

A New Species of the Genus *Camponotus* from Japan,
with Notes on Two Known Forms of the Subgenus
Myrmamblys (Hymenoptera, Formicidae)

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Abstract *Camponotus (Myrmamblys) yamaokai* sp. nov. is described and illustrated from Japan. *C. (M.) tokioensis* var. *atrigenatus* SANTSCHI and *C. (M.) tokioensis* var. *inconstans* SANTSCHI are synonymized with *C. (M.) tokioensis* ITO. *C. (M.) itoi* var. *nawai* ITO is recognized as a good species.

Camponotus itoi var. *nawai*, described by ITO in 1912, is commonly distributed from northern Honshu through Shikoku, Kyushu to the Tokara Islands of Japan. However, the junior author has observed that two ecologically distinct forms are included in it. One form is obligately monogynous, nuptial flight in August, larger in size, and distributes southern regions. The other form is facultatively polygynous, nuptial flight in May, smaller in size, and distributes northern regions (SATO, 1989). Through a careful comparison of syntype specimens of *C. itoi* var. *nawai* with those materials, we have concluded that the former is *C. itoi* var. *nawai* and the latter is a new species, which will be described hereinafter. In addition, we will also propose a new status and two new synonyms of the subgenus *Myrmamblys* from Japan.

Camponotus (Myrmamblys) nawai ITO, stat. nov.

Camponotus fallax var. *Nawai* ITO, 1914, *Annls. Soc. ent. Belg.*, 58: 44.

Camponotus (Myrmamblys) itoi var. *nawai*: EMERY, 1925, in WYTSMAN, *Genera Insectorum*, fasc. 183, Hym., Form.,: 138.

Camponotus (Myrmentoma) caryae var. *nawai*: WHEELER, 1928, *Boll. Lab. Zool. gen. agrar. Portici*, 21: 125.

Material examined. 451 colonies from the following localities in Japan: — Chiba Pref.: Mt. Kiyosumi-yama, Amatsu-kominato-machi. — Tokyo Pref.: Izu-ohshima Is., Toshima is., Shikine-jima Is., Miyake-jima Is., Hachijo-jima Is. — Kanagawa Pref.: Kawasaki-shi, Sagami-hara-shi, Manazuru-machi, Hayama-machi, Misaki-shi, Saru-shima Is. — Shizuoka Pref.: Shimoda-shi, Shimizu-shi. —

Mie Pref.: Kumano-shi, Mibama-machi, Kameyama-shi, Inabe-machi, Fujiwara-machi, Kiinagashima-machi. — Wakayama Pref.: Shirahama-machi, Susami-machi. — Ishikawa Pref.: Kaga-shi. — Fukui Pref.: Tsuruga-shi. — Kyoto Pref.: Maizuru-shi. — Hyogo Pref.: Toyooka-shi. — Aichi Pref.: Okazaki-shi. — Ehime Pref.: Matsuyama-shi. — Kagoshima Pref.: Kiire-machi, Yakushima Is., Takara-jima Is.

Distribution. Japan.

Remarks. Four syntype specimens were examined. We treat this form as a good species, since it is sympatric with *C. itoi* FOREL (two syntypes were examined) and distinctly differs from *C. caryae* (FITCH) of North America and *C. fallax* (NYLANDER) of Europe in having the convex and no incised anterior border of clypeus.

Camponotus (Myrmamblys) yamaokai sp. nov.

