FOREWING LENGTH AND FLIGHT PERIOD OF *DANAUS PLEXIPPUS* IN THE GULF STATES

by BRYANT MATHER

In 1945 BEALL and WILLIAMS presented a valuable and statistically well analyzed discussion of geographical variation of forewing length of *Danaus plexippus* Linnæus. BEALL and WILLIAMS give measurements of 1553 specimens from North America; 19 of these came from Florida and 105 from Louisiana. The largest ♂ and ♀ were from Ontario, the smallest from California. The averages and ranges of forewing length reported were:

	North America		Florida		Louisiana	
	♂♂	♀♀	♂♂	♀♀	♂♂	♀♀
Average	...	...	51.4	50.9	50.6	50.2
Maximum	59	57	54	55	56	53
Minimum	43	40	49	47	45	44
Number	848	705	11	8	71	34

The frequency data (Table 1) indicate that the most frequent forewing length was 52 mm in the entire sample of 1553 specimens, in the 848 ♂♂, in the 705 ♀♀, and in the 124 specimens from Florida and Louisiana. No specimens with forewing length less than 40 mm (44 mm in Florida and

TABLE 1. Frequency data [from Tables II and V of BEALL & WILLIAMS (1945)].

FW length mm	*nigrippus* ♂♂	♀♀	Total	%	Louisiana ♂♂	♀♀	Total	%	North America ♂♂	♀♀	Total	%
34	1		1	0.46								
38	1	1	2	0.92								
39		2	2	0.92								
40	1	1	2	0.92						1	1	0.06
41	2		2	0.92								
42		3	3	1.38						1	1	0.07
43	4	2	6	2.75					2	1	3	0.19
44	10	7	17	7.80		1	1	0.95	5	5	10	0.64
45	7	14	21	9.63	4		4	3.81	13	5	18	1.16
46	20	18	38	17.43	3		3	2.86	16	11	27	1.74
47	22	13	35	16.05	2	1	3	2.86	20	10	30	1.93
48	23	13	36	16.51	2	3	5	4.76	30	39	69	4.44
49	14	10	24	11.01	3	4	7	6.67	57	50	107	6.89
50	19	2	21	9.63	13	8	21	20.00	98	84	182	11.72
51	4	1	5	2.29	19	9	27	25.71	128	115	243	15.65
52		2	2	0.92	13	7	20	19.05	160	142	302	19.45
53	1		1	0.46	9	1	10	9.52	150	121	271	17.45
54					3		3	2.86	92	72	164	10.56
55									51	36	87	5.60
56					1		1	0.95	21	10	31	2.00
57									3	2	5	0.32
58									1		1	0.07
59									1		1	0.06
Totals	129	89	218	100	71	34	105	100	848	705	1553	100

Louisiana) nor more than 59 mm (56 mm in Florida and Louisiana) are recorded. BEALL (1946) refers to 105 specimens from Louisiana as representing late fall material, he also refers to Louisiana specimens in a subsequent paper (Beall, 1948). It is presumed that these are the same specimens that are referred to above.

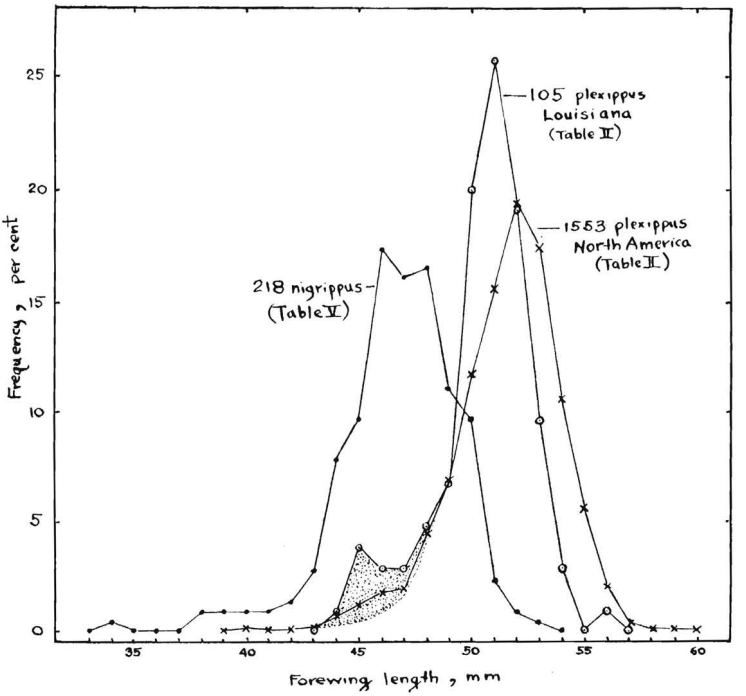
Data on 24 specimens collected by me are given in Table 2. For these 24 specimens as a group and for the 18 from Mississippi, the most frequent forewing length is also 52 mm. The Maryland female with a 38 mm forewing is 2 mm shorter than any among the 1553 examined by BEALL and WILLIAMS. The Mississippi female with a 41 mm forewing is 3 mm shorter than any of the 124 from Florida and Louisiana.

