Field records of larvae of *Euchalcia siderifera* (Eversmann, 1856) and *Euchalcia chlorocharis* (Dufay, 1961) (Lepidoptera, Noctuidae, Plusiinae) in Greece

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Abstract: In early May 2016 larvae and pupae of *Euchalcia chlorocharis* (Dufay, 1961) have been found on *Alkanna hellenica* (Boiss.) Rech.f. (Boraginaceae) in stony and partly sunny patches in open scrub near Delphi. At approximately the same time a trip to Mount Chelmos (northern Peloponnese) resulted in many larvae of *Euchalcia siderifera* (Eversmann, 1856) on *Solenanthus stamineus* (Desf.) Wettst. (also Boraginaceae) in sunny pastures. Larva, pupa, adult moths and larval habitat of both species are figured.

Freiland-Raupenfunde von *Euchalcia siderifera* (Eversmann, 1856) and *E. chlorocharis* (Dufay, 1961) (Lepidoptera, Noctuidae, Plusiinae) in Griechenland

Zusammenfassung: Anfang Mai 2016 wurden bei Delphi Raupen und Puppen von *Euchalcia chlorocharis* an *Alkanna hellenica* (Boiss.) Rech.f. (Boraginaceae) in teilbesonnter, steiniger Lage zwischen lockerem Gesträuch gefunden. Zur gleichen Zeit erbrachte eine Exkursion an den Chelmos (nördlicher Peloponnes) zahlreiche Raupen von *Euchalcia siderifera* an *Solenanthus stamineus* (Desf.) Wettst. (ebenfalls Boraginaceae) in besonnten Weiden. Von beiden Arten werden Raupe, Puppe, Falter und das Larvalhabitat abgebildet.

Introduction

Euchalcia Hübner, 1821 is a genus with an evolutionary hotspot in dry and most often mountainous regions of W-Asia (Asia Minor to Iran), partly also in Central Asia. In Europe, less than 10 species are known so far, some of them penetrating only in the (south-)easternmost parts, e.g. *E. biezankoi* (Alberti, 1965) in the southern Urals or *E. emichi* (Rogenhofer, 1873) in the East Aegean Islands (Greece) which indeed belong geographically already to Asia. Three of the European species are endemics, so *E. bellieri* (Kirby, 1900) in the SW-Alps of France and locally also Italy, *E. italica* (Staudinger, 1882) in the Abruzzes and *E. chlorocharis* in S-Balkans. Life cycles of most species are quite similar and show adaptations to semiarid climate. According to present knowledge most species develop only one generation per year with hibernating first-instar larvae in a dense cocoon. Larvae feed in spring and adult moths occur between late spring (lowlands) and summer (mountains). Hostplants of most species belong to the Boraginaceae family, only a few species are adapted to Ranunculaceae (especially *Aconitum* and *Consolida*).

Euchalcia chlorocaris is endemic to the Balkans where it is scattered especially in Greece in the mainland from the very North southward to N-Peloponnese, but also in adjacent parts of Albania and Macedonia (Goater et. al. 2003). Though the moths can be quite abundant at suitable places (e.g. around Delphi) the preimaginal stages are poorly known so far (Goater et al 2003). There is still no publication with images of the first instars (compare Beck 2000).

Euchalcia siderifera has a main distribution from Asia Minor to the Altai. In Europe, it is known only from Greece and the Ukraine (Crimea). In Greece the subspecies *siderifera achaiae* Dufay, 1968 occurs on Mount Chelmos (N-Peloponnese). The few other localities (Karpenisi: Mount Timfristos) that are mentioned in literature (Hacker 1989) need confirmation. The larvae of the nominotypical subspecies have already been found in Crimea (Vladimir Savchuk, pers. comm. 2016) on *Rindera tetraspis* Pall. (Boraginaceae). Photos from there have been published in Ahola & Silvonen (2011), but the hostplants and larvae of ssp. *achaiae* are still unknown.

In early May 2016 the author had the opportunity to study the larvae of both species during a short trip to Central Greece in the field. Thus photos, hostplants and hints on life cycle are introduced.

