

A new species of *Dodia* Dyar (Noctuidae, Arctiinae) from central Canada

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Abstract

Dodia tarandus Macaulay & Schmidt, **sp. n.**, a cryptic species previously confused with *D. albertae* Dyar, is described from Alberta, Canada. A key to North American *Dodia* is provided. Adults and genitalia of *D. albertae* and *D. tarandus* are illustrated.

Keywords

Dodia, Callimorphina, Holarctic, cryptic species

Introduction

Species of the genus *Dodia* Dyar (Arctiinae: Arctiini: Callimorphina) inhabit cold-climate habitats, notably taiga, and alpine- and subarctic tundra. The genus is distributed across northern North America and central- to eastern Asia. Tshistjakov and Lafontaine (1984) reviewed the genus, and included three species. Tschistjakov (1988, 1989) reviewed the Palaearctic taxa and described four new subspecies. Two additional species have been described since, one from Russia (Dubatolov 1990) and one from the Yukon Territory, Canada (Lafontaine and Troubridge 1999). The three Nearctic

taxa are illustrated in Lafontaine and Troubridge (1999) and also Troubridge and Lafontaine (2004). Extensive recent field work in Alberta, Canada, has shown that two similar (and locally sympatric) species have been going under the name *D. albertae* Dyar (Schmidt et al. 2004). The purpose of this paper is to describe the new species previously confused with *D. albertae*, and provide an updated identification key to North American *Dodia* species.

Methods and materials

Adult genitalia were prepared following the methods detailed by Lafontaine (2004). Line drawings were prepared from genitalia suspended in 30 % ethanol, using a *camera lucida* mounted to a Leica M-165C dissecting microscope. Repository abbreviations are as follows:

- CNC** Canadian National Collection of Insects, Arachnids, and Nematodes, Ottawa, Ontario, Canada.
UASM University of Alberta Strickland Entomological Museum, Edmonton, Alberta, Alberta.
USNM National Museum of Natural History (formerly United States National Museum), Washington, D.C., USA.
ZIN Zoological Institute Nauk, St. Petersburg, Russia.
ZMHB Zoologisches Museum, Humboldt Universität, Berlin, Germany.

Key to North American *Dodia* species

- 1 Forewing an even, translucent grey, without transverse bands; width of male valve at midpoint greater than $\frac{1}{4}$ total length of valve; vesica with two clusters of spines, one at apex and one at base; female corpus bursae slightly constricted medially.....***D. kononenkoi***
- Forewing with light and dark transverse bands; width of male valve at midpoint $\frac{1}{4}$ or less total length of valve; vesica with single apical cluster of spines (Figs. 6, 7); numerous smaller peg-like spinules may also be present (Fig. 6); female corpus bursae oval, wider posteriorly than anteriorly.....**2**
- 2 Forewing transverse bands meeting posterior margin at right angles; known only from dry, rocky tundra habitat in the Yukon (male unknown)***D. verticalis***
- Forewing transverse bands meeting anal margin at acute angle, running more or less parallel to outer margin; occurring in wet tundra and boreal peat bogs.....**3**
- 3 Forewing and thorax markings varying from nearly unmarked to moderately contrasting (subapical pale dash always contrasting), but never with basal and

- antemedial area paler than outer half of wing (Fig. 1); male valve apex with two short, blunt projections (Fig. 4); juxta wider than long (Fig. 4a); inflated vesica approximately as long as aedeagus (Fig. 6).....*D. albertae*
- Forewing and thorax contrastingly marked in mouse grey and whitish-grey banding, with basal and antemedial area noticeably paler than outer half of wing (Figs. 2, 3); male valve apex strongly bifurcate, with 2 longer narrower prongs (Fig. 5); juxta longer than wide (Fig. 5a); inflated vesica 2/3 or less length of aedeagus (Fig. 7) *D. tarandus*

Systematics

***Dodia albertae* Dyar**

Figs. 1, 4, 6, 8

Dodia albertae Dyar, 1901: 85.

Hypocrita atra A. Bang-Haas, 1912: 109.

Hyperborea kozhantshikovi Sheljuzhko, 1918: 104.

Dodia albertae eudiopta Tshistjakov, 1988: 638, fig. 5; subspecies.

