

[Sept. 1968]

**Taxonomic Studies on the Genus *Lasius* in Hokkaido,
with Ethological and Ecological Notes (Formicidae,
Hymenoptera). I. The Subgenus *Dendrolasius*
or Jet Black Ants¹⁾**

By

Katsusuke Yamauchi and Kazuo Hayashida

Zoological Institute, Hokkaido University and Koen-Gakuen Junior College
(With 8 Text-figures and 2 Tables)

Among numerous genera of ants, the genus *Lasius* Fabricius is one of the most troublesome groups to make a reasonable classification, for the lack of definite and reliable characters and extreme intraspecific variability, nevertheless it involves many common and ecologically important species. In his comprehensive monograph of the genus, Wilson (1955) recognized four subgenera and established 33 valid species out of 110 names so far published, in addition of six new species.

As a part of their myrmecological survey in Hokkaido, the writers have attempted since 1966 to clarify the taxonomy, ethology and ecology of *Lasius* in Hokkaido, for the lack of reliable revision in Japan. As the first step, the present paper deals with the species belonging to the subgenus *Dendrolasius* Razsky, or so-called jet black ants, famous for their trail making habit. Wilson recorded four species from Japan, among which *L. teranishii* has so far precisely been known by only a single queen specimen from Hokkaido. In his study of ecological distribution of ants in Hokkaido, started in 1957, one of the writers (K.H.) confirmed the occurrence of two *Dendrolasius* all over Hokkaido, but the distribution of the species was not always satisfactory. In the present paper, the materials so far accumulated were thoroughly re-examined as to various morphological characteristics. The key to species was prepared based upon all three castes, the male and worker of *L. teranishii*, both new to science, were described, and all available records of distribution of four species were compiled. Further some ethological and ecological notes were added to.

Before going further, the writers wish to express their cordial thanks to Prof. Mayumi Yamada and Dr. Shoichi F. Sakagami, Zoological Institute, Hokkaido University, for their kind guidance to the present study. Their sincere gratitudes are also expressed to Prof. Edward

1) Contribution No. 809 from the Zoological Institute, Faculty of Science, Hokkaido University, Sapporo, Japan.

Jour. Fac. Sci. Hokkaido Univ. Ser. VI, Zool. 16, 1968.

O. Wilson, Harvard University, for his valuable suggestions concerning the taxonomic characteristics studied.

1. Taxonomical Part

Examination of morphological characters and measurements of individual variation in workers and males were studied by using the specimens sampled from colonies found in Sapporo and its vicinity. In the case of worker, 20 specimens were randomly chosen from five colonies in each species except *L. spathepus*, only one colony of which was available. No sufficient material of males was obtained so that measurements were undertaken using the limited number of specimens available. Terminology on morphological characters and procedures of measurements follow the system by Wilson (1955). Each metric character (cf. 1.2.) was measured under 60 magnifications with an ocular micrometer of binocular microscope.

1.1. Key to Subgenera of Japanese *Lasius*.

Worker:

1. Body color yellow to yellowish brown; maximum eye length less than $0.20 \times$ head width, mostly less than $0.17 \times$ head width¹⁾ *Cautolasius*, *Chthonolasius*²⁾
- Body color brown to jet black; maximum eye length more than $0.20 \times$ head width 2
2. Body color brown to brownish black; terminal segment of maxillary palp about as long as maximum eye width *Lasius* s. str.
- Body color shining jet black; terminal segment of maxillary palp about half as long as or shorter than maximum eye width *Dendrolasius*

Queen:

1. Head broader than thorax just anterior to tegulae 2
- Head narrower than thorax just anterior to tegulae 3
2. Metapleural gland opening about as large as propodeal spiracle or smaller, lacking guard hairs *Dendrolasius*
- Metapleural gland opening larger than propodeal spiracle, provided with guard hairs *Chthonolasius*

1) In Wilson's key, this character also fits to *Dendrolasius*, but in the Japanese material maximum eye length of *Dendrolasius* is longer than $0.20 \times$ head width.

2) Wilson (1955) separated *Cautolasius* from *Chthonolasius* by metapleural gland and its opening, reduced in *Chthonolasius*, not in *Cautolasius*, in all castes, and by head broader than thorax in *Chthonolasius*, while narrower than thorax in *Cautolasius*, in queen and male. But the writers could find no such difference as to metapleural gland opening, at least between *L. (Chthonolasius) umbratus* (Nylander) and *L. (Cautolasius) flavus* (Fabricius). Consequently, *Cautolasius* and *Chthonolasius* are here distinguished only in reproductive castes, leaving the distinction in worker for the future.

3. Maxillary palp segments IV, V and VI subequal in length *Lasius* s. str.
 - Maxillary palp segments V and VI conspicuously reduced relative to IV *Cautolasius*

Male:

1. Matapleural gland opening about as large as propodeal spiracle or smaller, lacking guard hairs *Dendrolasius*
 - Matapleural gland opening larger than propodeal spiracle, provided with guard hairs. 2
 2. Mandible lacking preapical cleft, basal angle always broadly rounded, masticatory border curving gradually into basal border *Lasius* s. str.
 - Mandible with distinct preapical cleft, basal angle often distinctly marked, clearly separating masticatory and basal borders. 3
 3. Head including eyes broader than thorax just anterior to tegulae .. *Chthonolasius*
 - Head including eyes narrower than thorax just anterior to tegulae .. *Cautolasius*

1.2. *Japanese species of Dendrolasius Ruzsky*

Up to the present five species of the subgenus *Dendrolasius* have been recorded from the Palaearctic Region: *fuliginosus* (Latreille), *crispus* Wilson, *buccatus* Starcke, *spathepus* Wheeler and *teranishii* Wheeler. Except *L. buccatus* in Europe, the other four species are known from Far East, all of which are recorded from Japan. Myrmecofauna of Hokkaido involves all these four species, but *L. fuliginosus* and *L. teranishii* are relatively abundant, while *L. crispus* and *L. spathepus* more sparsely distributed as given later.

