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Two new species of *Grylloblatta* Walker, 1914 (Grylloblattodea: Grylloblattidae) from western North America, and a neotype designation for *G. rothi* Gurney 1953

CHRISTOPHER J. MARSHALL & DAVID A. LYTLE

Department of Integrative Biology, 3029 Cordley Hall, Oregon State University, Corvallis, OR 97331, USA.

E-mails: marshach@science.oregonstate.edu, lytlea@oregonstate.edu

Abstract

Grylloblatta rothi Gurney, 1953 is redescribed and a neotype is designated from Cultus Mountain in the Oregon Cascades, U.S.A. Two new species of *Grylloblatta* are described, bringing the total number of *Grylloblatta* species to 15. *Grylloblatta chintimini* new species is described from Marys Peak in the Coast Range of Western Oregon, where it occurs on snowpack near the 1250 m summit. *Grylloblatta newberryensis* new species is described from Newberry Volcano in Central Oregon, where it is associated with snowfields overlying geologically-young lava flows. Morphological characters, primarily derived from male genitalia, are presented to diagnose these species and differentiate them from other *Grylloblatta* spp. in Oregon, Washington, and California. Molecular sequences from the cytochrome oxidase subunit II gene suggest that significant divergence has occurred among these species and provide a tool to aid identification of juvenile and female specimens.

Key words: ice crawler, cryophilic, extremophile, Marys Peak, Newberry Volcano, grylloblattid

Introduction

The extant Grylloblattodea are represented by the single family Grylloblattidae, which encompasses five genera inhabiting montane areas on both sides of the Pacific Ocean. There are currently 13 described species and subspecies in the genus *Grylloblatta* Walker 1914, which ranges from British Columbia, Canada, south to central California, U.S.A. and east to the Rocky Mountain cordillera (Schoville & Graening 2013). *Grylloblatta* inhabit montane areas that receive significant winter snow pack. They are both nocturnal and cryophilic, requiring caves or complex underground structure (talus slopes, young lava fields) for refugia during daytime and the warm summer months. During the winter they can be found on snow fields at night, actively foraging for arthropods and other prey.

Although now-extinct lineages allied with the Grylloblattodea possessed fully formed wings (Grimaldi & Engel, 2005), all extant Grylloblattidae are apterous. This poor ability to disperse, coupled with the active formation and elimination of suitable habitat over geologic time, has likely contributed to both their diversification and their patchy distribution over their range.

Taxonomic advances in the group have been hindered by the loss of several important type specimens as well as a general difficulty in obtaining suitable series of adult specimens for morphological studies. *Grylloblatta rothi* was described in 1953 by Dr. Ashley B. Gurney based on two specimens sent to him by colleagues. The holotype was a single male specimen collected by Dr. Vincent Roth on September 12th, 1948 from “Happy Valley, on Century Drive about 15 to 20 miles south of Sisters, Ore. Altitude, 6,450 feet, about 2,000 feet below lowest snowfields” (Gurney 1953). The only other specimen known to Gurney was a female collected by J. E. Elsea in 1937 at Crater Lake, some 90 miles south of Happy Valley, which he designated as the allotype.

The holotype and allotype are registered in the USNM type ledger (under no. 61656) but could not be located by the curatorial staff. Dr. Joseph Kamp received two loans from the USNM: one in 1971 and another in 1976, both of which remain outstanding according to their records (David Furth, personal correspondence). Although the official loan forms do not make explicit reference to type material, correspondence between Kamp and Gurney

enough (1250 m) to accumulate reliable snowpack, surrounded by lower terrain that does not appear to be suitable *Grylloblatta* habitat. Further surveys are needed to determine whether this species is more widespread than we currently know, or stranded at the elevational limits of its range.

TABLE 1. Uncorrected pairwise genetic divergence (mitochondrial COII) of *Grylloblatta rothi*, *G. chintimini*, and *G. newberryensis* from other *Grylloblatta* species known from Oregon and adjacent areas. Intraspecific genetic variability is shown in the diagonal for the three species treated here.

Species	Locality	GenBank	<i>chintimini</i>	<i>newberryensis</i>	<i>rothi</i>	<i>siskiyouensis</i>
<i>chintimini</i>	Mary's Peak, OR	KF880960	0.0000			
<i>newberryensis</i>	Surveyor's Lava Flow, OR	KF880958	0.0649	0.0148		
<i>rothi</i>	Cultus Mt., OR	KF880959	0.0731	0.0723	0.0074	
<i>siskiyouensis</i>	Oregon Caves, OR	JN612961	0.1185	0.1009	0.1209	–
<i>oregonensis</i>	Oregon Caves, OR	JN612962	0.1315	0.1268	0.1358	0.0954
<i>marmoreus</i>	Big Foot Cave, CA	JN612963	0.1347	0.1180	0.1257	0.0954
<i>sculleni</i>	Santiam Junction, OR	KF880961	0.1721	0.1600	0.1510	0.1513
<i>gurneyi</i>	Merrill Ice Cave, CA	DQ457348	0.1120	0.1071	0.1136	0.1044
<i>chandleri</i>	Gray's Flat, CA	FJ918575	0.1266	0.1150	0.1185	0.1145
<i>barberi</i>	Caribou Powerhouse, CA	FJ918624	0.1039	0.1018	0.1113	0.1189
<i>chirurgica</i>	Chinook Pass, WA	DQ457346	0.1740	0.1511	0.1497	0.1546

continued.

Species	<i>oregonensis</i>	<i>marmoreus</i>	<i>sculleni</i>	<i>gurneyi</i>	<i>chandleri</i>	<i>barberi</i>	<i>chirurgica</i>
<i>chintimini</i>							
<i>newberryensis</i>							
<i>rothi</i>							
<i>siskiyouensis</i>							
<i>oregonensis</i>	–						
<i>marmoreus</i>	0.1111	–					
<i>sculleni</i>	0.1569	0.1540	–				
<i>gurneyi</i>	0.1159	0.1159	0.1606	–			
<i>chandleri</i>	0.1255	0.1267	0.1525	0.0681	–		
<i>barberi</i>	0.1311	0.1213	0.1716	0.1000	0.1213	–	
<i>chirurgica</i>	0.1611	0.1567	0.0986	0.1451	0.1480	0.1742	–

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