Type material. *Dodia albertae* – Type locality: “Calgary, Alberta, [Canada], head of Pine Creek.” Male lectotype designated by Tshistjakov and Lafontaine (1984), USNM type No. 5747 [USNM, photograph examined].

Hypocrita atra – Type locality: “Arasagun-gol (Sajan)” according to original description, label on lectotype reads “Arasagun-go / Sajan” [Sayan Mountain range, Mongolia]. Male lectotype designated by Tshistjakov and Lafontaine (1984) [ZMHB, photograph examined]. Note – *Hypocrita* is an incorrect subsequent spelling of *Hypocrita* Hübner, [1807].



Figures 1-2. Adult habitus of *Dodia albertae* (1) (Ft. McMurray, AB) and *D. tarandus* holotype (2) (Caribou Mtns, AB).



Figure 3. *Dodia tarandus*, live adult (Holmes Crossing, AB).

Hyperborea kozhantshikovi – Type locality: “in montes Dzhugdzhuz [Dzhugdzhur], ad flum. Dzhelinda” [Dzhugdzhur Mountains, Dzhelinda River, eastern Siberia; near the head of the Aldan River according to Tschistjakov (1988)]. Described from 1 male and 1 female syntype; male lectotype (and four paralectotypes) designated by Tshistjakov and Lafontaine (1984) [ZIN, genitalia slide no. 15,191; not examined]. Since only one male was included in the original type material, it is not clear which if any of the lectotype designations are valid. We follow Tschistjakov’s (1988) synonymy; he examined a genitalic preparation of the lectotype in his review of Palaearctic specimens of *D. albertae*, and treated *kozantshikovi* as a synonym of *D. albertae albertae*.

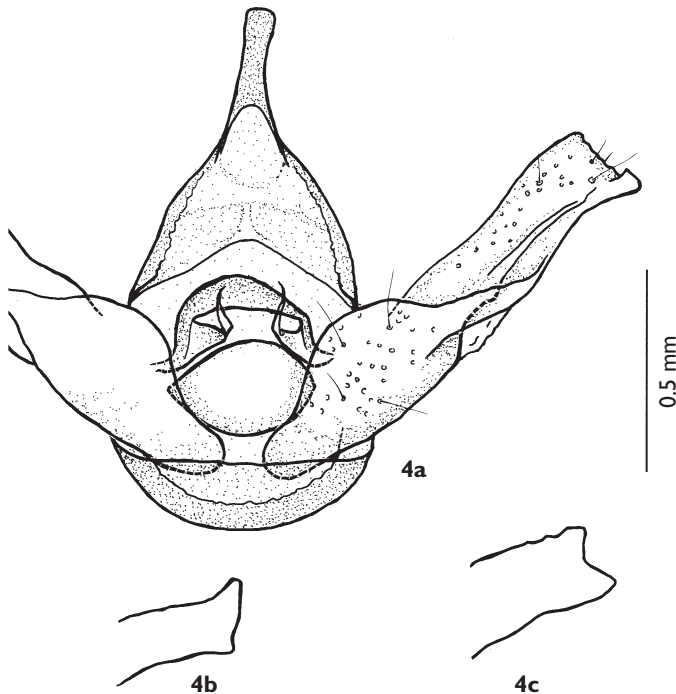


Figure 4. Male genitalia of *D. albertae*, ventral view of genital capsule (a) (Calgary, AB) and variation in valve apex (b – Caribou Mtns, AB; c – Muskox Lake, YT)

Dodia albertae eudiopta Tshistjakov, 1988 – Type locality: [Olenek River between lower Tomba and Alakit River, Russia]. Holotype male [ZIN; not examined]. The diagnosis and genitalic illustration of this taxon in the original description clearly show that it is more closely allied to *D. albertae* than to the new species described below.

Diagnosis. See species key, and diagnosis of *D. tarandus*.

Distribution and biology. *Dodia albertae* is widely distributed across the northern hemisphere in wet subarctic and subalpine tundra and boreal peat bog habitats (Fig. 9). In Eurasia it occurs from the Sayan Mountains eastward to eastern Siberia. In North America, it is distributed from the Yukon eastward to Labrador (Fig. 8).

