

***Triclistus* nr. *aitkeni*, a New Adventive Species to the Hawaiian Islands**

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Abstract. *Triclistus* nr. *aitkeni* (Hymenoptera: Ichneumonidae), an undescribed species not currently listed in the Hawaiian Terrestrial Arthropod Checklist, has been reared from caterpillars of six endemic moth species in the family Crambidae throughout the Hawaiian Islands. This note reports collection localities, host species, parasitism rates and some key morphological characters that can help identify this species.

The metopiine *Triclistus* nr. *aitkeni* (Cameron) (Hymenoptera: Ichneumonidae) is a koinobiont solitary larval-pupal endoparasitoid which is not currently listed in the Hawaiian Terrestrial Arthropod Checklist (Nishida 2002). This species is undescribed, but most closely resembles *T. aitkeni*, which has a widespread distribution in the Eastern Palearctic and Oriental regions. In the Oriental regions it has been recorded as a parasitoid of the rice pest *Cnaphalocrocis medinalis* (Guenee) (Lepidoptera: Crambidae) (He 1984, He et al. 1996).

Data reported in this note were taken from two parallel studies that aimed at quantifying the non-target parasitism by alien parasitoids on selected endemic Hawaiian moths (Kaufman 2008, King 2008). Even though parasitism records reported here date only as far back as 2004, J.W. Beardsley included this genus in his unpublished key to the Hawaiian Ichneumonidae, compiled in 1998. This suggests that this species has been present in the Hawaiian Islands for over a decade, which may explain its current widespread distribution within Hawaii.

Triclistus nr. *aitkeni* was reared from wild and sentinel larvae of six endemic moths in the family Crambidae: *Omiodes accepta* (Butler), *O. anastrepta* Meyrick, *O. antidoxa* Meyrick, *O. continuatalis* (Wallengren), *O. monogramma* Meyrick and *Udea stellata* (Butler) at 14 sites located on four of the six main Hawaiian Islands (Table 1). Collection sites ranged from low elevations dominated by non-native vegetation (e.g. Lyon Arboretum) to relatively pristine high elevations dominated by native vegetation (e.g. Mt. Kaala, Alakai Swamp).

Table 2 shows the number of wild larvae surveyed, total number of larvae parasitized, and number of larvae parasitized by *T. nr. aitkeni*. Parasitism by *T. nr. aitkeni* on *U. stellata* wild larvae ranged from 0.6 to 5.9 %, and accounted for 1.1 to 15.6 % of total parasitism (Table 2). *Triclistus* nr. *aitkeni* parasitism rates observed in wild *Omiodes* larvae varied by species and by collection locality; parasitism ranged from 4.3 to 33.3 % and contributed to 33.3 to 66.6 % of total parasitism (Table 2).

Table 3 shows parasitism rates by *T. nr. aitkeni* on *O. continuatalis* and *U. stellata* sentinel larvae, deployed in control exposure trials (Kaufman 2008, King 2008). Parasitism rates by *T. nr. aitkeni* on *U. stellata* sentinel larvae ranged from 0.8 to 8.8 %, and accounted for 12.9 to 90.9 % of total parasitism (Table 3). Parasitism by *T. nr. aitkeni* was recorded to be 8.8% in larvae of *O. continuatalis*, and contributed to 26.1% of total parasitism (Table 3).

In *U. stellata*, second to sixth instar larvae (headcapsule measurement 0.3 to 1.7 mm) seem to be suitable for parasitism (Kaufman 2008). Nevertheless, over 95 % of the parasitism on

Table 1. Geographical data (in decimal degrees) for collection sites.

