

Studies on the genus *Anterhynchium* and its related genera of the Ryûkyû Islands, Japan (Hymenoptera, Eumenidae)

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Abstract

The genera *Pararrhynchium*, *Rhynchium* and *Anterhynchium* in the Ryûkyû Islands (Nansei-shotô) are revised. One new species and 7 new subspecies are described. New forms are *Pararrhynchium tsunekii*, *Rhynchium quinquecinctum nambui*, *R. q. murotai*, *Anterhynchium flavomarginatum hanedai*, *A. f. amamense*, *A. f. sulphreum*, *A. f. insulicola*, and *A. f. procella*.

Introduction

It has long been known that many aculeate wasps are represented by several geographic races in the Ryûkyû Islands (Nansei-shotô), and that the study of their geographic variation is of special interest. Though some new forms of the genus *Stenodynerus* from Okinawa were recently described by YAMANE and GUSENLEITNER (1982), the eumenid fauna of this archipelago has not been thoroughly studied since the pioneer work by MATSUMURA and UCHIDA (1926) (see also TANO, 1983).

The present paper deals with the genus *Anterhynchium* and its allied genera in the Ryûkyûs. It is based mainly upon our own collections, but some important additional collections have been sent by several persons to whom we are much indebted. The names of collectors are abbreviated as follows: K. BABA (KB), Y. HANEDA (YH), T. MUROTA (TM), A. NAGATOMI (AN), T. NAMBU (TN), T. TANO (TT), K. TOMIYAMA (KT), S. YAMANE (SY), Sk. YAMANE (SKY).

The genus *Pararrhynchium*

This genus consists of a small number of species mostly restricted to eastern Asia (VECHT, 1963). *Ancistrocerus ishigakiensis* described from Yayeyama-shotô by YASUMATSU (1933) no doubt belongs to this genus. We have recognized three species in Japan, all of which are found in the Ryûkyûs.

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Key to the Ryûkyû species of the genus *Pararrhynchium*

1. Body markings yellow. Head and mesosoma richly marked with yellow. Female clypeus with the apical margin lamellate. Occipital carina in profile somewhat strongly bent at 3/5 from the top (Fig. 1). Metanotum without distinct longitudinal furrow. Basal lobe of aedeagus relatively thick, distinctly shorter than aedeagal apodeme; ventral process of aedeagus as in Fig. 9. Ishigaki-jima and Iriomote-jima.
 *P. ishigakiense* (YASUM.)
- Body markings orange. Head and mesosoma almost wholly black or with a few markings (clypeus, frontal spot, anterior margin of pronotum, etc.). Apical margin of female clypeus not lamellate, black. Occipital carina in profile evenly arched so that gena gradually narrowed below (Fig. 2). Metanotum various. 2
2. Clypeus above orange (♀). Frontal spot present. Antennal scape below orange (♀). Pronotum anteriorly orange. Gastral tergites III-V often with orange apical bands. Flattened part of female clypeus less sharply defined, not shining, with sparse medium-sized punctures. Metanotum usually with a deep median furrow. Mesoscutum nearly as long as wide. Basal lobe of aedeagus slender, as long as or only slightly shorter than aedeagal apodeme; ventral process of aedeagus as in Fig. 10. Tanega-shima (widely distributed in Japan proper and China).
 *P. ornatum ornatum* (SMITH)
- Clypeus entirely black. Frontal spot absent or much reduced. Antennal scape below ferruginous. Mesosoma entirely black. Gastral tergites III-VI wholly black. Flattened part of clypeus well defined, shining, with sparse fine punctures. Median furrow of metanotum indistinct. Mesoscutum longer than wide (50; 43). ♂ unknown. Amami-ôshima.
 *P. tsunekii* sp. nov.

Pararrhynchium ishigakiense (YASUMATSU)

Ancistrocerus ishigakiensis YASUMATSU, 1933, Annot. Zool. Jap., 14: 260-262, 271, f. 1, 2 (♀); 1935, Ibid., 15: 38.

Pararrhynchium ishigakiensis: YAMANE, 1982, New Entomol., 31: 12.

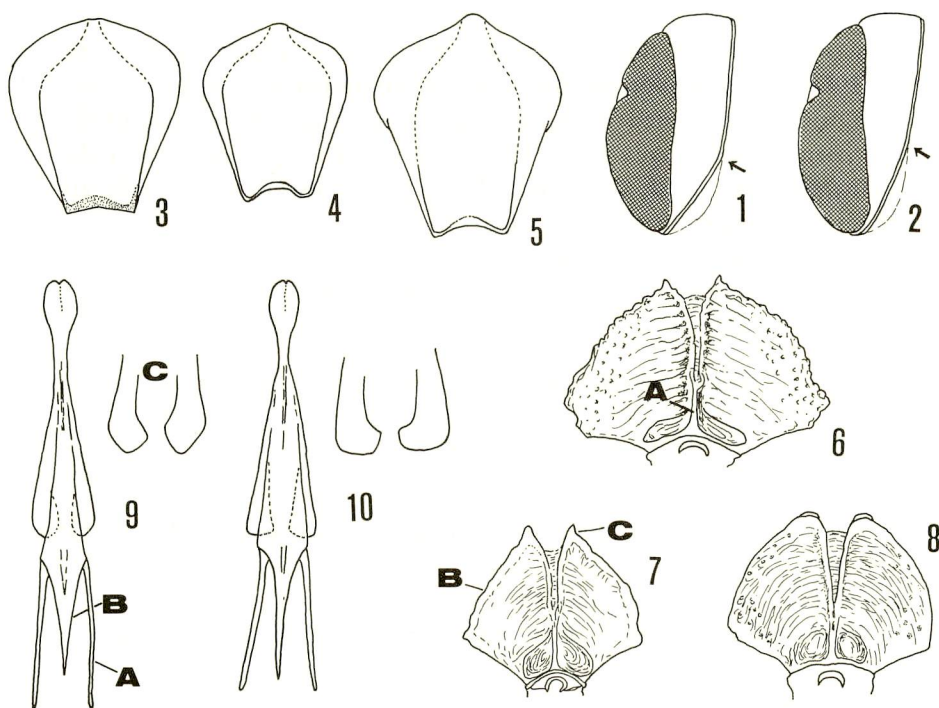
This species is closely related to *P. ornatum* but differs from the latter in the following details (only structural characters are mentioned): Female clypeus apically lamellate (Fig. 3); occipital carina in profile somewhat strongly bent at 3/5 from the top (Fig. 1); propodeal concavity much wider than high, not shining; inferior median carina of the concavity longer; superior carina apically forming a pair of relatively sharp teeth behind metanotum (Fig. 6); punctation on gastral tergite II much finer; basal lobe of aedeagus shorter than aedeagal apodeme (Fig. 9).

