ESPECIALLY FOR FIELD COLLECTORS

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THE RECENT REDISCOVERY OF *EUMÆUS ATALA* (LYCÆNIDÆ) IN SOUTHERN FLORIDA

by GEORGE W. RAWSON

Rare or supposedly extinct species of butterflies are always of particular interest to lepidopterists. Consequently, the recent discovery in Florida of a small colony of one of our unique tropical species, namely, *Eumæus atala florida* Röber, should be regarded as a special event. As YOUNG (1956) stated: "Records of its reoccurrence would be worth a published note."

Up to the time of the late twenties *atala* was regarded as quite common in the Miami area and in some of the Lower Florida Keys. In fact W. J. HOLLAND (1931: p.223) denotes the species as "swarming". Within recent years *atala* has become so rare that it is generally supposed to be extinct. KLOTS wrote (1951: pp.132-133): "the last records I know are of specimens taken about 1933 in an inland hammock near the Royal Palm State Park". More will be said about this particular area later.

Numerous causes have been attributed to the decline of *atala,* but one of the principal reasons, according to this writer's observations, seems to be the increasing scarcity of the specific food plant, that is the low-growing fern-like cycad, *Zamia* spp., commonly called "Coontie" by Floridians. According to SMALL's *Manual* (1933: pp.1-2), "The Zamias were known to the early Seminoles as Conti Hateka, which means white-root or white bread plant". Four species of this genus are listed by SMALL as occurring in the southern counties and in the Everglades of Florida. *Zamia integrifolia* seems to be the species most commonly referred to in the literature as the specific food plant for *atala* larvæ. The starchy underground stems constituted one of the principal sources of flour for the Florida aborigines and, later, the Seminoles. SMALL also stated, "The phenominal growth on the Everglade Keys now furnishes 'Florida arrowroot' to the white man".

Material changes must have occurred, because, during my five years residency in Florida, I have paid particular attention (during field trips, etc.) to the distribution of wild Coontie plants but have yet to find a native stand either in southern Florida or the Keys abundant enough to support more than a small and precarious colony of *atala.* Apparently clearing rural areas for human habitation, real estate developments, cattle ranches, etc. have diminished or destroyed the native stands of Coontie in all but private gardens, public parks, etc., where it is used for decorative purposes or as "an indigenous botanical novelty".

Within the last three or four years there have been "guarded reports" of small colonies of *atala* in wild or secluded places in southeastern Florida; but the first authentic record was obtained on 28 February 1959, by Mr. JACK DEMPWOLF's father, of Westfield, N. J., who secured a few specimens from a small colony while on a vacation trip. This locality has been kept a secret for what might be termed "Security Reasons".

The first information I received about the discovery of *atala* was from one of my former field companions, DONALD EFF of Boulder, Colorado. He, in addition to advising me of the discovery of *atala*, asked if I knew of anyone, preferably a lepidopterist living in southern Florida, who would be willing to visit the colony and capture a few female specimens. These would be used as foundation stock for the purpose of establishing an artificial or man-created colony of *atala* in a chosen area where the species would have a better chance of survival than in the place where Mr. DEMPWOLF made his interesting capture. Not knowing any person who was in a position to undertake a project of this kind and, knowing the matter to be urgent, I volunteered to carry out the suggestions mentioned by Mr. EFF in his letter to me.

Apparently DONALD EFF informed JACK DEMPWOLF of my offer to help because I received a letter from the latter appreciating my proffered cooperation and including special directions for finding the *atala* colony. JACK DEMPWOLF and his friends, knowing that the *atala* colony discovered by his father was in a precarious position due to the rapidly increasing demand for more and more land for development, decided that an attempt should be made to transfer a few captured females from the present colony to a more suitable location, where the species would have a better chance to prosper.

After my offer to assist in the establishment of the artificial colony of *atala*, I was fortunate in making arrangements with Dr. WILLIAM B. ROBERTSON, Park Biologist at the Everglades National Park, who promised to have a suitable spot located in the Park where captive females would be liberated. Curiously enough the area chosen was either near to, or perhaps the same place, where *atala* was last seen in 1933 (or 1935; see Young, 1956: p.209), namely the Royal Palm State Park (which is now part of the new Everglades National Park) east of Flamingo, Florida.

During the latter part of August 1960, while I visited the Everglades National Park, Mr. ERIC CHRISTENSEN, Park Naturalist, kindly showed me the spot chosen for the prospective *atala* colony. It consisted of a hardwood hammock not far from the National Park Service Headquarters, so situated that it would be under the protection and supervision of the Park officials and rangers.

