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On the Affinities between the Members of the *coarctatum*-Group of the Genus *Rhopalum* (Hym., Sphecidae, Crabroninae)[1]

With 22 Text-figures

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(*Communicated by* T. UCHIDA)

Three races belonging to the *coarctatum*-group of the genus *Rhopalum* (= *Euplilis*) have been known from different parts of the northern hemisphere, viz. *coarctatum* from Europe, *modestum* from North America and *nipponicum* from Japan respectively. Since the publication of Pate's paper (1943), the North American representative has been believed to be a synonym of the original race —*coarctatum* (Scopoli). As a result of a comparative study of the specimens from the above-mentioned regions, the present writer has reached the conclusion that the North American race should be referred to a subspecies of the nominate race, while the Japanese representative forms a distinct species:

The nominate race—*R.* (*R.* sect. *Corynopus*) *coarctatum coarctatum* (Scopoli, 1763)

The American race—*R.* (*R.* sect. *Corynopus*) *coarctatum modestum* Rohwer (1908)

The Japanese race—*R.* (*R.* sect. *Corynopus*) *nipponicum* (Kohl, 1915)

This opinion is based upon character differences found among them, as is described below:

1) Clypeus. Female. *coarctatum*: Fig. 1, *modestum*: Fig. 8, *nipponicum*: Fig. 15. Male. *coarctatum*: Fig. 4, *modestum*: Fig. 11, *nipponicum*: Fig. 18. As shown in the figures, the representative of the New World shows an intermediate state between the other two, the organ being closely allied in the female to that of the original race and in the male to that of the Japanese species.

2) Terminal protuberances of the occipital carina beneath the head. Female: Figs. 2 (*c*), 9 (*m*) and 16 (*n*). Male: Figs. 3 (*c*), 10 (*m*) and 17 (*n*). In the female

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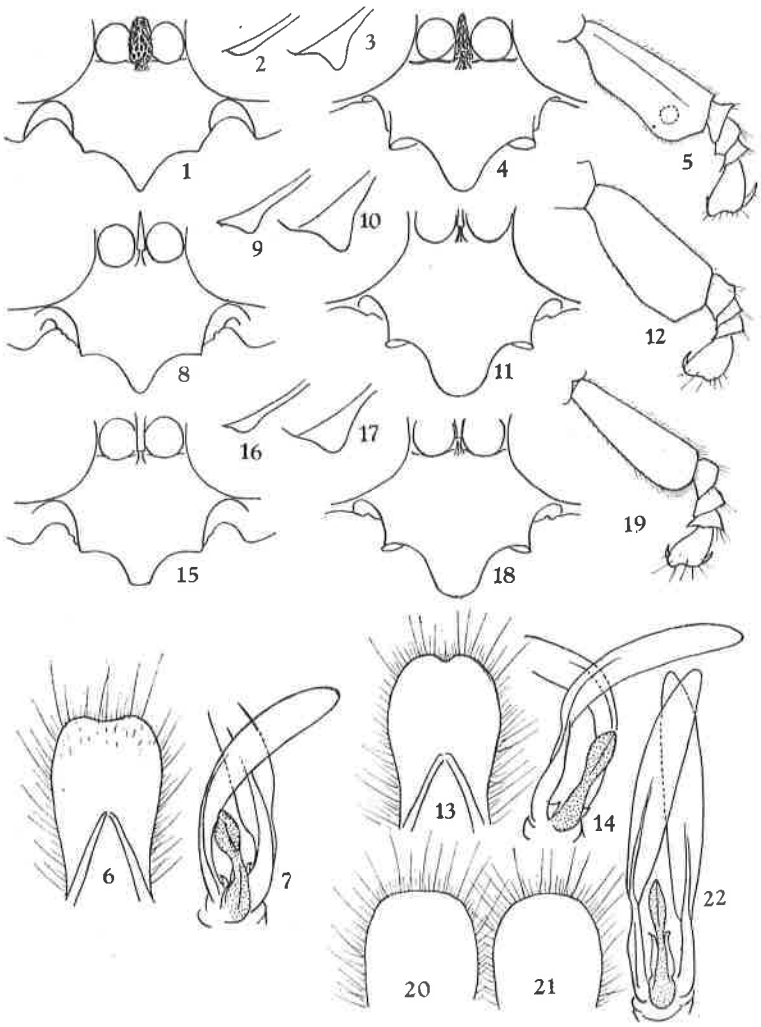
of *coarctatum* s. str. the protuberance is very slight, while in the other two races it is somewhat more developed. In the male, the character is better defined, and here also *modestum* seems to approach closer to *nipponicum*. Generally speaking, the developmental degree of this character in the specimens of the Nearctic Region may be said to represent an intermediate state.

