NOTES ON THE LIFE HISTORY OF ANETIA JAEGERI FROM HISPANIOLA (LEPIDOPTERA: NYMPHALIDAE: DANAINAE)

ANDREI SOURAKOV1 AND THOMAS C. EMMEL2

1Dept. of Entomology and Nematology, University of Florida, Gainesville, Florida 32611; and
2Dept. of Zoology, University of Florida, Gainesville, Florida 32611, USA

ABSTRACT.—Early stages of the endemic Hispaniolan danaid butterfly Anetia jaegeri (Ménétriès) (Lepidoptera: Nymphalidae), are described, and Asclepias nivea L. (Asclepiadaceae) is reported as being its food plant. Morphology of the last instar larva is examined for systematic implications, utilizing characters previously developed by Kitching (1985) for other danaines. Anetia jaegeri is found to be the most primitive of the 16 analyzed species of Danainae.

KEY WORDS: Asclepiadaceae, biology, Caribbean, cladistic analysis, Danaus, Dominican Republic, immature stages, Ithomiinae, larvae, life history, Lycorea, Methona, Neotropical, pupae, West Indies.

There are eight species of Danainae known from the island of Hispaniola: Danaus plexippus megalippe (Hübner), D. giglipus cleothea (Godart), D. eresimus tetys (Forbes), D. cleophile (Godart), Lycorea cleobaea cleobaea (Godart), Anetia briarea briarea (Godart), A. pantherata pantherata (Martyn), and A. jaegeri (Ménétriès) (Schwartz, 1988). This is the highest diversity for this subfamily in the New World (8 of 14 species). Part of this diversity could result from the high diversity of potential hostplants on this island: 31 endemic species in 9 genera of Asclepiadaceae (Brower et al., 1992).

Until very recently, information on the biology of the genus Anetia was absent. Ackery and Vane-Wright (1984) wrote:

"Virtually no reliable data have been published on any aspect of their biology, and a thorough investigation of these butterflies would be of considerable scientific value. . . . Anetia is the only genus within Danainae for which reliable early stage information is lacking. Food-plant data and larval tubercle configuration would be valuable — the latter particularly in view of Forbes' 1939 assertion that Anetia should be treated as the sister of all other Danainae on the basis of supposed (but we think unlikely) total lack of larval tubercles."

Brower et al. (1992) illustrated the life history of Anetia briarea, whose larvae were raised on a substitute hostplant of Florida milkweed vine, Cynanchum angustifolium (Asclepiadaceae), from eggs obtained in captivity. On Hispaniola, the natural hostplant for this species is Cynanchum sp. (Sourakov, unpubished). In 1993, the life history of Anetia thirza thirza (Geyer) from Mexico was described, and its food plant was reported as being a vine: Metastelma pedunculare (Asclepiadaceae) (Llorente-Bosquets et al., 1993). That confirmed earlier observations on A. thirza insignis (Salvin) in Costa Rica (DeVries, 1987). John E. Rawlins (pers. com.) raised A. jaegeri on Asclepias (Asclepiadaceae) and David K. Wetherbee (pers. com.) observed females ovipositing on the vine Cynanchum. In the present work, the first published native hostplant record for Anetia jaegeri is provided. We also compare its immature stages to those of A. briarea. The larva and pupa of A. thirza seem to be very similar to those of A. jaegeri, which, probably, reflects their taxonomic closeness.

Detailed study of the morphology of the immature stages of other Danainae previously had proved to be useful for reconstruction of the evolutionary history of this subfamily. Kitching (1985) recreated the evolutionary history of Danainae primarily on the basis of the larval morphology. His data set for the subfamily's larvae with the addition of the same characters from Anetia jaegeri was analyzed using the PAUP computer program. In Table 1, the complete data set for 77 larval characters utilized by Kitching is provided. We were able to score 62 of them in Anetia jaegeri. Missing characters are marked as "?". Our data are incomplete due to the lack of material: a single head capsule left after pupation of our sole larva was used to obtain characters for the cladistic analysis. We do not elaborate here on the characters utilized for the cladogram construction: they are discussed thoroughly in Kitching's work. We do, however, provide micrographs of larval organs, illustrating some of the characters utilized (Fig. 3). All characters listed in Table 1 are in the same sequence as Kitching's 77 binary/multistate larval characters, L1-L77.

DESCRIPTION OF LIFE HISTORY

In September 1995, the senior author collected danaine eggs on Asclepias nivea L. (Asclepiadaceae) host plants above Mata Grande, Santiago Province, at the elevation of 1500m in the Cordillera Central of the Dominican Republic, Hispaniola. Most hatched into larvae of Danaus cleophile or Danaus plexippus, with yellow-and-black striping and two pairs of tubercles. One of the eggs hatched into a larva with black-and-white striated dorsum and only one pair of black mesothoracic tubercles; this larva later metamorphosed into a female adult (Fig. 1: bottom left) of Anetia jaegeri.