Material and methods

Between 1. and 7. v. 2016 some 8 mature larvae, 6 pupae, 10 empty pupal skins and 2 moths (Fig. 7) of *E. chlorocharis* could be recorded around Delphi in 450–800 m during daytime by careful investigation of the hostplants. The larvae and some of the pupae have been reared to adult.

On 6. v. 2016 more than 60 larvae of *E. siderifera* have been found on Mount Chelmos between 1650 and 1800 m by searching for hostplants in the vast pastures. Some of the largest larvae have been collected and reared to the adult moths (Fig. 17).

Results and discussion

Larvae

The larva (Figs. 10–14) of *E. siderifera* is very similar to the very closely related *E. italica* (own observations in May 2013 in the Abruzzes). I found no significant difference in the colouration of the head capsule. The colouration of the body (fully-grown larvae) is much more homogenous green with only partial white breeze and indisdinct stripes, whereas *E. italica* shows a more inhomogenous colouration with clearer visible white stripes. This is most probably an adaptation to the still more whitish-tomentose leaves of *Cynoglossum magellense* Ten. (Boraginaceae).

The pupae of the two taxa are hardly separable.

The mature larva of *E. chlorocharis* (Figs. 1–3) is very similar to that of *E. emichi* (description and illustrations

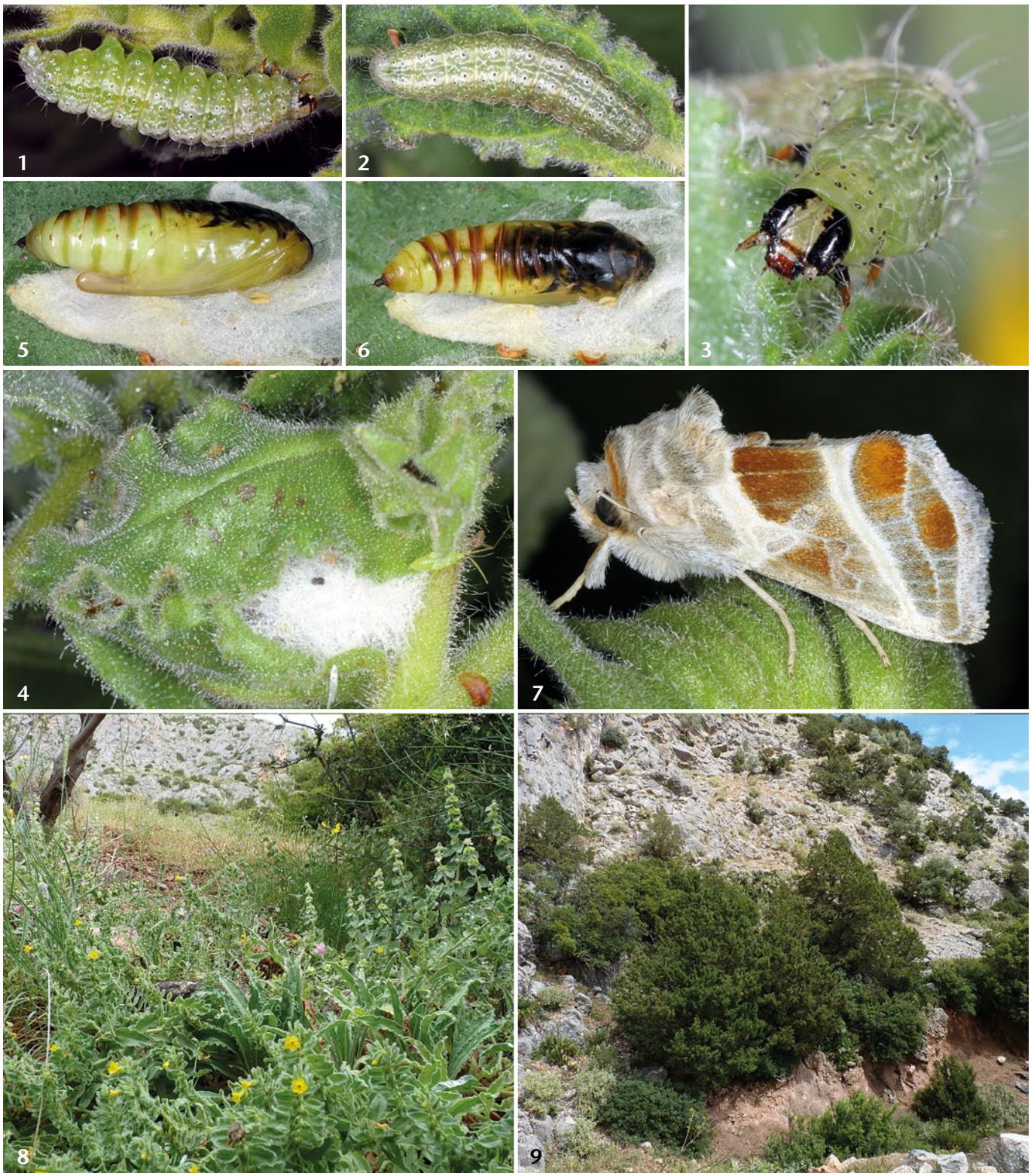

