



### Discovery of the male *Tiradelphe schneideri* (Lepidoptera: Nymphalidae, Danainae)—missing piece in an insect evolution puzzle

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#### Abstract

For 30 years the highly distinctive Schneider's Surprise butterfly, *Tiradelphe schneideri* Ackery & Vane-Wright, 1984, has been known only from the two original type specimens, both female. Here we describe and illustrate the previously unknown male of this Guadalcanal endemic member of the Danaina—the subtribe of Nymphalidae: Danainae to which *Tiradelphe* has always been assigned. Unexpectedly, male *T. schneideri* completely lack alar androconia, and are thus unlike all other species of Danaina and its sister group, the Amaurina. The new information will permit a reassessment of the phylogenetic relationships of *Tiradelphe*. This enigmatic genus may well be more isolated than previously supposed, with implications not only for our understanding of pheromone communication in these insects, but also the evolution and biogeography of the tribe Danaini in the Indo-Pacific.

**Key words:** Nymphalidae, Danainae, Danaini, Danaina, Amaurina, *Tiradelphe*, *Danaus*, *Tirumala*, androconia, evolution, Guadalcanal, Indo-Pacific, biogeography

#### Introduction

The only known locality for *Tiradelphe schneideri* is the summit of Mount Popomanaseu which, at 2335 m, is the highest point in the Solomon Islands. Previous attempts to rediscover this species (e.g. Tennent 1998) were unsuccessful. Owing to its unique characters, *T. schneideri* has great importance in an evolutionary context, with the unknown male being a long-missing piece in a “butterfly puzzle” (Vane-Wright & Boppré 1990). The puzzle relates to the evolution of complex and diverse male pheromone communication systems in milkweed butterflies (Vane-Wright & Boppré 1993).

Based on female characters only, initial phylogenetic analysis placed *Tiradelphe* in an unresolved trichotomy with the genera *Danaus* Kluk, 1780, which includes the well-known and very widespread Wanderer or Monarch butterfly, *D. plexippus* (Linnaeus, 1758), and the genus *Tirumala* Moore, 1880, the blue tiger butterflies (Ackery & Vane-Wright 1984; Vane-Wright & Boppré 1990). More recently, based on cladistic analyses of combined available morphological and molecular data, Brower *et al.* (2010) placed *Tiradelphe* as sister to (*Danaus* + *Tirumala*), with these three genera (subtribe Danaina) as sister to the Amaurina (*Parantica* Moore, 1880, *Miriamica* Vane-Wright, Boppré & Ackery, 2002, *Ideopsis* Horsfield, 1858, and *Amauris* Hübner, 1816).

*T. schneideri* was first discovered by a 1965 Royal Society-sponsored expedition to the summit of Mount Popomanaseu, on the island of Guadalcanal (Ackery & Vane-Wright 1984; Tennent 1998; Tennent 2002). Two female specimens were collected in open vegetation above the tree line at around 2300m during the first week of November 1965, just below the summit. Visiting the actual summit was prohibited by local taboo during the expedition (Vane-Wright & Boppré, 1990). An expedition by the Imperial College Solomon Islands Expedition (ICSIE) to Mount Popomanaseu during July 1996 aimed at discovering the male of *T. schneideri*. Although the insect was possibly seen during six days spent on the summit, the expedition failed to yield any specimens (Tennent 1998). Tennent (1998) considered that seasonality may have influenced the unsuccessful results of the ICSIE survey. The summit of Mount Popomanaseu is cloaked with montane moss forest and experiences almost incessant rain and strong winds.

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