilla* sp. 6 (Ogata, 1989)

Diagnosis. This species is closely resembles to *L. morimotoi* Yasumatsu, 1960. However, it is separated from the latter by the following characters: 1) terminal segment of antenna short, shorter than the length of the preceding 2 segments together (longer in *morimotoi*); 2) lateral surface of head almost parallel in full-face view (slightly convex in *morimotoi*); 3) petiolar node longer than postpetiolar node in dorsal view (almost the same length in *morimotoi*).

Description. Holotype worker. Structure: Head in full-face view rectangular, 1.41 times as long as wide, with almost parallel sides and convex posterior margin. Mandible with 3 teeth. Anterior margin of clypeus moderately convex. Antenna with 12 segments; scape length 0.40 times head length; 2nd segment as long as wide; 3rd to 11th segments each wider than long; terminal segment shorter than the length of the preceding 2 segments together. Eye absent.

Alitrunk long and flat dorsally; pronotum 0.09 mm in maximum width, with dorsal outline weakly convex; anterolateral corners rounded; dorsal outlines of each mesonotum and propodeum straight; posterodorsal corner of propodeum in lateral view rounded and lower than mesonotal dorsum. Petiolar node longer than wide, in lateral view with almost straight dorsal outline, convex anterodorsal corner and convex ventral margin; petiolar node in dorsal view 2.3 times as wide as long, with straight anterior margin and subparallel sides. Postpetiole in lateral view higher than long, with weakly convex dorsal margin, strongly convex ventral margin, and concave anterior margin; postpetiolar disc in dorsal view trapezoidal, 1.1 times as long as maximum width.

Gaster long; first gastral segment in dorsal view with almost parallel sides, with corners rounded anteriorly, 0.13 mm in maximum width.

Sculpture: Body weakly microreticulate; mandible, antenna and legs microreticulate.

Pilosity: Body including antenna and legs with moderately pubescence.

Color: Body yellow; mandible, antenna and legs yellow.

Measurements (mm): HL 0.20, HW 0.14, SL 0.08, CI 70, SI 57, WL 0.24, PNL 0.08, PH 0.06, DPW 0.05, PPL 0.06, PPH 0.07, PPW 0.06, TL 0.9.

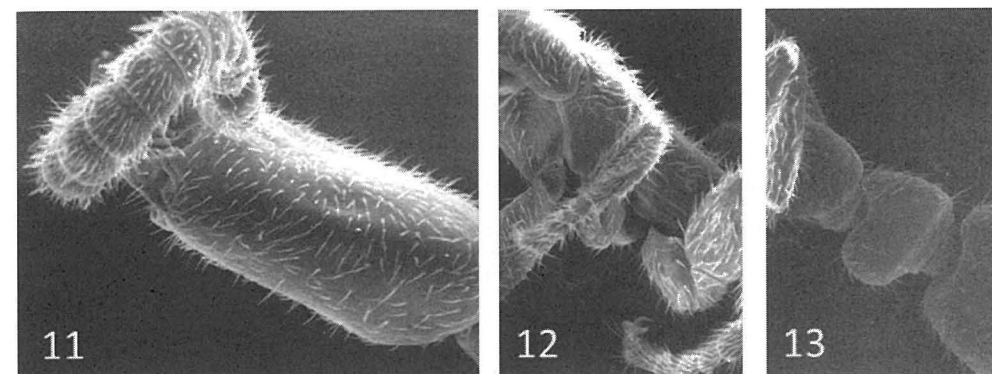
Holotype. Worker, Chibana-jyoushi, Okinawa-shi, Okinawa Pref., 20. iii. 1983 [labeled as 830320], H. Takamine leg.

Paratypes. 1 female, 4 workers, same data as holotype; 1 worker, Seifa-utaki, Chinen-son (Nanjo-shi now), Okinawa Pref., 12. iii. 1975 [labeled as 750312], Onoyama & Wada legs.

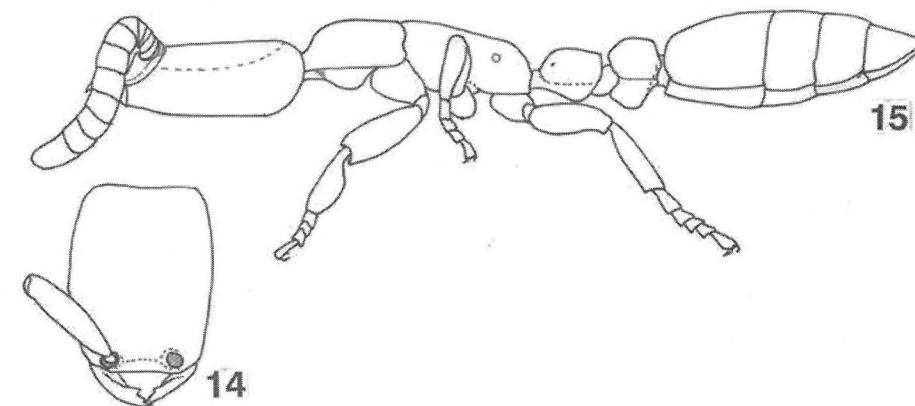
Type depository. Holotype: Osaka Museum of Natural History. Paratypes: the Osaka Museum of Natural History and National Institute of Agro-Environmental Sciences, Tsukuba.

Etymology. The specific epithet is based on the name of type locality, Okinawa-jima, the Ryukyu Islands.

Remarks. This species nests underground in forests. The dorsa of body including head of the paratype female are collapsed.



Figs. 11-13. *Leptanilla okinawensis* sp. nov., worker. --- 11, Head, lateral view; 12, alitrunk and legs, lateral view; 13, petiole and postpetiole, lateral view.



Figs. 14, 15. *Leptanilla okinawensis* sp. nov., worker. --- 14, Body, lateral view; 15, head, full-face view.

Subfamily Myrmicinae

Cardiocondyla kazanensis sp. nov.

(Figs. 16-19)

Japanese name: Iou-hadaka-ari

Cardiocondyla sp. (Terayama & Kubota, 2002); *Cardiocondyla* sp. 6 (Japanese Ant Database Group, 2003)

Diagnosis. This species resembles *C. emeryi* Forel, 1881, by the postpetiolar sternite without prominent anterolateral corners, microreticulate head, relatively long propodeal spines, and small body size. It is separated from the latter by the wider head, much strongly convex petiolar node, and straight postpetiolar dorsum.