Specimens examined. Ishigaki-jima: 1 ♀ (Kabira Park), 31 vii 1969 (TT); 8 ♂ ♂ 3 ♀ ♀ (Ishigaki-shi), 25 iii 1977 (J. NAKAYAMA); 1 ♂ 1 ♀ (Ishigaki-shi), 18-19 iv 1981 (T. FUJISAWA).

Iriomote-jima: 1 ♀ (Shirahama), 18 viii 1971 (S. YAMAUCHI); 1 ♂ (Funaura), 9 x 1977 (SY); 2 ♀ ♀ (Komi), 21-24 viii 1978 (TN); 1 ♀ (Ôhara), 15 v 1981 (AN); 1 ♂ 3 ♀ ♀ (Ôtomi), 17-19 v 1981 (AN).

Pararrhynchium tsunekii TANO et Sk. YAMANE, sp. nov.

Female. Similar to *P. ornatum* but differs in the following details: Clypeus apically more deeply emarginate (Fig. 4); flattened part of clypeus more distinctly defined, more



Figs. 1, 2. Head in profile (♀). 1, *Pararrhynchium ishigakiense*; 2, *P. ornatum*.

Figs. 3-5. Clypeus (♀). 3, *P. ishigakiense*; 4, *P. tsunekii*; 5, *P. ornatum*.

Figs. 6-8. Propodeum, posterior view. 6, *P. ishigakiense*; 7, *P. tsunekii*; 8, *P. ornatum* (A, inferior median carina; B, superior carina; C, tooth).

Figs. 9, 10. Aedeagus of male genitalia, dorsal view (A, apodeme; B, basal lobe; C, ventral view of ventral processes). 9, *P. ishigakiense*; 10, *P. ornatum*.

finely punctate and shining; thorax more slender (mesoscutum longer than wide); upper teeth of superior carina of propodeum rather sharp (Fig. 7); metanotum without distinct median furrow; punctures on gastral tergites much finer.

Black, with the following parts yellow or orange: basal triangular mark on mandible, frontal spots (lost in one specimen), very small spot behind eye, vertical face of gastral tergite I largely, other part of tergite I almost wholly, tergite II laterally and apically, two basal large markings on sternite II, spot at each postero-lateral angle of sternite II. Mandible dark ferruginous. Antennal scape below ferruginous. Tibiae and tarsi tinged with red; apical segments of tarsi brownish. Male unknown.

Holotype. ♀, Shin-mura, Amami-ôshima, 28 vii 1967, T. MUROTA leg.

Another specimen examined. Amami-ôshima: ♀ (Santarô-Pass), 23 vii 1967 (TM).

Pararrhynchium ornatum ornatum (SMITH)

Rhynchium ornatum SMITH, 1852, Trans. Ent. Soc. Lond., (2) 2: 36.

Odynerus ornatus: SCHULTHESS, 1934, Arb. Morph. Tax. Ent., 1: 70 (in key).

Odynerus shinto SCHULTHESS, 1908, Mitt. Schweiz. Ent. Ges., 11: 286.

Pararrhynchium ornatum ornatum: VECHT, 1963, Zool. Verh., 60: 95.

Pararrhynchium ornatum: ISHIKAWA, 1965, Icon. Ins. Jap. Col. Nat. Ed., 3: 297, pl. 149, f. 2.

For the characters of this species, see SCHULTHESS (1934), VECHT (1963) and ISHIKAWA (1965). Some important characters are illustrated in Figs. 2, 5, 8, and 10.

Though widely distributed in Japan proper and China, within the Ryûkyûs this species has been collected only from Tanega-shima. The specimens from this island agree well in coloration with those from Japan proper except that female clypeus is more extensively orangish than in the latter.

Specimens examined. Tanega-shima: 1 ♂ (Nishino-omote), 3 viii 1916 [H117]; 1 ♀ (Shimama), 6 viii 1916 [H120]; 1 ♀, 20 vii 1961 (AN).

Orancistrocerus drewseni drewseni (SAUSSURE)

Odynerus fukaianus SCHULTHESS, 1913, Ark. Zool. Stockholm, 8 (17): 4, 9, f. 8.

Orancistrocerus drewseni drewseni: VECHT, 1963, Zool. Verh., 60: 102-103.

Orancistrocerus drewseni: ISHIKAWA, 1965, Icon. Ins. Jap. Col. Nat. Ed., 3: 297, pl. 149, f. 1.

