DISCUSSION OF THE FLORA OF GUADALUPE ISLAND

Dr. Reid Moran[1]: Guadalupe Island lies about 250 miles south-southwest of San Diego, California, and about 160 miles off the peninsula of Baja California, Mexico. Volcanic in origin and separated from the peninsula by depths of about 12,000 feet, it is clearly an oceanic island.

Among the vascular plants recorded from Guadalupe Island and its islets, apparently 164 species are native. Goats, introduced more than a century ago, have eliminated some species and reduced others nearly to extinction. Outer Islet, a goatless refugium two miles south of the main island, has a native florula of 36 species. Nine of these (including *Euphorbia misera* and *Lavatera occidentalis*) are very scarce on the main island, largely confined to cliffs inaccessible to goats; another one (*Coreopsis gigantea*) has not been collected there since 1875; and five others (including *Lavatera lindsayi, Dudleya guadalupensis,* and *Rhus integrifolia*) have never been recorded from there. Although it is not known that these five ever did occur on the main island, presumably they did but were exterminated by the goats. These five, comprising 14 per cent of the native florula of Outer Islet, give the only suggestion we have as to how many species must have been eliminated from the main island by the goats before they could be found by botanists.

Also reported from Guadalupe Island are 42 species that probably are not native. Several of these, each found only once, apparently have not persisted; but, with the severe reduction of many native plants by the goats, other introduced plants have become abundant.

The total number of vascular plants reported from Guadalupe Island and its islets thus is 206 species – about 164 native and 42 introduced – though not all there at one time. For the size of the island, as Dr. Raven noted, the flora is rather small, compared to those of the islands off southern California. However, this flora more closely approaches that of Cedros Island, a continental

1. Dr. Moran showed color slides under the title "Guadalupe Island and its flora, what's left of it". His commentary without the pictures is not a complete unit suitable for inclusion here. But since several other speakers throughout the symposium referred to points that he raised, a statement of some of these points is included.

island at nearly the same latitude and with slightly greater area, nearly as great an elevation, and perhaps about the same or a little more diversity of habitats. Cedros Island has about 205 native and 22 introduced species. A direct relationship of size of flora to area of island assumes, as Raven said, that other things are equal, which of course they never are. The floras of Guadalupe and Cedros islands are relatively smaller than those of the Southern California Islands, probably because other things are less equal: At the lower latitude the climate is drier.

Of 132 non-endemic species that occur on Guadalupe Island about 107, or 81 per cent, occur on one or more of the islands off southern California; and 21 of these (such as *Crossosoma californicum* and *Galvezia speciosa*) are endemic to these islands and Guadalupe.

One of the endemic plants of Guadalupe Island is the palm, *Erythea edulis*, whose closest relative geographically is *E. armata* of northern Baja California. An intriguing question is how the first palm reached the island. Neither the fruit nor the seed will float in sea water. It is true that a branch bearing fruit could float, but the branches normally remain on the tree long after the fruit has fallen; and even if a fruiting branch did fall from the tree, it could scarcely be carried down a turbulent arroyo to the sea with the fruit still attached. The fruit and seed, about the size of a walnut, could hardly be carried accidentally by a bird; and it would take a very enterprising bird with great singleness of purpose to carry one 160 miles or more just for the future perplexity of botanists. Thus I have myself almost convinced that this palm could not be on Guadalupe Island; but there it is.

Dr. Sherwin Carlquist: Dr. Moran noted quite appropriately the difficulty of getting the rather large fruited palm, *Erythea edulis*, to Guadalupe Island via a single-minded and quite ambitious bird. I would like to make a comment on the basis of my studies in loss of dispersibility in the Hawaiian and other Pacific floras. There are very prominent trends toward seed gigantism on the islands; we need not postulate that the ancestor of the Guadalupe palm had nearly so large a fruit. Perhaps it was half as large or less, in which case only a half ambitious pigeon would have sufficed!

Dr. Thomas R. Howell: With regard to the Guadalupe palm, it is a possibility that the now extinct caracara, *Polyborus lutosus*, an endemic species that occupied Guadalupe Island, may possibly have been involved in bringing this plant to Guadalupe. This is highly speculative because this caracara was a carrion-eating falcon; but there is an African palm-nut vulture, *Gypohierax angolensis*, which feeds on the fruit of the African oil palm, *Elaeis guineensis*. It is not impossible that the ancestors of the Guadalupe caracara may have fed on some of the palm fruit and thus brought this seed over to the island. There are virtually no other birds known to occur on Guadalupe Island that might have brought even a smaller date to the island; even large pigeons are not known from Guadalupe.

I think we still need to worry a bit about this matter of transportation to Guadalupe Island, but the bird fauna is very small – that is, the land bird fauna – and most of these were quite small species and not likely to have been involved.