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ILLUSTRATED FIELD NOTES ON PAPILIO ASTYALUS PALLAS IN COSTA RICA (LEPIDOPTERA: PAPILIONIDAE)

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ABSTRACT.- Papilio astyalus females oviposited on Citrus trees in Palo Verde National Park, Costa Rica, during May 1994. Immatures ranging from eggs to final instar larvae were found on the same trees. Females and immatures are illustrated.

KEY WORDS: Argentina, behavior, Brazil, Central America, eggs, El Salvador, Honduras, hostplants, immatures, larvae, Mesoamerica, Mexico, Neotropical, oviposition, Rutaceae, Texas, USA.

Papilio astyalus Godart is a Citrus-feeding swallowtail with subspecies ranging from southern Texas south to northern Argentina (Beutelspacher and Howe, 1984; Tyler *et al.*, 1994; Brown *et al.*, 1995). The subspecies *P. astyalus pallas* Gray occurs coastally up to altitudes of 700-900m from southern Texas through Mexico to northwestern Costa Rica, although it is unknown from Honduras and El Salvador (Tyler, 1975). DeVries (1987) stated that "In the morning, both sexes visit flowers . . . and are seldom seen in the afternoon." Females are rare in Costa Rican collections (DeVries 1987).

During a brief stay at the Organization for Tropical Studies (OTS) facility in Palo Verde National Park in Costa Rica, we had the opportunity to observe P. a. pallas in the field. Two 5m tall Citrus trees were located side by side near the entrance of the main OTS laboratory building. At about 1330h on 16 May 1994, a P. a. pallas female flew to the Citrus trees (Rutaceae) and initiated oviposition flight. She landed several times and curled her abdomen to oviposit at least twice. Although the female eluded capture and flew off, she was distinguishable because of unique damage to her right hind wing. At about 1400h, a P. cresphontes female initiated oviposition flight which lasted about 10 min near the two Citrus trees. At about 1515h, a second P. a. pallas female flew to these trees and started to investigate leaves. She was captured and held overnight for photographs (Fig. 1). On 17 May at about 1315h, a third P. a. pallas female flew into the area, started ovipositing, and was captured (Fig. 2a, b).

After observing the first females, we searched the *Citrus* foliage for immatures. We found numerous eggs of three types. The most common were yellow eggs we believe to be those of *P. a. pallas* (Fig. 3; Tyler *et al.*, 1994). Less common were the familiar amber eggs of *P. cresphontes*. On one of the *Citrus* trees we saw two smaller, greenish yellow papilionid eggs we believe to be *Papilio androgeus epidaurus* Godman & Salvin (or possibly *P. torquatus tolmides* Godman & Salvin; Fig. 4). There were also a number of first and second instar caterpillars, appearing to be



Fig. 1-2. Female *Papilio astyalus pallas* captured at about 1520 on 16 May 1994 in Costa Rica: 1) Note distinctive damage on hind wings. 2a) Female captured at about 1320 on 17 May 1994; b) Ventral view of the same female.



Fig. 3-9. Development of *Papilio astyalus pallas* in Costa Rica: 3) Eggs on *Citrus* foliage. 4) Egg (left) and a smaller greenish yellow egg probably of *P. androgeus epidaurus* on *Citrus* foliage. 5) First instar *P. a. pallas* larva on *Citrus* foliage. 6) Early instar larva. 7) Large fourth instar on *Citrus* foliage. 8) Early fifth instar larva. 9) Large fifth instar larva with osmeterium extended.

mostly *P. a. pallas* (Fig. 5-6; Tyler *et al.*, 1994). We found 5 larvae in the fourth and fifth instars that we believe were all *P. a. pallas* (Fig. 7-9).

Given the observations of DeVries (1987), we thought it of interest to report our observations of female behavior these two afternoons and note the wide range of developmental stages which were present on these two adjacent *Citrus* trees. Such a range of stages suggests that females were also ovipositing as much as two weeks or more earlier. The rainy season had only begun about a week before our observations. According to DeVries (1987), *P. a. pallas* adults are most abundant in Costa Rica during June and July. This peak would be the adults of the generation we saw as immatures. Apparently, *P. a. pallas* passes the dry season as pupae.

The *P. astyalus pallas* subspecies reaches its southernmost distribution limits in northwestern Costa Rica, near this Palo Verde location. It has been noted elsewhere (in Brazil) that the introduction of *Citrus* near the range edge of *P. astyalus* can result in efficient colonization and rapid population increases (Tyler *et al.*, 1994; Brown *et al.*, 1995). Our observations are consistent with this reported behavior.

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