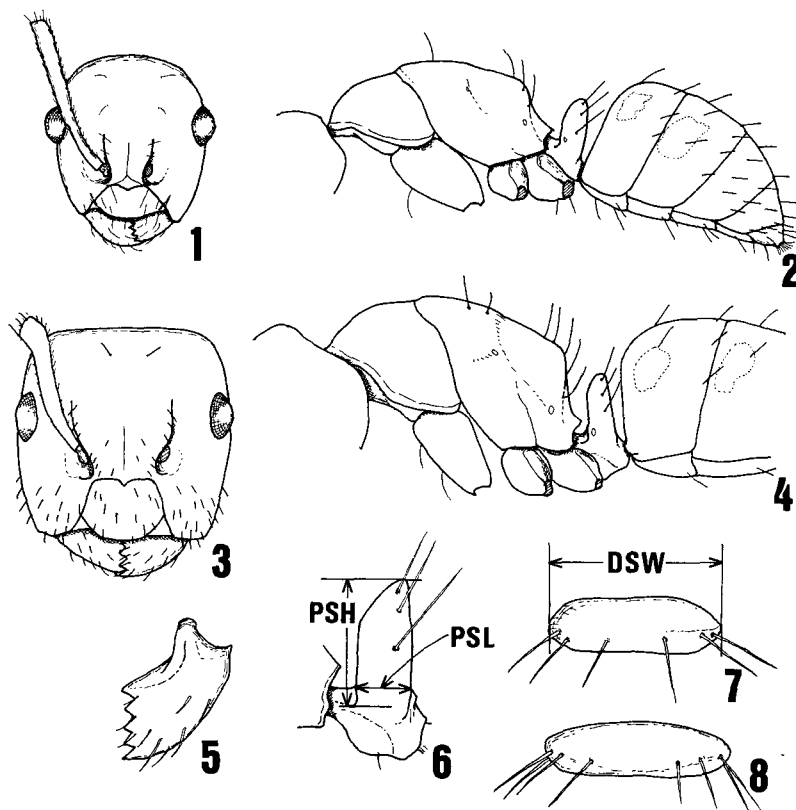
Minor worker. Head length (HL) 0.93–1.05 mm; head width (HW) 0.88–1.03 mm; scape length (SL) 0.80–0.98 mm; cephalic index (CI: $HW \times 100/HL$) 94–98; scape index (SI: $SL \times 100/HW$) 100–109; WEBER's length of alitrunk (WL) 1.15–1.45 mm; dorsal alitruncal width (AW) 0.70–0.79 mm; alitruncal width index (AI: $AW \times 100/WL$) 53–61; petiolar scale length (PSL) 0.14–0.18 mm; petiolar scale height (PSH) 0.28–0.38 mm; dorsal petiolar scale width (DSW) 0.38–0.45 mm; scale index (SCI: $PSL \times 100/PSH$) 46–50; scale width index (SWI: $DSW \times 100/AW$) 50–57; total length (TL) 3.5–4.2 mm. (Twenty individuals were measured.)

Head (Fig. 1) nearly as long as wide, with convex sides and convex occipital border in front view. Mandibles (Fig. 5) with rounded outer margin and five distinct teeth. Clypeus convex anteriorly. Eyes (Fig. 13) prominent and convex, 0.22–0.23 mm in maximum diameter. Antennae long and slender; scape projecting beyond the occipital border by about 1/3 of their length.

Alitrunk (Fig. 2) in profile with slightly convex pro- and mesonotal dorsa and almost straight propodeal dorsum. In lateral view, posterodorsal corner of propodeum rounded, not forming an angle. Petiolar scale (Fig. 6) thin and long; in lateral view, lower 2/3 of anterior and posterior borders almost parallel, upper 1/3 of anterior border gently convex; in dorsal view, 2.4–2.6 times as broad as long (Fig. 7).

Head, alitrunk and petiole shagreened; gaster and legs slightly less so. Head with erect or suberect hairs; mesonotum with a pair, posterolateral borders of propodeum with 3 pairs and petiolar scale with 3 pairs erect hairs; gastric tergites each with 2 rows of suberect hairs.

Head black, mandibles reddish brown, antennae and legs yellowish to medium brown. Pronotum reddish brown, mesonotum and propodeum black. Petiole and gaster black to blackish brown; 1st and 2nd gastric tergites each with



Figs. 1–8. *Camponotus yamaokai* sp. nov. (minor worker and major worker). — 1, Minor worker, head, frontal view; 2, minor worker, lateral view; 3, major worker, head, frontal view; 4, major worker, lateral view; 5, minor worker, mandible; 6, minor worker, petiole, lateral view (PSH: petiolar scale height, PSL: petiolar scale length); 7, minor worker, petiolar scale, dorsal view (DSW: dorsal petiolar scale width); 8, major worker petiolar scale, dorsal view.

two yellow spots.

