

The ant genus *Crematogaster* Lund, subgenus *Physocrema* Forel, in the Indochinese Peninsula (Hymenoptera: Formicidae)

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Abstract. Indochinese species of the genus *Crematogaster* Lund, 1831 subgenus *Physocrema* Forel, 1912 are reviewed. Four species are recognised in the region. Two taxa formerly treated as subspecies of *difformis*, *C. (P.) physothorax* Emery, 1889 and *C. (P.) seawardi* Forel, 1901, are raised to species level. An identification key to species in the region is presented.

Keywords: *Crematogaster*, *Physocrema*, *aurita*, *inflata*, *physothorax*, *sewardi*, lectotype designation, redescription, rank change

INTRODUCTION

The subgenus *Physocrema* is one of 16 subgenera of the genus *Crematogaster* (Bolton 1995), which is one of the most speciose genera of ants. The latest checklist (Bolton *et al.* 2006) counted 989 names (species and subspecies) in the species group, comprising 780 senior synonyms, 125 unavailable names and 84 junior synonyms. However no comprehensive taxonomic work has been produced using modern concepts, so that these statistics are far from complete. Although most recent taxonomic works on ants avoid subgenus classification, we follow the traditional framework as a working hypothesis. This is an approach to solve taxonomic problems in such a huge group (Ward 2007). While many of the subgenera appear polyphyletic some, such as *Decacrema* and *Xiphocrema*, are distinct, compact and seem to be monophyletic, which is also true for the subgenus *Physocrema*.

The subgenus *Physocrema* was established by Forel (1912) as a subgenus of *Crematogaster*. The type-species of the subgenus, *Crematogaster inflata* F. Smith, was subsequently designated by Wheeler (1913). The subgenus includes 14 species-group taxa and is characterised by having a swollen propodeum. It proves to be monophyletic because the swollen propodeum is strikingly apomorphic (Forel 1912; Donisthorpe

1941). The subgenus is an Asia-endemic taxon and widely distributed in mainland and insular Southeast Asia. The ants of the subgenus are arboreal. They nest under the bark of trees and forage mostly on trees.

Here the term Indochinese Peninsula is used to include the geographical region of Vietnam, Laos, Cambodia, Thailand and Myanmar. The area occupies a major part of the Indochinese subregion of the Oriental Region. In the subgenus, only a limited number of species are present in this area, with records from lower Burma (Bingham, 1903) and Thailand (Jaitrong & Nabhitabhata, 2005), although the species identifications were doubtful.

In the course of a taxonomic study of the genus *Crematogaster* in Asia, we examined the collection of Dr Bui Tuan Viet in Vietnam and found specimens belonging to subgenus *Physocrema* which had not been recorded from Vietnam previously (Yamane *et al.* 2003). Using the key provided by Donisthorpe (1941), the specimens could not be identified as any named species. Further, our survey of type materials in the museums of Europe and USA has revealed the correct species names, and some taxonomic changes to taxa formerly placed as subspecies have become necessary.

The present study examines the syntype specimens of *C. (P.) aurita* and clarifies taxonomic relationships between similar species in the

Indochinese Peninsula. It does not include those *Crematogaster* (*Physocrema*) species from the Malay Peninsula that do not extend into the Indochinese Peninsula as defined above.

MATERIALS AND METHODS

Type materials of *Crematogaster* (*Physocrema*) *aurita*, *C. (P.) inflata*, *C. (P.) physothorax* and *C. (P.) seawardi* were examined. Non-type materials and other morphologically similar species were also examined. Materials were mainly examined under a stereoscopic microscope, OLYMPUS SZX-12. Abbreviations of the specimen depositories follow Brandão (2000).

BMNH: The Natural History Museum, London, U. K.

MCSN: Museo Civico di Storia Naturale "Giacomo Doria," Genoa, Italy.

MHNG: Musee d'Histoire Naturelle, Geneva, Switzerland.

OXUM: Hope Entomological Collections of Oxford University Museum, Oxford, U. K.

ZMPA: Institute of Zoology of the Ukrainian National Academy of Sciences, Kiev, Ukraine.

Photographs were taken using a NIKON Coolpix-5400 digital camera with the stereoscopic microscope. Images were processed with Helicon Focus (Mac OSX version).

