

NEW POPULATIONS OF THE JAMAICAN GIANT SWALLOWTAIL, *PAPILIO (PTEROURUS) HOMERUS* (LEPIDOPTERA: PAPILIONIDAE)

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Abstract – New localities were recorded for the endangered swallowtail butterfly, *Papilio (Pterourus) homerus* (Papilionidae) in western Jamaica. This has important implications for the survival of the species.

Key words: Endangered species, Cockpit Country.

INTRODUCTION

Jamaica's Giant Swallowtail Butterfly, *Papilio (Pterourus) homerus* (F.) (formerly *Papilio homerus*, Tyler *et al.*, 1994) (Papilionidae) is endemic to the island and is the largest of the true swallowtails in the Americas (Smith *et al.* 1994, Tyler *et al.*, 1994). Of the 573 recognized species of Papilionidae, it is listed as one of the four endangered swallowtail species in the IUCN Red Data Book, "Threatened Swallowtail Butterflies of the World" (Collin and Morris, 1985), and consequently is protected under Appendix I of Convention for International Trade in Endangered Species (CITIES) and the Jamaican Wild Life Protection Act.

Historically, this butterfly ranged in at least 7 of Jamaica's fourteen parishes across the island, and there is evidence of 3 population centers, the Cockpit Country in the west, Mount Diablo in the center of the island and the junction of the Blue Mountain and John Crow Mountain ranges in the East; today only the western and eastern populations remain (Brown and Heineman, 1972; Emmel and Garraway, 1990; Turner, 1991; Garraway *et al.*, 1993). The eastern population has been under tremendous pressure due to habitat modification, the central population seems to have completely disappeared, while the remoteness and difficult terrain of the Cockpit Country makes the western population less vulnerable.

Most studies in recent times have concentrated on the eastern population, with minimal work in the west (Emmel and Garraway, 1990; Turner, 1991; Garraway *et al.*, 1993). Consequently, very little is known about the ecology of the western population.

The three population sites are distinct in structure. In the east, the population is centered around Corn Puss Gap and Cuna Cuna Pass, 610-750 m in altitude, extending southwards towards Bath and northwards into the Rio Grande Valley. There are numerous streams in deep ravines. The area is a mixture of primary and secondary montane forest, with shifting agriculture in the lower areas (Asprey and Robins, 1953; Kelly, 1983). *Hernandia catalpaefolia* Britton and Harris, the larval food plant in the east, is abundant.

The central population occupied an upland plateau 600-1000 m in altitude. The forest here is well developed with canopy up to 30 m. The area has been subjected to extensive development during the last six decades. Neither of the native Jamaican *Hernandia* spp. has been recorded from this area. *Hernandia senora* L., an introduced species from Mexico, was suggested as the larval food plant.

The Cockpit Country contains over 500 km² of rugged terrain. It is characteristic karst topography and consists of a jumble of steep, rocky cone-like hills all of similar height, separated by deep depressions, often obconic, 70 to 200 m deep, termed "cockpits" because they resemble cock-fight pits. The region as a whole ranges

between 300 to 750 m in altitude. The hillsides and tops support little or no soil while the cockpits generally contain rich soil. These cockpits sustain well developed very humid forests; the canopy is generally about 30 m, but emergent trees get up to 50 m. The vegetation is very diverse, with over 100 species of endemic to the area (Proctor, 1983). The larval food plant of *P. homerus*, *Hernandia jamaicensis* Britton and Harris, is relatively common throughout the area.

RESULTS AND DISCUSSION

The history of sightings of *P. homerus* in western Jamaica is documented in Table 1. The data were generally collected on 1-day trips into the area and there has never been a long term study of the population. Sightings of *P. homerus* have been restricted to the southern and southeastern portions of the Cockpit Country, a region stretching from Elderslie and Accompong, through Quickstep to Troy and Crown Lands. There had been no sightings of *P. homerus* in the northern region of the Cockpit Country, despite many trips into this area.

In April 1997, while conducting field research for the Jamaican Parrot Project (JPP) in Windsor, Snyder reported seeing *P. homerus*. His report was accepted with much uncertainty, given that JPP personnel had been working in this area since 1995 with no such observation. His report was soon confirmed. Several additional sightings of the Jamaican Giant Swallowtail were recorded at other locations in this northern region of the Cockpit Country thru 1999.

The JPP group also recorded sightings in the traditional areas in the southern and south-eastern Cockpit Country. Field work was carried out 5 days per week (at least 2 persons each day) from March to June each year. While the emphasis was on parrots, the group made special effort to record sightings of adult *P. homerus*.

At Windsor, Snyder recorded one sighting of *P. homerus* on April 2, 12 between April 6-8, and 1 on April 15, 1997. He also recorded one individual on April 14 on the Crown Lands Road, which is one of the previously known sites.