Major worker. HL 1.28–1.38 mm; HW 1.28–1.38 mm; SL 0.88–0.95 mm; CI 96–106; SI 67–73; WL 1.55–1.70 mm; AW 0.83–0.90 mm; AI 53–58; PSL 0.16–0.18 mm; PSH 0.38–0.55 mm; DSW 0.49–0.55 mm; SCI 37–47; SWI 56–61; TL 4.8–5.3 mm. (Twenty individuals were measured.)

Head (Fig. 3) rectangular, with almost parallel sides and straight occipital border in front view. Mandibles strong, with rounded outer margin and five distinct teeth. Anterior border of clypeus truncated, but weakly convex. Eyes (Fig. 15) convex, 0.25–0.28 mm in maximum diameter. Antennal scapes slightly exceeding the occipital border of head.

Alitrunk (Fig. 4) massive, with weakly convex pro- and mesonotal dorsa and

almost straight propodeum dorsum. Seen from lateral side, posterodorsal corner dully angulate, posterior border almost straight. Petiolar scale thin and long; seen from lateral side, both lower 2/3 of anterior and posterior borders almost parallel, upper 1/3 of anterior border convex; viewed in dorsal, 3.0–3.3 times as broad as long (Fig. 8), posterior border almost straight, but weakly convex.

Head with erect or suberect hairs, short suberect hairs abundant on lower half of head and mandibles. Dorsum of mesonotum with 2 or 3 pairs, posterolateral borders of propodeum with 3–5 pairs and petiolar scale with 3 or 4 pairs erect hairs. Gastric tergites each with 2 rows of suberect hairs. Head, alitrunk and petiole shagreened; gaster and legs slightly less so.

Head black to dark brown; mandibles reddish brown; clypeus, genae, and antennae brown to reddish brown. Pronotum reddish brown, mesonotum and propodeum black. Petiole and gaster black to dark brown, 1st and 2nd gastric tergites each with two yellow spots. Legs brown.

Female. HL 1.13–1.38 mm; HW 1.13–1.35 mm; SL 0.90–1.00 mm; CI 95–102; SI 72–93; WL 1.93–2.33 mm; AL 1.05–1.15 mm; AI 48–58; PSL 0.18–0.25 mm; PSH 0.38–0.45 mm; DSW 0.50–0.60 mm; SCI 46–59; SWI 44–53; TL 5.0–6.3 mm. (Ten individuals were measured.)

Head (Fig. 9) rectangular, with almost straight sides and convex occipital border. Mandibles with rounded outer margin and five distinct teeth. Anterior border of clypeus almost straight, weakly convex. Eyes (Fig. 17) convex and prominent, 0.35–0.38 mm in maximum diameter. Ocelli small, front angle of ocellar triangle obtuse; anteromedian ocellus 0.05 mm in diameter. Antennal scapes long, projecting beyond the occipital border by about 1/4 of their length.

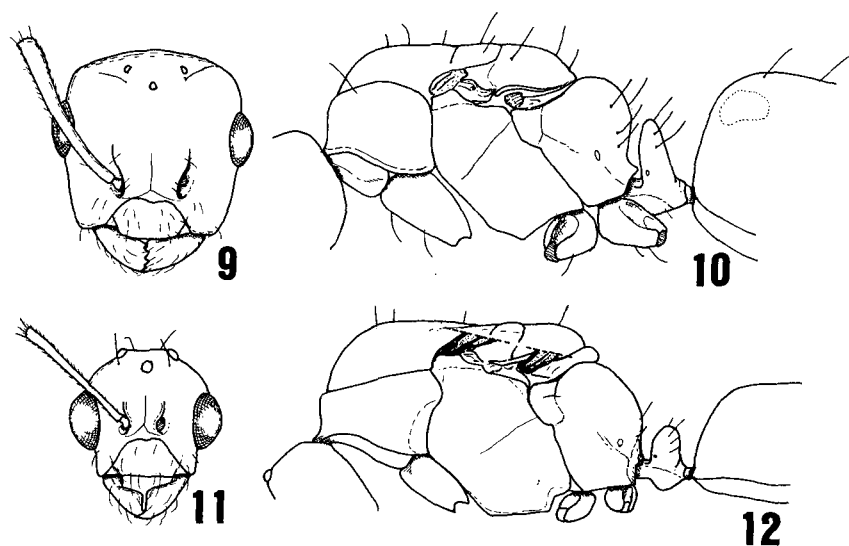
General form of alitrunk and petiole shown as in Fig. 10. Petiolar scale long; in lateral view, lower half of anterior and posterior borders almost parallel, upper half of anterior border weakly convex; in dorsal view, 2.7–3.0 times as broad as long, posterior border slightly concave; in front view, dorsal border convex.