Measurements were made under a Nikon SMZ-U microscope using a micrometer. All measurements are expressed in millimetres, represented to the second decimal place. Three worker sizes (small, medium and large) were measured for each taxon. The measurements for petiole and postpetiole, and general wording, follow Longino (2003). The waist index is newly described here.

Head Width (HW): Maximum width of head in full-face view, excluding the eyes.

Head Length (HL): Perpendicular distance from vertex margin to line tangent to anteriormost projections of clypeus in full-face view.

Cephalic Index (CI): $HW/HL \times 100$.

Scape Length (SL): Length of the first antennal segment, excluding the neck and basal condyle.

Scape Index (SI): $SL/HW \times 100$.

Eye Length (EL): Maximum length of the compound eye.

Pronotal Width (PW): Maximum width of the pronotum in dorsal view.

Weber's Length of the mesosoma (WL): Diagonal length, measured in lateral view from the anterior margin of the pronotum (excluding the collar) to the posterior extremity of the propodeal lobe.

Propodeal Spine Length (PSL): Measured from tip of propodeal spine to closest point on outer rim of propodeal spiracle (Longino, 2003).

Petiole Length (PtL): Viewed in lateral profile and measured in same plane as anterodorsal face, distance from posterior inflection point marking juncture of posterolateral lobes with cylindrical posterior portion of petiole segment, to anterior inflection point where petiole curves up to condyle or, if anterior inflection point not visible, where petiole is obscured by posteroventral lobes of propodeum (Longino, 2003).

Petiole Width (PtW): Maximum width of petiole in dorsal view.

Petiole Height (PtH): Viewed in lateral profile, perpendicular distance from ventral margin to highest point of posterolateral tubercles; if ventral margin is concave upward, measured from line tangent to uppermost portion of curve and oriented as close as possible to long axis of petiole (Longino, 2003).

Postpetiole Length (PpL): Viewing at an angle that maximizes length, perpendicular distance from line tangent to anterior inflection point (narrowest point when postpetiole is hourglass-shaped where it joins the helcium; point immediately anterior to node when helcium is sharply differentiated from node as a distinct cylindrical stem) to line tangent to posteriormost margin of lobes (if bilobed) or node (if globular) (Longino, 2003).

Postpetiole Width (PpW): Maximum width of postpetiole in dorsal view, excluding the helcium.

Petiole Height Index (PtHI): $PtH/PtL \times 100$.

Petiole Width Index (PtWI): $PtW/PtL \times 100$.

Postpetiole Width Index (PpWI): $PpW/PpL \times 100$.

Waist Index (WI): $PpW/PtW \times 100$.

KEY TO THE *PHYSOCREMA* SPECIES IN THE INDOCHINESE PENINSULA IN THE WORKER CASTE

1. Propodeal spiracles situated away from the metapleural gland orifices, the distance between them exceeding the width of propodeal spiracles (Fig. 12) *sewardi*
- Propodeal spiracles situated near the metapleural gland orifices, the distance between them similar to the width of propodeal spiracles (Fig. 11) 2
2. Clypeus smooth and shining, without longitudinal rugulae (Fig. 9). Bicoloured, yellow and red-brown (Fig. 6) *inflata*
- Clypeus striated with rugulae (Fig. 10) 3
3. Dorsal surface of head strongly striated with longitudinal rugulae (Fig. 1). Bicoloured, red-brown and dark brown (Fig. 3). Distinctly polymorphic *aurita*
- Anterior portion of dorsal surface of head striated with longitudinal rugulae (Fig. 10). Unicoloured, dark brown to black (Fig. 7). Monomorphic or weakly polymorphic *physothorax*

***Crematogaster (Physocrema) aurita* Karawajew** (Figs 1 - 4)

Crematogaster (Physocrema) aurita Karawajew, 1935: 92, fig. 18. LECTOTYPE worker (middle specimen of three on one pin) and paralectotype workers by present designation, CAMBODIA: Pursat, "Westufer des Grand Lac", 10.iii.1930, Nr 5778 (K. Davydov) (ZMPA) [examined].