Description. Holotype worker. Structure: Head in full-face view rectangular, 1.36 times as long as wide, with concave posterior margin, subparallel sides and rounded posterolateral corner. Mandible with 5 teeth; apical tooth largest; basal smallest. Anterior margin of clypeus convex. Antenna with 12 segments; scape short, not reaching posterior margin of head in full-face view; pedicel longer than wide; 3rd to 9th segments each wider than long; apical 3 segments forming a club, with relative length: ca. 1.8 : 2 : 6; apical segment 1.7 times as long as wide. Eye prominent, 0.10 mm in maximum diameter, and with ca. 12 facets in the longest row.

Promesonotum in lateral view with straight dorsal and anterior margins, in dorsal view with anterior margin of pronotum straight and marginate; pronotal humuli dully angulate; anterodorsal corner forming an angle; metanotal groove indistinct dorsally; dorsum of propodeum in lateral view slightly convex. Propodeal spine 0.04 mm in length, forming an acute triangle.

Petiole 1.36 times as long as high; peduncle relatively short; node in lateral view inverted U-shaped, with its anterior slope much more gentle than posterior slope; node in dorsal view oval, 1.33 times as wide as long, with distinctly convex anterior margin and weakly convex posterior margin; subpetiolar process small, triangular. Postpetiole slightly higher than long, with convex anterior margin and straight dorsal margin; ventral margin of sternite almost straight, without prominent anterolateral corner; node in dorsal view 1.38 times as wide as long, 1.80 times as wide as petiolar node, with concave anterior margin and convex sides.

Gaster in dorsal view oval, 0.37 mm in maximum width.

Sculpture: Head and alitrunk microreticulate; petiole smooth excepting weakly microreticulate basal portion; postpetiole weakly microreticulate; gaster smooth and shining

Pilosity: Body without distinct erect or suberect hairs; antenna with dense pubescence.

Color: Head, alitrunk and pedicels yellowish brown; gaster blackish brown; antennal scape, 2nd to 9th segments yellowish brown; club blackish brown; legs yellowish brown.

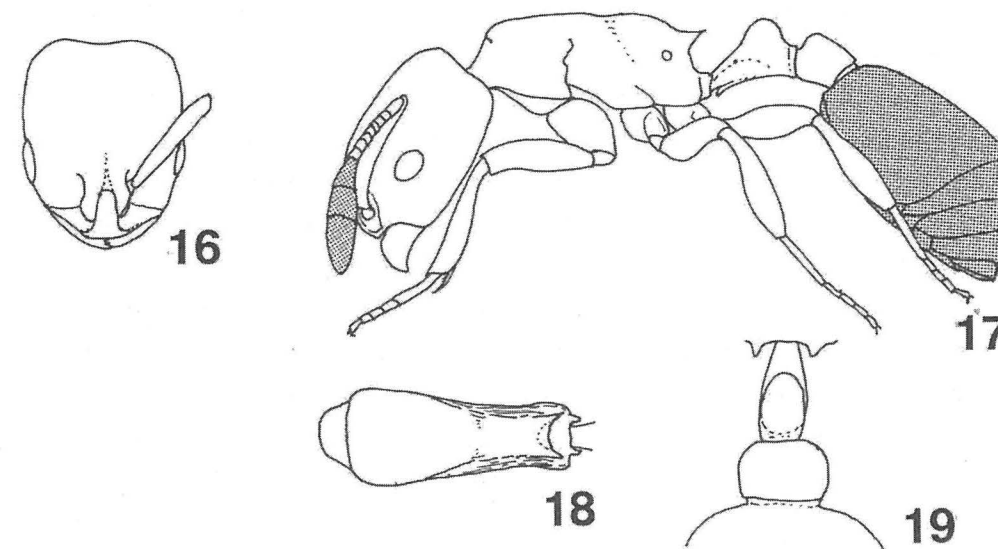
Measurements (mm): HL 0.53, HW 0.45, SL 0.30, CI 85, SI 57, WL 0.48, PL 0.19, PH 0.14, DPW 0.10, PPL 0.10, PPH 0.13, PPW 0.18, TL 1.4.

Holotype. Worker, Iwo-to, Volcano Is., Ogasawara-mura, Tokyo, 24-26. iv. 2001, M. Terayama leg.

Type depository. Holotype: National Institute of Agro-Environmental Sciences, Tsukuba.

Etymology. The specific epithet is based on the name of type locality, the Volcano Islands (Kazan Islands).

Remarks. This species is easily distinguished from the other species in the Volcano (Kazan) Islands, *C. obscurior* (Wheeler) and *C. sp. near kagutsuchi* Terayama (Okita et. al., in prep.), by the yellowish body color excepting gaster and antennal clubs blackish brown, indistinct metanotal groove (distinct in *obscurior*), and acute propodeal spines (very short in *C. sp. near kagutsuchi*).



Figs. 16-19. *Cardiocondyla kazanensis* sp. nov., worker. --- 16, Head, full-face view; 17, body, lateral view; 18, alitrunk, dorsal view; 19, petiole and postpetiole, dorsal view.

***Myrmica yezomonticola* sp. nov.**

(Figs. 20, 21)

Japanese name: Kita-kushike-ari

Myrmica sp. 8 (Onoyama & Sonobe, 1992; Japanese Ant Database Group, 2003)

Diagnosis. This species belongs to the *lobicornis*-group in the genus *Myrmica* by Radochenko & Elmes (2010), and most closely resembles *M. jessensis* Forel, 1901, by the longer than wide 5th antennal segment, bent basally and narrowed at base antennal scape. It is separated from the latter by the broadly U-shaped metanotal groove, shorter propodeal spines,

angulated anterodorsal corner of petiolar node, and shorter postpetiole.