Body with head shagreened, gaster and legs less shagreened than alitrunk. Erect or suberect hairs present on head, dorsum of alitrunk, petiole and gaster.

Head black; genae, clypeus and mandibles reddish brown; antennae medium to dark brown. Alitrunk, petiole and gaster black; pronotum dark brown to black; 1st and 2nd gastric tergites each with two yellowish spots. Legs brown; lower half of coxae, trochanters, and tips of femora and tibiae yellow.

Male. HL 0.73–0.75 mm; HW 0.85–0.88 mm; SL 0.74–0.75 mm; CI 105–117; SI 86–88; WL 1.68–1.88 mm; AW 0.98–1.05 mm; AI 54–63; PSL 0.17–0.20 mm; PSH 0.23–0.28 mm; DSW 0.33–0.40 mm; SCI 60–74; SWI 31–38; TL 4.1–4.5 mm. (Ten individuals were measured.)

Head (Fig. 11) including eyes slightly wider than long, with straight occipital border, rounded dorsolateral borders and almost parallelsides. Mandibles with only one strong apical tooth. Anterior clypeal border straight. Eyes prominent and convex, 0.32–0.33 mm in maximum diameter. Front angle of ocellar triangle



Figs. 9–12. *Camponotus yamaokai* sp. nov. (female and male). — 9, Female, head, frontal view; 10, female, lateral view; 11, male, head, frontal view; 12, male, lateral view.

obtuse, anteromedian ocellus 0.08 mm in diameter.

Alitrunk and petiole as in Fig. 12. Petiolar scale thick and low, dorsal border convex; in front view, dorsal border concave. Legs long and slender, hindtibiae 1.00–1.10 mm in length.

Subgenital plate (Fig. 22) hemi-circular, with median basal stalk. Genitalia as in Figs. 19 and 21; parameres gradually tapering to the apex and almost reaching the tip of aedeagus laterally.

Head, alitrunk and gaster shagreened; legs and gaster less shagreened than alitrunk. Erect hairs sparsely present on head, alitrunk, petiole and gaster.

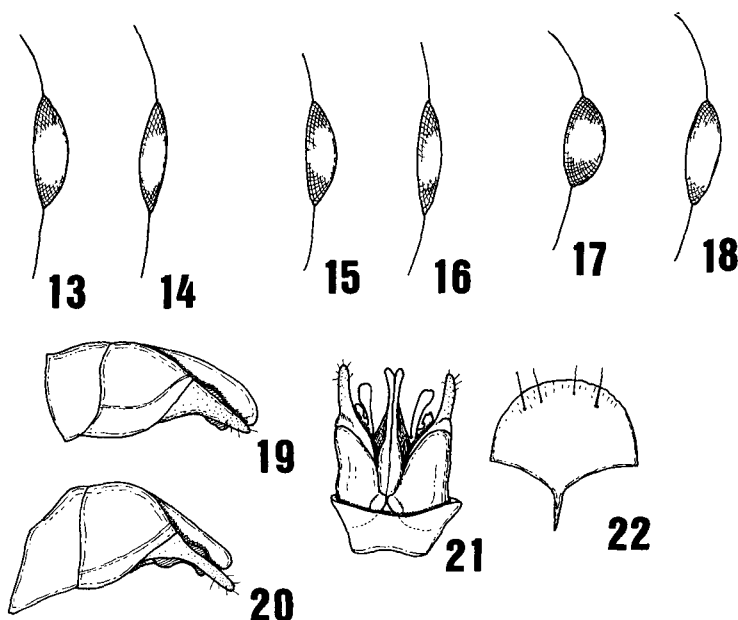
Black in color except for mandibles, pronotum and legs brown.

Holotype. Minor worker, Mt. Tsukuba-san, Tsukuba-shi, Ibaraki Pref., 13. X. 1986 (T. SATOH).