MEASUREMENTS AND INDICES

HW 0.95-1.84; HL 0.89-1.8; CI 102-110; SL 0.91-1.4; SI 76-96; EL 0.22-0.34; PW 0.5-1.04; WL 1.07-2.13; PSL 0; PtL 0.31-0.62; PtW 0.23-0.48; PtH 0.16-0.32; PpL 0.18-0.42; PpW 0.26-0.49; PtHI 50-52; PtWI 74-80; PpWI 117-146; WI 100-112 (Three workers measured).

GENERAL DESCRIPTION OF WORKER

Head subquadrate, slightly broader than long, with weakly concave posterior margin, rounded posterior corners and subparallel sides. Mandibles striate, with four teeth or five teeth in larger workers, apical and subapical teeth large. Anterior margin of clypeus convex with slightly impressed median portion; anterolateral margins of clypeus protruding anteriorly. Frontal triangle developed. Frontal carinae almost parallel, just reaching the line between anterior margins of eyes. Occipital carinae clear. Antennae 11-segmented; scape of large workers not reaching posterior corner of head; antennal club 4-segmented. Compound eyes large but not distinctly projecting beyond lateral margins of head in full face view.

In lateral view, pronotum and mesonotum forming a single convexity; mesonotum differentiated from pronotum in large workers; propodeum slightly raised relative to promesonotum. Anterior margin of pronotal collar slightly concave in dorsal view. Pronotum and mesonotum almost fused without defined suture, rarely promesonotal suture present in large workers. The ridge separating lateral portion from ventral portion of mesopleuron distinct. Metanotal groove almost straight in dorsal view, shallow and situated slightly posterior to the posterior ridge of lateral pronotum in lateral view; mesosoma not strongly constricted in middle in dorsal view. In dorsal view, no distinct longitudinal rugulae connecting mesonotum and propodeum; the boundary distinct. Metanotal and propodeal area enlarged and swollen. Metapleural gland opening circular, situated apart from hind coxal base, and near propodeal spiracle in lateral view – distance from propodeal spiracle not markedly greater than the spiracle width. Propodeal spines absent.

In dorsal view, the shape of the petiole elliptical with convex sides, longer than broad. Postpetiole without longitudinal median sulcus.

Clypeus sculptured with longitudinal rugulae. Integument entirely sculptured. Dorsal face of head covered with abundant longitudinal rugulae.

Standing setae abundant, some pairs on dorsal face of head and abundant on dorsal portion of mesonotum. Dorsal face of head with appressed setae. Clypeus with short and long setae. Fourth abdominal (i.e. first gastral) tergite with suberect and appressed setae. Metatibia with decumbent setae.

Body bicoloured, with head, promesonotum, petiole, postpetiole, gaster and legs dark brown; metanotal and propodeal area red-brown.

REMARKS

Workers of *C. (P.) aurita* show strong polymorphism. Small workers are very different from large workers in body size and sculpture. In small workers, scape can easily surpass posterior corner of head, but in large workers it does not. The surface of propodeal and metapleural area is more or less smooth and shining in small workers, but distinctly sculptured in large workers.

Jaitrong & Nabhitabhata (2005) listed *C. (P.) inflata* in the checklist of Thailand ants. During the course of our study of Thai *Crematogaster* specimens, we found that *C. (P.) aurita* could be misidentified as *C. (P.) inflata* in the literature, so caution should be exercised in interpreting past records.

DISTRIBUTION

This species is widely distributed in the Indochinese Peninsula, i.e. South Vietnam, Laos, Cambodia and Thailand except for southern parts (Fig. 5). However, the species has not been seen east of the Annamite Mountains, although it was recorded from northern parts of Thailand such as Chiang Mai. Its distribution could be limited to the northeast by this geographical barrier.

NON-TYPE MATERIALS

VIETNAM: 1 worker, Phan truong 5, Hui Lien, Cat Tien, 9.v.2003 (B. T. Viet). LAOS: 2 workers, Ang Nam Ngum, 24.viii.2003 (Y. Ochiai). THAILAND: 2 workers, Huai Tak, Lumpang Province, 26.ix.1999 (no collector's name); 1 worker, Huai Tak, Lumpang Province, 7.vii.1999 (no collector's name); 1 worker, Huai Tak, Lumpang Province, 8.vii.1999 (no collector's name); 1 worker, mixed deciduous forest, Thampati National Park, 8.viii.1999 (no collector's name); 3 workers, Wangchin plantation, Phrae Province, 22.ix.2000 (D. Wiwatwitaya); 2 workers, Teak plantation, Lumpang Province, 15.v.2004 (D. Wiwatwitaya); 3 workers, Pukae Botanical Garden, Saraburi Province, 1.vii.2002 (TH02-SKY-26) (Sk. Yamane); 1 worker, Pukae Botanical Garden,



Figs 1-4. Lectotype of *Crematogaster* (*Physocrema*) *aurita* Karawajew: 1, full face view; 2, dorsal view; 3, lateral view; 4, labels attached.