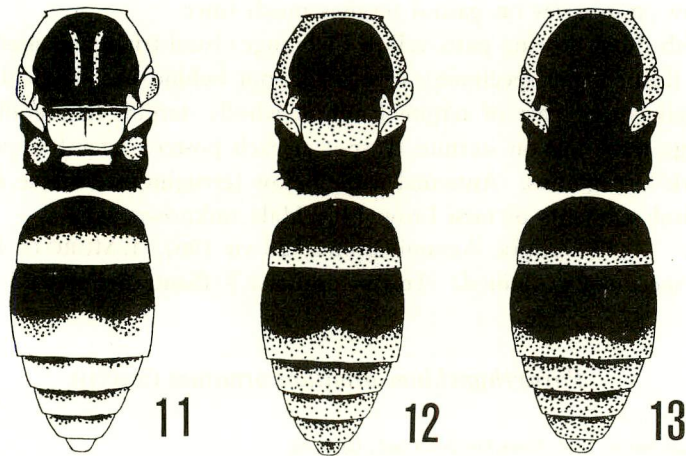
Specimens examined. Yaku-shima: 1 ♀ (Kusugawa), 9 viii 1981 (SKY); 1 ♀ (Miyano-ura), 11 viii 1981 (SKY).

Tanega-shima: 1 ♀ (Nishino-omote), 13 v 1981 (SKY).

These specimens agree well with specimens from the mainlands of Japan.

Rhynchium quinquecinctum (FABRICIUS)

This species has been treated as *R. brunneum* (FABRICIUS, 1793) or *R. haemorrhoidale* (FABRICIUS, 1775) by various authors (e. g., MATSUMURA u. UCHIDA, 1926; GIORDANI-SOIKA, 1941; ISHIKAWA, 1965). However, *R. brunneum* may be a geographical race or a synonym of *R. quinquecinctum* (FABRICIUS, 1787) (cf. SONAN, 1937), and *R. haemorrhoidale* is specifically different from *R. brunneum* as suggested by J. GUSENLEITNER (personal communication, 1981), who has found some structural differences between them. The population in the Japanese mainlands has sometimes been dealt with as a



Figs. 11-13. Colour pattern of mesosoma and gaster in the Japanese subspecies of *Rhynchium quinquecinctum* (♀). 11, *nambui*; 12, *murotai*; 13, *fukaii*.

distinct species, *R. fukaii* CAMERON, by some authors (e. g., VECHT and FISCHER, 1972; YAMANE, 1982a; see also GIORDANI-SOIKA, 1976). However, in the course of the present study we have concluded that all the Japanese forms of the genus *Rhynchium* are geographic races of *R. quinquecinctum*.

We have recognized the following three subspecies of this species in Japan: 1) *R. q. nambui* ssp. nov., Yayeyama-shotô (S. Ryûkyûs), 2) *R. q. murotai* ssp. nov., Okinawa-shotô, Amami-shotô and Nakano-shima (M. and N. Ryûkyûs), 3) *R. q. fukaii* (CAMERON), Honshû, Shikoku, and Kyûshû; Korea.

Rhynchium quinquecinctum nambui Sk. YAMANE, ssp. nov.

Female. Black, the following parts yellow or orange yellow (Fig. 11): Clypeus, supraantennal spot (often reduced), transverse frontal marking, a stripe along the inner margin of each eye always connected with the genal yellow band, transverse band on vertex interrupted medially (the band connected with the stripe), a line along the inner margin of each lateral ocellus, gena except outer margin above, antennal scape below, pronotum largely, mesopleural spot under wing base, margins of tegula except for outer margin, posttegula, posterior 2/3-3/4 of scutellum, posterior vertical part of metanotum (often reddish), spot on the dorsolateral angle of propodeum (often reddish), wide apical bands on gastral tergites I-V (that on tergite I narrower and more regular than the others), last tergite wholly (somewhat brownish), medially interrupted apical bands on sternites II and III, apical band on sternite IV, sternites V and VI wholly (somewhat brownish). Mandible yellowish brown (margins black). Antenna yellowish brown; scape above darker. Mesoscutum sometimes with a pair of narrow reddish lines. Fore femur, mid- and hind femora apically, tibiae and tarsi of all legs light brown to ferruginous, partly yellow.

Male. Very similar to the female in structure and coloration. Body markings usually paler. Yellow genal band much narrower. Mandible wholly yellow or basally with a yellow marking. Vertex without transverse marking.

Holotype. ♀, Komi, Iriomote-jima, 11 viii 1972, T. NAMBU leg.

Other specimens examined. Yonaguni-jima: 2♀♀ (Hikawa), 26 viii 1978 (TN).

Ishigaki-jima: 1♂, vii 1922 (S. HIRAYAMA); 1♀, viii 1922 (S. HIRAYAMA); 1♀ (Nosoko), 1 viii 1969 (TT); 1♂1♀ (Takeda), 13 viii 1972 (TN); 1♂ (Omoto-dake), 14 viii 1972 (TN); 1♀, 11 vii 1973 (H. TAKIZAWA); 2♂♂, 25 iii-1 iv 1977 (J. NAKAYAMA); 2♀♀ (Ishigaki-shi), 10 x 1977 (SY); 1♂, 8 iv 1978; 1♂ (Yonehara), 28 viii 1978 (TN); 1♀ (Banna-dake), 29 viii 1978 (TN); 1♀ (Yonehara), 16 iv 1981 (KB); 2♂♂ (Ishigaki-shi), 18 iv 1981 (T. FUJISAWA).

Iriomote-jima: 2♂♂, 17 iv 1962 (G. KUNO); 1♂1♀ (Shirahama), 25-28 vii 1969 (TT); 1♀ (Ôhara), 2 viii 1969 (TT); 2♀♀, 6 x 1977 (SY); 1♀, 16 iv 1978 (K. Ôhara); 2♀♀ (Ôhara), 19 viii 1978 (TN); 1♀ (Uyehara), 22 viii 1978 (TN); 2♂♂ (Sonai), 20 iv 1981 (T. FUJISAWA); 1♂ (Toyohara), 29 iv 1981 (AN); 1♀ (Ôhara), 24 v 1981 (AN); 3♂♂ (Ôtomi), 17 v 1981 (AN); 2♀♀ (Ôhara), 7 viii 1981 (J. TSUKAHARA); 2♂♂ (Toyohara), 29 iv 1982 (AN); 2♀♀ (Ôtomi), 28-29 iv 1982 (AN); 1♂1♀ (Ôhara), 28 iv-1 v 1982 (AN).

