

RANGE EXTENSION OF *DOLESCHALLIA TONGANA* (NYMPHALIDAE) TO THE SAMOAN
ARCHIPELAGO, WITH NOTES ON ITS LIFE HISTORY AND ECOLOGY

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ABSTRACT. Adults and larvae of the nymphalid butterfly *Doleschallia tongana vomana* Fruhst. were recently documented for the first time in the Samoan archipelago, on the island of Tutuila, American Samoa. Distributed from Melanesia to western Polynesia, this species consists of several sub-species, with *D. t. vomana* endemic to Fiji. The establishment of this species on Tutuila is likely the result of natural dispersal by adult(s) blown from Fiji, though the success of this colonization was made possible only as the result of human introduction of the host plants *Graptophyllum pictum* and *Pseuderanthemum carruthersii* (Acanthaceae).

The nymphalid butterfly *Doleschallia tongana* Hopkins is distributed through Melanesia eastward to western Polynesia. Formerly considered a subspecies of *D. bisaltide*, *D. tongana* was elevated to full species status by Parsons (1999). Based on a review of *Doleschallia* specimens, Parsons (1999) determined that *D. bisaltide* extended from India eastward to New Guinea, and that further eastward, specimens considered to be subspecies of *D. bisaltide* were in fact, *D. tongana*. *D. tongana* consists of about six sub-species, and is reported from the Bismarck Archipelago; the Solomons; New Caledonia; the New Hebrides; Tonga; Fiji; and Samoa (Parsons 1999). At the eastern end of the species' range, *D. t. vomana* Fruhst. is endemic to a number of islands in Fiji (Robinson 1975) and *D. t. tongana* Hopkins is endemic to a number of islands in the Tongan group (Hopkins 1927, Miller & Miller 1993).

The inclusion of Samoa in this species' range by Parsons (1999) appears to be based on a misreading of Hopkins (1927). In his account of *Doleschallia*, Parsons (1999) makes reference to a Samoan specimen of *D. bisaltide*, citing Hopkins (1927). However, while the principal focus of Hopkins (1927) was Samoa, he only reported *Doleschallia* from Tonga. Thus, prior to the observations reported here, there have been no records of *Doleschallia* from the Samoan Archipelago (Swezy 1921, Hopkins 1927, Comstock 1966, Kami & Miller 1998).

On 9 April 1997, an unidentified caterpillar was collected by RPC moving across a broad expanse of sidewalk in an urbanized section of the village of Pago Pago, island of Tutuila, American Samoa. It pupated on 11 April and emerged on 18 April. Just prior to pupation, the caterpillar measured ca. 50 mm in length. It possessed a black ground color with light speckling

dorsally and prominent cream colored stripes running longitudinally, located dorso-laterally and ventro-laterally. Each body segment had seven prominent black spines, with numerous smaller secondary spines. The base of each primary spine was pale metallic blue. From a distance, the most prominent features of the caterpillar are the black ground color with metallic blue spots, and the pair of light parallel stripes running longitudinally on each side.

On October 6, 1997, several unidentified caterpillars (Fig. 1) were independently observed by DV feeding on a *Pseuderanthemum carruthersii* (Seem.) Guillaumin (Acanthaceae) on the campus of American Samoa Community College located in the Malaeimi Valley. Several were collected and adults reared. These specimens were compared with that from April 1997, and all were tentatively identified as *Doleschallia bisaltide*. Assignment to the sub-species *vomana* was subsequently made by Dr. Jacqueline Miller, Allyn Museum of Entomology, Florida Museum of Natural History. Based on the revised taxonomy (Parsons 1999) these specimens would now be assigned to *D. tongana vomana*.

Since these initial records, the occurrence of larvae on the host plants or observations of adults in flight has become more frequent. Two additional adult specimens were collected in the Tafuna section of Tutuila (12 February 1998, 23 May 1998; Fig. 2) and *Doleschallia* larvae can now be found throughout the inhabited areas of Tutuila. Three adults have been deposited at the Allyn Museum of Entomology, Florida Museum of Natural History (Accession Number 1998-12). Considering that the records are distributed temporally and spatially (from Tula on the east end to Fagamalo on the west end, a distance of 30 km) and include both adult and larval forms, it appears that a breeding population has become established on Tutu-

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FIG. 1. Mature larvae of *Doleschallia tongana vomana* Fruhst. feeding on *Pseuderanthemum carruthersii*, Mapusaga, Tutuila, American Samoa. Photo by Don Vargo.

ila. This seems to be a recent occurrence, as this is a large, conspicuous species, readily observed and identified on the wing (once initially identified in hand).