Table 1 presents the result of measurements of six body parts: Scape length (SL), head length (HL) and width (HW), eye length (EL) and width (EW), pronotum width (PW). Mean values of all measurements are highest in *L. fuliginosus*, indicating largest head, largest eye, longest scape and widest pronotum among the four species. The other three species cannot clearly be distinguished by the mean values of all characters measured. Moreover, the ranges of all characters

Table 1. Comparison of the measurement values of six morphological characters among four species of *Dendrolasius*. Values are given mean, minimum and maximum respectively

	<i>crispus</i>	<i>fuliginosus</i>	<i>spathepus</i>	<i>teranishii</i>
SL	1.13(0.95-1.25)	1.25(0.96-1.37)	1.10(0.98-1.32)	1.80(0.92-1.22)
HL	1.27(1.01-1.35)	1.42(1.20-1.49)	1.22(1.13-1.16)	1.22(1.00-1.34)
HW	1.25(1.01-1.35)	1.37(1.80-1.49)	1.22(1.08-1.66)	1.20(1.00-1.34)
EL	0.26(0.22-0.30)	0.29(0.25-0.31)	0.26(0.24-0.35)	0.26(0.22-0.29)
EW	0.22(0.17-0.24)	0.24(0.17-0.26)	0.22(0.19-0.29)	0.22(0.18-0.25)
PW	0.73(0.58-0.82)	0.18(0.66-0.90)	0.72(0.66-0.91)	0.74(0.60-0.86)

considerably overlap among all four species, especially in head and scape. Therefore, the characters adopted are unsuitable to distinguish the four species concerned.

Among these species, *L. teranishii* has so far precisely been known only in a single queen,¹⁾ but one of the writers (K.Y.) could obtain all three castes from certain colonies of this species. The diagnoses of worker and male are given below, before the key to species.

1.3. Diagnosis of *L. teranishii*: Worker and Male

Lasius (Dendrolasius) teranishii Wheeler

Lasius (Chthonolasius) teranishii Wheeler, 1928: (120 Queen). Type locality: Nokkeushi, Hokkaido, Japan.

Lasius (Dendrolasius) teranishii, Wilson, 1955: 146-147 (Queen).

Lasius umbratus (nec Nylander), Teranishi, 1927: 90, 92-93, Fig. 6, 6A (Queen).

Lasius (Chthonolasius) ouchi Teranishi, 1940. 76 (Queen).

The queen of this species is clearly different from those of *L. fuliginosus* and *L. crispus* in strongly flattened antennal scape and leg, and from *spathepus* in fine, short and appressed hairs densely covering over the whole body. Such clear difference is not found in worker and male.

Worker: Body black, hairs white to golden; antennal funiculi blackish brown, maxillary palpi light brown, legs gradually brownish black to brown from base to tip. Pubescence very fine, short, appressed, uniformly and densely covering whole body, antennae and legs; standing hairs on head, thorax, antennae and legs very few, mostly shorter than terminal segment of maxillary palp; standing hairs on dorsal crest of petiole and gaster longer and denser.

Head slightly longer than broad, broadest at eye level, gently and roundly narrowing both above and below, with deeply concave posterior border; ocelli very small; frontal groove feeble; frontal carina distinct; clypeus broadly convex, anterior border slightly rounded, frontal keel developed at anterior part; mandible with 10 or 11 denticules; maxillary palp 6-segmented, IV, V and VI subequal in length; labial palp 4-segmented; antennal scape conspicuously flattened, slightly beyond occipital corner, each joint of funiculus longer than broad.

Thorax slightly broader than 2/3 head width; pronotum, seen from above, rounded in front and at sides; mesonotum, seen from above, short-elliptical, longer than broad, nearly as broad as 1/2 pronotum; propodeum obviously constricted just above propodeal spiracle; metapleural gland well developed with guard hairs.

Petiole rather thick, in profile, with anterior and posterior margins straight, dorsal border convex; seen from behind, broader above than below, with flat

1) Without no detail information, Kogure (1955) recorded the capture of "*L. (Chthonolasius) teranishii* Wheeler" (caste not mentioned) from Kamuikotan, Souunkyo Hotspring and Mt. Tokachidake.

dorsal border. Gaster oval, broadest at anterior border of 2nd segment.

Femora and tibiae conspicuously flattened, each femur with distinct longitudinal furrow at inner side.

Size (in mm, 80 specimens): body length 3.0–3.7, other measurements given in Table 1.

