SIZE OF *PAPILIO GLAUCUS* IN MISSISSIPPI

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A consideration of a limited amount of information on *Papilio glaucus* L. in Mississippi suggests that the population represented there is generally similar to that described from the District of Columbia (Clark, 1932) and from Virginia (Clark & Clark, 1951). Specimens assignable to *P. glaucus australis* Maynard, reported from "the Southern States" (Holland, 1947) and from "Georgia through Florida and Gulf States" (Klots, 1951), have not been found. A series of four males and two females was examined by Mr. C. F. DOS PASSOS and determined as *Papilio glaucus glaucus*. No yellow females (form "turnus") are known to have been found in Mississippi; none were found in the collection at Mississippi State College when it was examined by the writer in March 1953. It is therefore assumed that the statement by HUTCHINS (1933): *"Papilio glaucus* L. Uncommon. *Papilio glaucus turnus* L. Very common," must refer to the occurrence of yellow males and dark females. Mr. and Mrs. HANS EPSTEIN report (*in litt.*) that no yellow females are known to them to have been found in Alabama. The very small spring individuals previously reported from "as far south as the mountains of North Carolina" (Clark & Clark, 1951) and from Kansas (Field, 1938), occur at least as far south as central Mississippi.

The series of twenty specimens in the writer's collection has been examined (other Mississippi specimens known to exist but which were not examined include those in the collection at Mississippi State College, five in the collection of C. F. DOS PASSOS, and one in the collection of Dr. FRANK MORTON JONES taken by him in Biloxi in the spring of 1910). Two dimensions of each specimen were measured : wingspread and forewing length. The measurements were made using dividers, opened to the dimension being measured and then placed against a millimeter scale. *Wingspread* is the dimension indicated by WOHLFAHRT (1952) as "Spannweite". *Forewing length,* the dimension used by CLARK (1932) and CLARK & CLARK (1951), is the distance from the base to the apex of the forewing, and presumably is the dimension referred to by BROWN (1951) as the "greatest radius of the forewing." These data are given in Table II, and some of their relations are indicated graphically in Fig. 1. For these twenty specimens, the ratio of wingspread to forewing length varies from 1.50 to 1.77; the average is 1.63. Both the specimen with the 1.50 ratio and that with the 1.77 ratio are females. Fig. 1 indicates that there appears to be no tendency for the ratio to change with change in forewing length, with season, or with sex. The tendency for size to increase from spring to fall, and the tendency for females to be larger than males, are clearly indicated. No correlation is indicated between size and section of the state in which taken. Since the series includes only one specimen from the Gulf Coast, the possibility that a significantly different population, perhaps assignable to *P. glaucus australis,* occurs there remains to be investigated.

Information on the size range of *P. glaucus* is given in Table I. In all references except Clark (1932) and Clark & Clark (1951) the dimension given is "expanse." Reported values for expanse in inches have been converted to expanse in millimeters by multiplying by 25.4 and from expanse in mm. to forewing length in mm. by the formula:

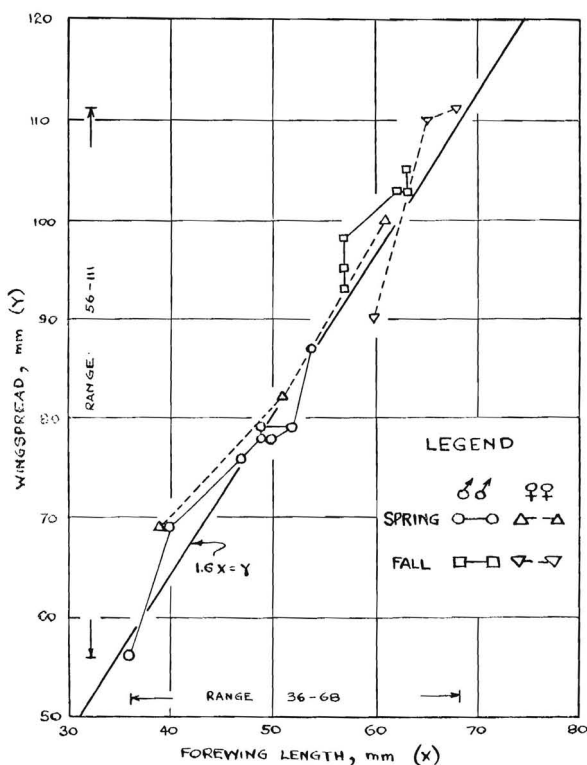$$\text{Forewing length} = 0.5\ (\text{expanse} - 4).$$

Fig. 1. Measurement relations of 20 *P. glaucus* from Mississippi.

The smallest length indicated by the references is 36 mm., the greatest 80 mm. (the greatest indicated in any reference other than Klots is 69 mm.); the extremes of the twenty Mississippi specimens are 36 and 68 mm. It is therefore suggested that the size range of *P. glaucus* in Mississippi is as great as is the size range of the species in the entire United States, except Florida. The CLARKS (1951) report Florida females with forewings up to 76 mm. in length; KLOTS (*in litt.*) refers to a yellow Florida female with a forewing length of 81 mm. as "not the largest I have seen."

