

## The Color Forms of the Common Hornet, *Vespa crabro* Linnaeus.

by J. Bequaert, Boston, Massachusetts, U. S. A.

Birula, basing his studies upon the extensive collections of the Museum of the Russian Academy of Sciences, published in 1925 a valuable review of several of the color forms of the common, Palaearctic hornet. In the course of my recent work with the North American Vespinae, I had to consider the status of these forms, in order to determine which of them has been introduced into the eastern United States. Incidentally I have reached some conclusions which I believe may help to understand the variations of this species in its original home. I was greatly helped in my study by a series of specimens received, at the United States National Museum, from Birula.

*Vespa crabro* is indigenous to Europe and temperate Asia (including Japan), covering nearly the entire Palaearctic Region, south of lat. 62°. It seems to extend farther north in Europe than in Asia. Its southern limits appear to be the Mediterranean, Asia Minor, Transcaspia, and Mongolia; but in the Far East it covers most of China and extends even into Siam. It does not appear to be a true member of the North African fauna, for I regard R. du Buysson's single record from Alger as due to an accidental introduction, if not to an error in labelling. At any rate, during some rather intensive collecting in Algeria, I have never seen it; nor has it been found there by Morice. It is of interest that the range of *V. orientalis* Linnaeus, the only other Palaearctic hornet, does not overlap that of *V. crabro*, except over a restricted area in the central part of the Mediterranean Subregion (Greece, Sicily and Dalmatia).

Throughout its vast area *V. crabro* is fairly variable in color, though much less so than many other Diptera, and even less than some of the other Vespinae which inhabit the same territory. Nevertheless, some at least of its variations show a fairly definite geographical segregation, and, though they are connected by evident transitional forms, there may be some

justification for treating them as geographical races, as Birula has done. Merely in order to be consistent with my other work on the *Diptera* and without wishing to decide their exact status, I shall at present regard them as color varieties.

The following key may help to recognize the several forms of *V. crabro* which, in my opinion, are sufficiently marked to warrant their distinction by name. Queens and workers will be placed more easily by means of this key than males. Also, it should not be forgotten that in a given district only the majority or the average of the specimens correspond to the definition of the form supposedly peculiar to that area. Aberrant specimens, sometimes strikingly different from the norm of the district, are occasionally seen, indicating that the several color forms have not yet reached that degree of hereditary stability which one should expect of true geographical races.

1. Vertex and outer orbits, or the outer orbits only, very extensively yellow or orange-yellow; the head being mostly of that color. . . . . 2
- Vertex and outer orbits mostly or wholly rufous-red; the vertex often more or less black. . . . . 7
2. Outer orbit yellow with at least an indication of a black or rufous spot, which in the queen is sometimes very large (absent in the male). Vertex with a large, sharply delimited black spot, extending from occiput to interantennal shield; the shield itself, as well as the ocular sinuses, yellow. Thorax blackish, with few red markings; mesonotum black. First abdominal tergite almost wholly black, with a narrow, apical, yellow fascia. Southwestern Siberia.

var. *altaica* Pérez.

- Head more extensively yellow, the outer orbit never with a black spot. Mesonotum often extensively red. . . . . 3
3. Yellow, apical fasciae of first to fourth tergites very narrow, sometimes incomplete, interrupted in the middle, or shortened on the sides, or some of them even absent; fifth tergite with a large, median, apical, yellow spot, often subquadrate and set off from the sides; sixth tergite entirely yellow. Pronotum mostly yellow or orange-yellow; mesonotum black or with small, anterior, russet spots. Ocellar region usually without black spot, sometimes russet. Central and southern China.

var. *oberthuri* R. du Buysson.

- Yellow, apical fasciae always present and complete on first to fourth tergites, though often narrower on the first; median part of yellow fascia of fifth tergite not conspicuously set off as a subquadrate spot. . . . . 4
- 4. Pronotum wholly or mostly yellow or orange-yellow, at least anteriorly; mesonotum extensively red. Vertex without distinct black spot in the ocellar region. Second abdominal tergite sometimes with a trace of yellowish, anterior spots. Southeastern Asia. var. *crabroniformis* F. Smith.
- Pronotum either red, rufous, or blackish, without yellow. 5
- 5. Thorax mostly blackish; mesonotum entirely of that color; pronotum rufous-red. Ocellar region generally with a black spot. Abdominal, yellow fasciae rather narrow; second tergite with apical fascia only, without even a trace of anterior blotches. Japan. var. *flavo-fasciata* Cameron.
- Thorax extensively red, especially on the mesonotum. Ocellar region russet, without distinct black spot. Second abdominal tergite often with at least traces of yellowish, transverse blotches in the anterior half. . . . . 6
- 6. Form of the British Isles, with the basal blotches of second tergite faint or absent. var. *gribodoi* J. Bequaert.
- Form of northern China, with the basal blotches of the second tergite generally quite distinct and more yellow. var. *birulai* J. Bequaert.
- 7. Second abdominal tergite, in addition to the apical, yellow fascia, with a large, dirty yellow to pale yellow, transverse spot on the anterior half, sometimes divided in the middle. No black ocellar spot. Mesonotum with rufous stripes. Shores of the Caspian Sea. var. *caspica* Pérez.
- Second abdominal tergite only with the apical, yellow fascia. . . . . 8
- 8. Thorax mostly black, with very few red markings; mesonotum entirely black. Ocellar region more or less blackish, often extensively so. Northern Europe and Siberia. typical *V. crabro* Linnaeus.
- Thorax abundantly marked with red, sometimes mostly of that color; mesonotum at least with traces of reddish. Ocellar region usually wholly rufous or red, at most with traces of blackish. Continental western Europe. var. *germana* Christ.

