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60.—THE PROPORTIONS OF THE FEMALE FORMS OF *PAPILIO*
POLYTES, L., IN THE DIFFERENT PARTS OF ITS GEO-
GRAPHICAL RANGE.

By EDWARD B. POULTON, D.Sc., F.R.S., *Fellow of Jesus College, Oxford,*
and Hope Professor of Zoology in the University.

The investigation here suggested is of great interest and importance and at the same time very easy to carry out. All that is required is to breed the butterflies from indiscriminately collected larvæ in each locality and send the specimens to me at the University Museum, Oxford, so that they may be sexed and recorded. Additional value will be given to the investigation by obtaining as full and accurate a record as possible of the relative proportions to each other and to their mimics in the same locality of the two models, *Papilio hector*, L., and *P. aristolochiæ*, F. If it be found impossible to breed the forms of *polytes*, interesting results may be gained, although of much less value, by the indiscriminate collection of the butterflies, particularly if all or as nearly as possible all the specimens seen on any given occasion are taken.

A short abstract of the results already obtained will show the great need for further investigations.

Ceylon. Mr. J. C. F. Fryer has recorded in *Phil. Trans. Roy. Soc., Lond.*, Series B, Vol. 204 (14th November 1913), p. 249, the results of breeding from 155 indiscriminately collected wild larvæ, viz., 66 males, 40 male-like females (*cyrus*, Hubn.), 24 *romulus*, F., females mimicking *P. hector*, and 25 *polytes*, L., females mimicking *P. aristolochiæ*. It is suggested that these results may be significant.

"In Ceylon, therefore, if the above statistics are reliable, the ratio between the mimetic and non-mimetic females is one which might be expected if it be assumed that there is no selection in favour of either of these forms of female; under these conditions the population is stable in composition and may remain so indefinitely.

"On the whole question, however, no final conclusions can yet be drawn, for, in the first place, the numbers obtained from the statistics may quite possibly be a coincidence, while in the second the effects of the phenomena discovered in connection with the fertility and mating of the species are quite unknown. Possibly the conclusion which can be drawn with the greatest confidence is that the extraordinary mimicry in the female sex is at present of little importance to the population of the butterfly in Ceylon. (*Ibid.*, p. 250)."

I have not at present been able to set beside Mr. Fryer's ratios those derived from breeding in other areas but the following evidence, quoted in all cases from the *Proc. Ent. Soc. Lond.*, goes far to disprove the general application of the conclusions set forth in the above-quoted paragraphs.

West slopes of Ashamboo Hills, North-West of Cape Comorin. In this locality in the extreme south of India, J. Williams Hockin collected (1905-16) 30 males, 1 *cyrus* female, 12 *polytes* females, 21 *romulus* female, 1 female intermediate between the last two. Of the 12 *polytes*, 4 were *stichius* with no white in the hindwing cell, 4 *polytes* with conspicuous white, and 4 intermediate. The female intermediate between *polytes* and *romulus* was an interesting form, indistinguishable from some of the forms of *theseus*, Cramer, from Borneo. As regards the models Mr. Hockin considered *hector* decidedly commoner than *aristolochiæ* and indeed the commonest *Papilio* in the district, *aristolochiæ* being second, and *polytes* third "but several lengths behind." (1917, lxxx-lxxxiii.)

The Ceylonese *polytes* females, although in a closely adjacent area, are very different in that the *stichius* form is almost unknown while the hind-wing cell of the great majority is conspicuously white-marked, a fact which, it can hardly be doubted, is related to the abundance in Ceylon as compared with India of forms of *aristolochiæ* with a white cellular spot in the hind wings (Rothsd. and Jord., *Nov. Zool.*, II, 1895, p. 248).

North Kanara. According to the extensive experience of T. R. Bell, largely derived from breeding, the *cyrus* form is excessively rare; it was in fact only once obtained and then by capture. Of the two mimetic forms, both abundant, *romulus* was perhaps the commoner. (1914, xcix-c.)

Neighbourhood of Madras City. Out of 45 females taken on two days in 1915 by Prof. and Mrs. Fyson, 23 were *polytes* and 22 *romulus*;

34 males were also captured. Twelve *hector* were taken and, on another day, one *aristolochiæ*. (1915, xcii-xciv.)

Singapore Island. In 1916 Dr. R. Hanitsch collected 27 males, 8 of the *cyrus* female and 9 of the *polytes* female together with 5 of the models of the latter. (1916, lxxvi-lxxviii.) Later in the same year he collected 34 males, 5 *cyrus* and 9 *polytes* (1917, xxx-xxxiv.)

The mainland (Johore) opposite Singapore Island. Dr. R. Hanitsch received from his collector 12 males, 3 *polytes* female and 1 *cyrus* female (March 1917), and a second example of the *cyrus* female (July 1917) together with 3 males taken on the same day and 8 males somewhat earlier. (1917, xxx-xxxi, lxxxiii-lxxxiv.)

These results from Singapore and mainland are very different from those recorded by Dr. Seitz who only remembers the *polytes* female in this locality. (1913, p. xxxii.)

The Hongkong and Macao Districts. The male-like female *cyrus* is, on the evidence of most naturalists, much the commonest form of the mimetic forms; *romulus* is unknown and the *polytes* female rare, as is its model, *aristolochiæ*. Of 10 examples from Stonecutter's Island in Hongkong Harbour 4 were males and 6 *cyrus* females. (1913, xxxi-xxxiii.)

I think it will be agreed that the results summarized above are sufficient to show how important it is to obtain evidence on a more extensive scale, and especially to carry out, in as many localities as possible, Mr. Fryer's method of breeding from indiscriminately collected larvæ.

I suppose that you all know that *Papilio polytes* is remarkable in Mr. Fletcher. having three forms of female, all different from one another. There is firstly the form *cyrus*, which is like the male, secondly the form *polytes* which resembles *Papilio aristolochiæ*, and thirdly the form *romulus*, which mimicks the female of *Papilio hector*. I have here specimens [exhibited] of these forms of females and of the two other *Papilios*, *P. aristolochiæ* and *P. hector*, which they mimick.

We at Pusa have tried some breeding experiments with *Papilio polytes* and I have here [exhibited] specimens of two generations reared from a captured female. As you will see, the females reared in this lot belong to the forms *cyrus* and *polytes*. We have not bred any *romulus* here as yet, although *romulus* does occur rarely at Pusa. In this connection I may note that *Papilio hector*, the model for the *romulus* form, does not occur at Pusa; I have seen it from Nagpur, where it is rare, but from nowhere north of that.

It will be of considerable scientific interest if any of you can assist by rearing *Papilio polytes* in numbers from known parents and sending

the resulting specimens either to Pusa or direct to Professor Poulton. It is not easy to rear them in numbers; at least, we have not found it possible at Pusa to rear more than two generations, so far.

If you will collect specimens of *P. polytes*, taking indiscriminately all the examples seen at one time in any one place of *P. polytes*, *P. hector* and *P. aristolochia*, that will also be useful, as giving us an idea of the relative proportions of occurrence of the different female forms and of the species which they resemble.

Another *Papilio* which would well repay breeding in numbers is *Papilio memnon* which has numerous distinct forms of females, some tailed and some tail-less. In Java both tailed and tail-less forms have been bred from one batch of eggs, but I do not think that *P. memnon* has ever been reared on any scale in India.

I am sure that I am endorsing the feelings of this Meeting in saying how grateful we are to Professor Poulton for sending us this paper.

