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GEOGRAPHICAL VARIATION AND SEX-RATIO IN LEUCOSPIS GIGAS (HYMENOPTERA, CHALCIDOIDEA)

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Berland (1934a) has drawn attention to the fact that in Europe the yellow-and-black form of *Leucospis gigas* Fab. occurs only in the female sex. According to his statistics 133 specimens from France and 19 from other countries were all females. Also in the collection of the Museum für Naturkunde Berlin, to which I had access through the courtesy of Dr. G. Steinbach, conservator of Hymenoptera, all yellow specimens of *L. gigas* from Europe (incl. some Mediterranean Islands) are females.

Of males, Berland mentions only two (apparently yellow?) specimens from North Africa, and Masi (1949) still considers the male so rare that he gives a very detailed description of a specimen which I sent him from Wadi Kelt.

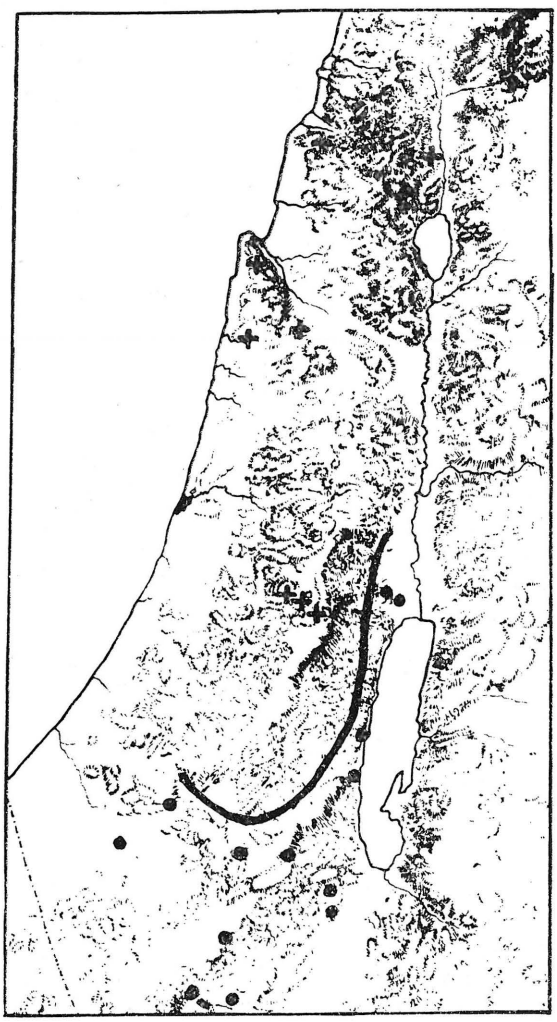

Fig. 1. Geographical distribution of *Leucospis gigas* F. f. *typica* (+) and f. *rufonotata* Westw. (●) in Israel.

Meanwhile it was found that *L. gigas* occurs in Israel in two distinct colour phases: 1) a form with all light parts yellow as in European specimens—later called f. *typica,* and 2) a form with these part of an orange to minium red colour. The latter colour phase was first described by Westwood as *Leucospis rufonotata* from Sicily, but it occurs also in other parts of the Southern Mediterranean e. g. Malta, North Africa, Israel, Jordan, Caucasus, from which places I have seen specimens.

Schletterer (1890), Masi (1949) and Bouček (1959) have already pointed out that *rufonotata* Westw. is only a colour variation of *L. gigas* and does not show any morphological differencies; therefore they never gave special attention to the sex ratio in this form.

The two forms of *L. gigas:* the yellow f. *typica* and the orange-red f. *rufonotata* occur in different regions in Erez Israel (Fig. 1).

F. *typica* occurs in the Mediterranean part of the country usually between 300 and 800 m., through the whole Central and Northern region and through the Judean Mountains to Jerusalem; it lacks in the Coastal plain.

F. *rufonotata* occurs in the Eastern Judean desert, the lower Jordan and Dead Sea valley, the Southern Negev to Wadi Raman and through the Western Negev. The ranges of these two forms never overlap and, as these are also distinguishable by their colour characters they should be considered as valid geographical races, at least in Israel. The line in Figure 1 tentatively shows the border between the two forms.

Sex ratio

Table I. enumerates the local material at my disposal, the large majority coming from my collection, but I have recorded also specimens from other zoological collections in the country.

Table I.: Sex Ratio in Leucospis gigas f. typica and f. rafonotata.

Leucospis gigas f. *typica* (33 ♀♀)

Jerusalem 28. IV.—20. VI	18 ♀♀	Carmel range 21. IV.—16. V.	3 ♀♀
Kiryat Anawim-Maaleh		Eilon 12. V.	1 ♀
Hahamishah 28. V.—11. VI.	8 ♀♀	Rosh Pina 9. V.	1 ♀
Binyamina 20. IV.—15. V.	2 ♀♀		

Leucospis gigas f. *rufonotata* (28 ♂♂, 42 ♀♀)