Data were also collected by Davis during 1998-1999; Table 2 represents the efforts of 3 years of study. The figures are of sightings and not absolute counts; there was the possibility of multiple counts of the same adult. April 1997 represented a time of relatively high activity at Windsor (14, including 6 in one day). The next highest numbers were in June 1998, May and June 1999; in each case, 5 adults were sighted in 1 day in the area near Dromily. The numbers were not unusual, compared to those obtained in the eastern population (see Table 4).

Garraway has led the Butterfly Group of the Natural History Society of Jamaica on a number of one day trips into the Windsor/

Dromily area since 1999. The numbers of adults seen are recorded in Table 3. The higher numbers of adults in July 1999 and May 2000 were seen at Dromily. However, the zero sighting in September 2000 was for both Dromily and Windsor. The data indicated that the northern population was still active at the site in 2001; moreover, it was probably active throughout the year.

It is not clear what these new sightings represent. Is it an expansion of geographic range? An increase in population size and a corresponding increase in range? Or a spatial shift of the population? The latter is unlikely, as adults were recorded in the traditional southern areas around the same time.

P. homerus seem to require wet sites with heavy rainfall and humidities close to 100%. Parnell (1984) and Emmel and Garraway (1990) found that the larvae seem unhealthy if grown in conditions which were not near to 100% humidity, and even drink droplets from the surface of leaves. Moreover, the wings of newly emerged adults fail to expand fully if the larvae were grown or the pupae kept in an environment less than near 100% humidity; apparently, lack of enough fluid can result in inadequate expansion of the large wings.

Rainfall in the John Crow and the Blue Mountains (the eastern population center) is very high. The Mountains lie directly across the path of the prevailing northeast trade winds; consequently, the region receives heavy rain throughout the year, with no significant dry season. Recorded annual means are 3780 mm at Ecclesdown on the eastern slopes, 7000 mm at Corn Puss Gap and 6300 mm at Millbank in the Rio Grande Valley on the western side of the mountain.

The annual rainfall in the northern region of the Cockpit Country is high (1500 mm), although lower than that in southern Cockpit Country (2000-2500 mm). Rainfall is quite seasonal, with a distinct dry season in January to March/April, the heaviest rains being in May and June and again in August to November. Rainfall is mainly convectional, the convection currents being strongest in the hot months with heavy downpours in the afternoons. In the cooler months, convection currents are the weakest and the air is less humid, so showers are fewer, lighter and shorter. This extensive dry season might be the critical factor limiting *P. homerus* populations in the Cockpit Country.

Research on the eastern population has shown that great spatial and temporal shifts in the numbers of *P. homerus* is not unusual, and consequently only consistent long term research can reveal the true geographic range. Table 4 shows adult sightings for the eastern population at Fishbrook, Rio Grande Valley, for the years 1991 and 1993. Data were collected 4 days per week (minimum 2 persons) during this time. There were major changes in numbers from month to month and year to year. Occasional one-day field trips in 1993 could have easily resulted in no sightings for that year; however, in 1991 the probability of sightings was significantly higher. One possibility therefore is that the continued presence of the JPP group in the northern Cockpit Country for 3 years might have revealed a distribution which the occasional one-day trips by previous workers missed. The new records might therefore be reflecting the effort of the researchers.

The other possibility is that these observations also represent an expansion into a part of the butterfly's normal range which has become recently favorable. This is supported by the fact that 1-day trips by Garraway during 1999-2001 (Table 3) did produce some sightings while such trips over the preceding decades never did. The region around Windsor had been heavily used by scientists and naturalist for decades (Avinoff and Shoumatoff, 1940; Lewis, 1949;

Brown and Heineman, 1972; Turner, 1991; Garraway 1984-1990, unpub., Garraway and Bailey 1990-1995, unpub.). Moreover, Rudolf Diesel (pers. comm.) worked for 3-4 months per year between 1989 and 1994 in the Windsor area, but never recorded *P. homerus*.

This type of population expansion or spatial shift would be after the model of Andrewartha and Birch (1954), in which changes in physical factors affect the suitability of different portions of the habitat, resulting in expansion or contraction of the population. Garraway and Murphy (unpublished) recorded similar expansion by *Heraclides pelaus* (F.) (Papilionidae) and *Siproeta stelens* L. (Nymphalidae) into the Long Mountains and Mona (St. Andrew) in wet years. These species are generally associated with the wet regions of Jamaica (Brown and Heineman, 1972; Smith *et al.* 1994).

The entire Cockpit Country might thus be regarded as potential habitat. The survival of the population might depend on this expanse of land being available to allow spatial and temporal shift in population distribution as areas become more or less favorable.