### 1. *Vespa crabro* typical form.

*Vespa crabro* Linnaeus, 1758, Syst. Nat., 10th Ed., I, p. 572 (Europe, without more definite locality). C. G. Thomson, 1869, Opuscula Entomologica, I, p. 79; 1874, Skandinavien Hymenoptera, III, p. 9.

*Vespa crabro major* Retzius, 1783, C. De Geer Gen. Spec. Insect., p. 63 (based upon de Geer's description and figure of the hornet of Sweden).

*Vespa crabro* var. *borealis* Radoszkowsky, 1863, Horae Soc. Ent. Rossicae, II, p. 128, Pl. XVI, fig. 15 (queen, worker and male; Pargolovo near Leningrad, Russia).

*Vespa crabro crabro* Birula, 1925, Arch. f. Naturgesch., XC, (1924), Abt. A, Heft 12, p. 99 (queen, worker and male).

As shown by Birula, typical *V. crabro* occurs throughout Scandinavia, northern, eastern and central Russia, southeastern Siberia (east of the Ienissei), northern Manchuria, and the Island of Sakhalin. I have seen it from Sweden, northern and eastern Russia and the Ussuri District of eastern Siberia (several specimens named *V. crabro crabro* by Birula).

Although Linnaeus gave no definite locality, there can be no doubt that he had before him the northern form of the species, which may even be recognized from the very concise original description: „*V. thorace nigro antice rufo immaculato, abdominis incisuris puncto nigro duplici contiguo.*“ The statement „*antice rufo immaculato*“ obviously refers to the pronotum. Mr. Robert B. Benson, who at my request has kindly examined the type of *V. crabro* in Linnaeus' collection, now at the Linnaean Society of London, recently wrote me that it is a queen with an all-black mesonotum and scutellum.

### 2. *Vespa crabro* var. *germana* Christ.

*Vespa crabro germana* Christ, 1791, Naturgesch. d. Ins. vom Bienen-, Wespen- u. Ameisengeschl., p. 215, Pl. XVIII, fig. 3 (no sex given; without locality, but by implication from Germany).

*Vespa crabro vulgata* Birula, 1925, Arch. f. Naturgesch., XC, (1924), Abt. A, Heft 12, p. 100 (queen, worker and male; Western Europe, without definite type locality).

Birula gives the distribution of this form as France, Spain, northern Italy, Germany, Hungary, Austria, Switzerland, Poland, Latvia (Kurland), and western and southern Russia (where it intergrades with the typical form). He also refers to it some of the specimens of eastern Siberia (Ussuri District). I have seen specimens from Germany, France, Switzerland, and Spain. It is, moreover, the form which has been introduced by man some 75 years ago into the eastern United States, where

it is now thoroughly naturalized in the southern part of New York State, southwestern Connecticut, and northern New Jersey (earliest definite record: 1854).

That Christ's „*germana*“ and Birula's „*vulgata*“ are based upon the same color form is evident enough from Christ's description and figure. He describes the thorax as follows: „Das Bruststück ist stark und braunschwarz, oben mit zwei rotbraunen Linien, desgleichen Flecken und Saum.“

### 3. *Vespa crabro* var. *caspica* Pérez.

*Vespa crabro* var. *caspica* Pérez, 1910, Actes Soc. Linn. Bordeaux, LXIV, p. 6 (queen; Talysch and Lenkoran, on the southwestern shore of the Caspian Sea).

*Vespa crabro meridionalis* Birula, 1925, Arch. f. Naturgesch., XC, (1924), Abt. A, Heft 12, p. 100 (queen and worker; several localities in Transcaucasia and one in Transcaspiä; in the latter *V. crabro* may have been introduced, as it is unknown from Turkestan).