Plate 1, Figs. 1–9: *Euchalcia chlorocharis,* larvae found on 2. v. 2016, vicinity of Delphi (450–800 m), Greece. All photos taken by the author. All photos (if not indicated as e.l. = ex larva rearing) taken in the field. — **Figs. 1–3:** Fully-grown larva; **1:** dorsal view; **2:** lateral view; **3:** head. **Fig. 4:** Cocoon. **Figs. 5–6:** Pupa, lateral, dorsal view. **Fig. 7:** Adult. — **Figs. 8–9:** Larval habitat with *Alkanna hellenica* (Boraginaceae).

see Wagner et al. 2017). Indeed, I found no clear and stable differences. In *E. emichi* the lateral head capsule is usually greenish from the stemmata (= ocelli) to the body in line with the first spiracle. *E. chlorocharis* obviously often (but not always, 6 out of 8 larvae) only shows a small green isle around the stemmata, totally encircled by black colouration. It must be further studied if this is really at least a tendency and not only modificatory. The thoracic legs show distally a clearer golden colour in *E. chlorocharis*. The white colour is often more extended in *E. chlorocharis*, the interdorsal lines (see Wagner et al. 2017) being broader. The fully-grown *E. chlocharis* larva is considerably larger than *E. emichi*.

The pupa of *E. chlorocharis* (Figs. 5-6) is usually lighter than *E. emichi,* the dark colouration being restricted to the dorsal head and thorax and – more brownish – to the dorsal abdomen, especially between the segments. The