Paratypes. The following abbreviations are used: w-minor workers; s-major workers; f-female(s); m-male(s). 170 w, 33 s, 7 f, 3 m, from the same nest as holotype. Miyagi Pref.: 104 w, 18 s, 8 f, 4 m, Kesenuma-shi, 5. IV. 1988 (T. SATOH); 139 w, 33 s, 2 f, 1 m, Mt. Aoba-yama, Sendai-shi, 4. IV. 1988 (T. SATOH); 270 w, 26 s, 37 f, 4 m, same data. Tochigi Pref.: 39 w, 15 s, 1 f, 13 m, Sano-shi, 3. IX. 1984 (K. MURATA); 88 w, 7 s, 4 f, 1 m, Mt. Tage-san, Utsunomiya-shi, 8. I. 1985 (K. MURATA); 23 w, 5 s, 1 f, 3 m, same data; 85 w, 21 s, 5 f, Mt. Matsukurasan, Karasuyama-machi, 4. XII. 1984 (K. MURATA); 98 w, 22 s, 18 f, 15 m, Mt. Ohira-yama, Tochigi-shi, 14. II. 1982 (M. TERAYAMA); 16 w, 3 s, 1 f, Mashikomachi, 16. XI. 1984 (K. MURATA). Ibaraki Pref.: 40 w, 7 s, 1 f, Mt. Butcho-zan,

Kasama-shi, 13. I. 1985 (K. MURATA); 10 w, 6 s, 1 f, same data; 35 w, 12 s, 1 f, Mt. Tomiya-san, Iwase-machi, 27. I. 1987 (K. MURATA); 68 w, 18 s, 2 f, Satomi-mura, Kuji-gun, 9. VI. 1986 (T. SATOH); 34 w, 12 s, 2 f, same data; 83 w, 12 s, 1 f, Mt. Tsukuba-san, Tsukuba-shi, 24. IV. 1986 (T. SATOH); 150 w, 21 s, 3 f, same data; 136 w, 19 s, 2 f, 1 m, same locality, 30. IV. 1986 (T. SATOH); 83 w, 16 s, 4 f, same data; 187 w, 28 s, 13 f, 10 m, same data, 24. IV. 1986 (T. SATOH); 265 w, 41 s, 17 f, 11 m, same locality, 2. XII. 1985 (T. SATOH); 296 w, 39 s, 19 f, 1 m, same data; 421 w, 64 s, 45 f, 18 m, same locality, 24. IV. 1986 (T. SATOH); 272 w, 48 s, 58 f, 9 m, same locality, 30. IV. 1986 (T. SATOH); 235 w, 30 s, 22 f, 1 m, same locality, 16. V. 1986 (T. SATOH); 246 w, 24 s, 33 f, same locality, 13. X. 1986 (T. SATOH); 357 w, 44 s, 3 f, same data. Chiba Pref.: 415 w, 51 s, 12 f, 34 m, Mt. Kiyosumi-yama, 21. IX. 1985 (T. SATOH); 179 w, 38 s, 36 f, 18 m, same data; 121 w, 12 s, 2 f, same data; 42 w, 11 s, 3 f, same data; 237 w, 34 s, 4 f, same locality, 22. IX. 1985 (T. SATOH); 211 w, 44 s, 11 f, 9 m, same data; 159 w, 22 s, 7 f, same data. Saitama Pref.: 5 w, 3 s, Higashi-matsuyama-shi, 15. II. 1975 (M. TERAYAMA); 16 w, 4 s, 3 f, 1 m, Nihongi-pass, Yorii-machi, 2. IV. 1976 (M. TERAYAMA); 189 w, 35 s, 7 f, Tokorozawa-shi, 4. X. 1986 (T. SATOH); 388 w, 72 s, 16 f, 7 m, same data; 751 w, 124 s, 19 f, 8 m, same data; 957 w, 172 s, 21 f, 14 m, same data; 42 w, 5 s, 3 f, same data; 193 w, 61 s, 14 f, same locality, 25. VII. 1986 (T. SATOH); 213 w, 43 s, 15 f, 4 m, same locality, 3. X. 1987 (T. SATOH); 223 w, 20 s, 7 f, 4 m, same data; 485 w, 51 s, 16 f, same data. Tokyo: 2 w, 2 s, Inagi-shi, 18. IV. 1988 (M. NISHIMURA). Kanagawa Pref.: 39 w, 10 s, 3 f, 1 m, Kakio, Kawasaki-shi, 7. III. 1981 (S. KUBOTA); 5 w, 5 s, 8 f, 1 m, same locality, 8. IX. 1984 (S. KUBOTA); 14 w, 5 s, 2 f, same locality, 11. II. 1980 (S. KUBOTA); 10 w, 1 f, same locality, 5. III. 1979 (S. KUBOTA); 19 w, 6 s, 2 f, same locality, 21. I. 1982 (S. KUBOTA). Shizuoka Pref.: 43 w, 12 s, 3 f, Kawatsu-machi, 20. VII. 1987 (T. SATOH); 64 w, 9 s, 3 f, same data; 37 w, 16 s, 1 f, same data. Nagano Pref.: 2 w, Matsumoto-shi, 10. V. 1985 (M. NISHIMURA). Mie Pref.: 4 w, Mt. Fujiwara-dake, Fujiwara-machi, 14. XII. 1980 (A. KAWAZOE); 43 w, 10 s, 8 f, same locality, 8. II. 1987 (A. KAWAZOE). Kyoto Pref.: 89 w, 13 s, 4 f, Tamba-machi, 1. V. 1988 (T. SATOH). Hyogo Pref.: 191 w, 24 s, 9 f, 7 m, Toyooka-shi, 12. X. 1987 (T. SATOH). Hiroshima Pref.: 32 w, 4 s, 4 f, Miyajima Is., Miyajima-machi, 3. VIII. 1988 (T. SATOH); 105 w, 14 s, 2 f, 10 m, same locality, 27. VIII. 1988 (T. SATOH); 44 w, 11 s, 1 f, 2 m, same data. Shimane Pref.: 124 w, 20 s, 6 f, Matsue-shi, 26. X. 1985 (F. ITOH); 21 w, 5 s, 1 f, Mt. Sanbe, 24. X. 1985 (GOUBARA). Ehime Pref.: 153 w, 21 s, 14 f, Mt. Ishizuchi, 29. VIII. 1988 (T. SATOH); 61 w, 10 s, 2 f, Mikawa-machi, 29. VIII. 1988 (T. SATOH). Kochi Pref.: 312 w, 46 s, 11 f, 5 m, Sagawa-machi, 30. VIII. 1988 (T. SATOH).