Irabu-jima: 2♂♂ (Saralama), 28 iv 1981 (T. FUJISAWA)

Rhynchium quinquecinctum murotai TANO, ssp. nov.

Pattern of body markings is very similar to that of the subsp. *nambui*, but the markings are much darker, especially on head and thorax (Fig. 12). Apical bands on gastral tergites are yellowish brown to ferruginous. Legs and antennae are also brownish or reddish. Metanotal marking is much reduced and often lost. In the male the clypeus, frontal marking, stripe along inner margin of eye below, and antennal scape below yellow; other markings are slightly paler than in the female.

The subsp. *fukaii* differs from the two Ryûkyû subspecies in that the scutellum and metanotum are usually wholly black and that the apical bands on gastral tergites I and II are much narrower (Fig. 13).

Holotype. ♀, Santarô-Pass, Amami-ôshima, 23 vii 1967, T. MUROTA leg.

Other specimens examined. Okinawa-jima: 1 ♂ (Ôsato), 3 viii 1969 (TT); 3 ♂ ♂ 1 ♀ (Naha), 9 viii 1972 (TN); 2 ♂ ♂ (Sashiki), 1 viii 1976 (S. YAMAUCHI); 1 ♂ (Toyogusuku), 4 viii 1976 (S. YAMAUCHI); 2 ♂ ♂ 1 ♀ (Kudeken), 30 ix 1977 (SY); 5 ♂ ♂ (Nakagusuku), 3 x 1977 (SY); 2 ♂ ♂ 3 ♀ ♀ (Naha) 29 ix 1977 (SY); 1 ♂ (Ogimison), 26 viii 1979 (H. NAGASE); 1 ♂ (Hyakuna), 1 vii 1981 (AN); 3 ♂ ♂ 2 ♀ ♀ (Nago), 29-30 vi 1982 (YH); 1 ♂ (Motobu), 1 vii 1982 (YH); 4 ♂ ♂ (Kunigami), 3-7 vii 1982 (YH).

Sezoko-jima: 1 ♂, 28 v - 1 vi 1982 (Y. IKIMORI & Y. ÔHIRA).

Yoron-tô: 1 ♀ (Gusuku), 5 viii 1972 (TN).

Okinoerabu-jima: 1 ♂ (Uchigusuku), 3 viii 1972 (TN).

Tokuno-shima: 1 ♂ (San), 1 viii 1972 (TN).

Amami-ôshima: 1 ♂ (Sato), 14 vii 1967 (TM); 1 ♂ (Sunô), 15 vii 1967 (TM); 1 ♂ (Kasari), 17 vii 1967 (TM); 1 ♂ (Gusuku), 21 vii 1967 (TM); 1 ♀ (Santarô-Pass), 23 vii 1967 (TM); 5 ♂ ♂ 2 ♀ ♀ (Sumiyô), 28 vii - 1 viii 1967 (TM); 1 ♀ (Yamatohama), 3 viii 1967 (TM); 1 ♀ (Yuwan), 27 vii 1972 (TN); 1 ♂ (Sumiyô), 29 vii 1973 (K. SAKAMOTO); 1 ♀ (Kasari), 7 vii 1981 (YH); 1 ♂ (Yamato), 9 vii 1981 (YH); 1 ♂ (Naze), 10 vii 1981 (YH); 2 ♂ ♂ 1 ♀ (Sumiyô), 10-17 vii 1981 (YH); 1 ♂ (Setouchi), 15 vii 1981 (YH).

Nakano-shima: 1 ♀, 16 viii 1943 (H100).

Anterhynchium flavomarginatum (SMITH)

This is a polytypic species comprising about ten subspecies distributed mainly in eastern Asia. Up to now three subspecies have been recorded from Japan, though the populations of the Ryûkyûs have not been completely studied (VECHT, 1963; YAMANE, 1981). In the Ryûkyûs we have recognized seven forms, five of which are described here as new subspecies. Most of them have a more or less wide range of variation in colour pattern. Although in some cases our conclusion may be justified only statistically, the present subdivision of this species may be useful in discussing the faunal relations among the islands. A detailed biometric study on some important characters is now in progress.

Comments on body markings. The ground colour of this species is black, sometimes partly replaced with brown or reddish brown. Body markings in the Ryûkyû forms varies from sulphur yellow through yellow and orange yellow to reddish brown in colour. Generally the markings on the head and thorax are paler than those on the gaster. Important markings are listed and explained below to facilitate the des-

cription of the geographic races.

1. Clypeus: ground colour much reduced in ♀ and almost lost in ♂; in ♀ the black portions will be called *black clypeal markings* for convenience; the black markings (sometimes replaced with brown) are generally developed in *hanedai*, *amamense* and *insulicola*, much reduced in *umeno*i and *procella*, but vary in development even in a single population.

2. Mandibular stripe: only seen in ♂ of *umeno*i.

3. Frontal marking: situated just above the antennal insertion, rarely connected with the supraclypeal marking.

4. Supraclypeal marking: usually very small and often lost.

5. Stripe on each ocular sinus along the lower inner margin of eye: always present in ♂, but variable in size; in ♀ only seen in *umeno*i.

6. Stripe on antennal scape below: seen in all the forms.

7. Genal band (*umeno*i), genal stripe or spot (other forms): usually upper genal stripe alone is seen; lower spot is seen in *procella*.

8. Pronotal marking: large and variable in size.

9. Pair of median stripes on mesoscutum: sometimes weakly developed, but usually absent.

10. Lateral stripe on mesoscutum along the base of each tegula: usually undeveloped, most strongly developed in ♀ of *procella* and *micado*.