3) Frontal process between the sockets of the antennae. In the European



Figs. 1–7 *Rhopalum coarctatum coarctatum* Scopoli, Figs. 8–14 *R. coarctatum modestum* Rohwer, Figs. 15–22 *R. nipponicum* Kohl (Fig. 20 *R. nipponicum hokkaidense* Tsuneki). 1, 8, 15 Clypeus of female, 4, 11, 18 Clypeus of male, 2, 9, 16 Protuberance at the end of occipital carina of female, 3, 10, 17 Same of male, 5, 12, 19 Front metatarsus of male, 6, 13, 20, 21 Last ventral plate of abdomen of male, 7, 14, 22 Male genitalia.

specimens examined, the process is extended into a plate on the top. This modification is especially marked in the female and the surface carries a coarse shagrinate sculpture. In the other two races the process is simple as a rule, but sometimes the American specimens bear a similar but much smaller plate. In general, the process in the Japanese specimens is thicker (in the laterally compressed state) than in the American specimens.

4) Expansion of the basitarsus of the front leg in the male. As shown in Figs. 5 (*c*), 12 (*m*) and 19 (*n*), the expansion is most devoloped in the American race and least in the Japanese. Generally, the legs of the Nearctic specimens are thicker and more robust than those of the European, the latter being more developed in that character than the Japanese representative.

5) Process on metatarsus of mid leg in the male. In the European as well as in the American examples, the process is situated in the middle or slightly before the middle of the segment, while in the specimens from Japan it is situated somewhat beyond the middle of the segment.

6) Metatarsus of the hind leg. In general, in the Japanese specimens the segment is relatively shorter and appears more widely expanded toward the apex. Between the other two races there is no difference beyond the range of individual variation which is fairly wide in this character.

7) Form of the last ventral plate of the abdomen in the male. The apex of the last ventral plate is rounded in *nipponicum* (Fig. 21), somewhat narrowly truncate in *n. hokkaidense* (Fig. 20), gently concave in *coarctatum* s. str. (Fig. 6; in the single specimen examined) and roundly incised in *c. modestum* (Fig. 13). According to the results of the examination of a number of specimens of *R. nipponicum* and *n. hokkaidense* there can be admitted a certain degree of variation in the form of the apical portion of the plate. However, in no single specimen has ever been observed the presence of the incision on the apical margin. The difference seems to be fairly important.

8) Male genitalia. There is no noteworthy difference in the form and structure of the male genital apparatus between *R. coarctatum* s. str. and *c. modetum*, whereas, a marked deviation can be observed in *R. nipponicum*, including *n. hokkaidense*. In the Japanese representatives, the sagitta or the penis is apically slenderer than in the other two, that is to say, it is not so stoutly swollen in the apical portion (Fig. 22) as in its congeners (Figs. 7, 14). The difference is so important that it seems sufficient to separate the series into two at the specific rank.

Remarks. In relation to the forms of the antennae, the abdominal petiole and the legs, measurements were taken upon as many specimens of foreign countries as possible and upon a corresponding number of those of the indigenous species, with regard to the relative length between the segments or between a certain segment and other convenient part of the body, as well as to the ratio of the width to the length within the same part. But no difference worthy of description, or no difference beyond the range of individual variation could be found among them, excepting the characters already described.

Specimens examined: 1 ♀ 1 ♂, Belgium; 3 ♀♀ 6 ♂♂, U.S.A. (Michigan, Washington, New Jersey, New York); 190 ♀♀ 220 ♂♂, Japan (*nipponicum* s.

str., 160 ♀♀ 120 ♂♂, *n. hokkaidense*, 30 ♀♀ 100 ♂♂)

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