On Individual Variation of a Structural Character in the Genus Oporinia Hb. (Lep. Geom.).

By
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The genus *Oporinia* Hb. (*Oporabia* Stph.) of the *Geometridae* consists of the following four species: *O. dilutata* Bkh., *christyi* Prout, *autumnata* Bkh., and *filigrammaria* H.-S., all being closely allied but all, however, possessing characteristic and constant differences in the genitalia. *O. filigrammaria* seems to be peculiar to the British Isles while the other species have a rather wide distribution, being reported from North and Central Europe, Ural, Armenia, Amurland, and from North America, the distribution of each species, however, still being very unsatisfactorily known because the determination of the species in most cases unfortunately has not been based upon the examination of the genitalia.

A very valid character forms in the male sex the appearence of the posterior edge of the ventral surface of the 8th abdominal segment (sternite) with its two chitinized projections: the octavals. As appears from fig. 1 the shape of the octavals in *O. dilutata* and in *O. christyi* is of similar type, but the distance is different. In an interesting paper entitled „The Specific Distinctness of Oporabia christyi" (Ent. Rec. 23, 1911 pp. 79–82) J. E. R. Allen proposes the supposition that "the distinction

between the species lies in the distance between these points", stating that: if the distance between the octavals is more than one third of the width of the abdomen, the specimen is *O. dilutata;* if less than one third, *O. christyi* – or, to use the metric scale: any specimen in which the distance is less than .33 mm will be *O. christyi*, and any in which it is greater will be *O. dilutata.* The interval of variation proved in *O. christyi* to be .12—.30 mm, in *O. dilutata* .36—.51 mm.

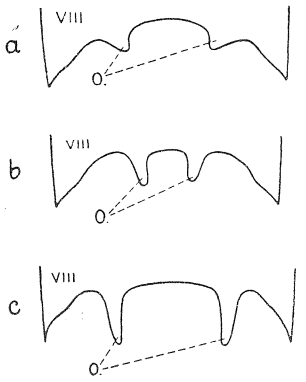

Fig. 1. Anal edge of 8th sternite in (a) *O. autumnata,* (b) *O. christyi,* and (c) *O. dilutata.* Scales removed. VIII: Eighth abdominal segment; o: Octavals.

As the material, however, on which these suppositions were founded was rather limited, viz. 26 specimens of *O. christyi* and the same number of *O. dilutata,* and as moreover the specimens of *O. christyi* all came from the same locality (Enniskillen) I have considered it of some interest to examine a somewhat larger material from localities far away from the above and thus experience if the said figures given by Allen may prove to be of universal validity.

The specimens, upon which the following investigations are based, originate from a great number of different localities in Denmark. In each specimen the scales have been removed from the 8th sternite by means of a small stiff brush and the measurements have then been executed under the microscope by means of an eyepiece micrometer. An enlargement of abt. 60 times I have found rather suitable in general; in cases where the greatest plus- or minus-deviation occur I have, however, controlled the figures at a larger magnification.*)

*) The degree of enlargement must be gaged very accurately before taking the measurements.

The figures appear from the tables (A and B); column I shows the measured distances of the octavals (rounded off to hundredths of mm) while column II exhibits the distribution of the material over these distances. Column III–V shows the (third of the) width of the 8th sternite, and lastly column VI –VIII shows the length of the forewing, thus indicating the apparent "size" of the insect. Fig. 2 shows the frequency curve of variation in size of the distance of the octavals in *O. christyi* and in *O. dilutata*, as appears from the Danish material. The abscissas represent the distance (x_n), while the ordinates are representing, not the corresponding number of specimens (S_n), [e. g. 18 in case of a distance of .20, see table A], but the average number of specimens as follows: $y_n = \frac{1}{3}(S_{n-1} + S_n + S_{n+1})$, [e. g. $\frac{1}{3}(14 + 18 + 10) = 14$ in case of a distance of .20, see table A], thus taking into account a possible error in the measurements of $\pm$ .01 mm. Moreover the ordinates have been transformed

Table A.

Oporinia christyi Prout.