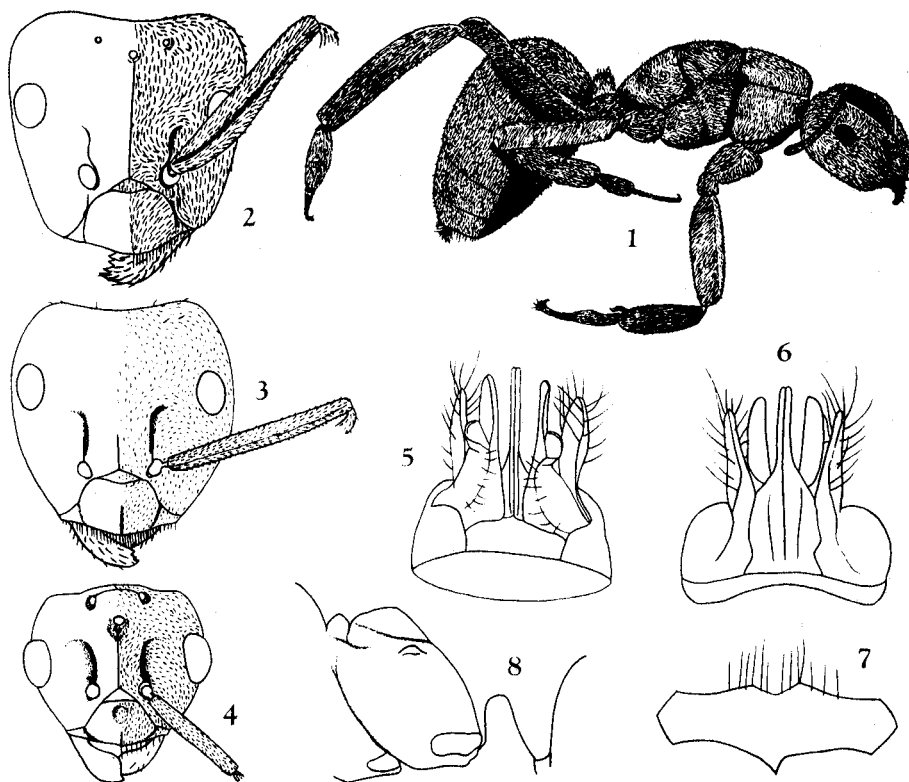


Fig. 1. *Lasius teranishii* Wheeler. 1, queen; 2, head of queen; 3, head of worker; 4, head of male; 5 and 6, ventral and dorsal view of male genitalia; 7, male subgenital plate; 8, worker propodeum seen from left side.

Male: Body brownish black, hairs white to golden; antennal funiculi and mandibles yellowish brown, legs gradually brownish black to brown from base to tip; wings slightly brownish hyaline, stigmata and veins blackish brown. Pubescence very fine, short, appressed, uniformly and densely covering whole body, antennae, wings and legs; standing hairs on head, thorax, antennae, wings and legs very few; standing hairs on dorsal crest of petiole and gaster, particularly those of ventral side of gaster, longer and denser.

Head excluding eyes slightly broader than long; ocelli prominent; frontal carina distinct; clypeus broadly convex, frontal keel developed only at anterior

part, anterior border nearly straight; mandible with basal angle always broadly rounded, masticatory border curving gradually into basal border, apical tooth distinct; antennal scape somewhat flattened; maxillary palp 5-segmented, III the longest, V second in length.

Thorax slightly narrower than head; scutum, in profile, convex, overhanging pronotum, seen from above, roundly projecting forward, concealing pronotum; parapsidal furrows approaching for each other at middle with shape of \cup ; scutellum, in profile, convex, obviously beyond scutum and propodium; metapleural gland reduced, lacking guard hairs.

Petiole rather thick, in profile, anterior and posterior borders almost straight, dorsal border generally round with a weak elevation medially. Subgenital plate and genitalia as illustrated in Fig. 1.

Femora and tibiae somewhat flattened.

Size (in mm, 10 specimens): body length about 4, head width 1.0–1.9, scape length 0.68–0.73, pronotum width 0.90–0.98.

Queen: Generally as in Teranishi (1927). The pubescence on whole body and appendages are uniformly dense, though not given in Teranishi.

Specimens used for description: 80 workers, 10 males and 2 queens, Sapporo, 21-June-1966, K. Yamauchi leg.; 1 queen, Mt. Atsusanupri, Akan National Park, 10-August-1958, K. Hayashida leg.

1.4. Key to the Japanese species of *Dendrolasius*

Following Wilson (1955), the writers rearranged the key to the Japanese species based upon the materials collected in Hokkaido.

Worker:

1. Dorsal crest of petiole thin and sharp in side view (cf. Fig. 2) 2
- Dorsal crest of petiole thick and dull in side view (cf. Fig. 2) 3
2. Antennal scape flattened, for most parts minimum width is about half of maximum width in cross-section; petiole asymmetrical in side view (cf. Fig. 2); standing hairs on pronotum mostly longer than terminal segment of palp ..
..... *spathepus*
- Antennal scape short-elliptical in cross-section; petiole tapering symmetrically from base to tip in side view (cf. Fig. 2); standing hairs on pronotum mostly shorter than terminal segment of maxillary palp *crispus*
3. Antennal scape short-elliptical in cross-section; petiole broadest at level of petiolar spiracle, tapering gradually to tip frontally (cf. Fig. 2); standing hairs on pronotum mostly longer than terminal segment of maxillary palp
..... *fuliginosus*
- Antennal scape flattened like *spathepus*; petiole broader above than below frontally (cf. Fig. 2); standing hairs on pronotum mostly shorter than terminal segment of maxillary palp *teranishii*

Queen:

1. Dorsal crest of petiole thin and sharp in side view (cf. Fig. 2) 2
- Dorsal crest of petiole thick and dull in side view (cf. Fig. 2) 3
2. Body except appendages virtually glabrous; petiole asymmetrical in side view (cf. Fig. 2); head broader than long; antennal scape, femur, tibia and metatarsus strongly flattened *spathepus*
- Body with abundant, fine and uniform hairs; petiole symmetrical in side view (cf. Fig. 2); head as long as broad; antennal scape, femur, tibia and metatarsus short-elliptical in cross-section..... *crispsus*
3. Body with long, stout standing hairs beyond dense, appressed pubescence; antennal scape, femur, tibia and metatarsus short-elliptical in cross-section *fuliginosus*
- Body without long standing hairs except at last two abdominal segments; antennal scape, femur, tibia and metatarsus strongly flattened *teranishii*