Prior to the observations reported here, neither one of us had observed the species on Tutuila. While one of us (RPC) had only been making observations on Tutuila since 1996, the other (DV) has been observing and collecting butterflies on Tutuila since 1988. Hopkins (1927) spent two years in Samoa and Comstock (1966) spent four months (June to October) collecting on Tutuila without encountering this species. In the Samoan Archipelago, *Doleschallia* presently is only known from Tutuila. We have spent many days afield in the Manu'a islands of American Samoa without observing it. We have not observed it on Upolu or Savaii either, but time spent afield on these islands has been very limited.

Existing data on the host plants of *Doleschallia* indicate the genus feeds primarily on members of the Family Acanthaceae, with Moraceae of minor importance to some species (Parsons 1999). *Doleschallia* in New Guinea feed principally on *Graptophyllum pictum* T. (Parsons 1991), and *Pseuderanthemum variable* is the principal host plant of *D. bisaltide* in Australia (McCubbin 1971, D'Abrera 1978, Common & Waterhouse 1972). Host plants recorded for *D. tongana* include *Graptophyllum pictum* on Manus and New Britain (Parsons 1999), *Pseuderanthemum* sp. on New Caledonia (Holloway & Peters 1976), and, in Fiji, *Graptophyllum insularum* (A. Gray) A.C. Smith, *G. pictum*, *Pseuderanthemum laxifolium* A. Gray, *Arthropus altilis* Parkinson, *A. integra* Thunb., and *Eryth-*

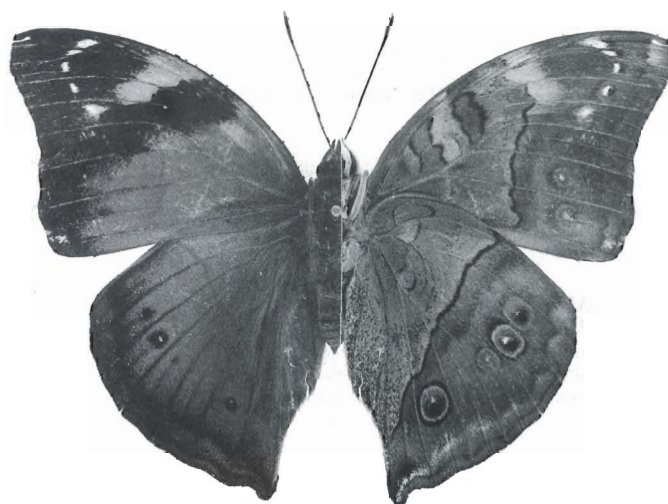


FIG. 2. Dorsal and ventral view of female *Doleschallia tongana vomana* Fruhst, collected 23 May 1998, Tafima, Tutuila, American Samoa. Allyn Museum of Entomology, Florida Museum of Natural History Accession 1998-12. Photos by Jacqueline Miller.

rina sp. (Robinson 1975). While there are no accounts of host plants of *D. tongana* from Tonga, *G. insularum* is a native species of Acanthaceae there (as well as in Fiji) (Whistler pers. comm.), and presumably serves as the host plant. On Tutuila, larvae of *D. t. vomana* have been observed feeding on *Pseuderanthemum carruthersii* (syn. *P. reticulatum*) and *Graptophyllum pictum*. These two plant species are native to Melanesia and Asia-Malaysia respectively.

With the exception of *Dicliptera samoensis* Seem, endemic to Upolu and Savaii (in the independent nation of Samoa) there are no native Acanthaceae in the Samoan archipelago. All are European introductions (primarily in the 20th century) and arrived either as weeds (7 species) or ornamentals (21 species) (Whistler 1992, 1994, 1995, pers. comm.). On Tutuila, *P. carruthersii* and *G. pictum* are widespread ornamental plantings.

Doleschallia occurs in primary and secondary forest, although accounts suggest it prefers forest edge or clearings rather than deep forest. *D. bisaltide* is reported from rain forest (Common and Waterhouse 1972) and "open spaces on the outskirts of jungle patches" (McCubbin 1971). In New Guinea, *D. tongana* occurs in marginal secondary forest, especially along creeks (Parsons 1999) and in New Caledonia it prefers rich primary forest but is often seen on low vegetation in the sun (Holloway & Peters 1976). However, its occurrence on ornamental hedges of *G. pic-*

tum (Parsons 1999), suggest an ability to utilize human-modified habitats as well. On Tutuila, observations have been in areas characterized by a mosaic of residences, plantations, secondary growth and urban/commercial development. Occurrence of *D. b. vomana* on Tutuila appears linked to the distribution of the ornamental plantings that serve as their larval host, though the extent of plantation and forest on Tutuila provide a habitat structure that is probably not unlike that in which it occurs elsewhere.