11. Marking on tegula: variable in shape.

12. Posttegula: usually entirely yellow.

13. Mesopleural spot under each wing base: usually present, but often lost in ♀ of *hanedai*.

14. Marking on scutellum: always seen, sometimes divided into two.

15. Stripe on metanotum (postscutellum).

16. Propodeal spots: variable in size, and completely lost in some forms.

17. Apical bands on gastral tergites I-V (or I-VI in ♂): bands on first two segments are always complete, but those on the subsequent ones may be replaced with brown or lost.

18. Spots on sternite II (and III), and apical bands on sternites III-V (or -VI in ♂): these bands are usually replaced with brown or lost.

19. Lateral spots on male mid- and hind coxae: in some forms completely lost; other parts of legs in ♂ are also marked with yellow, but their position and size are highly variable. In the foregoing descriptions of the forms only important characters will be mentioned.

Key to the Ryûkyû subspecies of *Anterhynchium flavomarginatum* (SMITH)

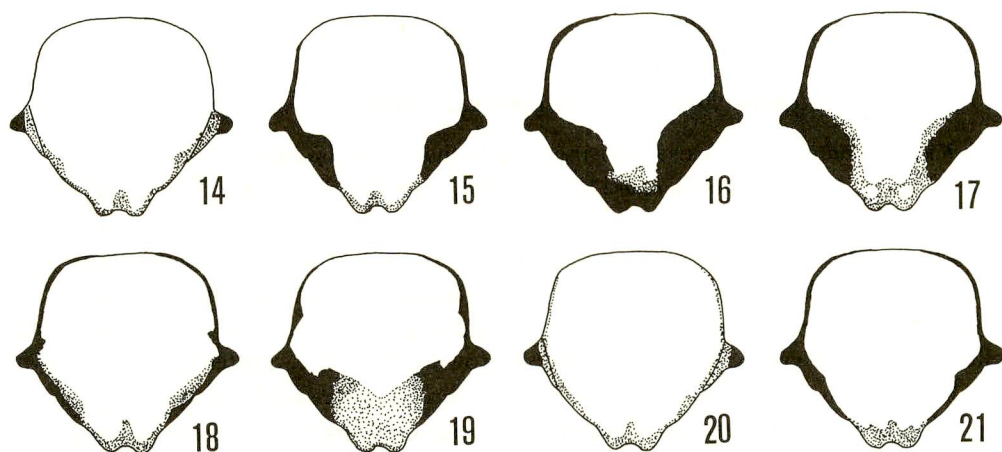
1. Ocular sinus with yellow stripe (♀). Mandible with yellow stripe (♂). Antennal scape almost entirely yellow (♂). Genal band developed (♂, ♀). Iriomote-jima and Ishigaki-jima.
..... *A. flavomarginatum umeno*i (YASUM.)
- Ocular sinus without yellow stripe (♀). Mandible without yellow stripe (♂). Antennal scape brownish or blackish above (♂). Gena with upper stripe (♂, ♀).
..... 2

2. Antennal flagellum brownish or ferruginous even on upper face (especially in ♀; darker in ♂). Mesopleural spot often lost (♀). Propodeum without yellow markings (♀; ♂ often with such markings). Body markings darker, partly brownish (♀; somewhat paler in ♂). Okinawa-jima and Sezoko-jima.
 *A. flavomarginatum hanedai* ssp. nov.
- Antennal flagellum black above (♂, ♀). Mesopleural spot present (♀). Propodeum often with yellow markings dorsolaterally (♂, ♀). Body markings yellow or orange yellow (♀; paler in ♂). 3
3. Only 1st and 2nd tergites with distinct yellow apical bands; other tergites completely black or with dark or blackish brown bands which are inconspicuous (♂, ♀). Last tergite and sternite almost entirely black (♀). Antennal pedicel usually black above (♂). Yaku-shima, and Japan proper. *A. flavomarginatum micado* (KIRSCH)
- Apical bands on gastral tergites III-V (or-VI in ♂) also yellow or orange yellow; (orange) yellow sometimes replaced with brown or reddish brown, but the bands usually clearly discernible (♂, ♀). Last tergite and sternite sometimes ferruginous, at least partly (♀). Antennal pedicel often ferruginous above (♂). 4
4. Markings on head and thorax sulphur yellow (♂, ♀). Yellow bands on tergites usually complete (♂, ♀); that on tergite I distinctly widened laterally, often with lateral prongs anteriorly (♂, ♀). Akuseki-jima.
 *A. flavomarginatum sulphreum* ssp. nov.
- Markings on head and thorax yellow or orange yellow (at most pale yellow in ♂). Apical bands on tergites III-V (-VI in ♂) often brownish or ferruginous (♂, ♀). 5
5. Last tergite almost entirely ferruginous (♀). Orange yellow apical bands on tergites III-V usually complete (♀). Antennal pedicel above usually black (♂). Mid- and hind coxae usually without yellow lateral spots (♂). Nakano-shima and Kuchino-shima.
 *A. flavomarginatum insulicola* ssp. nov.
- Last tergite black, at least partly (♀). Apical bands on tergites III-V often replaced with brown or reddish brown (♀). Antennal pedicel above often ferruginous (♂). Mid- and hind coxae often with yellow lateral spots (♂). 6
6. Yellow apical bands on tergite I wider, widened laterally, often with lateral prongs anteriorly (♂, ♀). Gena without lower yellow spot (♀). Yellow lateral stripes on mesoscutum much reduced or lost (♂, ♀). Black clypeal markings often developed (♀). Yoron-tô, Okinoerabu-jima and Amami-ôshima.
 *A. flavomarginatum amamense* ssp. nov.
- Yellow apical band on tergite I narrower, narrowed laterally (♂, ♀). Gena often with lower yellow (or orange) spot in addition to the upper stripe (♀; not seen in ♂). Mesoscutum with lateral yellow stripes (usually in ♀, sometimes in ♂). Black clypeal markings much reduced (♀). Iye-jima (Uji-guntô), Kuro-shima, Iô-jima and Yaku-shima.
 *A. flavomarginatum procella* ssp. nov.