Type depository. The holotype and some paratypes are deposited in the National Institute of Agro-Environmental Sciences, Tsukuba, and the other paratypes in the National Science Museum, Tokyo, the Osaka Museum of Natural History, and the Naturhistorisches Museum, Basel.



Figs. 13, 15, 17, 19, 21 and 22, *Camponotus yamaokai* sp. nov.; 14, 16, 18 and 20, *Camponotus nawai* Ito. — 13 and 14, Minor worker, compound eye; 15 and 16, major worker, *ditto*; 17 and 18, female, *ditto*; 19 and 20; male, genitalia, lateral view; 21, *ditto*, dorsal view; 22, male, subgenital plate.

Distribution. Japan.

Remarks. This species is closely related to *Camponotus nawai* Ito, but it differs from the latter in many characters as shown in Table 1.

Table 1. Differences between *C. yamaokai* sp. nov. and *C. nawai* Ito.

	<i>Camponotus yamaokai</i> sp. nov.	<i>C. nawai</i> Ito
Minor worker	Eyes much prominent (Fig. 13). Petiolar scale thin laterally (SCI 46–50).	Eyes weakly prominent (Fig. 14). Petiolar scale broad laterally (SCI 54–64).
Major worker	Eyes prominent (Fig. 15). Petiolar scale proportionately broad dorsally (SWI 55–61). Head smaller, HW usually less than 1.40 mm.	Eyes rather flat (Fig. 16). Petiolar scale proportionately narrow dorsally (SWI 44–50). Head larger, HW usually more than 1.43 mm.
Female	Head smaller, HW less than 1.45 mm. Eyes convex and prominent (Fig. 17).	Head larger, HW more than 1.50 mm. Eyes rather flat (Fig. 18).
Male	Parameres of genitalia gradually tapering to the apex, almost reaching the tip of aedeagus laterally (Fig. 19).	Anterior half of parameres of genitalia with parallel sides, exceeding the tip of aedeagus laterally (Fig. 20).