This form appears to be peculiar to Transcaucasia. I have seen one worker, from Liryk, which agrees well with both Pérez' and Birula's descriptions. Most probably Morice's record of *V. crabro* from Enzeli, Persia (on the southern shore of the Caspian Sea), also refers to the var. *caspica* (1921, Jl. Bombay Nat. Hist. Soc., XXVIII, p. 199). Whether or not it extends farther west into the Mediterranean Subregion, as Birula surmises, is open to question. The only *V. crabro* I have seen from Asia Minor, is a queen (labelled „Derinje“, a locality not found on the map, but possibly a misspelling of the Delidje River), with the coloration of typical *crabro*.

Birula has sent to the United States National Museum, as *V. crabro meridionalis*, a worker from the Ussuri District in eastern Siberia; but this specimen does not agree with his description. Moreover, in his published account, Birula does not include eastern Siberia in the area covered by his *meridionalis*.

### 4. *Vespa crabro* var. *birulai*, new name.

*Vespa crabro chinensis* Birula, 1925, Arch. f. Naturgesch., XC, (1924), Abt. A, Heft 12, p. 101 (worker and male; several localities in northern and central China, but no definite type locality designated). Not *Vespa chinensis* Fabricius, 1793.

This color form is found in northeastern China, especially in the province of Chi-Li. I have seen it from Peking. Possibly it occurs in Korea also, unless the form found there be the Japanese var. *flavo-fasciata* Cameron. In Sze-Chuen it occurs

together with the var. *crabroniformis*, with which it seems to intergrade.

**5. *Vespa crabro* var. *crabroniformis* F. Smith.**

*Vespa crabroniformis* F. Smith, 1852, Trans. Ent. Soc. London, (2) II, 2, p. 40 (queen and male; described from China, although no locality is given).

F. Smith gives no locality for his types, but his description was based upon specimens „collected by Mr. Fortune, during his late travels in China“. Although in the title and in the introduction the region where the collection was made is referred to as „North China“, the only definite localities mentioned in the paper are Ning-Po-Foo, Tein-Tung near Ning-Po, and the island of Chusan. All these are south of Shanghai, in the Province of Che-Kiang, which could hardly be called northern China.

Smith's description agrees well with three specimens from Siam, in the Museum of Comparative Zoölogy, Cambridge, Mass. He expressly mentions „the head orange-yellow“ and „the prothorax yellow; a broad central indistinct stripe on the mesothorax anteriorly, the tegulae ferruginous“. Of the male he states that it differs from the female „in having on each side of the second segment of the abdomen an oblique, indistinct, pale stripe running inwards, and also two minute pale dots“. These markings are present in the queen from Siam, but absent in the two workers. Perhaps Smith's „female“ was really a worker and not a queen. At the United States National Museum there are many specimens of *crabroniformis* from Suifu, Sze-Chuen; Soochow; Mt. Omei, Sze-Chuen; Nanking; and Yao-Gi. They show so many passages to the var. *birulai*, that it is doubtful whether the latter is worth retaining.

R. du Buysson's description of the var. *crabroniformis* (1905, Ann. Soc. Ent. France, LXXIII, 3, [1904,] p. 505) is misleading. It was evidently based upon a mixture of the Japanese var. *flavo-fasciata* Cameron and of the southern Chinese var. *crabroniformis*; perhaps also including specimens of the var. *birulai* J. Bequaert, of northern China.

**6. *Vespa crabro* var. *oberthuri* R. du Buysson.**

*Vespa oberthuri* R. du Buysson, 1902, Bull. Soc. Ent. France, p. 140 (worker; Siao-Lu and Ta-Tsien-Lu, both in Sze-Chuen, China); 1905, Ann. Soc. Ent. France, LXXIII, 3, (1904), p. 513 (worker).

At the United States National Museum there are two queens of this striking form, from Suifu, Sze-Chuen (D. C.

Graham), which agree well with du Buysson's description. The yellow fasciae of the first to fourth tergites are much narrower in one of these specimens than in the other. A worker from Chao-tung, Yunnan, and another from Ta-Tsien-Lu to Yachow, Sze-Chuen, are evidently the same form; but in these the apical fasciae are somewhat wider and the median, yellow patch of the fifth tergite is more triangular. I have been unable to find any difference in structure or sculpture between these specimens and the several other forms of *V. crabro*, of which I must regard *V. oberthuri* as an extreme color variation.

#### 7. *Vespa crabro* var. *flavo-fasciata* Cameron.

*Vespa flavo-fasciata* Cameron, 1903, The Entomologist, XXXVI, p. 280 (queen; Nugata, Shinanogawa, Japan).