The first attempt to capture female *atala* for breeding stock was made on 18 July 1960, in company with the late WILLIAM M. DAVIDSON, a retired government entomologist of Orlando, Florida. We visited the DEMPWOLF colony, arriving at our destination about mid-day. Very few *atala* were seen on this occasion, probably due to the fact that we were unfamiliar with the habitat. In the course of about one hour we captured twelve specimens from which four females were selected, the remainder being liberated for reasons of conservation.

The four captive females were taken to New Smyrna Beach, where I am living, and placed in a breeding cage with a supply of fresh *Zamia* fronds. Three days later (*i.e.*, July 21st) two of the females commenced to oviposit. One laid a batch of 43 ova, a second only 7. The larvæ were thrifty and the mortality rate quite low (*i.e.*, 6.2 percent). Thirty-one days after the females were confined in a breeding cage 31 pupæ had been successfully raised.

The pupæ were carefully packed and sent by mail to the Everglades National Park to Mr. CHRISTENSEN, who (because of Dr. ROBERTSON's absence at the time) promised to watch the pupæ carefully and liberate the imagoes in the spot selected near the Royal Palm Park. Mr. CHRISTENSEN reported that the imagoes emerged soon after they had been received and that they had been liberated in the chosen spot.

Unfortunately this, our first attempt, was doomed to be a failure. On the night of 11 September 1960, the tropical hurricane called "Donna" swept through the Everglades with such violence that serious damage was done to the hammock vegetation. Months after this no evidence could be found that *atala* had survived, either because of the storm or other adverse conditions.

Late in February 1961, a second visit was made to the DEMPWOLF colony. Only two specimens were seen and none taken. On 26 May 1961, a third visit was made to the spot. This time I was glad to find that the previous year's Hurricane "Donna" had not, apparently, caused any appreciable damage to either the hammock habitat or to the *atala* colony. Only two specimens were seen and none taken. On 26 May 1961, females were selected from numerous catches, all the rest being freed.

On 17 June 1961, 31 days after the thirteen female *atala* were confined to their cage, a total of 44 live pupæ had been successfully raised. These, as before, were mailed to Mr. CHRISTENSEN for liberation near the Royal Palm Park soon after the imagoes emerged from pupæ and could fly.

During the first attempt Mr. CHRISTENSEN had a special outdoor cage constructed to house the pupæ so that the emergence of imagoes could be carefully watched to see if copulation took place. However, as mating did not occur in captivity, the second lot of imagoes were taken to the Royal Palm Park area and liberated as before. Months after their liberation no evidence could be found that a colony of *atala* had been established. This time weather conditions (aside from a very dry spring and early summer) were favorable, and there were no tropical hurricanes to disrupt the programme.

While the explanation of our failure is hypothetical, it is quite evident that further attempts should not be undertaken without careful planning. In particular, potential habitats should first be thoroughly investigated to determine whether ecological conditions are suitable and that the location is safe from human interference or exploitation, or other detrimental factors. Furthermore, it is evident that a project of this kind is not likely to succeed by "remote control" or without careful planning, cooperative support, and organization.

The accomplishments of our European colleagues in saving some of their rarer Lepidoptera can be cited. For instance, the classical example of the successful artificial introduction into England of the Dutch subspecies of the English Large Copper Butterfly *Lycæna dispar* (which had become totally extinct in the Fen District in 1847 or 1848) stands out as a remarkable example of determined enthusiasm on the part of British lepidopterists and naturalists (see account in Ford, 1946).

During this work it was possible to study the early stages of *atala*. Because of this, notes were taken and drawings and photographs made of different stages of development. While the early stages and life history of *Eumæus atala* have already been described and published by Scudder (1875) and Schwarz (1888), and Dethier (1941), the first two publications are now out of print and all may be difficult to refer to. For this reason I hope the following new account of the early stages of *atala* will be of interest to those who find it difficult to refer to the earlier writers, or who are not in contact with well-stocked libraries.