It is extremely unlikely that the present series includes the extremes of size that occur in Mississippi, but it is believed also unlikely that specimens

materially smaller than the smallest included here will be found. Further collecting would provide confirmation of these assumptions. A larger, statistically more significant, series would permit calculations of frequency distribution by size, and, together with similar data from other areas, would permit comparisons between populations.

TABLE I. Forewing length, mm. (reported or computed)

Reference	Range	Min.	Max.	Min.-Max. Males	Min.-Max. Females
Macy & Shepard (1941,p.45)	25	36	61	....	....
Holland (1947,p.318)	25	36	61	36-49	42-61
Elrod (1906,p.21)	25	36	61	36-49	42-61
Wild (1939,p.18)	5	38	43	....	....
Saunders (1932,p.224)	6	49	55	....	....
Klots (1951,p.175)	31	49	80	....	....
Clark (1932,pp.184-5)	27	42	69	42-60	50-69
Clarks (1951,pp.135-6,140)	27	42	69	42-60	50-69
Haydon (1933,p.9)	25	36	61	36-52	42-61
20 Mississippi specimens	32	36	68	36-63	39-68

As was noted above, all the references to size except those by the CLARKS are to *expanse*. In none of them is a definition of expanse given. The following definition is given by FIELD (1938): "Expanse: the distance between the apices or other widest point of the wings when fully spread." The term "fully spread", as used in this definition, could have more than one interpretation. KLOTS (*in litt.*) states that the values given in the *Field Guide* (1951) refer to "wing expanse, obtained by adding the width of the thorax to two times the forewing length." This is an entirely clear definition and agrees with that indicated diagramatically for "Flugspanne" by WOHLFAHRT (1952). I fail, however, to see advantages to the use of expanse as the basic measure of butterfly size. The determination of expanse requires measurement and summation of two dimensions. Wingspread, involving measurement from the apex of one wing to that of the other, is not reliable, because it will vary depending on the spreading of the insect. Following length is a single, reliable, easily determined dimension and would seem to be the most useful.

A number of authors state dimensions in the style "3.00 to 4.25 in." It is doubted that the apparently indicated accuracy or precision to the nearest 0.01 in. is intended. If by "3.00" is meant "nearer 3 than 2¾ or 3¼" and if by "4.25" is meant "nearer 4¼ than 4 or 4½"; then it would be more accurate and distinctly preferable to write "3 to 4¼". It is misleading to write "3.00" unless it is intended to imply that the true value is greater than 2.995 and less than 3.005 (Simpson & Roe, 1939: p. 25). It would, of course, be much better to obtain and report such data in millimeters.

A series of as few as twenty specimens may provide the basis for tentative conclusions about certain significant characteristics and relations of the population sampled, provided that the series is considered as a sample and the conclusions are restricted to those justified by the sample. Extreme variants in a sample of any size should neither be ignored as freaks nor regarded as great prizes. They have equal significance with more typical specimens in giving the complete picture of the population of which they are members.

TABLE II. Data on Twenty *P. glaucus* from Mississippi

Sec-tion*	Locality	Sex	Date	Forewing Length, mm.	Wingspread, mm.	Ratio, W/FL
C	Clinton	M	8 Mar 53	36	56	1.55
N	Iuka	M	29 Mar 53	40	69	1.72
C	Clinton	M	8 Mar 53	47	76	1.62
N	Glen	M	29 Mar 53	49	78	1.59
C	Clinton	M	7 Apr 52	49	79	1.61
C	Clinton	M	2 Apr 52	50	78	1.56
C	Clinton	M	15 Mar 53	52	79	1.52
C	Clinton	M	15 Mar 53	54	87	1.61
	Average (spring males)			47.1	75.2	1.60
C	Clinton	M	10 Aug 52	57	93	1.63
C	Clinton	M	25 Jul 52	57	95	1.67
C	Vicksburg	M	10 Jul 51	57	98	1.72
S	Moss Point	M	3 Oct 53	62	103	1.66
C	Clinton	M	27 Sep 52	63	103	1.63
C	Vicksburg	M	17 Aug 51	63	105	1.67
	Average (fall males)			59.8	99.5	1.66
N	Tishomingo	F	28 Mar 53	39	69	1.77
N	Iuka	F	29 Mar 53	51	82	1.61
C	Clinton	F	9 Apr 53	61	100	1.64
	Average (spring females)			50.3	87.3	1.67
C	Clinton	F	24 Aug 52	60	90	1.50
C	Clinton	F	22 Jul 52	65	110	1.69
S	Hattiesburg	F	23 Sep 51	68	111	1.63
	Average (fall females)			64.3	103.7	1.61
	Grand Average (all twenty)			54.0	88.0	1.63
	Range (all twenty)			36-68	56-111	1.50-1.77

*N=North, C=Central, S=South [Moss Point (S) to Glen (N) = 300 miles]

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