The frequency data in Table 1 are plotted in the figure. For each distribution the most frequent forewing length is nearer the maximum than it is to the minimum, perhaps reflecting the fact that there are more cases in which circumstances intervene to cause a butterfly to fail to reach its normal size than there are cases in which a butterfly is caused to become larger than normal.

TABLE 2. Data on 24 specimens

Forewing length mm	Number of occurrences	Sex	Locality	Date
38	1	♀	Towson, Baltimore Co., Md.	22 Jun 34
41	1	♀	Clinton, Hinds Co., Miss.	3 Jun 51
49	3	♂	Clinton, Hinds Co., Miss.	3 Oct 46
		♂	Clinton, Hinds Co., Miss.	10 Oct 54
		♂	Biloxi, Harrison Co., Miss.	23 Sep 51
50	1	♀	Tuckahoe, Westchester Co., N.Y.	6 Aug 44
51	5	♀	Clinton, Hinds Co., Miss.	13 Oct 51
		♀	Clinton, Hinds Co., Miss.	28 Sep 52
		♀	Clinton, Hinds Co., Miss.	1 Apr 53
		♀	Jackson, Hinds Co., Miss.	23 Oct 54
		♀	Memphis, Shelby Co., Tenn.	24 Oct 54
52	7	♂ ♂	Clinton, Hinds Co., Miss. (2)	29 Sep 51
		♂	Clinton, Hinds Co., Miss.	29 Mar 52
		♂	Clinton, Hinds Co., Miss.	7 Apr 52
		♂	Clinton, Hinds Co., Miss.	8 Jul 52
		♀	Jackson, Hinds Co., Miss.	23 Oct 54
		♀	Gulfport, Harrison Co., Miss.	20 Mar 54
53	2	♂	Clinton, Hinds Co., Miss.	29 Sep 51
		♀	Clinton, Hinds Co., Miss.	6 Oct 51
54	3	♂	Clinton, Hinds Co., Miss.	29 Sep 51
		♂	Hollofield, Baltimore Co., Md.	5 Aug 33
		♀	Coalburg, Kanawha Co., W.Va.	6 Sep 51
57	1	♂	Tuckahoe, Westchester Co., N.Y.	6 Aug 44

The Louisiana sample is taken from a smaller area, is more homogenous, and shows a greater central tendency than the other two. The Louisiana frequency polygon has a second minor peak at 45 mm forewing length, stippled on the figure. The most frequent length for *D. plexippus nigrippus* is 46 mm.



A. H. CLARK (1941), after examining many specimens including 70 from the vicinity of New Orleans, La., taken in Nov. 1937 by PERCY A. VIOSCA, the same collector who provided the specimens examined by BEALL & WILLIAMS, concluded that some of these were *D. plexippus megalippe* Hübner (= *nigrippus* Haensch). CLARK and CLARK (1938,1951) discussed the matter further; they recorded the occurrence of individuals regarded as *megalippe* from Virginia, West Virginia (15 June and 4 July '38), Florida (18 Dec. '36), North Carolina (4 July '38), New York, Illinois, and Cornwall (England), as well as Louisiana; and regard them as "casual visitors . . . brought to this country on . . . steamers . . ." WILLIAMS (1942) suggested the possibility that these might be classed as intermediates rather than true *nigrippus*, noting that such intermediates occur in the West Indies, Panama, and occasionally on the north coast of South America. LAMBREMONT (1954) listed *D. plexippus melanippe* (Hübner) based on CLARK'S work and on one additional specimen in the Tulane collection taken in New Orleans 8 Aug 25. KLOTS (1951) stated: "Our Monarch is *D. p. plexippus* Huebner. The subspecies of Central and northern South America is *D. p. melanippe* Huebner (*nigrippus* Haensch) with shorter (46 mm), broader forewing with white subapical spots. Specimens resembling this occur as far north as New Jersey. We are dealing with a cline, with an enormous blend zone between northern and southern forms. We should refer to all North American specimens as race *plexippus*, no matter what their appearance." FIELD (1950) referred

to *megalippe* as "a subspecies that is not found in North America, except as a rare visitor . . . not known to have migratory habits."