Saraburi Province, 15.vi.2002 (C. Bourmas); 1 worker, Pukae Botanical Garden, Saraburi Province, 1.vii.2002 (D. Wiwatwitaya); 1 worker, Pukae Botanical Garden, Saraburi Province, 15.vi.2002 (C. Bourmas); 4 workers, Kalasin, 29.xii.1997 (K. Ogata); 4 workers, Maeklong, 29.xi.2003 (N. Matsushita); 6 workers, Maeklong Watershed Research Station, Kanchanaburi Province, 29.xi.2003 (TH03-SKY-147) (Sk. Yamane); 4 workers, Srinakarin Dam NP, 150-200 m asl, Kanchanaburi Province, 29.vi.2002 (TH02-SKY-37) (Sk. Yamane).

***Crematogaster (Physocrema) inflata* F. Smith**
(Figs 6, 9, 11)

Crematogaster inflatus Smith, F. 1857: 76, pl. 2, fig. 2. Syntype workers, SINGAPORE (OXUM), 3 workers, MALAYSIA: Sarawak, Borneo (BMNH) [examined]. Forel, 1912: 220: combination in *C. (Physocrema)*. Santschi, 1928: 128: description of queen.

MEASUREMENTS AND INDICES

HW 0.86-1.08; HL 0.85-1.05; CI 101-103; SL 0.85-0.96; SI 89-98; EL 0.20-0.22; PW 0.61-0.66; WL 1.18-1.34; PSL 0; PtL 0.32-0.38; PtW 0.23-0.27; PtH 0.16-0.19; PpL 0.18-0.20; PpW 0.24-0.30; PtHI 46-50; PtWI 67-71; PpWI 139-147; WI 106-110 (Three workers measured).

GENERAL DESCRIPTION OF WORKER

Head subquadrate, slightly broader than long, with weakly concave posterior margin, rounded posterior corners and subparallel sides. Mandibles striate, with four teeth or five teeth in larger workers, apical and subapical teeth large. Anterior margin of clypeus convex with slightly impressed median portion; anterolateral margins of clypeus protruding anteriorly. Frontal triangle undeveloped. Frontal carinae almost parallel, not reaching the line between the anterior margins of eyes. Occipital carinae clear. Antennae 11-segmented; scape surpassing posterior corner of head; antennal club 4-segmented. Compound eyes large but not projecting beyond lateral margins of head in full face view.

In lateral view, pronotum convex; mesonotum and propodeum forming a single convexity. Anterior margin of pronotal collar distinctly concave in dorsal view. Pronotum and mesonotum almost fused without defined suture. The ridge separating lateral portion from ventral portion of mesopleuron distinct. Metanotal groove slightly convex in dorsal median portion, shallow and abutting the posterior ridge of lateral pronotum in lateral view; mesosoma not strongly constricted in middle in dorsal view. In dorsal view, no longitudinal rugulae connecting mesonotum and propodeum; the boundary distinct except for median portion. Metanotal and propodeal area enlarged and swollen. Metapleural gland opening circular, situated apart from hind coxal base, and near propodeal spiracle in lateral view – distance from propodeal spiracle not markedly greater than the spiracle width. Propodeal spines absent.

In dorsal view, the shape of the petiole elliptical with convex sides, longer than broad. Postpetiole without longitudinal median sulcus.

Clypeus smooth and shining, without longitudinal rugulae. Integument entirely smooth and shining. A few rugulae present alongside frontal carinae and around metapleural gland opening.

Standing setae sparse, some pairs on dorsal face of head and dorsal portion of mesonotum. Dorsal face of head with appressed setae. Clypeus with abundant short and long setae. Fourth abdominal (=first gastral) tergite with abundant appressed setae.