I	II	III	IV	V	VI	VII	VIII
Distance of Octavals	Specimens	$\frac{1}{3}$ Width of 8th Segm. (approx.)			Length of right Forewing		
		minimum	average	maximum	minimum	average	maximum
mm	no.	mm	mm	mm	mm	mm	mm
.13	1	–	.35	–	–	17	–
.14	5	.28	.32	.36	15	16	17
.15	8	.29	.35	.47	16	16.5	18
.16	10	.28	.32	.43	12.5	15.5	19
.17	6	.32	.35	.37	15	16.5	17
.18	12	.27	.33	.42	14.5	16	18
.19	14	.30	.34	.40	15	16.5	18.5
.20	18	.27	.33	.38	14	16.5	18.5
.21	10	.29	.35	.41	16	17	19.5
.22	18	.25	.34	.40	13	16.5	19
.23	6	.27	.31	.33	15	16.5	17.5
.24	5	.32	.35	.39	16	16.5	17.5
.25	9	.28	.33	.37	14	16.5	19
.26	3	.30	.31	.33	15.5	16	17
.27	5	.27	.34	.39	16	17	18
.28	7	.29	.36	.45	16.5	17	18
.29	2	.35	.36	.37	18	18	18
.30	2	.39	.42	.45	15	16.5	18
.31	1	–	.33	–	–	18.5	–
.32	–	–	–	–	–	–	–
.33	1	–	.35	–	–	17.5	–

into percent of the total number of specimens of *christyi* (143) and *dilutata* (39) respectively.

Table B.

Oporinia dilutata Bkh.

I	II	III	IV	V	VI	VII	VIII
Distance of Octavals	Specimens	½ Width of 8th Segm. (approx.)			Length of right Forewing		
		minimum	average	maximum	minimum	average	maximum
mm	no.	mm	mm	mm	mm	mm	mm
.35	1	–	.32	–	–	17.5	–
.36	–	–	–	–	–	–	–
.37	1	–	.45	–	–	18.5	–
.38	1	–	.38	–	–	17	–
.39	1	–	.35	–	–	20	–
.40	3	.35	.38	.41	17.5	19	19.5
.41	–	–	–	–	–	–	–
.42	6	.28	.37	.46	17.5	18.5	20
.43	4	.35	.39	.42	18.5	19	19.5
.44	1	–	.37	–	–	18.5	–
.45	2	.35	.37	.39	18.5	19.5	20
.46	3	.35	.36	.37	17.5	18.5	19.5
.47	3	.35	.37	.39	18.5	19	19.5
.48	2	.42	.43	.43	18.5	19	19.5
.49	5	.32	.37	.41	17.5	19	20
.50	1	–	.40	–	–	18	–
.51	3	.35	.38	.43	18.5	19	20
.52	–	–	–	–	–	–	–
.53	1	–	.42	–	–	19.5	–
.54	1	–	.37	–	–	18.5	–

It will appear that: (*1*) the interval of diviation is almost of equal extent (abt. .25 mm) in the two species; (*2*) the average distance in *O. christyi* is abt. .20 mm, in *O. dilutata* abt. .45 mm; (*3*) in very rare cases the said character (not, however, the solitary character separating the two species) may be expected to fail as a means of separating them. The figures agree very well with those measured (in mm) by Allen, but on the other hand it will appear that (*4*) it is not correct to compare the distance of the octavals with the width of the abdomen. According to Allen (l. c.) the distance in *O. christyi* will be less than the third of the width of the abdomen, while in *O. dilutata* it will be more, but as also appears from the tables this distance may in *O. christyi* be equal to the third of the width of the 8th abdominal segment, and in several specimens of *O. dilutata* the distance

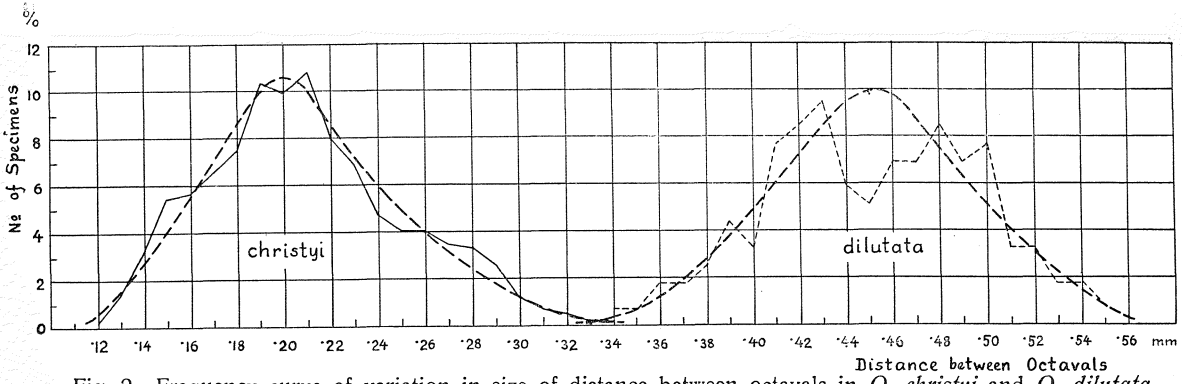

Fig. 2. Frequency curve of variation in size of distance between octavals in *O. christyi* and *O. dilutata.*