If the individuals taken from time to time in North America that are superficially indistinguishable from the non-North American population, *D. p. melanippe,* are part of that population and have arrived in North America by boat, plane, hurricane, or the like, then they are properly so designated. If they should become established as a resident population and do not interbreed with indigenous *D. p. plexippus,* then *D. p. melanippe* and *D. p. plexippus* are different species. If they interbreed with the local population, it remains *D. p. plexippus.* If these *melanippe*-like individuals are merely variants occurring in the *D. p. plexippus* population that, for some reason, more often turn up in coastal than in inland areas, then all that we have is *D. p. plexippus.* The minor peak at 45 mm on the Louisiana frequency distribution, the 46 mm peak on the *melanippe* frequency, the reference to 46 mm by KLOTS as characteristic of *melanippe,* the 38 and 41 mm individuals from Maryland and Mississippi listed on Table 2, all suggest that in southern and eastern coastal North America something happens to *D. plexippus* that adds an apparently significant and discontinuous batch of typically small individuals to the population. It may be entirely fortuitous that the data of BEALL & WILLIAMS for Louisiana suggest that this batch has a most frequent forewing length within 1 mm of that of *melanippe;* on the other hand it may indicate a *melanippe* content in the local population as suggested by CLARK. Careful studies appear urgently needed to establish the relations of these smaller individuals to the rest of the population. WILLIAMS (1949) stated that all of the over 160 individuals of *D. plexippus* captured or seen in the British Isles in the past 80 years, that have been examined, have been of the North American race. The CLARKS (1951) stated that of 157 individuals seen in England, 62 were captured, and that E. B. FORD wrote that 22 of these have been determined as to subspecies, and that one, caught in Cornwall in 1885, is said to be of the Central American type. FORD (1945) figured a specimen that he took in Cornwall in 1941. The CLARKS (1951) stated that this figure appears to represent the Central American form.

LAMBREMONT (1954) reported that *D. plexippus* has a flight period in Louisiana from mid-March through mid-December with April, October, and November as months of greatest abundance. He reported large southward moving flights in November 1941 and October 1949. Earliest and latest dates are 18 March 1950 and 15 Dec. 1949. These records do not agree with the report by VIOSCA quoted by WILLIAMS (1942): "Although Monarchs are absent in the deep south during the summer months, they arrive along the Gulf coast in numbers during October and November . . . After this migration we do not see any more throughout the winter." WILLIAMS (1942) stated that there is definite evidence in Florida of a period of summer absence — the last butterflies appear to leave Florida in the spring when the mean temperature rises above 75°F., and they begin to return at about the same temperature level. He remarked that there is some evidence that

the butterflies are absent from Louisiana both in summer and winter. He concluded: "The most important points now to be settled are to find how far north the zone of complete absence extends in the summer; how far north winter hibernation can occur; and hence what is the extent of the area (which seems to exist in Louisiana) in which the butterflies appear only in spring and autumn."

My observations in Mississippi since 1946 have indicated the earliest date of arrival: 8 March 1952, latest date seen: 25 Nov. 1953. The earliest date in the past eight years has not been later than 27 March. Adults have been seen in every five-day period from 5-10 March through 20-25 November except 20-25 June in one or more of the last eight years. Freshly emerged adults were noted on 3 June 1949 and 26 May 1951; larvæ were seen on 29 June 1947; a mating pair was seen on 2 April 1952. Large congregations were seen between 25 September and 6 October 1951 (mostly males) and between 1 and 7 October 1954 (moving south).

My observations and those of LAMBREMONT seem to indicate that the zone of summer absence does not include Louisiana and Mississippi, and that winter hibernation has not been recorded in those states. A mean temperature of about 75°F. or higher is likely to exist in Mississippi from May through September; *D. plexippus* is less frequent during those months than in April and October. The beginning and end of the annual flight in central Mississippi coincides closely with the average dates of the first and last killing frosts: 19 March and 8 November; the mean temperature in March is 55° to 60°F. and in November 50° to 55°F.

SUMMARY

Data on 18 specimens of *D. plexippus* from Mississppi indicate that the most frequent forewing length is 52 mm. One with a forewing length of 41 mm, smaller than previously reported from the South, and one from Maryland with a forewing length of 38 mm, smaller than previously reported from North America, are noted. Data from BEALL & WILLIAMS (1945) are reviewed, and their relation to the possible occurrence of *D. p. melanippe* in North America is discussed. The flight period of *D. plexippus* in Louisiana and Mississippi does not include an interval of complete absence in the summer. Winter absence in central Mississippi coincides with the period between the first and last killing frosts; there is summer reduction in abundance with average temperatures higher than 75°F.

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THE WHEELER EXPEDITIONS TO THE SOUTHWESTERN UNITED STATES, 1869 - 1876

by F. MARTIN BROWN

The various expeditions lead by Lieut. WILLIAM MONTAGUE WHEELER, Corps of Engineers, U. S. A., sent to explore and map the territory west of the 100th meridian were the source of much new material in all fields of natural history. They are of particular interest to students of butterflies since many specimens brought back were made the types of species described by WILLIAM H. EDWARDS. Detailed information about where these specimens were collected often is lacking in the original descriptions and on the types themselves. Thus it is important that the routes travelled and the time table of the travels be established with as great accuracy as possible for the use of specialists in need of this information. Off and on during the past twenty years I have spent many hours and days studying all aspects of the expeditions and following their routes through the west. Dr. CHARLES L. REMINGTON has asked me to prepare this information for publication and thus make it available to those who need it.

This is a short outline of the work done by the various field parties. Each of the parties for which I have been able to gather sufficient information will be treated in detail with the necessary maps to show the routes followed in succeeding papers.