Conservation Implications of a Newly Discovered Bee Species on Isla Robinson Crusoe, Chile

GREGORY J. ANDERSON,* GABRIEL BERNARDELLO,† AND MICHAEL S. ENGEL‡

*University of Connecticut, Department of Ecology and Evolutionary Biology, 75 North Eagleville Road, Storrs, CT 06269-3043, U.S.A., email ander@uconnvm.uconn.edu

†Instituto Multidisciplinario de Biología Vegetal, C. C. 495, 5000 Córdoba, Argentina

‡Division of Entomology, Natural History Museum and Biodiversity Research Center, and Department of Ecology and Evolutionary Biology, University of Kansas, Lawrence, KS 66045-7523, U.S.A.

The loss of a species and the impact on the community in which it existed is an appropriate and, unfortunately, not uncommon concern for biologists. Such losses are particularly important in mutualistic relationships such as pollination (Smith et al. 1995; Buchmann & Nabhan 1996; Kearns et al. 1998; Nabhan et al. 1998). We explore the possibility that the addition of a potential pollinator—in this case, a species new to science—could be of equal concern.

Islands often lack the same array of pollinating agents that serve similar plant species on continents (Carlquist 1974; Barrett 1998). The small but biologically important Juan Fernández Islands have been of particular interest in this regard because they are depauperate of animals in general and of pollinators specifically (Skottsberg 1928; Bernardello et al. 1999; Anderson et al. 2000). The archipelago is best known for its plant species (Stuessy et al. 1992; Marticorena et al. 1998) and for two species of hummingbirds, one of which is the only endemic known from oceanic islands (Colwell 1989).

This archipelago is one of the few places where there was no human settlement prior to sixteenth-century European maritime expansion (Wester 1991). It comprises two main islands, both of volcanic origin: Isla Robinson Crusoe (Masatierra), 667 km west of continental Chile, and Isla Alejandro Selkirk (Masafuera), 181 km farther west. Isla Robinson Crusoe is approximately 4 million years old and Isla Alejandro Selkirk is 1–2.4 million years old (Stuessy et al. 1984). In terms of native pollinators, the islands contain two species of hummingbirds. The insect fauna, however, is notably depauperate. Previous surveys of insects in general have demonstrated little diversity (Johow 1896; Kuschel 1952). There are a few flower-visiting flies and moths, but none of these are specialists, and most floral visitations are described as casual at best (Anderson et al. 2000). Until recently, there has been a complete lack of native bees and other flower-visiting Hymenoptera (Kuschel 1952). Also surprising, given the wide array of introduced plants and animals (many of them noxious) (Colwell 1989; Stuessy et al. 1997), is the lack of introduced bees or wasps. Effective pollination is brought about primarily by the hummingbirds, by self-compatibility, and by wind-distributed pollen (Bernardello et al. 1999; Anderson et al. 2000). Thus, the discovery of halictid bees on the islands in the past two decades is of particular interest.

Haroldo Toro (personal communication) and his students collected the first bees on Isla Robinson Crusoe in 1980 and 1981. Since the early 1990s, a few additional bee samples have been collected as part of an intensive study of the flora, its relationships, its evolution, and its reproductive capacity. In spite of hundreds of hours of observation of the flora in the field and multiple studies of the insect fauna, the bees collected were always taken in the environs of the village of San Juan Bautista, the only permanent human settlement on the archipelago. The 1980–1981 samples were collected near El Pangal, a tourist lodge, and the later samples were collected near the base of the most popular tourist trail and from the botanical gardens of the Corporación Nacional Forestal (CONAF), all near the perimeter of the village. In 1981 and in the later collections, the bees were uncommon but were found visiting flowers of native species (e.g., a natural hybrid of *Wahlenbergia*, Campanulaceae) cultivated in the CONAF gardens.

The bee collections are notable for two reasons. First, the species collected is new to science. The bees have been studied in detail and compared with other members of the genus *Lasioglossum* subgenus *Dialictus* from adjacent continental Chile. The variation of the island bees is different from all known extant continental

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species, so the species was described as new (Engel 2001). Technically then, this new bee is an endemic to the archipelago. It is possible, however, that this *Lasioglossum* is also a relatively new adventive or human introduction to the island. It would therefore represent an as-yet-uncollected, and likely uncommon, new continental species rather than a continental waif that arrived on the island and evolved in situ. The species of *Lasioglossum* subgenus *Dialictus* are often very similar and hard to distinguish from one another. One can never be sure that all species have been collected from a region, in particular with relatively small insects like these. There are most certainly more insect species to be collected and new species to be identified, especially in some groups like the Hemiptera. But given nearly a century of intensive study of the biota, especially the flora (e.g., Hemsley 1884; Johow 1896; Skottsberg 1921, 1953; Marticorena et al. 1998), and given numerous studies focusing on the pollination biology (e.g., Skottsberg 1928; Sun et al. 1996; Bernardello et al. 1999; Anderson et al. 2000), it is unlikely that something as significant as a flower-frequenting bee pollinator has been overlooked until now. The long and intensive study of the flora and its pollination, the recent discovery of the bees in the village, and their lack of subsequent dispersal beyond the areas of human habitation all argue instead for the recent introduction of a new continental species.

This is an unusual but not unprecedented situation. Recognition of a species first on an island, apparently as an endemic, with subsequent collection of specimens on source continents is documented among the flowering plants. For instance, *Taraxacum fernandezianum* (Asteraceae) was first described by Dahlstedt (quoted by Skottsberg 1921) as endemic to both large islands of this archipelago. Subsequently, this species was found ". . . from sea level to 3000′ throughout much of Central and South America, to the West Indies and Bermuda" (Richards 1976). Making the same point, but in reciprocal fashion, is the historical biogeography of *Calystegia tugurorium* Hook. f. (Convolvulaceae; Stapf 1928). This species was described, based on collections from Captain Cook's first voyage, as endemic to the North Island of New Zealand. Subsequently, *C. tuguriorum* has been found on the Juan Fernández archipelago and in southern Chile (Marticorena et al. 1998).

Second, these halictid bees are also important because, if they persist and spread out from the village into the native vegetation, they could become important pollinators (especially considering that *Lasioglossum* species are generally widely polylectic). Their importance, in conservation terms, could be either positive or negative. Spreading populations of the bees might provide the biotic pollinator service that many of the plant species lack. The flowers of many of the species are effectively wind-pollinated (Bernardello et al. 1999; Anderson et al. 2000), but several retain the bright corollas and even nectar rewards inherited from their biotically pollinated continental progenitors. The symbiotic interaction of the bees and flowers could serve the plants and the bees, yielding fruits and seeds for the plants and nectar and pollen for the bees. On the other hand, the bees might well focus their activity on the native hummingbird-pollinated plants, species that have much higher nectar volume than other species. If so, the bees could reduce the resource the hummingbirds depend on and thus negatively effect their populations, especially of the endemic *Sephanoides fernandensis*, a species already threatened by other introductions (Colwell 1989).

Thus, it remains to be seen whether an effort should be made to encourage or eliminate the new, and presumably adventive, *Lasioglossum* on Isla Robinson Crusoe. Until populations of these bees are identified on the continent, they constitute an endemic new species and at the least an interesting addition to the biodiversity of the islands. It will take time, however, to determine whether they pose a threat or an advantage to the native flora and fauna.

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