***Dodia tarandus* Macaulay & Schmidt, sp. n.**

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Figs. 2, 3, 5, 7, 6

Type Material. Holotype ♂: “CAN[ADA]: Alberta, Caribou Mtns., / E[ast] shore of Wentzel L[ake]. / 59.060°N, 114.430°W / 17 – Jun – 2003 / BC Schmidt & GG Anweiler”; “UASM# / 34567”; “[DNA barcode voucher number] BCSC# / 93”; “Voucher Specimen / Western CDN Moths / DNA Barcode Project / B.C. Schmidt 2005/06 [blue label]”; “Database # / CNC LEP / 00053353”. [CNC]. **Paratypes:** 3

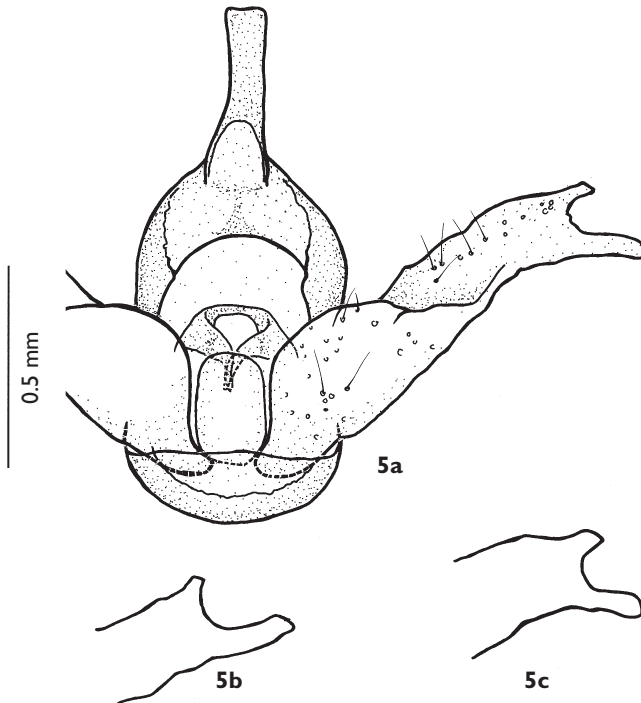
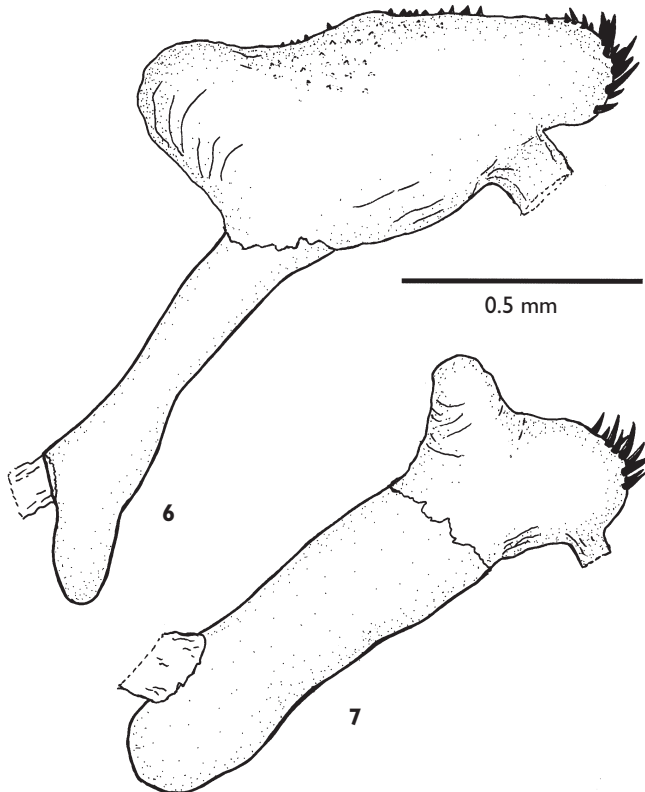


Figure 5. Male genitalia of *D. tarandus*, ventral view of genital capsule (a) and variation in valve apex (b – Caribou Mtns, AB; c – Harlan, SK).