Anterhynchium flavomarginatum umenoi (YASUMATSU)

Rhynchium umenoi YASUMATSU, 1933, Annot. Zool. Jap., 14: 262-265, 271, f. 3.

Anterhynchium flavomarginatum umenoi: VECHT, 1963, Zool. Verh., 60: 81; YAMANE, 1981, Trans. Shikoku Ent. Soc., 15: 224-225 (in key).



Figs. 14-21. Clypeal colour patterns of the Ryûkyû subspecies of *Anterhynchium flavomarginatum* (♀). 14, *umeno*; 15, *hanedai* (Okinawa-jima); 16, *hanedai* (Sezoko-jima); 17, *amamense*; 18, *sulphreum*; 19, *insulicola*; 20, *procella*; 21, *micado*.

Female. Well agrees with the original description by YASUMATSU (1933). Body markings are yellow, but sometimes orangish; the type specimen which was said to have orange-yellow markings may represent one extreme of variation. Pronotum is black in its posterior portion. Mesoscutum sometimes possesses very faint median stripes. Propodeum almost always lacks yellow markings. VECHT (1963) mentioned that the Taiwanese form well agrees with YASUMATSU's description of this form, but these two forms are not alike at all.

Male. Yellow markings rich; the markings paler than in the female, and only rarely orangish. Mandible with yellow stripe. Supraclypeal spot present, often connected with frontal mark. Antennal scape entirely yellow; pedicel brownish; 1st flagellar segment below and some of the terminal segments below ferruginous. Gena yellow except for posterior portion. Tegula-yellow except for central ferruginous part. Apical bands on gastral tergites I-VI rather wide (last tergite entirely brownish but sometimes apically yellowish); apical bands on sternites II-VI narrow and yellow (last sternite light brown). Tergites V and VI, and sternites V and VI sometimes brownish basally. Legs light brown, with yellow markings on femora and tibiae.

The male of this form is readily separated from that of any other form by the entirely yellow scape, well developed yellow genal band, and the yellow stripe on mandible. We could not find any important difference in colour pattern between the populations of Ishigaki-jima and Iriomote-jima.

Specimens examined. Ishigaki-jima: 2♂♂ (Nagurahama), 31 vii 1969 (TT); 2♂♂ (Takeda), 13 viii 1972 (TN); 1♀ (Mt. Omoto), 30 viii 1978 (K. HARA); 1♀ (Yonehara), 28 viii 1978 (TN); 1♀ (Mt. Banna), 29 viii 1978 (TN).

Iriomote-jima: 6♂♂4♀♀ (Funauro), 9 x 1977 (SY); 1♀ (Hoshidate), 8 x 1977 (SY); 5♂♂6♀♀ (Komi), 11-24 viii 1978 (TN); 2♀♀ (Kanebire-taki), 23 viii 1978 (TN); 1♀ (Funauro), 22 viii 1978 (TN); 1♀ (Ôhara), 19 viii 1978 (TN); 1♂2♀♀ (Ôhara), 20-24 v 1981 (AN); 2♂♂1♀ (Toyohara), 20 v 1981 (AN); 1♂ (Sonai), 20 iv 1981 (T. FUJISAWA);

1 ♀ (Ôhara), 2 v 1982 (AN).

Anterhynchium flavomarginatum hanedai TANO, ssp. nov.

Rhynchium mandarineum SAUSSURE: MATSUMURA u. UCHIDA, 1926, Ins. Matsum., 1: 37-38.

Anterhynchium flavomarginatum umenoi: YAMANE, 1981, Trans. Shikoku Ent. Soc., 15: 224-225 (in key, part).

Female. Body markings yellow, orange yellow and brown. Clypeus yellow, with lateral black or brown markings which are variable in size and shape (Figs. 15, 16). Frontal spot yellow, tinged with brown. Upper genal stripe very small and orange yellow. Fovea on vertex with dense reddish brown pubescence. Antennal scape brownish above, yellowish below; flagellum blackish brown to reddish brown even on the upper face. Pronotum yellow (sometimes orangish or ferruginous); lower and posterior portions black. Mesopleural spot yellow to ferruginous, often lost. Scutellum and metanotum with orangish or ferruginous markings which are variable in size (often reduced). Propodeum always without yellowish markings. Apical bands on gastral tergites I-V orange yellow (those on tergites III-V rarely ferruginous). Last tergite light brown to ferruginous. Sternite II with an orange-yellow apical band which is widely interrupted medially; subsequent sternites often with dark ferruginous, narrow, apical bands; last sternite ferruginous. Legs almost entirely ferruginous, but coxae, and sometimes trochanters and femora basally blackish; without yellow spots.

Male. Similar to the female in colour pattern, but body markings paler. Antennal scape brown or blackish above, yellow below; flagellum ferruginous (sometimes much darker above); hook slightly yellowish. Propodeum sometimes with yellow spots. Orange-yellow apical band on tergite I sometimes widened laterally, rarely with lateral prongs anteriorly; last tergite usually blackish. All the apical bands on tergites yellowish (not ferruginous). Sternites II-VI with yellow or orange apical bands (often interrupted medially). Legs light brown to ferruginous, extensively marked with yellow.

This subspecies is characterized by the ferruginous flagellum (especially of the female), and the darkest body markings in the female (Fig. 23).

Holotype. ♀, Tôbaru, Kunigami, Okinawa-jima, 3 vii 1982, Y. HANEDA leg. (Coll. Ent. Inst. Hokkaido Univ.).