The head width in profile of females, males, major and minor workers of *C. yamaokai* and *C. nawai* were measured under a stereoscopic binocular microscope accurate to 0.025 mm (Table 2). From the Table 2, all castes or sexes of *C. yamaokai* have the smaller head than that of *C. nawai*. In particular for the females and the major workers, the two species are distinct without overlapping of size ranges. The distributions of *C. yamaokai* and *C. nawai* are indicated in Fig. 23.

Table 2. Head widths of *C. yamaokai* sp. nov. and *C. nawai* ITO (in mm).

Caste or sex	<i>C. yamaokai</i>				<i>C. nawai</i>			
	Mean	S.D.	n	Locality ³⁾	Mean	S.D.	n	Locality ³⁾
Female ¹⁾	1.33	0.03	90	Tsukuba	1.53	0.05	18	Shimoda
	1.34	0.03	53	Kiyosumi	1.54	0.04	6	Amatsu
Male	0.88	0.01	20	Tsukuba	0.89	0.01	30	Shimoda
	0.86	0.01	20	Kiyosumi	0.90	0.05	64	Amatsu
Major worker ²⁾	1.32	0.05	100	Tsukuba	1.51	0.08	100	Shimoda
	1.34	0.05	100	Kiyosumi	1.51	0.08	100	Amatsu
Minor worker ²⁾	0.94	0.04	100	Tsukuba	0.99	0.06	100	Shimoda
	0.94	0.04	100	Kiyosumi	0.99	0.07	100	Amatsu

1) Queens of *C. yamaokai* show bimodal size distribution (SATOH, 1989), but measurements in large-sized queens are given in the table.

2) Individuals from 10 nests from each location were measured.

3) Tsukuba: Mt. Tsukuba-san, Ibaraki Pref. Kiyosumi: Mt. Kiyosumi-yama, Chiba Pref. Shimoda: Shimoda-shi, Shizuoka Pref. Amatsu: Amatsu-kominato-machi, Chiba Pref.

Camponotus (Myrmamblys) tokioensis ITO

Camponotus Itoi tokioensis ITO, 1912, Anns. Soc. ent. Belg., 56: 341.

Camponotus (Myrmamblys) itoi tokioensis: EMERY, 1925, in WYTSMAN, Genera Insectrum, fasc. 183, Hym. Form.: 138.

Camponotus (Myrmamblys) tokioensis v. *atrigenatus* SANTSCHI, 1937, Bull. Anns. Soc. ent. Belg., 77: 384. **Syn. nov.**

Camponotus (Myrmamblys) tokioensis v. *inconstans* SANTSCHI, 1937, Bull. Anns. Soc. ent. Belg., 77: 385. **Syn. nov.**

Camponotus (Myrmentoma) tokyoensis [sic.]: MENOZZI, 1940, Mushi, Fukuoka, 13: 11.

Camponotus (Myrmamblys) tokioensis: ONOYAMA, 1980, Kontyû, Tokyo, 48: 201.

Material examined. 21 colonies from the following localities in Japan: — Saitama Pref.: Kumagaya-shi, Higashi-matsuyama-shi, Sayama-shi. — Ibaraki Pref.: Mito-shi. — Kanagawa Pref.: Kawasaki-shi, Manazuru-machi. — Tokyo Pref.: Izu-oshima Is., Oume-shi. — Chiba Pref.: Tateyama-shi, Narutou-machi. — Mie Pref.: Kaisan-machi.

Distribution. Japan, Korea, China.

Remarks. According to the original descriptions, var. *atrigenatus* differs from the nominate species in having the black anterior portion of head and less shining surface of body, var. *inconstans* differs from nominate species in having the



Figs. 23. Geographical distributions of *C. yamaokai* (●) and *C. nawai* (■) in Japan.

darker anterior portion of head. However, comparing nine syntypes of var. *atrigenatus* and six syntypes of var. *inconstans* with the nominate species, we have concluded that those are not significantly different from the latter in morphology.

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