♂ 1 ♀. Alberta, Caribou Mountains, Wentzel Lake, 59.05208°N 114.42628°W, 8 Jul 2003, D.A. and S.M. Macaulay, 1 ♀; Alberta, Holmes Crossing Ecological Reserve, 9 km southeast of Fort Assiniboine, 59.276°N, 114.826°W, 9 Jun 2004, D.A. Macaulay, 1 ♂; Saskatchewan, Harlan, 9 Jun 1942, P.F. Bruggemann, 1 ♂; same data as previous, 19 Jun 1946, 1 ♂; Manitoba, Gillam, 1 Jul 1939, G.S. Brooks, 1 ♂ [CNC, UASM].

Diagnosis. *Dodia tarandus* can usually be distinguished from *D. albertae* by external characters, namely the more extensive white coloration of the forewings, slightly more robust and more contrastingly marked thorax (Figs. 2, 3). Internally, the valve apex is strongly bifid (Fig. 5) (bluntly so in *D. albertae*, Fig. 4), the aedeagus is 4 × longer than wide (Fig. 7) (5 × in *D. albertae*, Fig. 6), and the vesica is approximately ½ the length of the aedeagus (Fig. 7) (equal in length to aedeagus in *albertae*, Fig. 6). Identification of male specimens can be confirmed by brushing the scales off of the valve apex and examining the apical processes.

Description. Head – Antennae in both sexes simple and filiform, ciliate ventrally (females more sparsely ciliate), with a lateral, subapical seta on each side of segment; antenna covered with grey-brown and white scales dorsally; eyes large, rounded and widely spaced; palpi short, reaching lower margin of eye with long hair-like white scales; frontal tuft consisting of long brown and white, hair-like and paddle-like scales. **Thorax**



Figures 6-7. Aedeagus with inflated vesica of *D. albertae* (6) and *D. tarandus* (7).

– slender and proportioned similar to that of most Geometridae; covered in grey-brown and whitish hair-like and paddle-shaped scales; patagia and tegulae brown centrally, bordered with whitish scales; ventral thorax and legs brown-scaled. **Forewing** – (Figs. 2, 3) average length 15.6 mm ($n = 3$) for males, 14.3 mm ($n = 1$) for female; broad and translucent, covered with white hair-like and paddle-shaped scales; patterned white with vertical grey-brown banding basally with denser banding medially; females with more white scaling and slightly narrower wing shape; both sexes with distinct subterminal white dash at costa. **Hindwing** – (Fig. 2) smoky grey, translucent, lacking any distinguishable markings. **Male genitalia** – (Figs. 5, 7) uncus broad basally and constricted subapically with blunt, truncate apex; apex of valve with a pointed process dorsally and slightly longer, straight, finger-like process ventrally; aedeagus $4 \times$ longer than wide; vesica simple with basal diverticulum located dorsally, and apical diverticulum with crest-like row of 5-6 spines, smaller spinules absent; ductus ejaculatorius positioned ventrally below apical diverticulum. **Female genitalia** – not distinguishable from those of *D. albertae*; unforked anterior part of anterior apophysis about twice as long as forked part and similar in length to posterior apophysis; ductus bursae cylindrical and membranous; corpus bursae oval (length to width ratio 5:4), lacking signa; dorsal pheromone gland similar in length to papillae anales, apical quarter split into two broad, blunt branches.

Distribution and biology. *Dodia tarandus* has been found in boreal black spruce bogs and adjacent open pine uplands from central Alberta eastward to Manitoba (Fig. 8). In Alberta, specimens were collected in wet, shrubby spruce bogs and adjacent open pine woods at Holmes Crossing Ecological Reserve and the Caribou Mountains (Fig. 9),



Figure 8. Distribution of examined specimens of *D. albertae* and *D. tarandus*.



Figure 9. Habitat of *D. albertae* and *D. tarandus*, showing typical wet peat bog habitat near Wentzel Lake, Caribou Mountains, Alberta. Dominant vegetation consists of *Eriophorum* sp. (left foreground), *Picea mariana* (Mill.) BSP, *Ledum* sp., *Kalmia* sp. and *Spaghnum* sp.

flying in strict sympatry with *D. albertae* at the latter site. Males have been collected at ultraviolet and mercury vapour light, and the sole known female was netted during the day. Adults have been collected between early June and early July. Larval biology and host plants are not known, but host plants are likely to be one or more species of the plant groups common in peatland habitats such as *Salix* and various Ericaceae. In central Asia, *D. sazonomi* Dubatolov larvae hibernate and feed on *Dryas* (Rosaceae), and accept dandelion in captivity (Murzin 2003), suggesting the larvae are generalists.