Wadi Kelt 5. IV.	1 ♂ 3 ♀♀	Tel Yeruham 1. V.	2 ♂♂ 1 ♀
Jericho 12. IV.	1 ♀	Tel Yeruham 7. VI.	3 ♀♀
Jericho 22. IV.	1 ♀	Tel Yeruham 14. VI.	1 ♀
Beersheba 25. IV.	3 ♂♂	Treibe Dunes 26. IV.	1 ♀
Beersheba 5. V.	3 ♂♂ 5 ♀♀	Ejn Boqeq 8. IV.	3 ♂♂
Revivim 29. IV.	4 ♂♂ 2 ♀♀	Ejn Geddi 30. III.	4 ♂♂ 5 ♀♀
Revivim 1. V.	2 ♀♀	Ejn Moor 15. IV.	2 ♂♂
Revivim 11. V.	2 ♂♂	Bir Ided 22. IV.	2 ♂♂ 1 ♀
Revivim 16. V.	1 ♂ 7 ♀♀	Wadi Fuqra w'out date	1 ♂
Revivim 21. V.	3 ♀♀	Wadi Fuqra 5. IV.	1 ♀
Tel Yeruham 9. IV.	1 ♀	Wadi Nafq 22. IV.	1 ♀
Tel Yeruham 25. IV.	2 ♀♀	Wadi Raman 21. IV.	1 ♀

All specimens of f. *typica* are females and therefore agree with the sex ratio given by other authors (loc. cit.) for the European populations.

Of the f. *rufonotata* the ratio is 28 ♂♂ : 42 ♀♀. But while the ratio of 100% of females in the first case is conclusive, the ratio of about 2 ♂♂ : 3 ♀♀ is not, because as shown in Table I., the females have a much longer period of flight than the males. Though at each date all specimens of *L. gigas* were collected regardless of sex, the number of collecting hours in each month were not equal. Nevertheless in most cases where larger series were collected males and females were present. But the males occurred from 30. III. to 11. V. with a medium value around 14. IV., while the females were collected from 30. III. to 14. VI. with a medium value around May 2nd. As the females seem to live longer, they are caught in larger quantities, but in the first part of the season during the month of April the ratio was 19 ♂♂ : 20 ♀♀, i. e. approximately 1:1. But while the exact percentage of the males is not so important, the importance lies in the fact, that they occur regularly in the red population and not as an exception!

In his description of the male from Wadi Kelt, Masi (1949) already mentions that whilst the general light colour is "reddish yellow" (quasi "red orange"), several parts are pure "yellowish". There is a considerable variability in the hue of red in different specimens and different parts of the body. While almost all females and half the males have a uniform body colour of Grenadine red to Orange chrome (nomenclature according to Ridgway: Color Standards, 1912), many of the males are of lighter colour reaching Cadmium yellow on the thorax and legs and even Warm buff on the abdomen (colour of the f. *typica:* Empire yellow to Lemon yellow). These more yellow male forms are of importance for the evaluation of the two yellow male specimens mentioned by Berland (1934a) from North Africa. These males must be more yellow than f. *rufonotata* females and at least avvicinate f. *typica,* as he mentions the orange forms: 16 females and 9 males under the name of *L. miniata* Klug. I had the opportunity to compare the type female of *L. miniata* Klug in the Museum für Naturkunde in Berlin, and, though *L. gigas* f. *rufonotata* and *L. miniata* agree coloristically almost completely, especially in their orange colouration, the morphological characters differentiate these two species very well, as Schletterer (1890), Masi (1935) and Bouček (1959) have repeatedly pointed out. No *L. miniata* occur in my material from Israel, and the type specimen of Klug remains the only specimen Schletterer, Bouček and I have seen. It is therefore very likely that all or most of the specimens mentioned by Berland (1934a) as *L. miniata* belong actually to *L. gigas* f. *rufonotata* and the yellow 5 females, 2 males and the orange 16 females, 9 males from North Africa belong together. This assumption is supported by a series of 4 females and 1 male from Constantine (Algeria) 1.—15. VII. 1910 leg. Seitz in the Berlin Museum of which 3 males and 1 female are typical *rufonotata* while 1 male is almost yellow. It seems therefore likely that the North African population as a whole may belong to f. *rufonotata,* which differs from f. *typica* not only by its colour and distribution, but also by the presence of a considerable percentage of males in the population.

The Western palearctic species of the genus *Leucospis* may be divided into two biological groups: one in which the males are absent or very rare, the females multiplying probably parthenogenetically, and another in which males occur frequently and reproduction is sexual. In different forms of *L. gigas* both types may occur.

males frequent	males absent or rare
L. dorsigera F.	*L. bifasciata* Klug
L. brevicauda F.	*L. turkestanica* Rad.
L. intermedia Illig.	*L. elegans* Klug
L. gigas f. *rufonotata* Westw.	*L. gigas* F. f. *typica*
	L. biguetina Jur.

Melanism

While the populations of the f. *typica* in Israel show almost no colouristic variation, the f. *rufonotata* shows a decided tendency to melanism. Schletterer (1890) already mentions that the uniform black mesonotum is almost characteristic for the male and he never saw such a female. In my material of 24 males, 16 have no or very reduced paired mesonotal spots, while of 32 females it is missing in only 3. To an even more advanced form of melanism belongs 1 male from Ejn Geddi 30. III. which has the whole thorax incl. metanotum and the first abdominal segment completely black and the orange bands on tergites 2—4 broadly interrupted by black. Transitory specimens from Revivim, Ejn Moor, Bir Ided with much narrower light bands on the pronotum and abdomen are more common. This shows, that melanism may occur in most of the f. *rufonotata* populations in the South.

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Abstract

In Israel occur two different forms of *Leucospis gigas* F.: f. *typica* and f. *rufonotata* Westw. which should be considered subspecies as they show differences in colouration, exclude each other geographically (Fig. 1) and show different tendencies towards melanistic variation. Furthermore in the f. *rufonotata* Westw. males occur regularly (probably 50 %) while from the f. *typica* no males are known. It is probable that some of the North African populations of *L. gigas* also belong to the f. *rufonotata* Westw.