Description. Holotype worker. Structure: Head in full-face view rectangular, as long as wide, with weakly concave posterior margin, subparallel sides and rounded posterolateral corner. Anterior margin of clypeus moderately convex. Antenna with 12 segments; scape narrowed, bent basally; its angle ca. 100 degrees; bend margined with thin lamella at right-angle to axis; pedicel longer twice as long as wide; 3rd and 4th segments each 1.2 times as long as wide; 5th segment wider than long, 0.9 times as long as wide; 6th segment 1.2 times as long as wide; apical 4 segments forming a club, with relative length: ca. 4 : 5 : 5 : 11; apical segment 1.8 times as long as wide. Eye prominent, 0.25 mm in maximum diameter, and with ca. 17 facets in the longest row.

Promesonotum in lateral view with straight almost dorsal outline, in dorsal view with anterior margin of pronotum weakly convex and marginate; anterodorsal corner forming an distinct angle; pronotal humeri dully angulate; metanotal groove distinct dorsally as a broadly U-shaped impression; dorsum of propodeum in lateral view flat; propodeal spine acute, 0.26 mm long, 1.7 times as its basal width.

Petiole almost as long as high; peduncle short; node in lateral view convex dorsal margin and weakly concave anterior slope, ventral margin straight, in dorsal view longer than wide, with parallel sides; subpetiolar process small, needle-shaped. Postpetiole in lateral view 0.78 times as long as high, with convex dorsal and ventral margins, in dorsal view 0.76 times as long as wide, 1.63 times as wide as petiolar node, with convex anterior margin and convex sides.

Gaster in dorsal view oval, 1.12 mm in maximum width, with weakly concave anterior margin and dully angulate anterolateral corners.

Sculpture: Head rugose; frons with about 12 longitudinal rugae; clypeus with about 20 longitudinal striae. Dorsum of mesosoma strongly rugose, with about 8 longitudinal rugae, with smooth interspaces; sides with longitudinal rugae, with microreticulate interspaces. Petiole and postpetiole weakly rugose, with microreticulate interspaces. Gaster smooth and shining

Pilosity: Dorsa of head and mesosoma with moderately abundant erect or suberect hairs; the longest hair ca 0.13 mm. Petiole with 3 pairs of suberect hairs and postpetiole with 5-6 pairs of suberect hairs. Gaster moderately abundant suberect hairs; the longest ca. 0.16 mm.

Color: Body blackish brown; antenna brown, excepting blackish-brown thin basal lamella of scape; mandible brown; legs brown.

Measurements (mm): HL 1.10, HW 1.09, HW-II 0.98, SL 0.77, CI 99, CI-II 89, SI 70, SI-II 79, WL 1.35, PL 0.40, PH 0.39, DPW 0.28, PPL 0.35, PPH 0.46, PPW 0.45, TL 4.6.

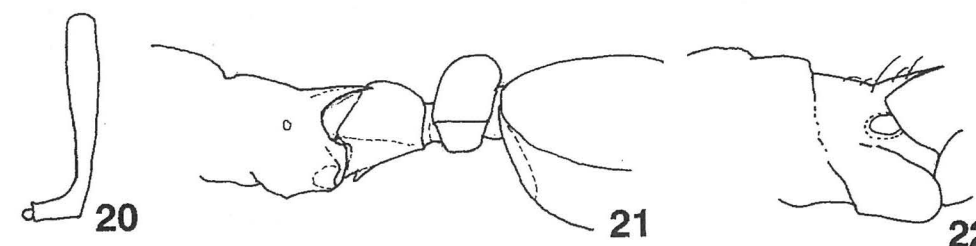
Holotype. Worker, Mt. Shokanbetsu-dake, Mashike-cho, Hokkaido, 3. ix. 1983, K. Kinota leg.

Paratypes. 3 workers, the same data as holotype.

Type depository. National Institute of Agro-Environmentatal Sciences, Tsukuba.

Etymology. The specific epithet is based on the old name of type locality, Yezo (= Hokkaido).

Remarks. This species is found in the mountains of Hokkaido up to higher elevations and nests in open sites.



Figs. 20-22. *Myrmica yezomonticola* sp. nov. (worker, figs. 20, 21) and *Crematogaster izanami* sp. nov. (worker, fig. 22). --- 20, Antennal scape; 21, propodeal spine, petiole and postpetiole, lateral view; 22, propodeal spine, lateral view.

***Crematogaster izanami* sp. nov.**

(Fig. 22)

Japanese name: Harinaga-shiriage-ari

Crematogaster sp. 5 (Onoyama & Morisita, 1992)

Diagnosis. This species belongs to the subgenus *Crematogaster* s. str. by the 12-segmented antennae terminating in a 3-segmented club. It is separated from the other Japanese congeners by the long propodeal spines and smooth pronotal and mesonotal dorsa.

Description. Holotype worker. Structure: Head in full-face view as long as wide, with weakly convex posterior margin and convex sides; posterolateral corner rounded, not forming an angle. Anterior margin of clypeus widely convex. Antenna with 12 segments; scape long, exceeding posterior margin of head in full-face view; pedicel 1.8 times as long as wide; 3rd to 9th segments each almost as long as wide; apical 3 segments forming a club, with relative length: ca. 4 : 5 : 10; apical segment 2.1 times as long as wide. Eye 0.18 mm in maximum diameter, with ca. 13 facets in the longest row.

Pronotum higher than mesonotal dorsum, with a straight dorsal outline, in dorsal view with anterolateral corner which is rounded and not forming distinct angle. Mesonotal dorsum in

lateral view almost flat. Metanotal groove not incised dorsally. Dorsum of propodeum in lateral view slightly convex. Propodeal spine slender, 0.15 mm in length, ca. 4.0 times as long as basal width.

Petiole low, 1.83 times as long as high, in lateral view with straight dorsal outline; subpetiolar process indeveloped; petiole in dorsal view widest at anterior portion and narrowed posteriorly; maximum width 2.33 times wider than minimum width. Postpetiole in lateral view 1.15 times as long as wide, with straight ventral margin and weakly convex dorsal margin, in dorsal view, 1.67 times as wide as long, with straight anterior margin, concave posterior margin, and convex sides; dorsal disc with median furrow.

Gaster subtriangular, 1.00 mm in dorsal maximum width.