Site	Elevation (m)	Latitude	Longitude	Insect host
Oahu				
Mt. Kaala	1115	21.50327	-158.14714	<i>O. antidoxa</i>
Kunia	550	21.46290	-158.09953	<i>U. stellata</i>
Lyon Arboretum	228	21.33386	-157.80714	<i>O. continuatalis</i>
Paliikea	781	21.41279	-158.09953	<i>U. stellata</i>
Tantalus	460	21.32996	-157.82249	<i>U. stellata</i>
Kauai				
Alakai Swamp Trail	1128	22.13526	-159.62582	<i>O. monogramma</i>
Ditch Trail	981	22.13159	-159.63171	<i>U. stellata</i>
Pihea Trail	1189	22.15146	-159.61542	<i>O. accepta</i> <i>O. antidoxa</i>
Maui				
Makawao FR	1152	20.81267	-156.27004	<i>U. stellata</i>
Makawao FR	914	20.82472	-156.26487	<i>O. anastrepta</i>
Hawaii				
Kipuka Ki	1315	19.44339	-155.31633	<i>U. stellata</i>
Kipuka Puauulu	1229	19.43742	-155.30328	<i>U. stellata</i>
Olaa	1245	19.47372	-155.26125	<i>U. stellata</i>
Thurston Lava Tube	1189	19.41298	-155.23771	<i>O. accepta</i>

U. stellata sentinel larvae was observed in fourth and fifth instar, suggesting that it prefers parasitizing these larval stages. As a result, disparities in *T. nr. aikeni* parasitism rates with respect to total parasitism on *U. stellata* wild and sentinel larvae, might be attributed to the underrepresentation of fourth and fifth instar larvae during the surveys of wild larvae (Kaufman 2008). Similarly, fourth through eighth instar *Omiodes* larvae (headcapsule measurement 0.9–2.0mm) appear to be suitable hosts for *T. nr. aikeni*, based on life stage observations at the time of collection and known exposure interval of sentinel larvae in controlled exposure trials (King 2008). While headcapsule widths do not correspond exactly to developmental stages across *Omiodes* species, larval development in the genus is broadly comparable. In all cases, *T. nr. aikeni* adults emerged directly from moth pupal cases, so parasitism did not become evident until after pupation of the caterpillar.

Triclistus nr. aikeni might be confused with *Hypsicera femoralis* (Fourcroy), another Hawaiian metopiine of adventive origin (Nishida 2002). Both are readily identifiable as Metopiinae by the strongly swollen femora and strongly convex face, but they are easily distinguished by leg color and details of head structures. *Hypsicera femoralis* has reddish brown to brown legs, has a strongly protuberant face, forming a shelf-like protrusion that bears antennal sockets (Fig. 1A), and its antennal sockets are not separated by a high lamella (Fig. 1C). *Triclistus nr. aikeni* has yellow legs, has a weakly protuberant face (Fig. 1B), and its antennal sockets are separated by a high lamella (Fig. 1D).

Our initial identification to the genus level was confirmed by Dr. David Wahl at the American Entomological Institute (Gainesville, Florida). Dr. Gavin Broad at the National