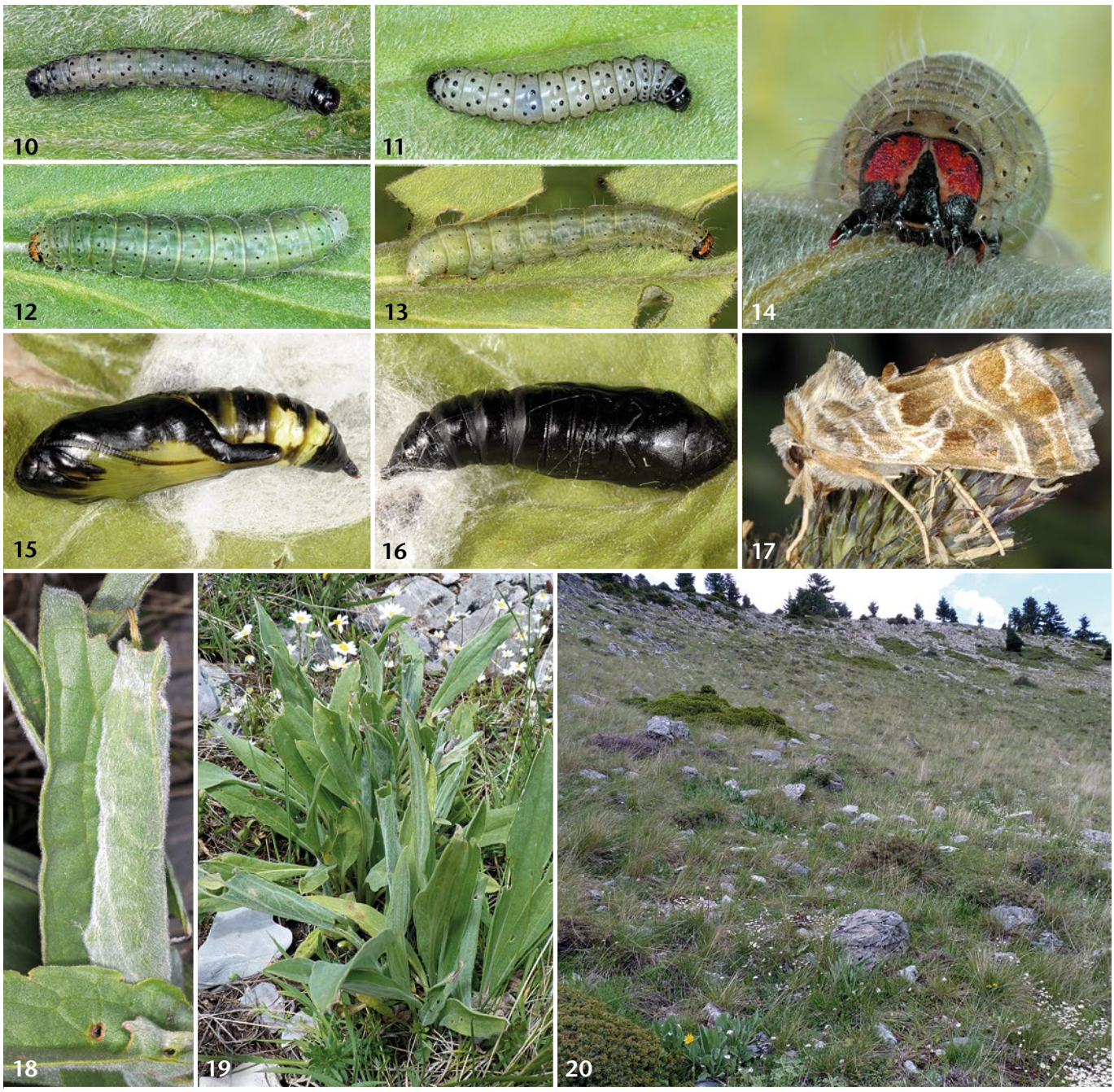

Plate 2, Figs. 10–20: *Euchalcia siderifera*, larvae on 6. v. 2016, Peloponnese, Mount Chelmos (1650–1800 m), Greece. — **Fig. 10:** Young larva. **Fig. 11:** Half-grown larva. **Fig. 12–14:** Fully-grown larva; **12:** dorsal view; **13:** lateral view; **14:** head. **Fig. 15–16:** Pupa, lateral, dorsal view, e.l. rearing. **Fig. 17:** Adult, e.l. rearing. — **Fig. 18:** Larval tube. **Fig. 19:** Larval habitat with *Solenanthus stamineus* (several tubes visible). **Fig. 20:** Larval habitat with *Solenanthus stamineus*.

ventral side is more or less pure greenish yellow. In *E. emichi* the light colour is usually reduced to the central part of the ventral side.

Host plants and larval habitats

Euchalcia chlorocharis larvae (Figs. 1–3) have been recorded only on *Alkanna hellenica.* Around Delphi this plant showed a scattered distribution in open scrub and on rocky embankments and cliffs. Where the plants grew the larvae or pupae had been quite constant. Thus the main problem was to find the plant. In 750–800 m elevation, larvae, pupae and empty pupal skins have been more or less equal in numbers whereas in 450 m only 3 empty skins and a moth could be detected. *Alkanna hellenica* only occurs on the Peloponnese and in the Sterea Ellas region (e.g. Delphi). It is closely related to *A. orientalis* (L.) Boiss. which occurs in Europe only in the East Aegean Islands and as a subspecies or even synonym of which *A. hellenica* is often regarded despite morphological differences. In the area of Delphi the only other *Alkanna* that I encountered at that time was *A. tinctoria* (L.) Tausch. But the few plants had already largely finished their season in this early year and no traces of larvae could be seen. The widespread Mediterranean *A. tinctoria* is a hostplant for *Euchalcia emichi* in the East Aegean Islands, e.g. Samos (Wagner et al. 2017). As *A. hellenica* misses north of Sterea Ellas, other *Alkanna* species must be the hostplants there, e.g. *A. pindicola* Hausskn. or *A. graeca* Boiss. & Spruner.