Other specimens examined. Okinawa-jima: 1 ♂ 1 ♀ (Okinawa), S. SAKAGUCHI; 1 ♂ (Okinawa), viii 1905 (KUROIWA); 1 ♀ (Shuri), 11 vii 1968 (S. HASHIMOTO); 1 ♂ (Naha), 9 viii 1972 (TN); 4 ♂ 1 ♀ (Nakagusuku), 3 x 1977 (SY); 1 ♂ (Ogumi-son), 26 viii 1979 (H. NAGASE); 1 ♂ (Kunigami-son), 3-4 viii, 1980 (KB); 1 ♂ (Hyakuna), 1 vii 1981 (AN); 2 ♂ (Yona), 3 vii 1981 (AN); 2 ♂ (Hentona), 4 vii 1981 (AN); 1 ♀ (Oku), 5 vii 1981 (AN); 12 ♂ 4 ♀ (Tôbaru, Kunigami), 3-9 vii 1982 (YH); 3 ♀ (Yabu, Nago), 30 vi 1982 (YH); 1 ♀ (Nagojôshi), 29 vi 1982 (YH); 4 ♂ (Okuma, Kunigami), 6-7 vii 1982 (YH); 1 ♂ (Besî, Motobu), 1 vii 1982 (YH).

Sezoko-jima; 3 ♀, 28 v - 1 vi 1982 (Y. IKIMORI & Y. ÔHIRA).

Anterhynchium flavomarginatum amamense TANO, ssp. nov.

Female. Body markings are in pattern similar to those of the subspecies *hanedai*, but much paler in colour. Black (brown) clypeal markings generally developed, but

variable (Fig. 17). Antennal flagellum above entirely blackish, rarely tinged with reddish brown, but sometimes brownish below. Mesopleural spots never lost. Yellow markings on scutellum and metanotum rather developed. Propodeal spots always present, sometimes much developed. Yellow apical band on tergite I sometimes slightly widened laterally; that on tergite II usually distinctly widened laterally; last tergite and sternite usually blackish, at least partly. Yellow bands on tergites III-V very often replaced with reddish or dark brown. Legs ferruginous; femora usually blackish basally.

Male. Body markings paler than in the female. Similar to the male of the subspecies *hanedai*, but differs in the following points: Body markings paler (yellow; only rarely orangish), antennal flagellum blackish (segments VII-IX below and last two segments wholly ferruginous), propodeum almost always with yellow spots, yellow band on tergite I much wider and often with anterior prongs on each side, apical bands on tergites III-VI very often reduced or replaced with brown.

Holotype. ♀, Uken, Amami-ôshima, 28 vii 1972, T. NAMBU leg. (Coll. Ent. Inst. Hokkaido Univ.)

Other specimens examined. Yoron-tô: 1 ♂ 1 ♀ (Chyabana), 6 viii 1972 (TN). In the male specimen propodeal spots absent; gastral tergite I with laterally narrowed apical band which has no lateral prongs. In the female specimen black clypeal markings much reduced; yellow apical band on tergite I narrow and laterally narrowed; apical bands on tergites III-V dark ferruginous as in pale specimens of the subspecies *micado*. A possibility exists that some of the specimens from Yoron-tô and Okinoerabu-jima (see below) are descendants of immigrants from Kyushu (subsp. *micado*) through human activities.

Okinoerabu-jima: 1 ♂ (Tokutoki), 4 viii 1972 (TN); 1 ♀ (Uchigusuku), 3 viii 1972 (TN); 2 ♀♀ (China), 19 v 1981 (KT, KUKIDOME & KOYA); 1 ♂ 1 ♀ (Shinjô-Ôyama), 15-16 vii 1981 (Y. TAKAI). The colour pattern of the specimens from this island is rather variable. The female from Uchigusuku is typical *amamense* except that the clypeus lacks black marks. The male from Tokutoki well agrees with the male of typical *amamense*. However, the two females from China and the male from Shinjô-Ôyama agree well with *micado* in many details.

Amami-ôshima: 14 ♂♂ 4 ♀♀ (Shinmura), 16 vii-1 viii 1967 (TM); 1 ♂ 1 ♀ (Gusuku), 21 vii 1967 (TM); 1 ♂ (Santarô Pass), 23 vii 1967 (TM); 2 ♀♀ (Kasari), 17-21 vii 1967 (TM); 1 ♀ (Sato), 14 vii 1967 (TM); 1 ♀ (Asani), 13 vii 1967 (TM); 1 ♀ (Tomori), 16 vii 1967 (TM); 1 ♂ (Yuwan), 27 vii 1972 (TN); 1 ♀ (Naze), 27 vii 1972 (TN); 1 ♂ (Yuwan), 6 vii 1980 (H. NAGASE); 1 ♂ (Eboshi-dake), 6 vii 1980 (H. NAGASE); 1 ♂ 4 ♀♀ (Naze), 10-18 vii 1981 (YH); 1 ♂ 2 ♀♀ (Kasari), 7 vii 1981 (YH); 1 ♂ (Setouchi), 16 vii 1981 (YH); 1 ♀ (Sumiyo), 13 vi 1981 (YH).

Anterhynchium flavomarginatum sulphreum Sk. YAMANE, ssp. nov.

This subspecies is unique in its sulphur yellow body markings, especially on head and thorax (apical bands on gastral tergites often slightly orangish). The following characters are also useful in separating it from the other forms. Black clypeal markings moderately developed (♀); frons sometimes with a supraclypeal yellow spot (♂); antennal flagellum below often ferruginous (♀); yellow markings on scutellum, metanotum and dorsal part of propodeum much developed (♂, ♀); gastral tergites I and II with