The Early Stages of *Eumæus atala*

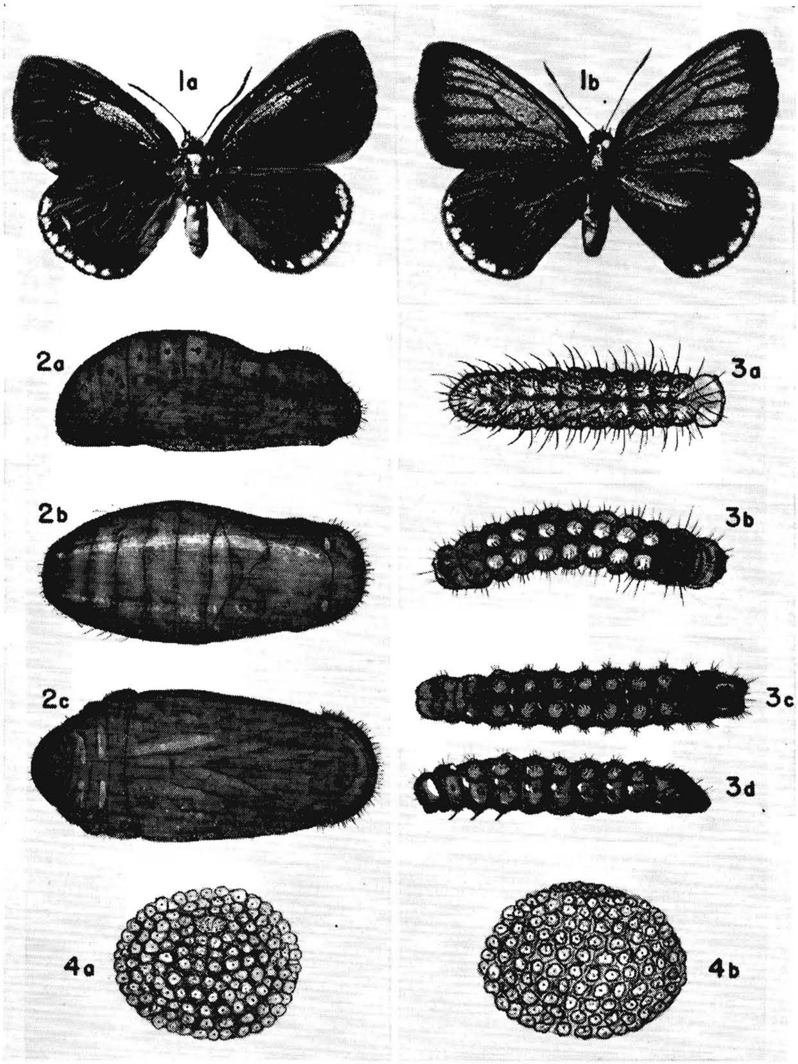
OVUM: *Eumæus atala* oviposits in clusters, generally on the upper side of *Zamia* leaflets, usually near the tip and occasionally on the stem of a frond. In color the ovum is light gray and pitted with crater-like depressions becoming gradually smaller and more compact from the base upwards toward the micropyle. The average diameter is 1.5—2 mm. The morphology is similar to an inverted bole (see figs. 4a, 4b for sketches of ovum). Ova commence to hatch 4 to 5 days after oviposition, and the young larvæ consume the micropyle together with about one-half of the egg shell. The ova are cemented or attached to their support so firmly that heavy showers, etc., do not dislodge them.

LARVA: Newly hatched larvæ are 2.5 mm. (plus or minus) in length. The body is yellowish brown during the first or second instar (figs. 3a, 3b). As the larvæ become more mature (figs. 3c, 3d), the body becomes reddish brown and finally a brilliant brick-red with two parallel rows of seven bright yellow spots which, when nearing full development, are so large that they almost cover the entire dorsal surface. The legs are black and the mandible olive brown. As in the case of other lycænid larvæ, a hood or cowl on the first thoracic segment over-hangs the head, which is usually not seen from above unless the larva is eating. The larvæ are gregarious and remain so through to pupation. Very young larvæ first consume the external cellular layer of tissue on the upper side of *Zamia* leaflets, commencing near the tip. This produces a moth-eaten appearance to the place where the leaflet has been consumed. When more mature, larvæ consume the entire leaflet. The larval stage requires about 18 days. Just before pupation the larvæ stop feeding, hunch up, and remain stationary. The number of instars was not determined.

PUPA: The shape of *atala* pupæ is similar to the general lycænid type, as may be seen by referring to the drawings (figs. 2a-c). The pupal length is 1.5 cm. (plus or minus). The color is light reddish brown, and the integument is thin enough to reveal the yellow spots on the back of the encased pupa. When nearing the time for the emergence of the imago, the pupa changes color to a dark brown and then becomes opaque. The outlines of wings, antennæ, legs, etc., are plainly discernible on the surface of the pupa.

Pupation takes place on *Zamia* leaflets and also on the stem of the frond. The pupa is very loosely attached by means of a silken girdle passing around the mid-section of the body; both ends of the girdle are attached to the *Zamia* leaflet or other support. There is no caudal attachment. In fact, the pupa turns and twists in such a way that it appears to be coming loose from its moorings. The pupal stage, depending on temperature, etc., lasts for approximately 10 days. Imagoes emerge, generally, during the early morning hours and are fully capable of flight very soon after emerging.