A number of other locations across the island seem suitable for *P. homerus*; however, these have never been the subject of any long term study. One such area is Dolphin Head Mountain, Hanover Parish, west of the Cockpit Country. Questions also exist about the former central population habitats.

At Dolphin Head Mountain, there are many deep damp ravines similar to those generally used by *P. homerus*. Here, *Hernandia* is common, but an examination of the leaves in 1995 did not reveal the characteristic larval damage (leaves of *Hernandia* damaged by *P. homerus* larvae may remain for over three years on a tree and hence make a reliable record of population activity). Rainfall is high (2500 mm annually), but highly variable with significant dry periods. Again, this dry season might be the limiting factor for *P. homerus*.

There has been some doubt if the records from Mount Diablo were of a true population center or of just a transient group. The central population was recorded by Swainson (1901); Kaye (1926) mentioned its occurrence but it is not clear if it was actually seen by him. Avinoff and Shoumatoff (1940) worked extensively in this area but never found the species. No sighting has been recorded in recent times, but it should be borne in mind that the area has been extensively developed for agriculture over the last century. The rainfall here is lower than that in the Cockpit Country (1200 mm), with an intense dry season in January to March/April and again in July. As stated earlier, extremes of rainfall are not suitable for sustaining a *P. homerus* population.

There is clearly a need for an extensive study of the western population, as the Cockpit Country presents a relatively large expanse of suitable habitat and so might be of utmost importance for survival of this magnificent butterfly.

ACKNOWLEDGMENTS

We are extremely grateful to the members of the Jamaica Parrot Project who carefully document sighting of *P. homerus*. These JPP staff are: Tyrone James, Albert Junior, Susan Koenig, Danville Holmes, Elma Kay, Arthur Salmon, Simone Bryce and Mark Wilson. Thanks also to the members of the Butterfly group of the Natural History Society of Jamaica, Catherine Murphy and Carol Miller, who accompanied Garraway on his trips to the area. Thanks also to Rudolf Diesel of Universität Bielefeld, Germany, who shared his information with us. Thomas C. Emmel (University of Florida) read the manuscript and provided extensive editorial comments that improved the final paper.

TABLE 1. Number of *P. homerus* adults sighted/netted* in western Jamaica, 1901-1986. (u = unknown. CMHN = Specimens in the collection of the Carnegie Museum of Natural History).

Month	Year	Site	Nos.	Reference
u	1901	Moneague	u	Brown & Hein. 1972
u	1925	Mount Diablo	u	Kaye 1926
u	1926	Unknown	common	Kaye 1926
u	1928	Balaclava	1	Brown & Hein. 1972
u	1937	Mount Diablo	0	Avinoff & Shou.1940
u	1937	Cockpit Country	present	Avinoff & Shou.1940
u	1937	Spring nr. Belmore Castle	u	Avinoff & Shou. 1940
u	1937	Acompong	u	Avinoff & Shou. 1940
u	u	Payne Patent	u	Brown & Hein. 1972
June	1937	Paine nr. Quickstep	u	Avinoff & Shou. 1940
June 11	1937	Pen, Cockpit Country	1*	CMNH
June 17	1937	Pen, Cockpit Country	1*	CMNH
June 18	1937	Pen, Cockpit Country	1*	CMNH
April 21	1940	Wilson's Run nr. Troy	1*	CMNH
Aug.	1949	Cockpit Country	20	Lewis 1949
June	1951	Wilson's Run nr. Troy	u	Brown & Hein.1972
Oct.	1971	Cockpit Country	1	Turner 1991
Aug.	1986	Elderslie	>5	Emmel & Garraway 1990

TABLE 2. Number of adult *P. homerus* sighted in the Cockpit Country by the Jamaica Parrot Group (1997-1999). New locality: northern region encompassing Dromily and Windsor; Traditional locality: southern and south-eastern region encompassing Acompong, Elderslie, Quick Step to Warsop.

Month	No. adults sighted at new locations			No. adults sighted at traditional Locations		
	1997	1998	1999	1997	1998	1999
March	0	0	0	0	0	1
April	14	1	0	1	1	1
May	0	0	5	0	0	2
June	0	6	8	0	3	3
Total	14	7	13	1	4	7

TABLE 3. Numbers of *P. homerus* adults sighted by Garraway in the Northern Cockpit Country, 1999-2001.

	July 1999	Sept. 1999	Oct. 1999	Sept. 2000	May 2001
No. of sightings	6	1	0	0	3

TABLE 4. Numbers of *P. homerus* adults sighted or netted by Garraway and Bailey at Fishbrook, 1991-1993.

Months	No. adults sighted/netted		No. adults sighted/netted	
	1991	1993	1991	1993
January	6	0	July	23
February	0	0	August	14
March	14	0	September	5
April	55	0	October	0
May	13	0	November	0
June	16	0	December	1
Total	1991 -147; 1993 - 8			

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