Body bicoloured, with head, promesonotum, petiole, postpetiole, gaster and legs red-brown and metanotal and propodeal area yellow.

REMARKS

The bicoloured coloration of yellow and red-brown is unique to this species. This coloration is possibly a model for Batesian mimicry in other arthropods (Maruyama *et al.* 2003; Ito *et al.* 2004).

DISTRIBUTION

Myanmar (Mergui, Tenasserim), Malay Peninsula, Borneo and Java [Bingham, 1903] (Fig. 5). Not known north of ~12°N.

SPECIMENS EXAMINED

THAILAND: 3 workers, Bala-Hala, Narathiwat Province, 20.x.2003 (Y. Sittimul). MALAYSIA: 8 workers, Ulu Gombak, Malay Peninsula, 3.xii.2005 (S. Hosoiishi); 2 workers, 50 ha Plot, Lambir NP, Miri, Sarawak, 7.i.1993 (Sk. Yamane); 6 workers, nr. waterfall, Lambir NP, Sarawak, 27.vi.2004 (SR04-SKY-17) (Sk. Yamane); 2 workers, Semengoh NP, Sarawak, 18.iv.1993 (Sk. Yamane); 1 worker, Gunong Rara Tamau, Sabah, 18.ii.1997 (K. Eguchi). INDONESIA: 2 workers, Kutai National Park, E. Kalimantan, 3.xii.1988 (A. Suzuki); 2 workers, Bukit Soehart (UNMUL forest), E. Kalimantan, 12.viii.1992 (Sk. Yamane).

Crematogaster* (*Physocrema*) *physothorax**Emery stat. rev.**

(Figs 7, 10)

Crematogaster deformis r. *physothorax* Emery, 1889: 506. Syntype workers, MYANMAR: Thagata, Tenasserim (MCSN) [examined]. Emery, 1922: 140: combination in *C. (Physocrema)*. Dalla Torre, 1893: 84; Bingham, 1903: 146: raised to species. Wheeler, W. M., 1919: 75; Emery, 1922: 140: subspecies of *difformis*.

MEASUREMENTS AND INDICES

HW 1.09-1.19; HL 0.97-1.13; CI 104-111; SL 0.89-1.01; SI 84-88; EL 0.20-0.23; PW 0.55-0.63; WL 1.12-1.39; PSL 0; PtL 0.32-0.38; PtW 0.23-0.28; PtH 0.16-0.19; PpL 0.19-0.24; PpW 0.24-0.26; PtHI 50-54; PtWI 71-83; PpWI 106-129; WI 90-106 (Three workers measured).

GENERAL DESCRIPTION OF WORKER

Head subquadrate, slightly broader than long, with weakly concave posterior margin, rounded posterior corners and subparallel sides. Mandibles striate, with four teeth or five teeth in larger workers, apical and subapical teeth large. Anterior margin of clypeus convex with slightly impressed median portion; anterolateral margins of clypeus protruding anteriorly. Frontal triangle undeveloped. Frontal carinae almost parallel, just reaching the line between the anterior margins of eyes. Occipital carinae clear. Antennae 11-segmented; scape surpassing posterior corner of

head; antennal club 4-segmented. Compound eyes large but not projecting beyond lateral margins of head in full face view.

In lateral view, pronotum and mesonotum forming a single convexity; propodeum slightly raised relative to promesonotum. Anterior margin of pronotal collar slightly concave in dorsal view. Pronotum and mesonotum almost fused, without defined suture. The ridge separating lateral portion from ventral portion of mesopleuron distinct. Metanotal groove almost straight in dorsal view, not shallow and situated posteriorly to the posterior ridge of lateral pronotum in lateral view; mesosoma not strongly constricted in middle in dorsal view. In dorsal view, a few longitudinal rugulae connecting between mesonotum and propodeum; but the boundary distinct. Metanotal and propodeal area enlarged and swollen. Metapleural gland opening circular, situated apart from hind coxal base, and near propodeal spiracle in lateral view – distance from propodeal spiracle not markedly greater than the spiracle width. Propodeal spines absent.

In dorsal view, the shape of the petiole elliptical with convex sides, longer than broad. Postpetiole without longitudinal median sulcus.