Male:

1. Dorsal crest of petiole thin and sharp in side view (cf. Fig. 2) 2
- Dorsal crest of petiole thick and dull in side view (cf. Fig. 2) 3
2. Petiole asymmetrical in side view (cf. Fig. 2); antennal scape and tibia distinctly flattened; pygostyle thick, tapering gradually from base to tip .. *spathepus*
- Petiole symmetrical in side view (cf. Fig. 2); antennal scape short-elliptical in cross-section; pygostyle parallel sided not tapering to tip *crispsus*
3. Antennal scape short-elliptical in cross-section; standing hairs on scutum long, relatively dense; parapsidal furrows almost straight *fuliginosus*
- Antennal scape flattened; standing hairs on scutum very short, very few; parapsidal furrows (-shaped) *teranishii*

2. Etho-ecological Part**2.1. Habitat and nest site preference.**

In Europe, *L. fuliginosus* has been recorded from various habitats, including non woodland habitats such as dry meadows with poplar or willows in Germany (Gösswald, 1932). On the other hand, in Japan, at least in Hokkaido, this species is mostly confined to woodlands, not extending its range too much beyond wood margins.

In Europe, *L. fuliginosus* invariably makes carton nests. The nests are made primarily in standing tree trunks and rotten stumps, rarely in and around the roots of trees, under stones and open soil (Gösswald, 1932; Gaspar, 1965). In Japan, this species is frequently discovered in rotten parts of standing tree trunks (Teranishi, 1928) and around roots of trees (Hayashida, 1960), rarely in decayed stumps (Hayashida, 1960). *L. spathepus* also makes carton nests and prefers just as sites same as in *L. fuliginosus* in Japan (Teranishi, 1928; Hayashida, 1960). No

detailed record on habitat and nest site preferences of both *L. teranishii* and *L. crispus* have hitherto been published. Table 2 shows the frequency distributions of habitat and nest site preferred by the four species, based upon the data obtained in 1966-67, unbiased as to discovery.

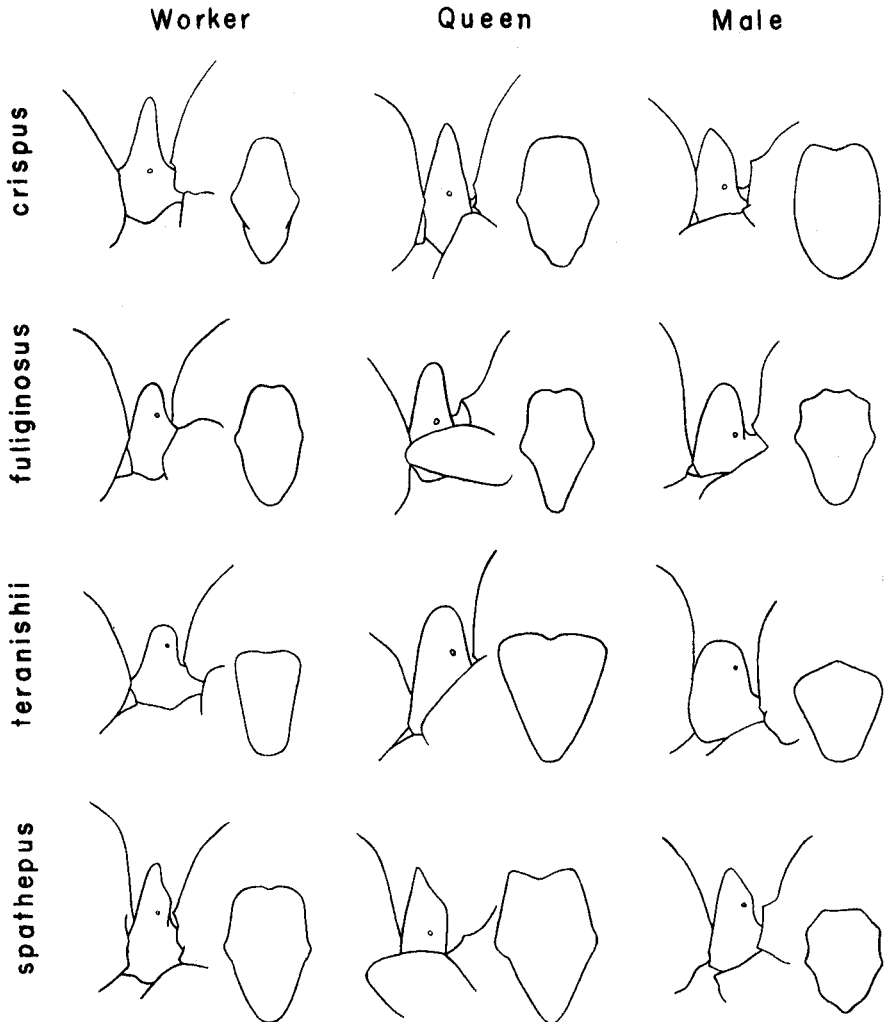


Fig. 2. Petiole of worker of *Dendrolasius*. (Left seen laterally; right seen frontally)

