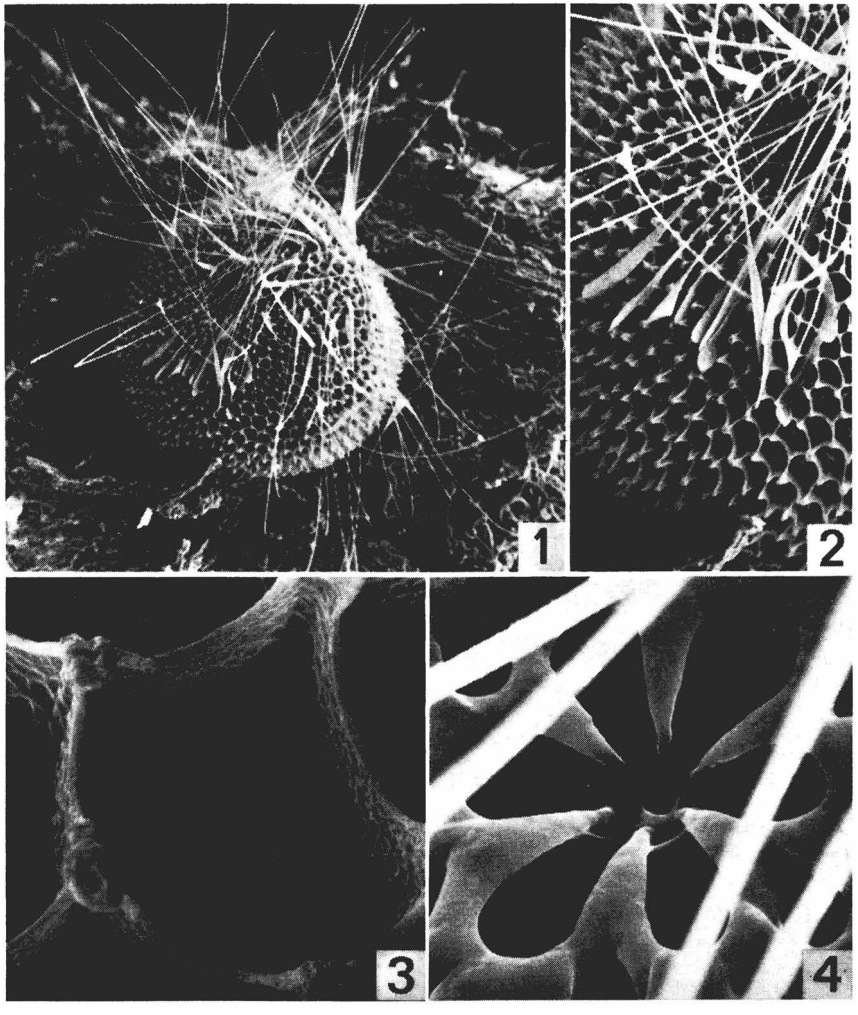
FEMALE ANAL HAIR TUFT IN *NORDMANNIA MYRATLE* (LYCAENIDAE): EGG-CAMOUFLAGING FUNCTION AND TAXONOMIC SIGNIFICANCE

ICHIRO NAKAMURA
41 Sunrise Boulevard, Williamsville, Buffalo, New York 14221

Females of certain Palaearctic eumaeinid butterflies have a cluster of specialized scales, the so-called anal hair tuft, at the tip of their abdomens. The best known example is the South European *Nordmannia acaciae* (Fabricius). The actual function of the structure apparently remains undocumented, even though similar structures in other genera (see below) are known to be used for camouflaging eggs with the scales. The purpose of this short note is to show that the female anal hair tuft of a closely allied species, *Nordmannia myrtale* (Klug), does function as an egg-camouflaging device. The taxonomic significance of the hair tuft will also be discussed briefly, as the genus *Nordmannia* Tutt traditionally includes species with and without the structure in the female (Tutt, 1907; Higgins, 1975). *N. myrtale* is the type species of the genus.

N. myrtale was originally described from "Syria" (today's Lebanon) and its range extends to Turkey (A. Koçak, unpublished) and perhaps to Armenia (*armena* Rebel). The southern distribution limit is Mt. Hermon on the frontier (since 1967) of Lebanon, Syria, and Israel where it occurs above c. 1600 m on the southern slopes. The food plant found at 2000 m is *Cerasus prostrata* (Lab.) Ser. (Rosaceae), a typically Irano-Turanian subalpine dwarf shrub from the plant geographical point of view. In late June 1975, some freshly laid eggs were obtained from the plants. Several shells and dead eggs (some parasitized) remaining from the previous year were also found. As usual in this group, the eggs were located on wrinkled parts of the twigs and at branching points. Some were as close to the ground as a few centimeters; the plant itself is only 20–30 cm high.