Sculpture: Head smooth band shining; promesonotal dorsum smooth; propodeal dorsum weakly microreticulate; lateral surface of pronotum smooth; mesopleuron reticulate; side of propodeum weakly microreticulate. Pedicels microreticulate. Gaster smooth and shining.

Pilosity: Dorsum of head with scattered erect hairs; the longest hair on head ca. 0.08 mm; long erect hairs present on pronotum (several pairs), mesonotum (2 pairs), propodeum (2 pairs), petiole (2 pairs), and postpetiole (4 pairs); propodeal spine with 3 hairs. Gaster with scattered erect or suberect hairs.

Color: Body blackish brown; antenna and legs yellowish.

Measurements (mm): Holotype: HL 0.75, HW 0.75, SL 0.55, CI 100, SI 73, WL 0.83, PL 0.33, PH 0.18, DPW 0.30, PPL 0.23, PPH 0.20, PPW 0.25, TL 2.9.

Holotype. Worker, Kamiyama, Amamoi-oshima, Kagoshima Pref., 21. v. 1988, K. Hayashida leg.

Type depository. National Institute of Agro-Environmental Sciences, Tsukuba.

Etymology. The specific epithet is the Japanese noun Izanami, which is the name of a Japanese goddess.

***Crematogaster miroku* sp. nov.**

(Figs. 23-25)

New Japanese name: Okinawa-shiriage-ari

Diagnosis. This species belongs to the subgenus *Orthocrema* by the 11-segmented antennae terminating in a 2-segmented club and yellowish body color. This species resembles to *C. osakensis* Forel, 1900, but is separated from the latter by the carinate dorsolateral corners of mesonotum and smooth and shining mesopleuron.

Description. Holotype worker. Structure: Head in full-face view as long as wide,

with almost straight posterior margin and round posterolateral corners. Mandible with 4 teeth; apical 2 teeth acute and longer than basal 2. Anterior margin of clypeus convex. Antenna with 11 segments; scape exceeding posterior margin of head in full-face view; pedicel longer than wide; 3rd to 9th segments each longer than wide; 10th segment 1.3 times as long as wide; apical segment 2.3 times as long as wide. Eye small, weakly prominent, 0.13 mm in maximum diameter, with about 15 facets in the longest row.

Pronotum in lateral view with a straight dorsal outline, in dorsal view with anterolateral corners which are rounded and do not form distinct angles, with carinate dorsolateral margins. Mesonotal dorsum in lateral view with almost straight dorsal outline, in dorsal view with carinate dorsolateral margins. Metanotal groove incised dorsally. Dorsum of propodeum slightly convex in lateral view. Propodeal spine acute and long, 0.08 mm in length, about 4.0 times as long as its basal width.

Petiole in lateral view 1.29 times as long as high, with straight dorsal margin and weakly convex ventral margin, in dorsal view 1.5 times as long as wide, widest at posterior end, with weakly convex sides; subpetiolar process small, triangular. Postpetiole in lateral view weakly higher than long, with convex dorsal margin and straight ventral margin, in dorsal view 1.4 times as long as wide, with straight anterior margin and convex sides.

Gaster in dorsal view subtriangular, with straight anterior margin, 0.60 mm in maximum width.

Sculpture: Head and alitrunk smooth and shining; clypeus with a pair of longitudinal carinae; mesopleuron smooth and shining. Petiole with weakly microreticulate sides and smooth dorsal surface. Postpetiole smooth and shining. Gaster smooth and shining.

Pilosity: Head dorsum with erect hairs; the longest one 0.15 mm. Long erect hairs present on the promesonotum (3 pairs) and propodeum (1 pair); petiole and postpetiole each with several pairs of long suberect hairs. Gaster with abundant long suberect hairs which are 0.17-0.25 mm in length.

Color: Body yellow.

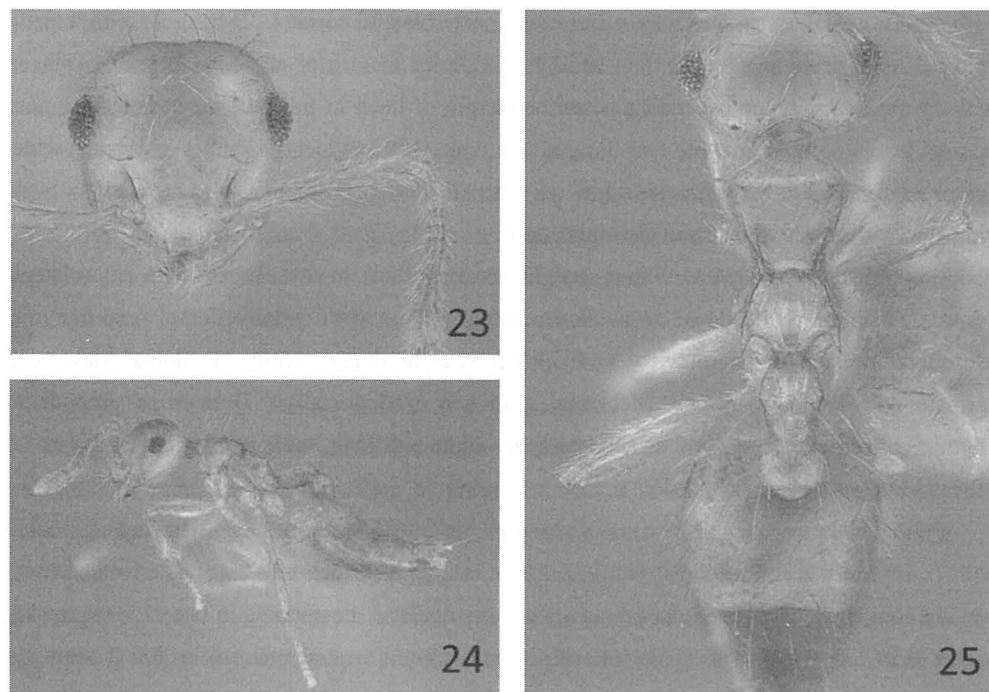
Measurements (mm): HL 0.50, HW 0.50, SL 0.48, CI 100, SI 96, WL 0.53, PL 0.18, PH 0.14, DPW 0.16, PPL 0.14, PPH 0.15, PPW 0.16, TL 2.2.