The preference for woodland as habitat (82.5%) and hollowed tree trunks as nest site (75.5%) are obvious from the table. Within the present study, *L. crispus* and *L. spathepus* were found only in woodlands. On the other hand, though

Table 2. Habitat and nest site preference of four *Dendrolasius* species in Sapporo and the vicinity

Habitat types: WL (Woodlands); WM (wood margins); HG (grassy or herbaceous lands); SH (grassy or herbaceous lands of sand dunes); BS (bare sandy area or lands with sparse vegetation). Nest site types: h (in hollowed tree trunks); r (around the roots of trees); d (decayed stumps); u (under stones)

Species	Number of colonies discovered from									
	Various habitats					Various nest sites				Total
	WL	WM	HG	SH	BS	h	d	r	u	
<i>fuliginosus</i>	24	3	1			22	3	3		28
<i>teranishii</i>	3	1		1	1	3	1	1	1	6
<i>crispus</i>	5					5				5
<i>spathepus</i>	1						1			1
Total	33	4	1	1	1	30	5	4	1	40

the number of colonies is still insufficient, *L. teranishii* was found both from woodland and openland, and from various nest sites.

2.2. Foraging activities and production of sexual forms

L. fuliginosus is well known by the formation of remarkable foraging paths, which are mostly made in shaded woodlands or woodmargins avoiding sunny places, rarely run across the open places.

A brief sketch of the seasonal trend of this species in Sapporo is given as follows. At the beginning of the active period, middle April, the workers of *L. fuliginosus* are found only near the nest, still in a lethargic appearance, often clustering under the fallen leaves. Parallel to rise of soil temperature, they gradually extend the action radius. In late April they arrive at the point about 10 m apart from the nest mainly along fallen logs. Until the appearance of homopterous insects, the important food source as milking cows, they depend mainly upon plant saps from aconites, red-berried elders, etc. By the appearance of aphids or coccids, in middle to late May, the foraging paths become more stable and actively extend to many trees. The increase of foraging activity is rapid in early spring, but the decrease is relatively slow in autumn until the cessation of field activity in early November. During warm seasons foraging parties are seen both in day and night without marked change of activity.

Observations on the other species of *Dendrolasius* were made only occasionally, but no remarkable differences from *L. fuliginosus* both in foraging paths and seasonal trend of the activity were recognized.

Some observations were made on the diurnal rhythms of the foraging activity of *L. fuliginosus* and *L. crispus* as shown in Figs. 3 and 4. In the observations in

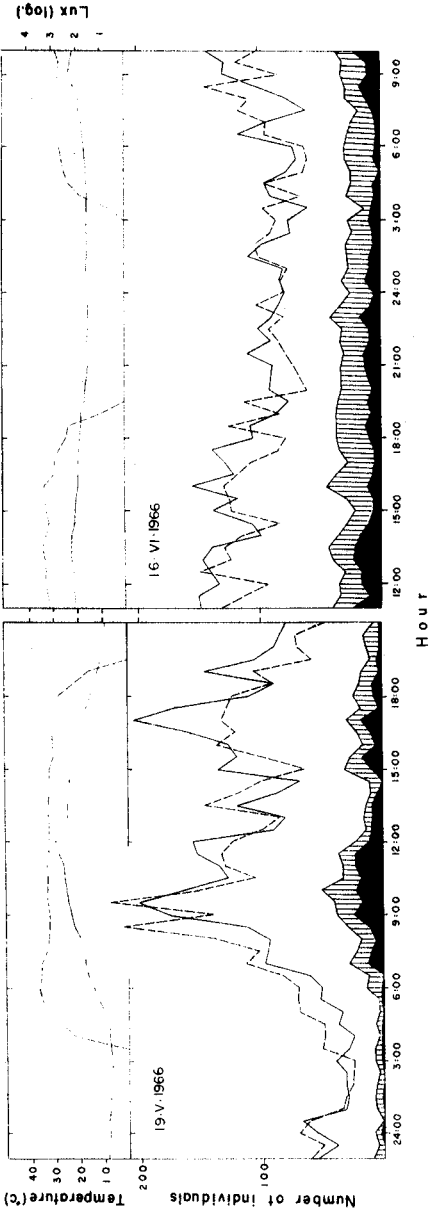


Fig. 3. Diurnal rhythm of foraging activity of a colony of *Lasius fuliginosus*. Number of workers passing a path was counted during five minutes at every 30 minutes at 100 cm distant from one nest entrance. Thin solid line, air temperature; thin broken line, intensity of illumination; thick solid line, total number of returning workers; thick broken line, total number of starting workers; striped area, number of returning workers carrying honeydew; black area, number of returning workers carrying animal food.

