

The Most Northerly Black Witch (*Ascalapha odorata*): A Tropical Moth in the Canadian Arctic

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A specimen of the Black Witch (*Ascalapha odorata*) was collected in August 2006 near Churchill, Manitoba, at 58.7652°N. This represents the most northerly record for this species. DNA barcode comparison of 93 specimens of *A. odorata* in the Barcode of Life Data Systems revealed low genetic divergence even though these specimens were collected from a large geographical area. The haplotype of the Churchill specimen was shared by only one other individual (collected in the Yucatán Peninsula of Mexico) in the Barcode of Life Data Systems. A definite assignment of the geographic origin of the Churchill specimen is not possible with current data, but more extensive analysis of Central American populations with additional genetic markers might resolve this uncertainty.

Key Words: Black Witch; Mariposa de la muerte; *Ascalapha odorata*; DNA barcoding; distribution; genetic divergence; migratory; migration; Manitoba

Ascalapha odorata (Linnaeus) (Black Witch) is one of the largest members of the superfamily Noctuoidea in North America. Although it has been collected from Canada to Argentina and even from Hawaii (Quinn

2008–2014*) (Figure 1), the natural breeding range of *A. odorata* is thought to be limited to Central America and the southernmost United States, including Texas and Florida (Wagner *et al.* 2011; Quinn 2008–2014*).

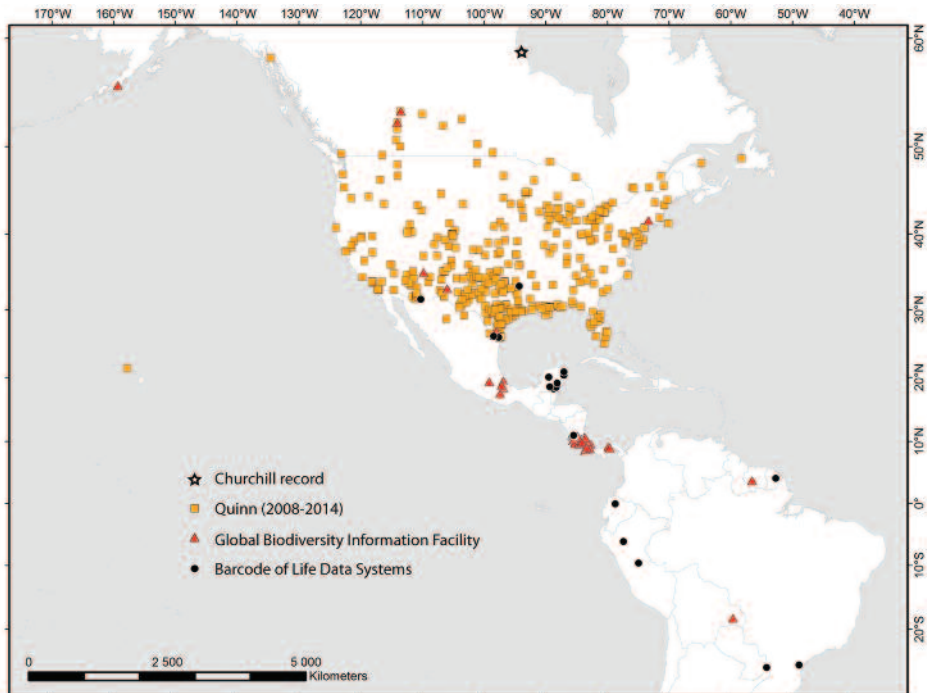


FIGURE 1. Collection sites of specimens of *Ascalapha odorata* (Black Witch) currently registered in the Barcode of Life Data Systems (black dots, star), the Global Biodiversity Information Facility (red triangles), and by Quinn (2008–2014*) (orange squares), accessed January 2014, most northerly observed record from Bird Cove, 18 km east of Churchill (star).

The caterpillars of the Black Witch have also been observed on introduced acacias in the greater Los Angeles area (Wagner *et al.* 2011).

This moth is a seasonal migrant to more northerly regions of North America. Most Canadian records are from summer and early autumn. Quinn (2008–2014*) gives an excellent summary of records from the United States and Canada, and several additional records are available through the Global Biodiversity Information Facility (<http://www.gbif.org>). These are shown in Figure 1. Additional North American sightings can be seen in the Butterflies and Moths of North America website (Opler *et al.* 2013*) and the North American Moth Photographers Group website (North American Moth Photographers Group 2014*), although many of these records are the same as those reported by Quinn (2008–2014*).

Most past Canadian records derive from sites in southern Canada, but specimens have a broad longitudinal distribution, with records from Newfoundland to British Columbia. In 2012 there were particularly frequent incursions of this moth into Canada (Quinn 2008–2014*).

The species also appears to engage in southerly and altitudinal migrations, as specimens are known from as far south as Argentina and into Andean locales (Henderson 2002). Its broad dispersal to temperate and high-elevation sites may reflect migratory flights to cooler environments, as is known for a number of other noctuoids (Kevan and Kendall 1997).