*Vespa crabro* var. *tartarea* R. du Buysson, 1905, Ann. Soc. Ent. France, LXXIII, 3, (1904), p. 506 (queen and worker; Yokohama, Japan).

I regard this as the peculiar, Japanese representative of *V. crabro*. I have seen it from Kyoto (28 workers, Ac. Nat. Sci. Phila.), Kanagawa near Yokohama, Sapporo (Hokkaido), and Kiushiu. Kono and Tamanuki (1928, Insecta Matsumurana, II, 3, p. 129) have recorded the var. *tartarea* from northern Sakhalin; but the form which occurs there is typical *V. crabro*, according to Birula.

#### 8. *Vespa crabro* var. *gribodoi*, new name.

*Vespa crabro* var. *anglica* Gribodo, 1891, Bull. Soc. Ent. Italiana, XXIII, p. 242 (queen; England). Not *Vespa anglica* „Leach“ F. Smith, 1843.

*Vespa crabro* E. L. Ormerod, 1868, British Social Wasps, p. 35, Pl. I (queen, worker and male). E. Saunders, 1896, Hymenoptera of the British Islands, p. 151, Pl. XX, fig. 1. (Anonym), 1924, Ministry of Agric., London, Miscell. Publ., No. 44, p. 3, Pl. I, fig. 7.

This very striking form appears to be the only one known from the British Isles, where it is found only in the South of England and in Wales. I have cited some of the descriptions and figures based upon British specimens. I have seen a worker from England (Arthur Loveridge), a male from Farnham Royal, Bucks. (George Salt), and a queen and worker from Colchester (Am. Mus. Nat. Hist.). The var. *gribodoi* is more like the var. *birulai* of northern China than like the var. *germana* of western continental Europe.

I regret that Gribodo's name *anglica* cannot be retained for this form, on account of the earlier *Vespa anglica* „Leach“ which is a synonym of *Vespa sylvestris* (Scopoli). I have not

been able to trace the name *Vespa anglica* in any of Leach's, writings, but it seems to have been used for a number of years in British collections. The first mention in print I have found is by one „E. N. D.“ in 1835 (Loudon's Mag. Nat. Hist., VIII., p. 627), as a synonym of *Vespa holsatica* Fabricius. Since this article is anonymous, the reference should perhaps not be given standing in nomenclature. The name was, however, validated (according to the rules) by F. Smith in 1843 (The Zoologist, I, p. 168), as a synonym of *Vespa holsatica*, thus preventing any subsequent use of „*anglica*“ in the genus *Vespa*. This early *Vespa anglica* was seemingly overlooked by C. D. Sherborn, when he compiled the „Index Animalium“.

### 9. *Vespa crabro* var. *altaica* Pérez.

*Vespa crabro* var. *altaica* Pérez, 1910, Actes Soc. Linn. Bordeaux, LXIV, p. 5 (queen; Altai).

*Vespa crabro altaica* Birula, 1925, Arch. f. Naturgesch., XC, (1924), Abt. A, Heft 12, p. 98 (queen, worker and male). Wnukowsky, 1929, Zoolog. Anzeiger, LXXXIII, p. 219.

According to Birula, this form occurs in southwestern Siberia, from the Ural Mountains to Lake Baikal, southward to the Altai Mountains and western Mongolia. At the United States National Museum, I have seen one queen, one worker and one male, from western Siberia, sent by Birula.

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The following two names should be mentioned also in connection with *V. crabro*.

*Vespa jurinei* H. de Saussure, 1853, Et. Fam. Vesp., II, p. 133 (no sex given; Albania). The size (25 mm from frons to apex of second tergite) and the spread of the wings (56 mm) seem to indicate a queen. I believe that the description was made from a specimen of *V. orientalis* Linnaeus, either abnormal in coloration or in which the pale markings of the abdomen had been obliterated. *V. orientalis* has the apical portion of the fourth submarginal cell somewhat infuscated and the lobes of the clypeus more produced than in *V. crabro*. The type of *V. jurinei* should be at the British Museum.

*Vespa crabro* var. *immaculata* F. Morawitz, 1889, Horae Soc. Ent. Rossicae, XXIII, p. 161 (worker; Nanpin in the Province Kan-Su, China). R. du Buysson suspected that the description was based upon a queen of *Vespula media* (Retzius).



Birula (1925, Arch. f. Naturgesch., XC, [1924], Abt. A, Heft 12, p. 102), who saw Morawitz' type, states that it is specifically distinct from *V. crabro*, and he also records it from the Province of Sze-Chuen, China. Unfortunately Birula adds nothing to the original description, which, so far as it goes, covers well some specimens of *Vespa auraria* var. *nigrithorax* R. du Buysson I have seen from Sze-Chuen.

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