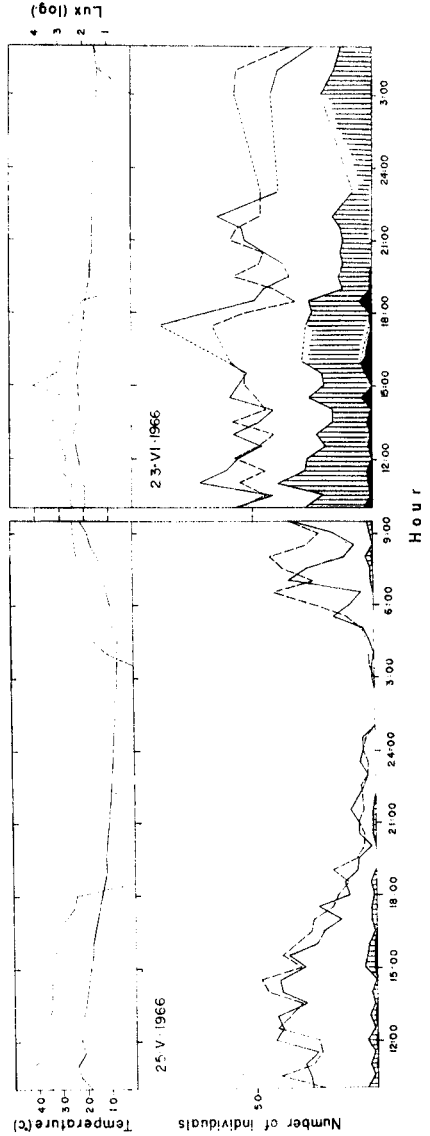


Fig. 4. Diurnal rhythm of foraging activity of a colony of *Lasius crispus*. The observation point was at 50 cm from one nest entrance. Otherwise as in Fig. 3.

May on both species, the tree canopies were still sparse to allow the occasional penetration of sunshine on the ground. Correspondingly the temperature of the ground surface fluctuated considerably during daytime. The foraging is intense in daytime and early evening, decidedly decreasing when the air temperature falls below 10°C. An inactive case near noon may be explained by the relatively high temperature of ground surface caused by direct insolation. In the observations on June 16 and 23 on *L. fuliginosus* and *L. crispus* respectively, dense foriages of trees did not permit the penetration of direct insolation on the ground. The foraging intensity was stable both in day and night, without any significant differences between two species, *L. fuliginosus* and *L. crispus*.

No detailed observation was made upon the foraging activities of *L. teranishii* and *L. spathepus*, but casual observations suggest no particular difference from *L. fuliginosus* and *L. crispus*.

No systematic observation on the phenology of the production of sexual forms was made. From occasional inspections of some nests of four species, mainly in Sapporo in 1966-67, winged males and females were found within nests or near nest entrances as follows: *L. fuliginosus* (early June to middle September), *L. crispus* (middle July to middle September), *L. teranishii* (late July to late August), *L. spathepus* (only from August to early September in the single nest studied). These data suggest the appearance of nuptial flights approximately in middle July to August in all species, though direct observation was not carried out.

2.3. Occurrence of temporary social parasitism

Many European investigators have observed that *L. fuliginosus* lived together with *Lasius umbratus* (Nylander) in the same nest. This fact indicates a temporary social parasitism practiced by *L. fuliginosus*, utilization of *L. umbratus* colonies by *L. fuliginosus* at nest foundation (Donisthorpe, 1922). Mixed colonies of *L. fuliginosus* and *L. umbratus*, also occasionally including *Lasius rabaudi* (Bondroit), have been found repeatedly and successful adoptions of dealate queens by host colonies have also been obtained under artificial condition. For instance, Stärcke (1944) could induce the experimental adoption of *L. fuliginosus* queens by colonies of *L. rabaudi*, *L. niger* (Linnaeus) and *L. alienus* (Foerster). Furukawa (1953) observed a colony of *L. umbratus* which involved both *L. fuliginosus* and *L. umbratus* in the next year. He also observed, in a colony of *L. niger*, the queen of *L. fuliginosus* side by side with that of *L. niger*, though mixed colonies of these two species could not be obtained under artificial condition.

Up to the present, no instance of temporary social parasitism in the other three *Dendrolasius* species has been reported. Fortunately, one of the writers (K.Y.) could discover two mixed colonies of *L. teranishii* and *L. flavus* (Fabricius) as follows:

1. On July 10, 1966, many colonies of *L. flavus* were examined at littoral sand dune, Hama-Koshimizu near Abashiri, Northeast Hokkaido. From a single nest

found around the root system of grass, dwarf workers of *L. teranishii* were discovered together with normal sized workers of *L. flavus*. The queens of either species could not be discovered. Many workers and pupae were brought to the laboratory. All workers of *L. teranishii* emerged from the pupae were distinctly larger than their older sisters (cf. Fig. 5, a and b).

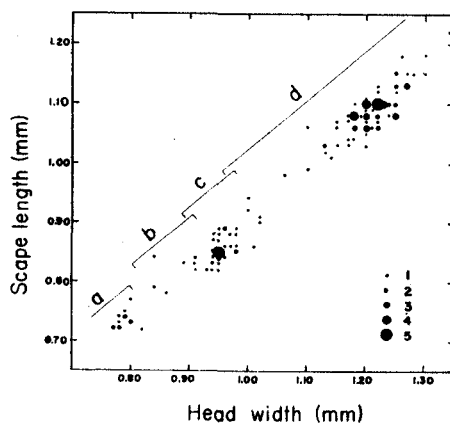


Fig. 5. Head width-scape length relationship in workers of *Lasius teranishii* in the mixed colonies with *Lasius flavus*.

a, workers found in the mixed colony in Hama-Koshimizu; b, workers of the Hama-Koshimizu colony emerged in the laboratory; c, workers found in the mixed colony in Sapporo; d, workers from four normal colonies in Sapporo.

2. Another mixed colony of *L. teranishii* and *L. flavus*, containing one queen of the former species, was obtained by K.Y. at riverside in Sapporo, under a stone (cf. Figs. 6, 7). All pupae brought to the laboratory produced workers of *L. teranishii*.