The larval habitat (Figs. 8–9) of *E. chlorocharis* can be described on the one hand as dry and warm, open scrub interspersed with garrigue, rocks, small screes and smaller or larger embankments. On the other hand also cliffs or stone walls are inhabited. The degree of bush coverage is obviously only of secondary importance provided that it is not too dense (estimated up to 70%).

Euchalcia siderifera larvae (Figs. 10–14) could be found on *Solenanthus stamineus* in stony pastures on Mount Chelmos. This plant is a very scarce mountain species in Greece and only known from very few places in N-Peloponnese (e.g. Mount Killini, Mount Chelmos) and on Mount Giona (Dimopoulos & Georgiadis 1992). By far the largest stands occur on Mount Chelmos. Outside Europe *S. stamineus* is widespread from Anatolia across the Caucasus and Iran to Afghanistan and Kashmir. Thus its range overlaps largely with that of *E. siderifera* and it is very probably used also in other regions as a hostplant.

In Crimea larvae of *E. siderifera* have been recorded on *Rindera tetraspis* (V. Savchuk, pers. comm.) on slopes between 150 and 200 m. This species misses in Greece. But with *Rindera graeca* (A. DC.) Boiss. & Heldr. there is a close relative which shows a scattered distribution in the Peloponnese, Central and northwestern Greece. It also occurs on Mount Chelmos, but has not been recorded during my short visit in May 2016. The relevance for *E. siderifera* remains to be studied.

The larval habitats on Mount Chelmos (Figs. 19–20) are in general open pastures, often south-sloped. They are usually interspersed with stones and rocky sections, but this is not a strict requirement. I recorded larvae in a large area of several hectares. Larger plants have been often settled by 2–5 larvae whereas smaller ones most often only housed a single larva. Larvae both used flowering and sterile plants. This seems to be a clear ecological difference to the very closely related *Euchalcia italica* that needs inflorescences (of *Cynoglossum magellense* Ten., Boraginaceae) in the first instars and changes to leaves only when older.

According to my experience *E. siderifera* is easiest mapped by searching for the larvae. It would be very interesting to check the other known sites of *S. stamineus* in Greece and also the best stands of *Rindera graeca* (e.g. on Mount Timfristos, for old records compare Hacker 1989). Maybe *E. siderifera* can be found (again) at least in small populations there, too. In the case of Mount Killini this is very probable due to the short distance from Mount Chelmos (app. 15–20 km).

Life cycles

In the very warm spring 2016 *E. chlorocharis* larvae must have been mature already at least from early April or even in March. In early May already many cocoons had released the moths and only a few larvae could still be recorded. Thus flight time should have started in April. In colder years and in higher and/or more northern localities moths are still recorded in July or even early August. Larvae should be mature then until June.

Younger larvae could not be recorded but they very probably live in spun shelters constructed in the tips of younger shoots as it is the case with related species like *E. emichi* or *E. consona* (Fabricius, 1787). In the last instar they live openly on the plant without shelter. Pupation (pupa Figs. 5–6) occurs on the plant or in its direct vicinity in a dense cocoon between leaves (Fig. 4), most often quite near the ground. Like most congeners (except *E. consona*) this species has very probably only one generation per year with supposed hibernation of the small larvae in a cocoon.

The warm spring 2016 had also effects on *E. siderifera*. Its larvae ranged from very small to mature and some had obviously already pupated. This quite unequal development is also reported from Crimea (V. Savchuk). In my opinion it is quite unusual to find mature larvae in 1700–1800 m already in early May. In this year flight time must have started in the last third of May. In normal years it should start not before early June and last far into July. In lower elevations (Crimea, according to V. Savchuk in 150–200 m) larvae have been observed (supposedly in normal years) from mid-April (already also mature ones) to early May and moths started in mid-May.

Up to the last moult the larvae live within a spun tube (Fig. 18) made of one or sometimes more leaves. They usually feed from the tip of the tube. In the last instar they often sit openly on the upper side of the leaves when resting. But they still use the last tube as a refuge.

Pupation (pupa see Figs. 15–16) seems to occur more often away from the hostplant. I searched several plants with traces of mature larvae without detecting a cocoon. In captivity, pupation occurred in a not so dense (compared with *E. chlorocharis*) cocoon between leaves.

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