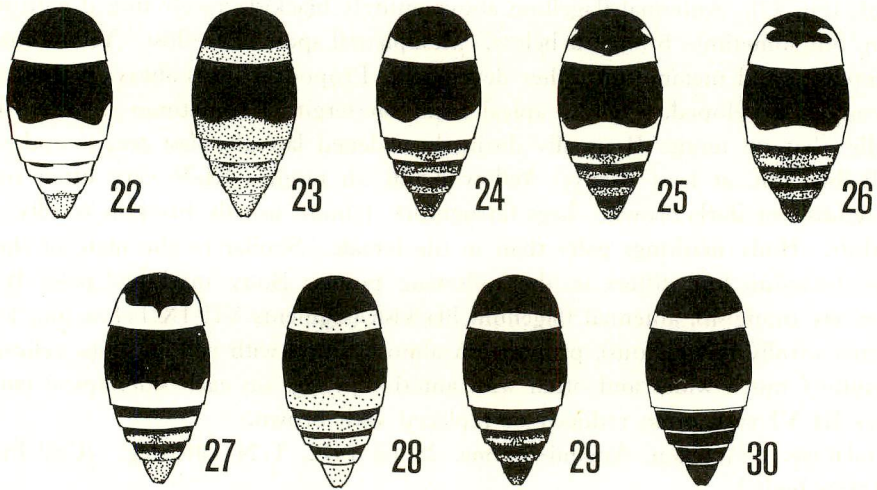


Fig. 22-30. Gastral colour patterns of the Ryûkyû subspecies of *Anterhynchium flavomarginatum* (♀). 22, *umenoi*; 23, *hanedai*; 24-26, *amamense*; 27, *sulphreum*; 28, *insulicola*; 29, *procella*; 30, *micado*.

apical bands distinctly widened laterally (that on tergite I often with lateral prongs anteriorly) (♂, ♀); apical bands on tergites III-V/VI usually not replaced with brown (♂, ♀) (Fig. 27).

Holotype. ♀, Akuseki-jima, 7 viii 1981, K. TOMIYAMA leg. (Coll. Ent. Inst. Hokkaido Univ.).

Other specimens examined. Akuseki-jima, Tokara-rettô: 12 ♂♂ 7 ♀♀, 7-10 viii 1981 (KT).

Anterhynchium flavomarginatum insulicola Sk. YAMANE, ssp. nov.

Similar to the subspecies *amamense*, but differs from the latter in the following details (Fig. 28). *Female*: Apical bands on gastral tergites I-V usually orange yellow (in *amamense* those on tergites III-V replaced with brown or at least partly ferruginous), last tergite and sternite ferruginous (in *amamense* at least partly blackish), antennal flagellum below more blackish (in *amamense* often tinged with reddish brown). *Male*: Antennal pedicel above black (in *amamense* ferruginous); mid- and/or hind coxae wholly black (in *amamense* often with yellow lateral spots).

In both sexes, the yellow markings on scutellum and metanotum less developed than in *amamense*. Yellow apical band on tergite I relatively narrow.

Holotype. ♀, Kuchino-shima, Tokara-rettô, 25 v 1982, K. TOMIYAMA leg. (Coll. Ent. Inst. Hokkaido Univ.).

Other specimens examined. Nakano-shima: 1 ♀, 21 viii 1943; 1 ♂ 8 ♀♀ (Satomura), 13-19 vii 1982 (Y. TAKAI); 2 ♀♀ (Funakura), 14 vii 1982 (Y. TAKAI).

Kuchino-shima: 4 ♂♂ 3 ♀♀, 28 vii-1 viii 1981 (KT); 39 ♂♂ 7 ♀♀, 24-27 vi 1982 (KT).

Anterhynchium flavomarginatum procella Sk. YAMANE, ssp. nov.

This subspecies is characterized by the following set of characters. Black clypeal markings much reduced (♀) (Fig. 20); gena often with a lower yellow (or reddish) spot in addition to the upper one (♀); mesoscutum with a yellow stripe on each side along the whole length of the base of tegula (usually in ♀, sometimes in ♂); propodeum with yellow markings on the dorsolateral face (♂, ♀); yellow apical band on gastral tergite I narrow, laterally narrowed (♂, ♀); gastral tergites III-V usually with yellow apical bands which are sometimes replaced with reddish brown (♂, ♀); last tergite and sternite black (♀); antennal pedicel above often tinged with reddish brown (♂).

This form is closely related to the subspecies *micado* of the Japanese mainlands. However, the yellow markings are more developed especially on the gaster. The small yellow or reddish marking on gena below is peculiar to this form. The lateral yellow stripes on mesoscutum are most developed in this form.

Holotype. ♀, Ôsato, Kuro-shima, Mi-shima, 4 ix 1981, Sk. YAMANE leg. (Coll. Ent. Inst. Hokkaido Univ.)

Other specimens examined. Iye-Jima, Uji-guntô: 1 ♀, 6-9 x 1981 (SKY).

Kuro-shima: 36 ♂♂ 31 ♀♀ (Ôsato), 30 viii - 5 ix 1981 (SKY).

Iô-jima: 5 ♂♂ 2 ♀♀, 1-3 vi 1982 (SKY); 1 ♂ 2 ♀♀, 7 viii 1982 (KT). The females from this island are typical *procella* except that propodeal yellow markings are less developed, and that black clypeal markings somewhat developed, but in the male the antennal pedicel is always black above and the propodeum often lacks yellow spots as in *micado*.

Yaku-shima: 1 ♀ (Kosugi-dani), 29 vii 1971 (K. SAKAMOTO); 1 ♀ (Shitogo), 10 viii 1981 (SKY); 1 ♀ (Onoaida), 9 viii 1981 (SKY). Many other specimens from this island are intermediate between *procella* and *micado*.

Tanega-shima: 1 ♂ 1 ♀, 4 viii 1916.

Anterhynchium flavomarginatum micado (KIRSCH)

For the characters of this form, see VECHT (1963) and YAMANE (1981). Most closely related to the subspecies *procella*, from which it is often difficult to distinguish. Some specimens from Yaku-shima, especially from Miyanoura, are *micado*-type. Since Miyanoura is the largest port in Yaku-shima and connected with Kagoshima (Kyushu) by liners, there is a possibility that *micado*-type individuals on this island are descendants of immigrants from Kyushu (by means of human activities), and that intermediate individuals are hybrids with the indigenous *procella*.

Specimens examined. Yaku-shima: 2 ♂♂ 3 ♀♀ (Miyanoura), 8-10 viii 1981 (SKY).

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