These two examples clearly indicate that *L. teranishii* is a temporary social parasite on *L. flavus*. Except these two mixed colonies, many other colonies of *L. teranishii* were discovered from hollows and roots of large living trees, that is, from the places usually not preferred by *L. flavus*. Probably *L. teranishii* at first uses the colony of *L. flavus* for nest foundation. Later, the colony becomes monospecific by the gradual deaths of host workers. Then, the colony seemingly migrate to the place appropriate for the specific preference. Such migration is also expected when *L. fuliginosus* utilizes the nest of *L. niger* for colony foundation, because, nest site preferences of both species overlap only partly. Though no instance of temporary social parasitism in *L. spathepus* and *L. crispus* has been reported, their queens resembles the queen of *L. fuliginosus*, *L. teranishii* and *L. umbratus*, which practices the temporary social parasitism, in some morphological characters, for instance, head broader than thorax. This favor suggests to the assumption that they are also temporary social parasites.



Figs. 6 and 7. Mixed colony of *Lasius teranishii* and *L. flavus*, discovered in Sapporo.

The workers of *L. teranishii* primarily born in the mixed colony are smaller than those emerged in the monospecific colonies (cf. Fig. 5, a). Especially the workers found in Hama-Koshimizu are typically dwarf, only as large as the host workers, *L. flavus*, one of the smallest species in the genus *Lasius*. Probably, the deficiency of nutritional supply due to an unfavorable heterospecific condition is responsible for such size difference.

2.4. Geographical distribution

The geographical distribution of five known species of *Dendrolasius* is summarized as follows:

1. *L. buccatus*: Recorded only once from Bosnia (Stärcke, 1942).
2. *L. fuliginosus*: Transpalaeartic. In Europe often recorded as common species from many area, for instance, Southern Finland (Wilson, 1955), Sweden (Forsslund, 1947), Norway (Holgersen, 1944), England (Donisthorpe, 1927), Ireland (O'Rourke, 1950), etc. (cf. also Wilson, 1955). In Asia, rare or absent in Central Asia (Menozzi, 1939; Eidmann, 1941), but rather frequently found in Eastern Asia, for instance, Korea and Japan (according to Wilson, 1955). In Japan less abundant in the Southern Japan, but widespread and abundant in Hokkaido (Hayashida, 1960).
3. *L. spathepus*: Frequently recorded from Korea and Japan (Wilson, 1955; Hayashida, 1960).
4. *L. crispus*: From Korea and Japan (Shikoku and Honshu) (Wilson, 1955), and from Hokkaido in the present study.
5. *L. teranishii*: Only from Hokkaido (Teranishi, 1927; Kogure, 1955).

From this list, it is recognized that the subgenus is confined to the Palaearctic Region, and particularly common in northern forest zones. The distribution of four species, in Hokkaido, is presented in Fig. 8. *L. fuliginosus* is commonest and most widely distributed in Hokkaido, recorded from 20 out of 23 localities in the map. In the course of the present study, it was clarified that *L. teranishii*, so far precisely known only by a single queen, was relatively widespread in Hokkaido. Eight localities, where this species was discovered, are distributed throughout Hokkaido, except for the central area, though the number of colonies discovered is small everywhere. As given in the taxonomic part, all three castes of this species were now recognized so that its further discovery from the area out of Hokkaido is not impossible. *L. spathepus* was recorded from eight localities, but so far unknown from the northern area. Finally, *L. crispus* is known only from two localities, Sapporo and Hidaka-Monbetsu, both in southern area of Hokkaido mainland, nevertheless the species is not very rare in Sapporo. The myrmecofauna of Hokkaido is relatively homogenous, but the faunal make-up is in general slightly different between southwestern and northeastern halves. It is open to the further study, whether or not the absence of *L. spathepus* in northern area and limited records of *L. crispus* reflect such faunal transition.

Finally, the ecological position of the subgenus *Dendrolasius* are briefly mentioned. At least in Hokkaido, this subgenus is mainly dependant on the homopterous insects infesting large living trees. The visits to such trees are practiced by forming well demarcated paths. They are quite aggressive to any ants and other animals which interfere with their paths. So far only tiny and criptic ants, such as *Paratrechina flavipes* (F. Smith) and *Pheidole ferrida* Smith, have been found near their paths.

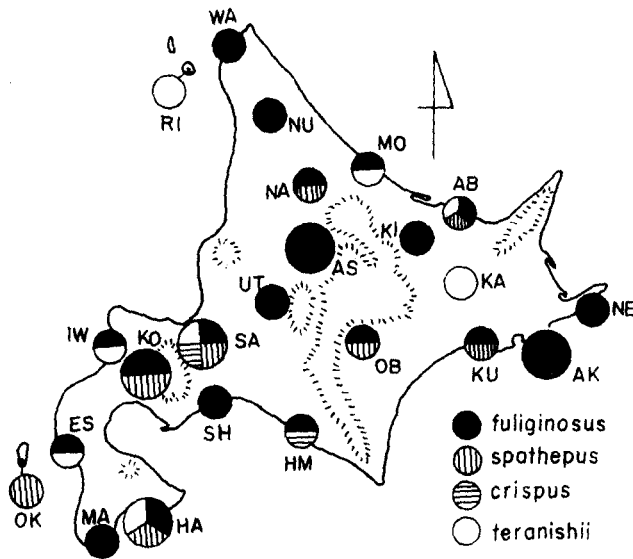


Fig. 8. Geographical distribution of four species of the subgenus *Dendrolasius* in Hokkaido.

