SYMPOSIUM CONCLUSIONS AND SUMMATION

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It seems clear that this symposium has served a useful function, i.e. to summarize the bulk of the research that has been conducted on the insect fauna of the California Channel Islands. It is somewhat surprising that the fauna is not better studied, since the islands are near a sizeable aggregation of systematic entomologists. Interest in the Channel Islands probably has been discouraged by the lack of easy accessibility, but these restrictions have preserved the islands in their current state.

It is obvious that much remains to be done to establish even a cursory understanding of the entomofauna of these interesting islands. As a rough example of the completeness of our knowledge of the fauna, Powell (this symposium) devised a method to estimate the extent of the total Lepidoptera fauna for each island. Using the number of species, he compared the percentage of butterflies of the total lepidopterous fauna of North America north of Mexico with the same percentage for each of the islands. Assuming that the butterflies are as well known on the islands as on the mainland and assuming that the ratio of number of butterfly species to total number of Lepidoptera species also is the same, Powell estimates that as little as 26% of the lepidopterous fauna is known for San Miguel Island and as much as 88% is known for Santa Cruz. Based on several recent observations he now believes that these estimates are too high. In late spring 1984 on Santa Cruz Island he discovered nearly 50 lepidopterous species not previously known to occur there, more than a 10% addition to the fauna (Powell, personal comm.). S. Miller (this symposium) presented figures of known number of species of insects vs. estimated number of species for each island; totals of his data suggest that slightly less than one third of the insect fauna of the islands is known. Although these methods provide approximations only, they make the point that much remains to be done even to develop a complete list of taxa. Research on such interesting topics as faunal turnover rates, the effects of recent introductions, or the effects of feral-mammal removal are of considerable importance, but such studies are strongly dependent upon a sound taxonomic foundation of the insects.

Regardless of the paucity of information, certain patterns seem to be consistent among the majority of groups that have been analyzed. Correlation between island area and number of species was demonstrated in all groups except bees, sphecid wasps and tiger beetles. It is unclear why bees and sphecid wasps do not fit this pattern. The cause does not appear to be lack of collecting since bees are well correlated with other variables. Restrictive habitat requirements of tiger beetles apparently are the cause of this group's lack of conformity. If the size of habitable areas on the islands were used as a factor in the analysis rather than total area, it is hypothesized that tiger beetles would be consistent with other groups.

In bees and mealybugs, significant correlations were found between species diversity and maximum island elevation. A similar finding was demonstrated by Weissman and Rentz (1976), but they were quick to point out that elevation and certain

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group. Of the endemics that occur on more than one island but are found on both northern and southern islands, there are 38 northern island records and only 21 southern island records. These data are consistent with expectations based on geological evidence. Assuming that dispersal is a relatively uncommon phenomenon, the existence of Santarosae (an amalgamation of Anacapa, Santa Cruz, Santa Rosa, and San Miguel Islands) within 6 km of the mainland in the later part of the Pleistocene and the isolation of each of the southern islands, would explain the many single-island endemics in the south and few in the north. Multiple-island endemics would predominate in the north, and with greater isolation, the southern islands would have more exclusive endemics.

For many years scientists have suggested that many if not most endemics on the islands are relictual and not truly autochthonous taxa. Weissman (this symposium) hypothesized that this is not the case in the Orthoptera. Rust et al. (this symposium) suggested that endemics that are conspicuously different from closely related species probably are relictual in nature and closely similar species are likely candidates as autochthonous endemics. Within the insects, it is likely that many cryptic endemic taxa occur on the islands and that most of these are yet to be discovered.

In conclusion, I would like to take the view of an optimist and speculate about the future. I hope that the near future finally brings an end to the ravages of the many feral animals on the islands, allowing these interesting and unique insular habitats to begin to return to a more natural state. It is beyond the realm of possibility to expect research on the entire insular insect fauna any time soon, but a reasonable goal for the future would be for several diverse insect groups to be studied in considerable detail. The contents of this symposium would seem to suggest that we have a reasonable start on this goal. It is important that these studies include surveys not only of the islands, but also of the faunas of the adjoining mainland, the coastal areas including the coastal mountain ranges, and the desert areas in the southeastern areas of California and Arizona. Research on groups that contain several closely related endemic taxa should include phylogenetic analyses to determine if there is evidence of vicariance patterns. The future should be especially interesting when studies of insular populations are monitored under conditions of expanding habitats after the disturbances of feral animals are eliminated. It is strongly recommended that those administrators who are in a position to take action against adventive mammals on the islands do so as rapidly and expeditiously as possible. Each year that they remain, additional species of the endemic biota are eliminated. Unless action is taken quickly, many unique organisms will become extinct before they are discovered and studied.

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