Etymology. The name *tarandus* reflects this species' initial discovery and occurrence in the Caribou Mountains of Alberta, and also the habitat it shares with the also elusive Woodland Caribou, *Rangifer tarandus* (L.).

Discussion

Although *Dodia* species are rarely collected, the few records of *D. tarandus* suggest it to be less widespread than *D. albertae*; so far it is known only from the boreal region of central Canada. It is expected that additional surveying of peatlands will show *D.*

tarandus to be more widespread, since nearly all boreal forest Lepidoptera species have a broad, nearly transcontinental distribution.

Comparisons of molecular data ('barcode' fragment of *cox1* mtDNA; Barcode of Life Data System, Ratnasingham and Hebert 2007) from two specimens of *D. tarandus* (Caribou Mountains) were 2 % divergent from *D. albertae* samples (Alberta, Yukon, Labrador), including sympatric specimens from the Caribou Mountains. However, one Alberta and one Yukon specimen of *D. albertae* also exhibited *D. tarandus* haplotypes. The cause of this discordance is currently not clear; arctiines appear to be particularly prone to gene tree paralogy, including the genus *Grammia* Rambur (Schmidt and Sperling 2008) and also other genera such as *Neoarctia* Neumögen and Dyar, *Virbia* Walker, and *Haploa* Hübner (Schmidt, unpubl. data).

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References

- Bang-Haas A (1912) Neue oder wenig bekannte palaearktische makrolepidopteren. IV. Deutsche Entomologische Zeitschrift *Iris* 26: 103-110.
- Dyar HG (1901) Diagnosis of a new arctian. *Journal of the New York Entomological Society* 9: 85.
- Lafontaine JD (2004) Noctuoidea: Noctuidae (part), Noctuinae (part - Agrotini). In: Hodges RW (Ed) *The Moths of North America*, fascicle 27.1. Wedge Entomological Research Foundation, Washington, D.C., 385 pp.
- Dubatolov VV (1990) Arctiinae (Lepidoptera: Arctiidae) of southern Siberian mountains. Part 2. In: Zolotarenko GS (Ed) *Arthropods and helminths: collected scientific works*. Nauka, Novosibirsk. 139-169. (In Russian).
- Murzin V (2003) *The Tiger Moths of the former Soviet Union*. Pensoft publishers, Sofia–Moscow.
- Ratnasingham S, Hebert PDN (2007) BOLD: The Barcode of Life Data System. *Molecular Ecology Notes* 7: 355-364.
- Schmidt BC, Macaulay DA, Pohl GR (2004) Survey of Lepidoptera in the Sub-arctic Ecoregion of northeastern Alberta. I. 2003 Survey of the Caribou Mountains Wildland Park. Prepared for the Alberta Natural Heritage Information Centre, Parks and Protected Areas

- Division, Alberta Community Development, Edmonton, Alberta. http://www.biology.ualberta.ca/old_site/uasm//alg/downloads/Caribou_Report_2004.pdf
- Schmidt BC, Sperling FAH (2008) Widespread decoupling of mtDNA variation and species integrity in *Grammia* tiger moths (Lepidoptera: Noctuidae). *Systematic Entomology* 33: 613-634.
- Sheljuzhko AL (1918). Diagnoses lepidopterorum novorum Sibiriae. *Neue Beiträge zur Systematischen Insektenkunde* 1: 104.
- Troubridge JT, Lafontaine JD (2004) The Moths of Canada. Canadian Biodiversity Information Facility. http://www.scib.gc.ca/spp_pages/misc_moths/phps/mothindex_e.php
- Tshistjakov YA (1988) Tiger moths of the genus *Dodia* Dyar, 1901 (Lepidoptera, Arctiidae) of the fauna of the USSR. *Entomologicheskoe Obozrenie* 67: 632-643. (In Russian).
- Tshistjakov YA (1989) Moths of the genus *Dodia* Dyar, 1901 (Lepidoptera, Arctiidae). *Entomological Review* 68(2): 90-101.
- Tshistjakov YA, Lafontaine JD (1984) A review of the genus *Dodia* Dyar (Lepidoptera: Arctiidae) with description of a new species from eastern Siberia and northern Canada. *Canadian Entomologist* 116: 1549-1556.