Large circles are records taken from quantitative sampling, small circles from qualitative sampling. Sectors of each circle merely mean the presence, not the relative abundance. Abbreviations of localities: AB, Abashiri; AK, Akkeshi; AS, Asahigawa; ES, Esashi; HA, Hakodate; HM, Hidaka-Monbetsu; IW, Iwanai; KA, Kawayu; KI, Kitami; KO, Kozawa; KU, Kushiro; MA, Matsumae; MO, Monbetsu; NA, Nayoro; NE, Nemuro; NU, Numakawa; OB, Obihiro; OK, Okushiri Is.; RI, Rishiri Is.; SA, Sapporo; SH, Shiraoui; UT, Utashinai; WA, Wakkanai.

Therefore, they are very successful to defend their life-space, but the latter is so limited and differentiated that their influence upon other ant species and other animals is seemingly not general but strongly localized. Moreover, the number of colonies is not abundant anywhere, probably in part caused by the difficulty of nest foundation, depending on other subgenera of *Lasius*. In conclusion, this subgenus has the most specialized mode of life in *Lasius*, by which they occupy a relatively isolated niche within the local ant community.

Summary

The four species of the subgenus *Dendrolasius* Razsky of the genus *Lasius* Fabricius are found in Hokkaido: *fuliginosus* (Latreille), *spathepus* Wheeler, *crispus* Wilson and *teranishii* Wheeler. A critical taxonomic study of these species was made and key to the species was prepared based upon all three castes. The most reliable and distinctive characters are shape of petiole and standing hairs on pronotum in workers, body hairs in queens and shape of petiole in males. The worker and male of *L. teranishii*, so far precisely known only by a single queen, were described.

Some ethological and ecological remarks were given as to habitat and nest site preferences, foraging activities, phenology of sexual forms, temporary social parasitism and geographical distribution. All species prefer the woodland habitats and mostly nest in hollowed tree trunks except *L. teranishii* which was occasionally found in grassy sand dunes and stony river banks, nesting under stones. Foraging activity through the paths characteristic to the subgenus is performed both in day and night under moderately warm temperature, but disturbed under direct insolation. Mixed colonies composed of *L. teranishii* and *L. flavus* (Fabricius) were discovered. The former species is a temporary social parasite of the latter. *L. fuliginosus* and *L. teranishii* are widely distributed in Hokkaido, *L. spathepus* is also found in many localities except the northernmost area, but *L. crispus* so far only from the southwestern areas of Hokkaido mainland.

References

- Donisthorpe, H. 1922. The colony founding of *Acanthomyopus* (*Dendrolasius*) *fuliginosus* Latr. Biol. Bull. 42: 173-184.
- 1927. British ants, their life-history and classification. London, pp. 436.
- Eidmann, H. 1941. Zur Oekologie und Zoogeographie der Ameisenfauna von Westchina und Tibet. Wiss. Ergeb. der 2. Brooke Dolan-Expedition 1934-1935. Zeit. Morphol. Oekol. Tiere 38: 1-43.
- Furukawa, H. 1953. Ari no kekkon (In Japanese. "Marriage of ants"). 225pp., with 2 pls, Hôsei Univ. Press, Tokyo.
- Försslund, K.H. 1947. Svenska myror. 1-10. Ent. Tidskr. 68: 67-80.
- Gaspar, Ch. 1965. Notes sur l'écologie et l'éthologie des espèces du genre *Lasius* (Hymenoptera Formicidae). Ins. Soc. 12: 219-230.
- Gösswald, K. 1932. Oekologische Studien über die Ameisenfauna des mittleren Maingebietes. Zeit. Wiss. Zool. 142: 1-156.
- Hayashida, K. 1960. Studies on the ecological distribution of ants in Sapporo and its vicinity. Ins. Soc. 7: 125-162.
- 1964. Studies on the ecological distribution on ants in Kutchan and its adjacent area. Jour. Sapporo Otani Junior College 2: 107-129.
- and Maeda, S. 1960. Studies on the ecological distribution in Akkeshi. Jour. Fac. Sci. Hokkaido Univ. Ser. VI, Zool. 14: 305-319.
- Holgensen, H. 1944. The ants of Norway. Nyt. Mag. Naturv. 84: 165-203.
- Kogure, T. 1955. Additional notes on ants of central Hokkaido. Saishû to Shiiku 17: 93. (In Japanese).

- Menozzi, C. 1939. Formiche dell' Himalaya e del Karakorum raccolte dalla Spedizione Italiana comandata da S.A.R. il Duca di Spoleto (1929). *Atti Soc. Ital. Sci. Nat.* **78**: 285-345.
- O'Rourke, F.G. 1950. The distribution and general ecology of the Irish Formicidae. *Proc. Roy. Irish Acad.* **52B**: 383-410.
- Stärke, A. 1942. Drie nog onbeschreven Europeesch miervormen. *Tijdschr. Ent.* **85**: 24-29.
- 1944. Retouches sur quelques formis d'Europe. III. Autres *Lasius*. *Ent. Ber.* **11**: 153-158.
- Teranishi, C 1927. Notes on Japanese ants I. Aberrant Forms. *Zool. Mag., Tokyo* **39**: 88-94. (In Japanese with English résumé).
- 1928. Japanese ants, their behavior and distribution I. *Ibid.* **41**: 239-251. (In Japanese).
- 1940. "Descriptions of several ant forms". "Late Cho Teranishi's work" (311+95pp., Osaka). Appendix. Unpublished papers: 76-82.
- Wilson, E.O. 1955. A monographic revision of the ant genus *Lasius*. *Bull. Mus. Comp. Zool.* **113**: 1-199.
- Wheeler, W.M. 1928. Ants collected by Prof. F. Silvestri in Japan and Korea. *Boll. Lab. Zool. Portici* **21**: 96-125.
-