Interestingly enough, the fresh pale brown eggs were invariably covered with long scales (Fig. 1), although weathering left only a few damaged scales or none at all on the old shells and dead eggs. The morphology of the scales on the eggs corresponds exactly to those of the female abdominal tip. Such egg-camouflaging is presumably a defense mechanism against parasitic insects and predators, although its effectiveness could be questioned in certain cases (see below). It also seems likely that the female anal hair tuft has other functions as well; in *Nordmannia* the color of the hair tuft is either black or white de-



Figs. 1–4. Egg of *Nordmannia myrtale* (Klug) (Mt. Hermon, 2000 m, 28. vi. 1975; on *Cerasus prostrata*; I. N. leg.): 1, whole egg in situ, magnification 55 × (egg diameter 0.72 mm); 2, the same, part, magnification 123 ×; 3, cell structure, magnification 1320 ×; 4, micropyle, magnification 1320 ×.

pending on the species and therefore it contrasts conspicuously with the rest of the abdomen, suggesting a role in courtship.

Morphologically the egg (Figs. 1–4) resembles those of related species but differs in a number of structural aspects (for SEM photographs of an egg of *spini* Denis & Schiffermüller group, usually included in genus *Strymonidia* Tutt, see Nakamura, 1976). Since the egg provides ex-

tremely useful taxonomic characters, its fine structures are also included in the figures. The number of radiating micropylar cells varies between five and six.

Certain other groups of butterflies are also known to camouflage eggs by an analogous method, usually but not always in association with a grossly visible anal hair tuft. They include the following Palaearctic, Oriental and African genera of Lycaenidae and Hesperiidae: *Japonica* Tutt (Theclinae, Theclini) in which the two Japanese species lacking a conspicuous hair tuft collect dust as well as scales to conceal the eggs, although rather poorly (see e.g., Shirozu & Hara, 1960–62); *Chaetoprocta* de Nicéville (Theclinae, Theclini) in which the female of the sole species of the genus carries a conspicuous hair-tuft and uses it effectively for camouflaging eggs (Wynter-Blyth, 1957); *Daimio* Murray (*sens. str.*) and *Tagiades* Hübner (Pyrginae, *Tagiades* group) in which the eggs of known examples are covered by scales to such an extent that the shell may not be visible at all (see e.g., Shirozu and Hara, 1960–62). The species of the African genus *Pseudaletis* Druce (Theclinae, Aphnaeini) have a female anal hair tuft, but a camouflaging function does not seem to be on record (Stempffer, 1967).

Thus, the degree of perfection in camouflaging eggs differs considerably among genera; the way it is achieved may also vary. According to Wynter-Blyth (1957), the scales stick to the egg automatically as the female *Chaetoprocta odata* (Hewitson) lifts the abdomen from the egg. To my knowledge, the females of *Daimio* and *Tagiades*, as well as *Japonica*, make deliberate efforts to conceal their eggs. I have not witnessed the oviposition behavior of *N. myrtale*, but the orientation and clustering of scales on the egg (Fig. 1) clearly mark several brushing strokes by the female abdomen. It is therefore possible that the egg-camouflaging behavior and the anal hair tuft have evolved partly independently of each other. The sporadic presence of the female anal hair tuft in widely separated genera indicates that it is a case of convergence as previously suggested (Eliot, 1973). Yet, it is of interest to note that the two Theclini genera mentioned above have been considered to be rather primitive on structural grounds (Shirozu & Yamamoto, 1956).

Regardless of its evolutionary significance, the hair tuft as a taxonomic character seems to be constant within each of the genera and calls for a re-examination of the current view of the genus *Nordmannia*. The genus as originally introduced (Tutt, 1907) and as currently in use (Higgins, 1975) is based on characters of doubtful significance, and consequently includes heterogeneous elements. Therefore, it is worth

pointing out that the species possessing female, anal hair tufts comprise, on other grounds as well, a homogeneous group distinct from those without such structure (*ilicis* Esper, *esculi* Hübner).