Holotype. Worker, Higashi-son, Kunigami-gun, Okinawa-jima, Okinawa Pref., 3. xi. 2012, H. Takamine leg.

Paratypes. 6 workers, same data as holotype.

Type depository. National Institute of Agro-Environmental Sciences, Tsukuba.

Etymology. The specific epithet is the Japanese noun Miroku (Miroku Bosatsu), which is the name of a Japanese god. In Okinawa Miroku Bosatsu is called 'the milk god'.



Figs. 23-25. *Crematogaster miroku* sp. nov., worker. --- 23, Head, full-face view; 24, body, lateral view; 25, body, dorsal view.

Subfamily Dolichoderinae

Tapinoma sahoime sp. nov.

Japanese name: Konuka-ari

Tapinoma sp. 2 and 3 (The Myrmecologists Society (Japan), 1988); *Tapinoma* sp. 3 (Onoyama & Terayama, 1991)

Diagnosis. This species was formerly identified as *T. indicum* Forel, 1895, in Japan. In fact, the present species resembles *T. indicum*. However, the type specimens of the *T. indicum* have been examined, and it is concluded that the Japanese population is separable at the species level by the smaller size and yellow coloration of body, and several morphological differences (Onoyama & Terayama, 1991).

Description. Holotype worker. Structure: Head in full-face view 1.14 times as long as wide, with almost straight posterior margin and convex sides. Anterior margin of clypeus almost straight in the middle. Eye small, 0.03 mm in maximum diameter, with 6 facets in the

longest row. Antennal scape relatively short, just reaching posterior margin of head in full-face view.

Mesosoma short, about as long as head. Promesonotal dorsum convex in profile; pronotal slope steeper than that of mesonotum; anterior margin of pronotum convex in lateral view; dorsal disc 0.63 times as long as wide, and 0.23 mm in maximum width; anterolateral corner dully angulate; metanotal groove deeply incised dorsally. Dorsum of propodeum short and convex in lateral view; propodeal declivity. Petiole low, without distinct scale.

Gaster 0.32 mm in maximum width in dorsal view.

Sculpture: Head and alitrunk largely smooth and shining; antenna microreticulate; gaster very weakly microreticulate; legs microreticulate..

Pilosity: No erect hairs on head and mesosoma; 4th tergite of gaster with several erect hairs.

Color: Body pale yellow.

Measurements (mm): HL 0.39, HW 0.35, SL 0.27, CI 88, SI 80, WL 0.43, PL 0.10, PH 0.07, DPW 0.08, TL 1.3.

Holotype. Worker, Simiyo-son, Amami-oshima, Kagoshima Pref., 1. vii. 1983, M. Terayama leg.

Paratypes. 5 workers, same data as holotype; 8 workers, Shimoda, Shizuoka Pref., 30. iv. 1985, M. Terayama leg.; 1 queen, 2 workers, Izu-oshima, Tokyo, 8. iv. 1981, M. Terayama leg.; 4 queens, 4 workers, Tsu-shi, Mie Pref., 5. vii. 1986, M. Terayama leg.; 1 worker, Sata-misaki, Kagoshima Pref., 10. viii. 1984, M. Terayama leg.; 1 queen, 2 workers, Yaku-shima, Kagoshima Pref., 23. viii. 1990, A. Hiramine leg.; 3 workers, Sueyoshi, Naha-shi, 13. iii. 1984, K. Yamauchi leg.; 3 workers, Urauchi, Iriomote-jima, Okinawa Pref., 28. iii. 1991, M. Terayama leg.

Type depositary. Holotype: National Institute of Agro-Environmental Sciences, Tsukuba. Paratypes: National Institute of Agro-Environmental Sciences, Tsukuba; National Museum of Nature and Science, Tsukuba.

Etymology. The specific epithet is the Japanese noun Sahoime, which is the name of a Japanese goddess.

Remarks. Nests are located in the soil or hollow twigs.

Subfamily Formicinae

Parapatrechina sakuya sp. nov.

(Figs. 26, 27)

Japanese name: Tsuya-sakura-ari

Paratrechina sp. (Terayama & Kubota, 1994, 2002)

Diagnosis. Among the Asian congeners, this species resembles to *Paraparatrechina sakurae* (Ito, 1914) **comb. nov.** (formerly *Nylanderia sakurae*) in Japan, and *P. sauteri* (Forel, 1913) in Taiwan by the wide 2nd to 4th flagellar segments, each wider than long, antennal scape without subdecumbent hairs, propodeum with a pair of setae and small body size not exceeding 2.0 mm in workers. However, it is distinguished from the latter by the smooth and shiny genal areas of head (microreticulate and opaque in *sakurae* and *sauteri*), dense pubescence on head and legs (sparse on both species), almost straight dorsal margin of mesonotum (weakly convex in both), and dully angulate posterodorsal corner of propodeum (not forming an angle in both species).

Description. Holotype worker. Structure: Head in full-face view 1.07 times as long as wide, with convex sides and convex posterior margin. Mandible with 5 teeth. Anterior margin of clypeus moderately convex. Compound eye 0.08 mm in maximum diameter. Ocelli present, but obscure. Antenna relatively short; scape slightly exceeding posterior margin of head; 2nd segment (pedicel) wider than long; 3rd and 4th segments each wider than long; terminal segment 1.8 times as long as wide.

Mesosoma short, about as long as head. Pronotal dorsum in lateral view convex; anterolateral corners in dorsal view rounded; mesosoma in lateral view with a straight dorsal outline; metanotal groove shallow and short. Propodeal dorsum Propodeum in lateral view with a short and convex dorsal face and almost flat declivity face. Petiolar node in lateral view asymmetrical inverted V-shaped, with almost vertical anterior margin and oblique posterior margin; in posterior view, dorsal margin of node concave.

Gaster in dorsal view oval, 0.40 mm in maximum width.

Sculpture: Frons and vertex of head microreticulate; gena smooth and shining; mandible largely smooth. Alitrunk with microreticulate dorsum and smooth and shining sides. Gaster very weakly micropunctate and rather shining. Legs largely smooth.