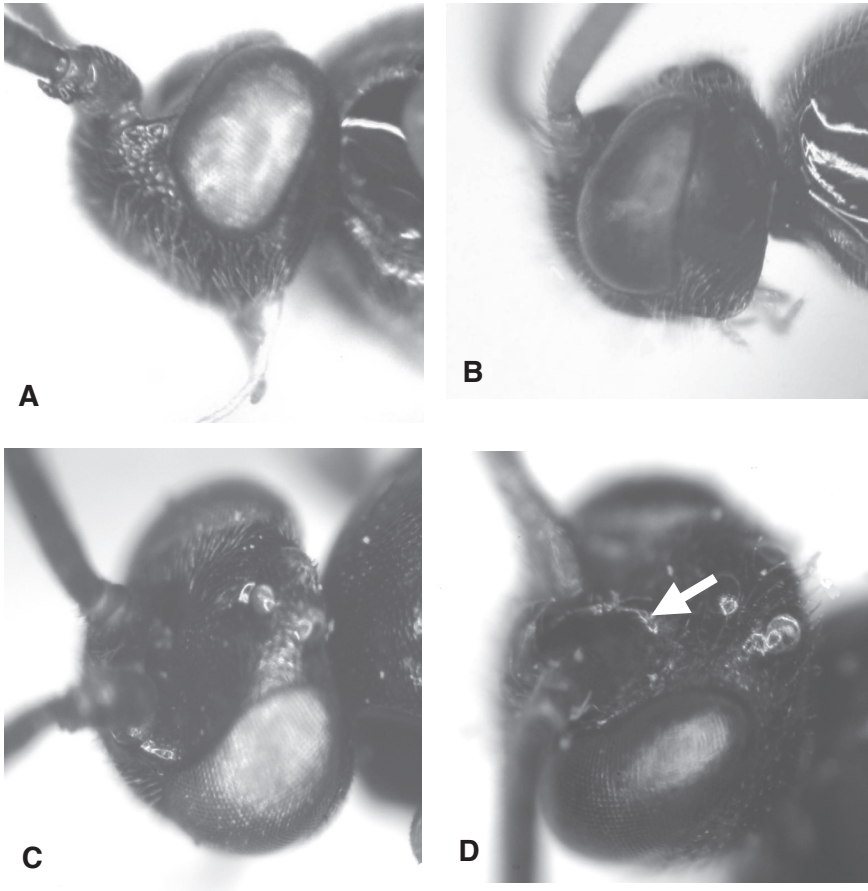


Figure 1. Lateral and dorsal views of heads of *Hysicera femoralis* (A,C) and *Triclistus nr. aitkeni* (B,D). Arrow in figure 1D points at lamella that separates antennal sockets.

History Museum (London, United Kingdom) confirmed that the species is undescribed, and provided the species-level identification of *T. nr. aitkeni* (Cameron). Voucher specimens are kept at the American Entomological Institute and Natural History Museum. Additional voucher specimens are to be deposited at the Bishop Museum (Honolulu, Hawaii) and University of Hawaii at Manoa Insect Museum.

Acknowledgments

We would like to acknowledge Dr. Mark Wright for providing funding for species identification through a USDA TSTAR grant.

Table 2. Total number of wild larvae collected by species and parasitism rates by *T. nr. aitkeni*.

	Total larvae surveyed	Survived lab rearing	Total parasitized n (%)	Parasitized by <i>T. nr. aitkeni</i> n (%)
<i>U. stellata</i>				
Ditch trail ¹	865	583	96 (16.5)	15 (2.6)
Kipuka Ki ²	149	113	22 (19.5)	1 (0.9)
Kipuka Puauulu ¹	901	564	274 (48.6)	4 (0.7)
Kunia ¹	527	345	190 (55.1)	2 (0.6)
Makawao FR ²	54	43	18 (41.9)	1 (2.3)
Olaa ²	37	34	17 (50.0)	2 (5.9)
Palikeya ¹	1033	639	356 (55.7)	13 (2.0)
Tantalus ¹	134	93	38 (40.9)	2 (2.2)
<i>O. accepta</i>				
Pihea Trail ³	41	35	18 (51.4)	8 (22.8)
Thurston Lava Tube ⁴	64	48	39 (81.3)	3 (7.7)
<i>O. anastrepta</i>				
Makawao FR	8	5	5 (100)	1 (20.0)
<i>O. antidoxa</i>				
Mt. Kaala ³	8	7	3 (42.8)	2 (28.5)
Pihea Trail ⁵	9	9	9 (100)	3 (33.3)
<i>O. monogramma</i>				
Alakai Swamp Trail ⁵	62	46	4 (8.6)	2 (4.3)

1 Monthly surveys carried out from July 2004 to July 2006

2 Surveys carried out on April'06, July'06, October'06 and January'07

3 Survey carried out in June'07

4 Surveys carried out in August'08

5 Surveys carried out in August'07 and October'07

Table 3. Total number of sentinel larvae deployed by species and parasitism rates by *T. nr. aitkeni*.

	Total larvae deployed	Survived lab rearing	Total larvae parasitized n (%)	Larvae parasitized by <i>T. nr. aitkeni</i> n (%)
<i>U. stellata</i>				
Ditch Trail	573	249	30 (12.0)	22 (8.8)
Kunia	192	87	14 (16.1)	4 (4.6)
Palikea	392	132	31 (23.5)	4 (3.0)
Tantalus	370	133	3 (2.3)	1 (0.8)
Kipuka Ki	176	71	8 (11.3)	6 (8.5)
Olaa	272	153	11 (7.2)	10 (6.5)
<i>O. continuatalis</i>				
Lyon Arboretum	394	68	23 (33.8)	6 (8.8)

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