Clypeus sculptured with longitudinal rugulae. Integument entirely smooth and shining. Rugulae present with the anterior portion of dorsal face of head. Costulate rugulae present with pronotum and mesonotum.

Standing setae sparse, some pairs on dorsal face of head and promesonotum. Dorsal face of head with appressed setae. Clypeus with decumbent setae. Fourth abdominal (=first gastral) tergite with appressed setae.

Body colour black.

REMARKS

The taxon was raised to species by Dalla Torre (1893), and Bingham (1903) followed this treatment. But Wheeler (1919) and Emery (1922) treated it as a subspecies. When the taxon was first described, there was confusion concerning the species name of *difformis*. As Bolton (1995) noted, the name was misspelled as *deformis* by Roger (1863) and many subsequent authors.

Examinations of syntype specimens in MCSN revealed that the taxon is sympatric in distribution and should be a good species. *C. (P.)*

physothorax is unique in having (1) monomorphism or weak polymorphism in size; (2) smooth and shining integument.

DISTRIBUTION

Myanmar (Tenasserim: Haungdraw Valley, Ataran Valley; Karennee; Lower Burma: Pegu Yoma) [Bingham, 1903]; Borneo (Kuching) [Wheeler, 1919] (the identification is doubtful). Malay Peninsula.

This species is distributed from south-western parts of the Tenasserim mountain range to the Malay Peninsula (Fig. 5).

SPECIMENS EXAMINED

THAILAND: 1 worker, Bala-Hala, Naratiwat Province, 25.ix.2001 (O. Jodnok); 1 worker, Bala-Hala WS, Naratiwat Province, 25.ix.2001 (R. Phoonjampa); 1 worker, Bala-Hala, Naratiwat Province, 29.ix.2001 (S. Hasin). MALAYSIA: 3 workers, 1 male, Ulu Gombak, 2.xii.2005 (S. Hosoiishi); 2 workers, 1 queen, Ulu Gombak, Selangor, 3.xii.2005 (S. Hosoiishi).

Crematogaster (Physocrema) sewardi Forel stat. nov.

(Figs 8, 12)

Crematogaster deformis r. *sewardi* Forel, 1901: 64. Syntypes workers and queen, Borneo (H. Seward) (MHNG) [examined]. Emery, 1922: 140: combination in *C. (Physocrema)*.

MEASUREMENTS AND INDICES

HW 0.85-1.32; HL 0.77-1.22; CI 105-111; SL 0.70-0.96; SI 72-83; EL 0.16-0.24; PW 0.51-0.74; WL 0.96-1.40; PSL 0; PtL 0.28-0.42; PtW 0.21-0.36; PtH 0.15-0.22; PpL 0.19-0.28; PpW 0.23-0.34; PtHI 52-57; PtWI 74-86; PpWI 113-129; WI 94-116 (Three workers measured).

GENERAL DESCRIPTION OF WORKER

Head subquadrate, slightly broader than long, with weakly concave posterior margin, rounded posterior corners and subparallel sides. Mandibles

striate, with four teeth or five teeth in larger workers, apical and subapical teeth large. Anterior margin of clypeus convex with slightly impressed median portion; anterolateral margins of clypeus protruded anteriorly. Frontal triangle undeveloped. Frontal carinae almost parallel, not reaching the line between the bottom of eyes. Occipital carinae clear. Antennae 11-segmented; scape not reaching posterior corner of head in large workers; antennal club 4-segmented. Compound eyes large but not projecting beyond lateral margins of head in full face view.

In dorsal view, the shape of the petiole elliptical with convex sides, longer than broad. Postpetiole without longitudinal median sulcus.

Clypeus sculptured with longitudinal rugulae. Integument entirely sculptured. Several rugulae alongside frontal carinae.

Standing setae sparse on dorsal face of head, abundant on promesonotum. Dorsal face of head with decumbent setae. Clypeus with short setae. Fourth abdominal (first gastral) tergite with appressed setae. Dorsal setae on fourth abdominal tergite directed posteriorly.

Body colour black.

REMARKS

C. (P.) sewardi has been referred to as *C. (P.) difformis* for a long time and many researchers have used this name. It is possible that *C. (P.) sewardi* was misidentified as *C. (P.) difformis* in the past (e.g. Bingham, 1903; Jaitrong & Nabhitabhata, 2005).