Firstly, the specific status of many named forms in the *myrtale-acaciae* group is still obscure due largely to their extreme superficial uniformity and practically identical genitalia. On the other hand, *ilicis* and *esculi* were once considered as conspecific, reflecting their superficial resemblance. Although the genitalia of both groups are internally quite uniform, there are some notable differences between the groups as, for instance, in the phallus. Geographically, *ilicis* and *esculi* are typically Mediterranean in distribution, although the former has established itself in Central Europe as have several other Mediterranean species. The *myrtale-acaciae* group is centered within the area conveniently called the Irano-Anatolian region of the Middle East. Again, the extension of *acaciae* into Southwest Europe along the northern shore of the Mediterranean has a number of parallel examples among groups centered in the Middle East. This is evidently due to the climatic history of the Mediterranean region (e.g., Bonatti, 1966) and the persistence of similar ecological niches in the two regions today. Ecologically, the *ilicis-esculi* group is basically an inhabitant of warm, relatively mesic Mediterranean maquis and forests, associated with evergreen, sclerophyllous oaks which are the main larval food plants of *ilicis* (those of *esculi* are apparently unknown). The fact that *ilicis* has been reported to feed on *Prunus* L. is hardly surprising since food plant specificity seems relatively plastic in the whole group of related genera. This is probably one of the factors that permitted northward expansion of *ilicis* in Europe. In contrast, the *myrtale-acaciae* group prefers, as a whole, more xeric habitats and is better adapted to the cold, being associated with certain vegetation types such as steppe forest characteristic of Irano-Anatolian region. The food plants are *Prunus* L., *Crataegus* L. (for *acaciae* in Yugoslav Macedonia; Nakamura, unpublished observation), and other arboreal Rosaceae. There is as yet no indication of oaks being utilized by this group. In short, the *myrtale-acaciae* group and the *ilicis-esculi* group are natural groups distinct from each other by criteria which may justify generic separation. It is a matter which should be decided in a revision of the entire, much larger group of related genera.

ACKNOWLEDGMENTS

I thank A. Shmida, Department of Botany, Hebrew University of Jerusalem, for botanical identifications and Tova Rivnay, Department of Entomology, Faculty of Agriculture, Hebrew University Campus at Rehovot,

for assistance in taking the SEM pictures. The unpublished data provided by Dr. A. Koçak, Ankara University, are much appreciated.

LITERATURE CITED

BONATTI, E. 1966. North Mediterranean climate during the last Würm glaciation. Nature, London 209: 984–985.

ELIOT, J. N. 1973. The higher classification of the Lycaenidae (Lepidoptera): A tentative arrangement. Bull. Brit. Mus. Nat. Hist. (Ent.) 28: 373–505.

HIGGINS, L. G. 1975. The classification of European butterflies. Collins, London. 320 p.

NAKAMURA, I. 1976. Descriptions of two new species of butterflies (Lepidoptera, Lycaenidae) from the South Sinai. J. Ent. (B) 44(1975): 283–295.

SHIROZU, T. & A. HARA. 1960–62. Early stages of Japanese butterflies in colour, vols. I & II. Hoikusha, Osaka. 285 p., 120 col. pls. (Text in Japanese).

SHIROZU, T. & H. YAMAMOTO. 1956. A generic revision and the phylogeny of the tribe Theclini (Lepidoptera; Lycaenidae). Sieboldia, Fukuoka 1: 329–421, pls. 35–85.

STEMPFFER, H. 1967. The genera of the African Lycaenidae (Lepidoptera: Rhopalocera). Bull. Brit. Mus. Nat. Hist. (Ent.) Suppl. 10.

TUTT, J. W. 1907–08. A natural history of the British Lepidoptera, vol. 9. Swan Sonnenschein & Co., London. x + 495 p., 28 pls.

WYNTER-BLYTH, M. A. 1957. Butterflies of the Indian Region. The Bombay Natural History Society, Bombay. xx + 523 p., 72 pls.

NOTES AND NEWS

On behalf of the Society, I thank Elaine R. Hodges for generously providing her drawing of *Cosmopterix bacata* Hodges that appears on the front cover of each issue of Volume 30 of the *Journal*. I am very grateful to the following persons who silently contributed by reviewing one or more manuscripts during the past year: A. M. Blanchard, J. K. Bouseman, F. M. Brown, K. S. Brown, Jr., H. K. Clench, D. R. Davis, J. P. Donahue, J. C. Downey, D. C. Ferguson, C. D. Ferris, R. S. Funk, H. N. Greenbaum, D. F. Hardwick, R. R. Irwin, R. O. Kendall, L. D. Miller, T. A. Miller, W. E. Miller, R. W. Neck, H. H. Neunzig, T. Pliske, J. C. E. Riotte, T. D. Sargent, D. K. Sell, A. M. Shapiro, F. W. Stehr, J. G. Sternburg, J. R. G. Turner, F. A. Urquhart, and A. M. Young. Assistance with the improvement of various submitted illustrations was contributed by L. LeMere, Illinois Natural History Survey, and G. L. Venable, Smithsonian Institution. B. P. Sweeney and C. L. Kyse are thanked for their typing services. Finally, I acknowledge my associate editors, W. H. Allen and J. G. Sternburg, for supporting me in numerous and invaluable ways.

G. L. GODFREY
Editor