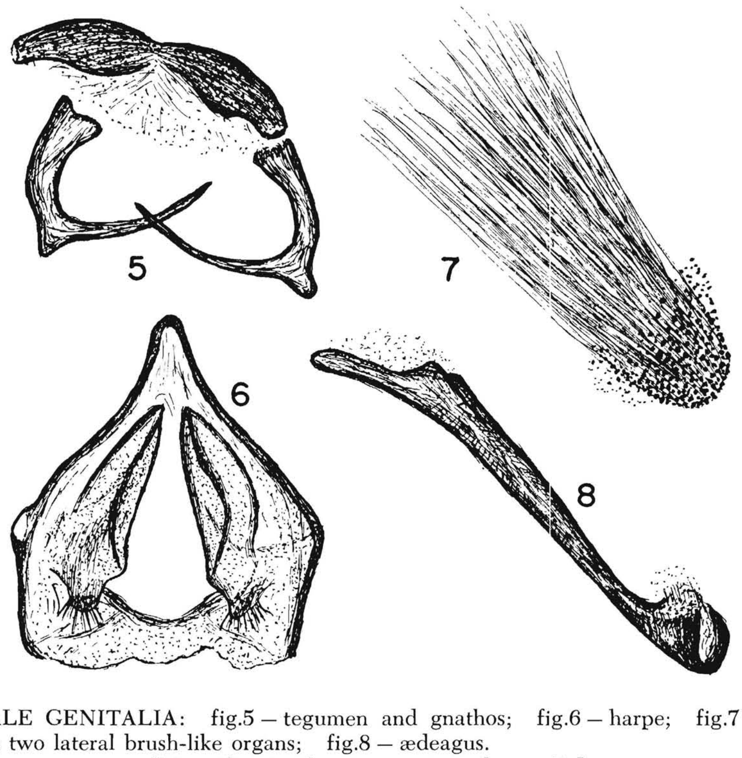
IMAGO: So little was seen of *atala* in a wild state that I have not much to add to what has already been stated by other writers. The remark made by KLOTS in his indispensible *Field Guide* (1951) about its flight is indeed amusingly accurate, namely "*Atala* has a deceptively slow and lazy-looking flight". It can, however, gather considerable speed if one misses his stroke with the net! After this, the insect rises and rapidly disappears over the top of trees and bushes at an accelerated



ADULT: fig. la — ♀, upperside; fig. lb — ♂, upperside.
PUPA: fig. 2a — lateral view; fig. 2b — dorsal view; fig. 2c — ventral view.
LARVA: fig. 3a — first instar, dorsal view; fig. 3b — second instar, dorsal view; fig. 3c — last instar, dorsal view; fig. 3b — same, lateral view.
OVUM: fig. 4a — subdorsal view; fig. 4b — lateral view.

[Figs. la, lb photographs; others drawn by author.]

speed. The number of broods per year appears to be unknown. We know, however, that broods occur during the latter part of February, the latter part of March, and again toward the end of July. When raised in confinement, about 33 days are required between oviposition and pupation. Ten or more additional days are required for the emergence of imagoes, thus making the span from egg to imago a matter of about 42 days. Captured specimens placed in the breeding cage died within a period of a week or less, so that the duration of life on the wing may be quite brief. Under subtropical conditions, it is very difficult to determine the number of broods per year, because there is much over-lapping in a number of species, some of which (even in central Florida) are on the wing from January to December.



MALE GENITALIA: fig.5 — tegumen and gnathos; fig.6 — harpe; fig.7 — one of the two lateral brush-like organs; fig.8 — ædeagus.
[Magnification here approximately × 43.]

E. atala is sexually dimorphic, the males being quite easy to differentiate from the less brilliantly colored females. This fact is quite important in selecting females for breeding and for liberating unwanted males (if one is fortunate enough to have this opportunity). The genitalic construction of male *atala* (figs. 5-8) is quite interesting; there is a brush-like organ on each side of the genitalia which apparently functions as a scent organ (see Ehrlich & Ehrlich, 1961: p.188).

In conclusion, my thanks and appreciation for the cooperation and encouragement in this unfortunately unsuccessful venture go to my late friend and field companion William Davidson. Also to Donald Eff, Jack Dempwolf, Dr. Alexander B. Klots, and Dr. Charles L. Remington of Yale University, all of whom encouraged me in tackling this project. I also wish to thank Dr. William Robertson and Mr. Eric Christensen, members of the Staff of the Everglades National Park for their cooperation in locating a place in the Park and for their appreciated assistance. I am sure that we are all very disappointed that our efforts were apparently not successful, but it can be truthfully said that failure certainly was not due to lack of cooperation or to a keen desire to accomplish our objective.

Because the present status of *atala* in Florida is in a precarious condition due to man's so-called "conquest of Nature", it is urgent that further measures should be immediately undertaken to save this interesting and unique butterfly from what appears to be inevitable extinction, while we still have material available for foundation stock. Lepidopterists must unite towards further attempts to conserve and protect this species while there is yet time.

I therefore hope that this paper will create sufficient interest so that we can, either individually or collectively, organize or formulate plans for further action.

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