Ascalapha odorata is a recurring visitor to Canada, but most past records have been restricted to southern regions of the country. Although one of its larval host plants, *Gymnocladus dioica* (Kentucky Coffee-tree), is native to Carolinian Canada and adult food resources of over-ripe fruit (e.g., *Prunus* spp.) are widespread in Canada, this species is unlikely to become established, as all life stages are believed to be intolerant to prolonged freezes (Wagner *et al.* 2011).

The primary motivation for this paper lies in reporting the discovery of a live female *Ascalapha odorata* on 18 August 2006 resting on *Empetrum nigrum* (Black Crowberry) at Bird Cove, a rocky headland on Hudson Bay about 18 km east of Churchill, Manitoba (58.7652°N, 93.8682°W) (Figure 2). This specimen represents the most northerly record for any Black Witch, displacing the previous record holder, a specimen collected at Auke Bay, 13 km north of Juneau, Alaska (58.3833°N, 134.5822°W) (Spangler 1957).

The Churchill specimen is the first individual of *A. odorata* found in the Low Arctic tundra. This individual probably arrived in the Hudson Bay area on strong southerly winds about a week before its discovery (P. Kevan, personal observation). The specimen is now housed in the Biodiversity Institute of Ontario at the University of Guelph, and its photograph is accessible on the Barcode of Life Data Systems (Ratnasingham and Hebert 2007): http://www.boldsystems.org/index.php/Public_RecordView?processid=DSCNI024-07.



FIGURE 2. The presence of *Ascalapha odorata* (Black Witch) near Churchill, Manitoba. A and B: The worm but living specimen collected near Bird Cove, 18 km east of Churchill, Manitoba, on 18 August 2006. C: Paul Hebert documents the most exciting catch of the day. Photos: T. Ekrem.

Ninety-three sequences from the DNA barcode region of the cytochrome *c* oxidase 1 gene are currently available for *A. odorata* on the Barcode of Life Data Systems (Ratnasingham and Hebert 2007). The records are from a wide geographical range (Figure 1), but all are members of the same Barcode Index Number (cluster) (BOLD:AAA5595*).

The average *p*-distance among these sequences is 0.28%, and the maximum distance is 1.38%. The *p*-distance to the nearest neighbours is 6.6%. Most of the *A. odorata* sequences fall into a single cluster, but the Churchill specimen belongs to a rather divergent group, represented by just three other individuals, two from the Yucatán Peninsula (Mexico) and one from Costa Rica (Figure 3).

Although it may never be possible to firmly establish the point of origin of the Churchill specimen, further analysis of barcode variation in Central and South American populations of *A. odorata* coupled with the

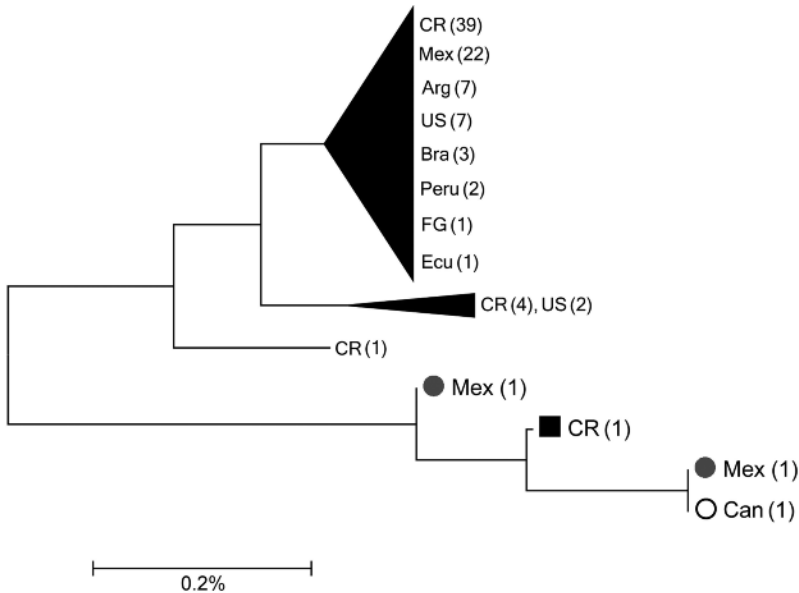


FIGURE 3. Neighbour-joining tree of DNA barcodes for *Ascalapha odorata* (Black Witch). Cluster with the specimen collected near Bird Cove, 18 km east of Churchill, Manitoba, on 18 August 2006, is coded: Churchill (open circle), Yucatán Peninsula (grey dots), Costa Rica (square). The tree was generated using Kimura 2-Parameter distances and pairwise deletion of gaps with MEGA5 (Tamura *et al.* 2011).

analysis of additional gene markers might permit the resolution of this uncertainty.

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