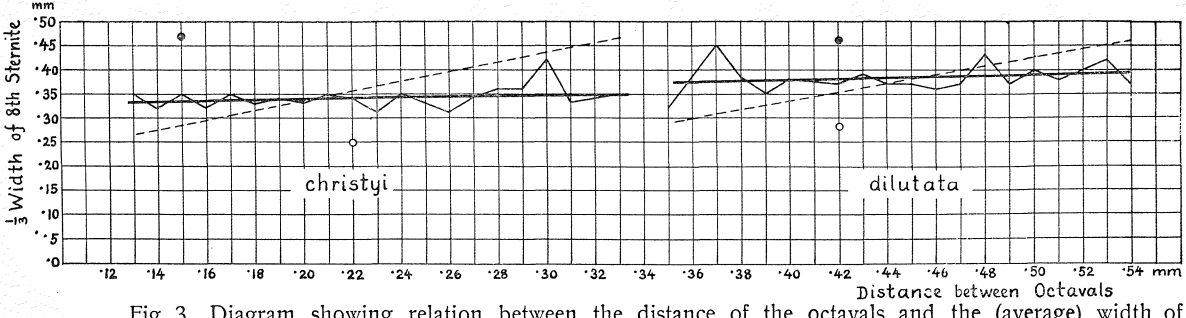

Fig. 3. Diagram showing relation between the distance of the octavals and the (average) width of the segment in *O. christyi* and *O. dilutata.* A black (white) circle indicates maximum (minimum) of the width of the segment, as measured.

is smaller than the third of the width of the 8th abdominal segment. The fact is that the distance of the octavals and the width of the segment are properties varying independent to each other. This appears plainly from fig.3, where the coordinates represent the distance of the octavals and the (third of the) width of the 8th abdominal segment (column IV) respectively; in case of a coincident variation in size of these two factors the curve would incline as indicated by the dotted line, whereas it will be seen that the curve forms an almost horizontal line. In the same way I have found it unnecessary to denote the measurements by the ratio to e. g. the wingexpanse (see Allen p. 81).

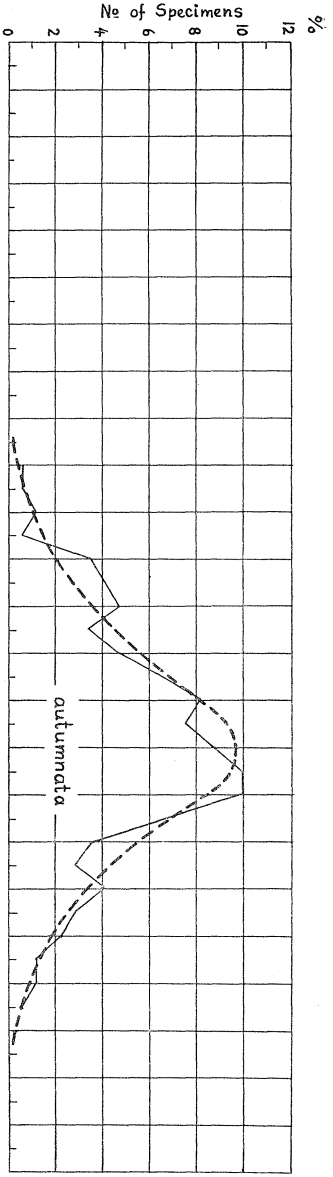

Fig. 4. Frequency curve of variation in size of the distance between octavals in *O. autumnata.*

I have not been able to include *O. filigrammaria* in the investigation, but finally states the shape of the frequency curve of variation in

size of the distance of the octavals in the last species, viz. *O. autumnata* (fig. 4), as appears from a material consisting of 57 Danish specimens, showing an average distance of abt. .40 mm and an interval of diviation of abt. .28 mm.