Pilosity: Head with moderately abundant suberect hairs. Antennal scapes lacking erect or suberect hairs. Pronotal dorsum with 2 pairs of erect hairs; one pair at anterior portion and other at near posterior end; mesonotal dorsum with a pair of erect hairs; propodeal dorsum with a pair of erect hairs. Petiolar node without erect hair. Gaster with suberect hairs which are moderately spaced; the longest hair ca. 0.04 mm. Femora and tibiae lacking erect or suberect hairs.

Color: Body blackish brown; legs blackish brown excepting tibiae light brown.

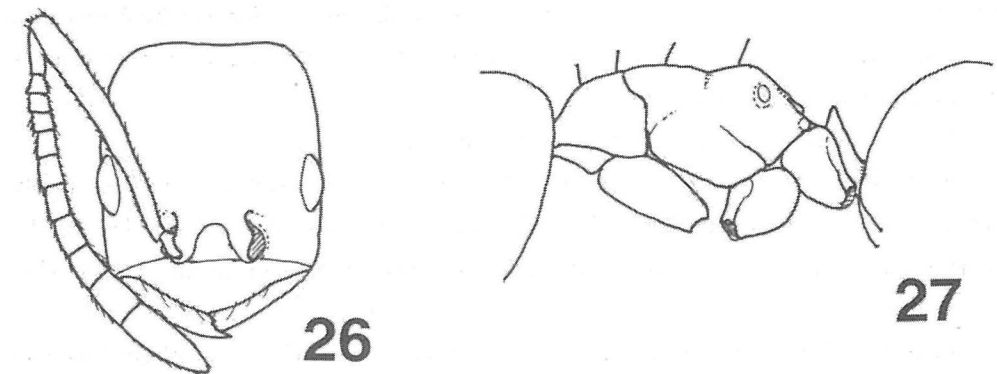
Measurements (mm): HL 0.46, HW 0.43, SL 0.45, CI 93, SI 105, WL 1.03, PNL 0.13, PH 0.14, DPW 0.35, TL 1.5.

Holotype. Worker, Aogashima, Izu Is., Tokyo, 8. viii. 1988, M. Terayama leg.

Paratypes. 5 workers, same data as holotype.

Type depository. National Institute of Agro-Environmental Sciences, Tsukuba.

Etymology. The specific epithet is the Japanese noun Sakuya (= Konohanano-sakuya-hime), which is the name of a Japanese goddess.



Figs. 26, 27. *Paraparatrechina sakuya* sp. nov., worker. --- 26, Head, full-face view; 27, alitrunk, lateral view.

***Camponotus kunigamiensis* sp. nov.**

(Figs. 28-32)

New Japanese name: Kunigami-oo-ari

Diagnosis. This species belongs to the subgenus *Myrmamblys* of the genus *Camponotus* by the convex anterior clypeal border, 5-toothed mandibles, long antennal scapes, and small body size not exceeding 7 mm in workers. This species is in the minor worker distinguished from the other East Asian species in this subgenus by the following characters: 1) propodeum in lateral view with convex dorsal outline; 2) propodeal declivity below strongly produced posteriorly; half of slope much steep and forming an angle at middle; 3) petiolar node in lateral view thick, asymmetrical, with anterior margin shorter than posterior margin; 4) first to 3rd gastral terga each with a pair of brownish elliptical spots at anterior portion.

Description. Holotype minor worker. Structure: Head in full-face view 1.12 times as long as wide, with convex sides and convex posterior margin. Mandible with 5 teeth. Anterior margin of clypeus moderately convex. Eye 0.14 mm in maximum diameter, weakly protruding. Antenna relatively long; scape exceeding posterior margin of head by 2/5 its

length; 2nd segment 2.3 times as long as wide; 3rd and 4th segment 1.5 and 1.6 times as long as wide, respectively.

Pronotum in dorsal view with weakly convex dorsal outline; in dorsal view, anterolateral corners rounded, 0.38 mm in maximum width; mesonotum in lateral view with almost straight dorsal outline; metanotal depression absent. Propodeal dorsum convex in lateral view, sloping from anterior end to posterior end; posterodorsal corner rounded, not forming an angle. Petiolar node in lateral view thick and high, asymmetrical, with anterior margin shorter than posterior margin; node in dorsal view 2.3 times as wide as long, with weakly convex anterior margin and straight posterior margin.

Gaster in dorsal view oval, 1.25 mm in maximum width.

Sculpture: Head weakly microreticulate; antenna microreticulate, mandible largely smooth. Alitrunk microreticulate; microreticulum on pronotum weaker than that on the mesonotum. Petiole smooth. Gaster very weakly microreticulate, and shining. Legs weakly microreticulate.

Pilosity: Head with scattered erect hairs. Pronotal dorsum with a pair of erect hairs at mid length; mesonotal dorsum with a pair of erect hairs; propodeum with ca. 10 erect hairs at posterior margin; the longest hair ca. 0.30 mm. Petiolar node with 4 pairs of erect hairs. Gaster with suberect hairs which are moderately spaced.

Color: Head black; mandible, anterior margin of clypeus and antenna brown. Pronotum and mesopleuron brown; mesonotum and propodeum black. Petiole blackish brown. Gaster black; 1st to 3rd gastral terga each with a pair of brownish elliptical spots at anterior portion; anterior half of 1st to 3rd terga each brownish; posterior half blackish; the rest terga blackish. Legs brown excepting trochanters yellowish brown.