A direct comparison of syntypes of *sewardi* in MHNG and those of *difformis* in BMNH and OXUM confirmed that the taxon should be raised to species level. *C. (P.) sewardi* is characterised by the combination of (1) propodeum distinctly raised relative to promesonotum in lateral view; and (2) dorsal setae on fourth abdominal tergite directed posteriorly (the setae of the posterior portion directed medially in *difformis*).

C. (P.) difformis, *C. (P.) physothorax* and *C. (P.) sewardi* are geographically sympatric in the Malay Peninsula. The taxonomic status of the other subspecies, *difformis vacca*, will be discussed in the future.

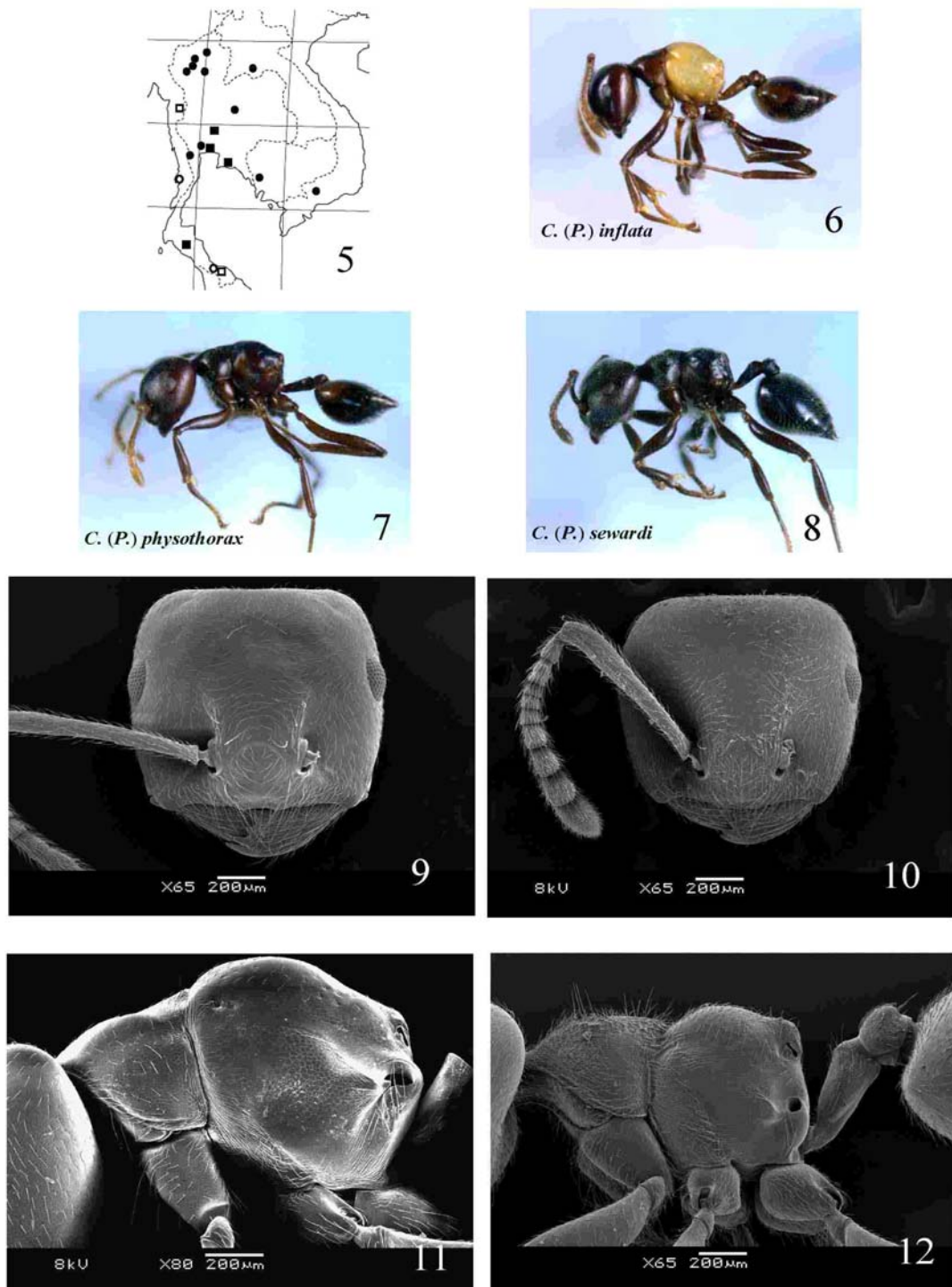


Fig. 5. Distribution of *Physocrema* species in Indochina area. ● *C. (P.) aurita*; ○ *C. (P.) inflata*; ■ *C. (P.) sewardi*; □ *C. (P.) physothorax*.