While it is impossible to be certain of the mechanism by which *D. t. vomana* has reached Samoa, there are at least two scenarios. First, it may have arrived as larvae, in a shipment of *Pseuderanthemum* or *Graptophyllum*. However, importation of these plant species to Samoa occurred early in the 20th century. Our report of the first occurrence of *D. t. vomana* in Samoa, decades after the importation of its host plants suggests it did not arrive in association with that activity.

A second and more likely scenario is one of colonization from Fiji. Though not without exception for some species, there is consensus that most of the Samoan macro-lepidoptera arrived via Fiji (Hopkins 1927, Swezey 1948, Robinson 1975, Holloway 1979, 1983). Given this species' vagility, and the fact that tropical storms and cyclones in this region often pass from west to east, it seems inevitable that individuals of *D. t. vomana* would arrive in Samoa from time to time. However, until fairly recently (the 20th century), its ability to successfully colonize Samoa would have been limited by a lack of host plants. The modern introduction of several species of Acanthaceae, which serve as larval hosts on Tutuila, has apparently allowed a more recent colonization event to meet with some success. Whether this will result in a more permanent establishment is unknown, as is the extent of this species' present distribution among the other islands of the Samoan Archipelago.

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LITERATURE CITED

- COMMON, I. F. B. & WATERHOUSE, D. F. 1972. Butterflies of Australia. Angus and Robertson, Sydney. 498 pp.
- COMSTOCK, J. A. 1966. Lepidoptera of American Samoa with particular reference to biology and ecology. Pacific Ins. Monograph 11:1-74.
- D'ABRERA, B. 1978. Butterflies of the Australia Region. Lansdowne Press, Melbourne. 415 pp.
- FRUHSTORFER, H. 1913. In Seitz, A. (1908-1928). Macrolepidoptera of the World. Volume 9. Stuttgart.
- HOLLOWAY, J. D. 1979. A survey of the lepidoptera, biogeography and ecology of New Caledonia. Series Entomologica 15. W. Junk, The Hague. xii + 588 pp.
- . 1983. The biogeography of the macrolepidoptera of south-eastern Polynesia. *GeoJournal* 7(6):517-525.
- HOLLOWAY, J. D. & PETERS, J. V. 1976. The butterflies of New Caledonia and the Loyalty Islands. *J. Nat. Hist.* 10:273-318.
- HOPKINS, G. H. E. 1927. Butterflies of Samoa and some neighbouring island groups. *Insects of Samoa: part III, fasc. 1:1-64.* Brit. Mus. (Nat. Hist.) London.
- KAMI, K. S. & MILLER, S. E. 1998. Samoan insects and related arthropods: checklist and bibliography. Bishop Mus., Tech. Rep. No. 13. 121 pp.
- MCCUBBIN, C. 1971. Australian Butterflies. Thomas Nelson (Australia), Melbourne. 206 pp.
- MILLER, J. Y. & MILLER, L. D. 1993. The butterflies of the Tonga Islands and Niue, Cook Islands, with the descriptions of two new subspecies. *Bishop Mus. Occ. Pap.* 34:1-24.
- PARSONS, M. 1991. Butterflies of the Bulolo-Wau Valley. Bishop Mus. Press, Honolulu. 280 pp.
- . 1999. The butterflies of Papua New Guinea: their systematics and biology. Academic Press, San Diego. xvi + 736 pp.
- ROBINSON, G. S. 1975. Macrolepidoptera of Fiji and Rotuma, a taxonomic and biogeographic study. E.W. Classey, Faringdon. vii + 362 pp.
- SWEZEY, O. H. 1921. The butterflies of the Samoan islands. *Proc. Haw. Ent. Soc.* 4:601-607.
- . 1948. Distribution of Lepidoptera in Pacific island groups. *Proc. 6th Pacific Science Congress. Entomology* 317-324.
- WHISTLER, W. A. 1992. Botanical Inventory of the proposed Ta'u Unit of the National Park of American Samoa. Univ. Hawaii, Cooperative National Park Resources Study Unit, Tech. Rep. #83. 100 pp.
- . 1994. Botanical Inventory of the proposed Tutuila and Ofu Units of the National Park of American Samoa. Univ. Hawaii, Cooperative National Park Resources Study Unit, Tech. Rep. #87. 142 pp.
- . 1995. Wayside plants of the islands: a guide to the lowland flora of the Pacific islands. *Isle Botanica*, Honolulu. 202 pp.