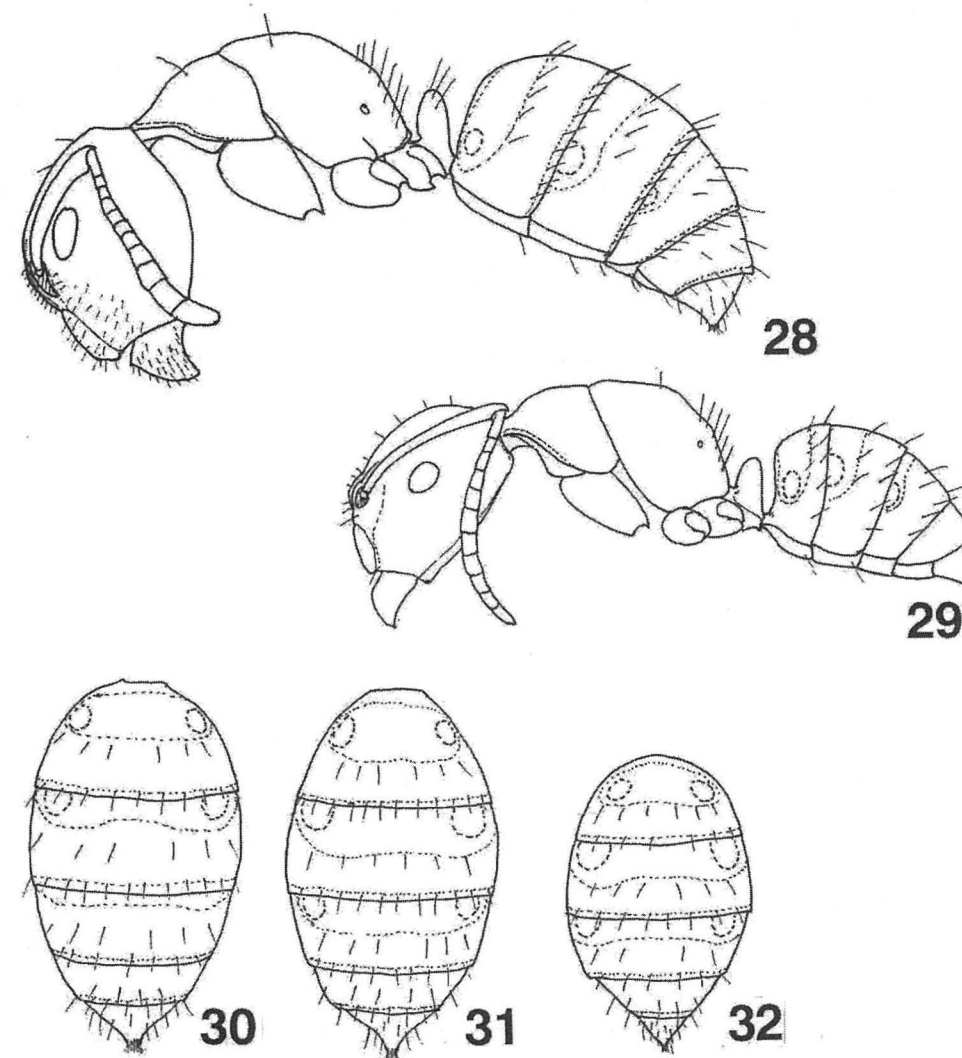
Measurements (mm): HL 1.20, HW 1.08, SL 1.08, CI 90, SI 100, WL 1.55, PNL 0.20, PH 0.55, DPW 0.36, TL 4.5.

Major worker. Structure: Head in full-face view almost as long as wide, with convex sides and straight posterior margin. Mandible with 5 teeth. Anterior margin of clypeus moderately convex. Eye 0.32-0.38 mm in maximum diameters, weakly protruding. Antenna relatively long; scape exceeding posterior margin of head by 2/5 its length; 2nd segment 2.3 times as long as wide; 3rd and 4th segment 1.5 and 1.6 times as long as wide, respectively.

Alitruncal dorsum in lateral view strongly convex, sloping from anterior portion of pronotum to posterior end of propodeum; metanotal depression absent; posterodorsal corner of propodeum rounded, not forming an angle. Petiolar node in lateral view thick and high, asymmetrical, with anterior margin shorter than posterior margin; node in dorsal view 2.3 times as wide as long, with weakly convex anterior margin and straight posterior margin.

Gaster in dorsal view oval, 1.20-1.32 mm in maximum width.

Sculpture: Head and antenna microreticulate, mandible largely smooth. Alitrunk microreticulate; microreticulum on pronotum weaker than that on the mesonotum. Petiole smooth. Gaster very weakly microreticulate, and shining. Legs weakly microreticulate.



Figs. 28-32. *Camponotus kunigamiensis* sp. nov., worker. --- 28, Body, lateral view, major worker; 29, ditto, minor worker, 30, 31, gaster, dorsal view, major worker; 32, ditto, minor worker.

Pilosity: Head scattered erect hairs. Pronotal dorsum with a pair of erect hairs at mid length; mesonotal dorsum with a pair of erect hairs; propodeum with ca. 10 erect hairs at posterior margin; the longest hair ca. 0.17 mm. Petiolar node with 4 pairs of erect hairs. Gaster with suberect hairs which are moderately spaced.

Color: Head black; mandible, anterior margin of clypeus and antenna brown. Pronotum and mesopleuron brown; mesonotum and propodeum black. Petiole blackish brown. Ground color of gaster black; 1st to 3rd gastral terga each with a pair of brownish elliptical spots at anterior portion; anterior half of 1st to 3rd terga each brownish, posterior half blackish; the rest terga blackish. Legs brown excepting trochanters yellowish brown.

Measurements (mm): (n=4) HL 1.45-1.60, HW 1.35-1.50, SL 1.02-1.17, CI 92-95, SI 71-80, WL 1.65-1.77, PNL 0.18-0.21, PH 0.45-0.50, DPW 0.35-0.36, TL 5.5-6.4.

Variation. The spots on the 3rd gastral tergum in the major workers vary from distinct to absent (Figs. 30, 31).

Holotype. Minor worker, Okuma, Kunigami-son, Okinawa-jima, Okinawa Pref., 29. xii. 2010, K. Kinomura & N. Ogawa leg.

Paratypes. 3 minor workers, 4 major workers, same data as holotype.

Type depository. National Institute of Agro-Environmental Sciences, Tsukuba.

Etymology. The specific epithet is based on the name of type locality, Kunigami-son.

Remarks. This is an arboreal species.

