

normal pattern of malic acid build-up and breakdown. The strong control exerted by the light/dark cycle is evidenced by the abrupt reversal of acidification/deacidification after a 12 hr shift in the photo period.

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### A New Subspecies of *Chrysoperla externa* (Hagen) from Cocos Island, Costa Rica (Neuroptera: Chrysopidae)

The entomofauna of Cocos Island, an isolated oceanic island 500 kilometers west of Costa Rica, is at present under investigation in an effort coordinated by Charles L. Hogue, of the Natural History Museum of Los Angeles County, and Scott E. Miller, of the Santa Barbara Natural History Museum (Hogue and Miller 1981). The subspecies described below is of interest as it represents a morphologically differentiated population of a widespread and abundant mainland species.

#### *Chrysoperla externa cocosensis*, n. subsp.

*Description.*—Face short, eyes very prominent, genae red marked, often a red v-mark on vertex and red spots on occiput near eyes (Fig. 6). Maxillary palpi black-lineate, terminal palpomere fuscous. Scape short, unmarked, flagellum pale, segments slender, setae on basal segments pale, those near apex darker. Pronotum short, anterior corners lightly marked with brown on some specimens; each side bearing a patch of 40-50 pale trichobothrial setae with brown bases, and a few (about eight) normal dark setae, remainder of thoracic setae pale.

Wings slender, tips acute, venation pale, delicate, small dark marks on auditory organ; in forewing, base of Cu and a short interval of 2A dark. Setae sparse, dark, only weakly curved, their length equalling about half the width of a gradate cell. Third median cell moderately long, intramedian cell short, terminating well basad of the first crossvein from Rs. Venational pattern as in Figure 1.

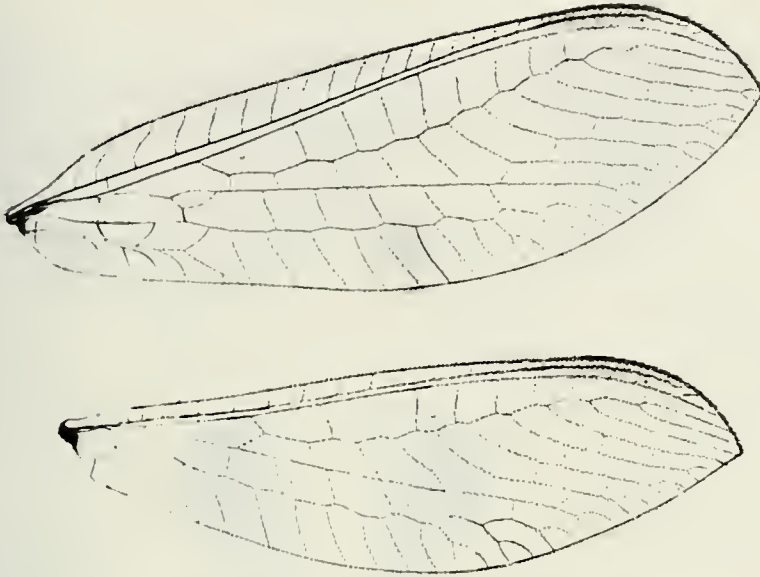


Fig. 1. *Chrysoperla e. cocosensis*. Wings of paratype male.