The larva of A. jaegeri maintains the same pattern throughout the whole development period. In its early instars, it resembles fourth instars of A. briarea, illustrated by Brower et al. (1992). However, A. jaegeri's larva has uniform fine black-and-white
TABLE 1. Kitching's (1985) data set of scored larval characters re-run on PAUP with the additional taxon of Anetia jaegeri. The 77 characters, reading from left to right, correspond to L1-L77 of Kitching. (0,1,2,3,4 = character states as scored by Kitching for species 1-15 and 17, and by Sourakov for species 16; * = not comparable; ? = missing data). Methona themisto (Hübner) (Ithominae) is used as an outgroup.

<table>
<thead>
<tr>
<th>TAXA</th>
<th>CHARACTER</th>
<th>STATES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Danaus chrysippus</td>
<td>20002 01210 21010 12010 10101</td>
<td>00021 10000 11001 00010 00100 21010 00100 00012 10010 11100 00</td>
</tr>
<tr>
<td>Danaus plexippus</td>
<td>31002 02120 21010 12010 10101</td>
<td>10021 10000 11001 00010 00100 21010 00100 00012 10010 11100 00</td>
</tr>
<tr>
<td>Danaus plexippus</td>
<td>22002 02210 21010 12010 10101</td>
<td>10021 10000 11001 00010 00100 21010 00100 00012 10010 11100 00</td>
</tr>
<tr>
<td>Danaus plexippus</td>
<td>32002 02210 21010 12010 10101</td>
<td>10021 10000 11001 00010 00100 21010 00100 00012 10010 11100 00</td>
</tr>
<tr>
<td>Danaus plexippus</td>
<td>32002 02210 21010 12010 10101</td>
<td>10021 10000 11001 00010 00100 21010 00100 00012 10010 11100 00</td>
</tr>
<tr>
<td>Danaus plexippus</td>
<td>32002 02210 21010 12010 10101</td>
<td>10021 10000 11001 00010 00100 21010 00100 00012 10010 11100 00</td>
</tr>
<tr>
<td>Danaus plexippus</td>
<td>32002 02210 21010 12010 10101</td>
<td>10021 10000 11001 00010 00100 21010 00100 00012 10010 11100 00</td>
</tr>
<tr>
<td>Danaus plexippus</td>
<td>32002 02210 21010 12010 10101</td>
<td>10021 10000 11001 00010 00100 21010 00100 00012 10010 11100 00</td>
</tr>
<tr>
<td>Danaus plexippus</td>
<td>32002 02210 21010 12010 10101</td>
<td>10021 10000 11001 00010 00100 21010 00100 00012 10010 11100 00</td>
</tr>
<tr>
<td>Danaus plexippus</td>
<td>32002 02210 21010 12010 10101</td>
<td>10021 10000 11001 00010 00100 21010 00100 00012 10010 11100 00</td>
</tr>
</tbody>
</table>

Fig. 1. Stages of Anetia jaegeri: Top left: fourth instar larva; Middle left: Close-up of gold spots of the pupal eye-pieces; Bottom left: Female adult; Middle: Last instar larva on the food plant of Asclepias nivae; Top right: pupa, ventral view; Middle right: pupa, lateral view; Bottom right: pupa, dorsal view.

CONCLUSIONS

Brower et al. (1992) found that Asclepias curassavica (which we successfully used as a substitute food plant), as well as three other species of Asclepias, were not accepted by larvae of Anetia briarea. Asclepias curassavica and A. incarnata appeared to be even toxic to first-instar larvae. Larvae of A. briarea were therefore raised on a milkweed vine, Cynanchum angustifolium. These observations, combined with our data, suggest that in nature different species of Anetia are capable of utilizing different milkweed species with different degrees of toxicity. Such adaptation could have led to radiation of the genus on Hispaniola in the first place.

Cladistic analysis of the larval set of characters (Table 1), derived from Kitching (1985) and our present data, leads to the conclusion that Anetia jaegeri is the most primitive among analyzed members of the subfamily (Fig. 2), confirming similar
conclusions reached by Brower et al. (1992). All of the analyzed Danainae taxa are more closely related to each other than to Anetia. Not being specialists in the group, we are not attempting to further discuss Anetia's taxonomic position in Danainae.

ACKNOWLEDGMENTS

We would like to thank Dr. Lincoln P. Brower (University of Florida) for his encouragement to publish these data and his help in obtaining copies of important references. We also thank Coronel Pedro De Jesus Candelier Tejada, Director Nacional de Parques, and Ing. Agron. Jose Matos, Director, Departamento de Vida Silvestre, Republica Dominicana, for providing us with research and collecting permits.

This manuscript is published as Florida Agricultural Experimental Station Journal Series No. R-04986.

REFERENCES

Ackery, P. R., and R. I. Vane-Wright

Brower, L. P., M. A. Ivie, L. S. Fink, J. R. Watts, and R. A. Morantz

DeVries, P. J.

Kitching, I. J.

Llorente-Bosquets, J., C. Pozo-De La Tijera, A. Luis-Martinez