***Camponotus senkakuensis* sp. nov.**

(Figs. 33-35)

Japanese name: Okinawa-kuro-oo-ari

Camponotus sp. 6 (Terayama et al., 1991)

Diagnosis. This species belongs to the subgenus *Camponotus* s. str. of the genus *Camponotus* and most closely resembles to *C. japonicus* Mayr, 1866, from the Japanese mainland, Korea and China and *C. sachalinensis* Forel, 1904, from Russia, Hokkaido and mountainous areas of Honshu in Japan. However, it is distinguished from the latter two by the following characters: 1) anterior margin of clypeus produced medially (not produced medially in *sachalinensis*); 2) 1st gastral tergite with moderately dense pubescence and less lustrous (sparse pubescence and somewhat lustrous in *sachalinensis*); 3) 2nd gastral tergite with relatively sparse pubescence, arranged in rows that do not overlap (more dense, arranged in rows that overlap each other in *japonicus*, sparse in *sachalinensis*).

Description. Holotype worker. Structure: Head in full-face view 1.13 times as long

as wide, with convex sides and convex posterior margin. Mandible with 5 teeth. Anterior margin of clypeus produced medially. Eye 0.56 mm in maximum diameter, weakly protruding. Antenna relatively long; scape exceeding posterior margin of head by 2/5 its length; 2nd segment 2.3 times as long as wide; 3rd and 4th segment 1.5 and 1.6 times as long as wide, respectively.

Pronotal dorsum in lateral view weakly convex and lower than mesonotal dorsum, in dorsal view, anterolateral corners rounded, 0.89 mm in maximum width; mesonotal dorsum in lateral view convex; metanotal depression absent. Propodeum in lateral view short, with dorsal outline convex; posterodorsal corner not forming an angle. Petiolar node in lateral view thick, asymmetrical, with anterior margin shorter than posterior margin; node in dorsal view 2.3 times as wide as long, with weakly convex anterior margin and straight posterior margin.

Gaster in dorsal view oval, 2.23 mm in maximum width.

Sculpture: Head and antenna weakly microreticulate; mandible largely smooth. Alitrunk, petiole and gaster microreticulate. Legs largely smooth.

Pilosity: Vertex with several erect hairs. Anterior margin of clypeus with ca. 12 erect hairs. Pronotal dorsum with a pair of suberect hairs at mid length; mesonotal dorsum with a pair of suberect hairs; propodeum with 3 pairs of erect hairs; the longest hair ca. 0.17 mm. Petiolar node with 3 pairs of erect hairs. Gaster with moderately abundant suberect hairs and dense pubescence; 1st gastral tergite with moderate pubescent and less lustrous; 2nd gastral tergite with relatively sparse pubescence which is arranged in rows that do not overlap.

Color: Body black; 1st to 4th gastral terga each with pale yellowish transverse band at posterior margin; mandible, antenna, and legs blackish.

Measurements (mm): Holotype: HL 1.23, HW 1.05, SL 1.16, CI 85, SI 110, WL 1.77, PNL 0.27, PH 0.53, DPW 0.35, TL 9.1. Paratype workers (n=2): HL 1.00, 1.56, HW 0.78, 1.47, SL 1.11, 1.37, CI 78, 94, SI 142, 93, WL 1.51, 2.14, PNL 0.24, 0.32, PH -, -, DPW 0.28, 0.38. TL ca. 8.0, 10.8.

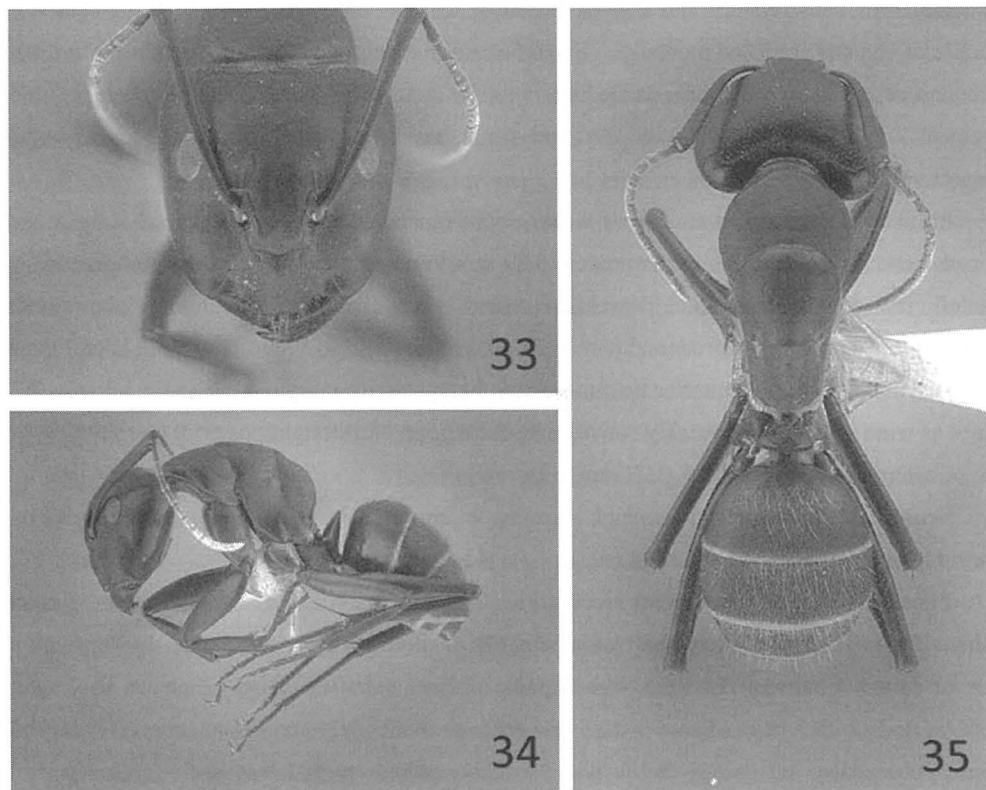
Holotype. Worker, Uotsuri-jima, Senkaku Islands, Okinawa Pref., 13.iii.1979 [labeled as 790313], T. Abe leg.

Paratype. 1 worker, same data as holotype; 1 worker, Uotsuri-jima, Senkaku Islands, Okinawa Pref.

Type depository. Osaka Museum of Natural History.

Etymology. The specific epithet is based on the name of type locality, the Senkaku Islands.

Remarks. This species is found only on Uotsuri-jima island in the Senkaku Islands.



Figs. 33-35. *Camponotus senkakuensis* sp. nov., worker. --- 33, Head, full-face view; 34, body, lateral view; 35, body, dorsal view.

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