Figs 6-8. *Physocrema* species in lateral view: 6 – *C. (P.) inflata*; 7 – *C. (P.) physothorax*; 8 – *C. (P.) sewardi*.

Figs 9-10. Full face view: 9 – *C. (P.) inflata*; 10 – *C. (P.) physothorax*.

Figs 11-12. Mesosoma in lateral view: 11 – *C. (P.) inflata*; 12 – *C. (P.) sewardi*.

DISTRIBUTION

This species is quite common and widely distributed in Southeast Asia, i.e. Thailand, Malay Peninsula, Borneo, Sumatra, Java and Bali. It has not been recorded from northern parts of the Indochinese Peninsula (Fig. 5).

SPECIMENS EXAMINED

THAILAND: 6 workers, Sakaerat lowland forest, Nakornratchasima, 10.vii.1999 (Sk. Yamane); 6 workers, Nam Tok Philio National Park (300-500m asl), Chanthaburi Province, 22.xi.2003 (Sk. Yamane); 4 workers, Khao Soi Dao, Chanthaburi Province, 19.vii.1997 (H. Okido); 2 workers, Khao Chong (riverside), Trang Province., 24.viii.1998 (Sk. Yamane) MALAYSIA: 11 workers, 7 miles, Cameron Highlands, 9.iii.2005 (S. Hosoiishi); 3 workers, Poring, Kinabalu (HQ, 550 m asl), Sabah, 17.iii.1995 (Sk. Yamane); 2 workers, Kota Kinabalu, Sabah, 22.vii.1996 (K. Eguchi). SINGAPORE: 3 workers, 4.xii.1995 (Sk. Yamane); BRUNEI: 2 workers, mixed dipterocarp forest, on Dryobalanops beccarii, Site 7. 50 m asl, Fog 11, Andalau, viii.1991 (N. Mawdsley); INDONESIA: 3 workers, Kutai, Kalimantan, 17.viii.1986 (T. Yajima); 2 workers, Teluk Kabung nr Padang, Sumatra, 14.viii.1985 (Sk. Yamane); 1 worker, Sako nr Tapan, Sumatra, 4-5.ix.1985 (Sk. Yamane); 2 workers, P. Rakata Kecil, Krakatau Is., 31.vii.1982 (Sk. Yamane); 2 workers, P. Peucang nr Ujung Kulon, 5.viii.1982 (Sk. Yamane); 3 workers, Bogor, Java, 4-8.xi.1985 (Sk. Yamane); 3 workers, 1 male, Pulau Rakata, Krakatau Is., Sunda Strait, 1.i.2007 (RK07-SKY-04) (Sk. Yamane); 1 worker, 1 queen, Pulau Sertung, Krakatau Is., Sunda Strait, 30.xii.2006 (RK06-SKY-35) (Sk. Yamane); 2 workers, Pulau Sebesi, Lampung Province, Sunda Strait, 12.viii.2005 (Syaukani); 2 workers, P. Anak Krakatau, Krakatau Is., Sunda Strait, 17.viii.2005 (RK05-SKY-113) (Sk. Yamane); 3 workers, 1 male, Surisura, Pulau Siberut, Mentawai Is., 20.ii.2007 (SU07-SKY-041) (Sk. Yamane); 2 workers, Carita, W. Java, 24.xii.2006 (JV06-SKY-08) (Sk. Yamane); 2 workers, Bogor, Java, 9.xi.1985 (Sk. Yamane); 1 worker, Campus of Gajah Mada Univ. (100m asl), Yogyakarta, Java, 19.xii.2002 (F. Yamane); 6 workers, Dusun PK, Jelati Mendaya, Bali, 5-6.v.1998 (Sk. Yamane).

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