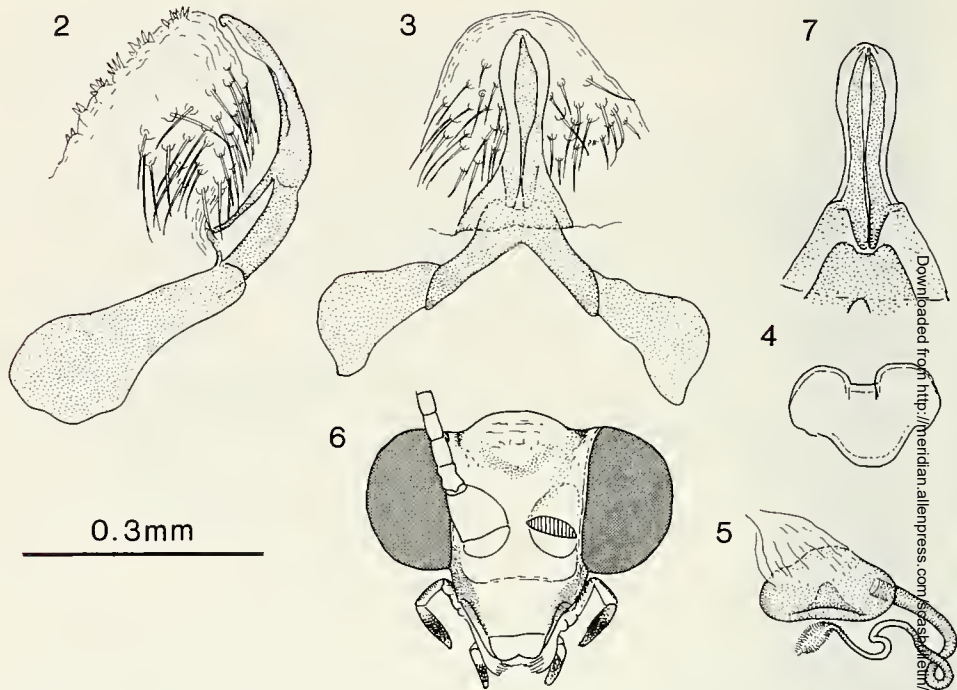
Abdomen pale, setae pale, those of terminal area brownish. Male ectoprocts and ninth sternite formed as usual in this genus. Tignum narrow with black spot on ligulate acumen. Mediuncus (Fig. 3) with a single median band, dark staining with chlorazol black e narrowed basally, and with thin lateral expansions. Gonosaccus with numerous long gonosetae dorsally, and ventrally with clumped spinellae bearing central scent pores. Female: subgenitale (Fig. 4) simple, broad, spermatheca (Fig. 5) short, vela not well tanned.

Measurements (millimeters, means in parentheses, N = 5 (males), = 8 (females)): antenna, ♂, 10.1–12.8 (11.3), ♀, 10.5–12.0 (10.9); forewing length, ♂, 10.0–11.9 (11.1), ♀, 10.7–12.2 (11.5), width, ♂, 3.3–3.8 (3.6), ♀, 3.4–3.8 (3.5).

*Type material*.—Costa Rica, Cocos Island, Wafer Bay, meadow, 9-III-1980, T. A. Sherry and T. K. Werner (in alcohol). Holotype male and three male, seven female paratypes in Los Angeles County Museum of Natural History; one male, one female paratype in Adams Collection.

*Discussion*.—As this material is preserved in alcohol, it is not possible to determine the body color. Some specimens retain red markings on the head as described.

This subspecies is very similar to typical *Chrysoperla externa* (Hagen) (new combination), differing principally in structure of the mediuncus. In *C. e. externa*, two distinct bands, dark staining, extend to the mediuncus tip, separated for their entire length by a non-staining area. In *C. cocosensis* it appears that the medial area is dark-staining, the lateral bands being desclerotized and displaced laterally. The wings, especially the forewing are somewhat more acute in *C. e. cocosensis* than in *C. e. externa*. Ecologically, the two subspecies appear to be similar in that the adults are often found associated with grass. I have collected *C. externa* by sweeping grass in Cuba and Central America, but have rarely encountered it on



Figs. 2-6. *C. e. cocosensis*. Fig. 2, gonarcus complex, lateral view; Fig. 3, same, dorsal view; Fig. 4, subgenitale, ventral view; Fig. 5, spermatheca, left lateral view; Fig. 6, head, anterior view. Fig. 7, *C. e. externa*, mediuncus, dorsal view. Scale for genitalic illustrations.

shrubs or trees. The guts of the Cocos Island specimens are filled with grass pollen, and they were collected in a meadow.

The western hemisphere species of *Chrysoperla* are for the most part widespread, and the number of species is low. In South America for example, only *C. externa* and *C. asoralis* Banks (new combination) are present, the range of *C. externa* extending from Chile and Argentina to the southeastern United States and Antilles. Such a range indicates good powers of dispersal, suggesting that *C. externa cocosensis* has originated from colonization by one or more individuals of *C. e. externa*.

Navás described several varieties of *C. externa*, based upon variation in coloration. I have examined types and Navás-determined specimens of most of the varieties and have not found genitalic differences. Except for the Cocos I. population, I have found the genitalia to be rather uniform in *C. externa*. While it is of course quite possible that the Cocos Island population may be a biologically distinct species. I do not consider that its relatively weak morphological differentiation warrants its taxonomic differentiation at the species level. Morphological differences in island populations of wide-ranging chrysopid species have been reported by Adams (1959) for *Mallada basalis* (Walker) and *M. alcestes* (Banks), and by Tjeder (1966) for *M. boninensis* (Okamoto).

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