

A HISTORY OF ENTOMOLOGICAL EXPLORATION ON SANTA ROSA ISLAND

by Scott E. Miller



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Introduction

My compilation of data on insects of the California Channel Islands, based on all available published records and many unpublished (e.g., museum specimen) records, includes a total of 2837 species (S.E. Miller and C.E. O'Connell, manuscript). Of these, 601 species are known from Santa Rosa Island. Comparison with the neighboring islands, Santa Cruz Island with 1574 species and the much smaller San Miguel Island with 348 species, suggests that the insect fauna of Santa Rosa Island is still very incompletely known. These numbers are for insects only, and do not include related arthropods (e.g., spiders, myriopods, crustaceans, etc.), although the related arthropods are included in this essay. Santa Rosa Island can be expected to host a less diverse insect community than Santa Cruz Island, because the latter is larger, more topographically diverse (e.g., has a central valley), and hosts greater habitat diversity. However, Santa Rosa Island has not had the intensity of sampling effort that Santa Cruz Island has seen, especially through activities associated with the University of California research station.

Several chapters by Scott Miller and F.G. Hochberg in Woodhouse (1981) review the state of knowledge at that time of insects and other invertebrates of Santa Rosa Island. Miller and Menke (1981)

provided an overview of the history of entomological exploration of the California Channel Islands. This more detailed treatment for Santa Rosa Island is drawn from those accounts, with additional references to published and unpublished (primarily specimen labels in museum collections) sources. A full entomological bibliography for the California Islands is provided in Miller and Menke (1981) and Miller (1985b, 1993). For a general introduction to the natural history of insects on the islands, see Miller (1985a).

Analyses by Scott Miller and Yves Basset (manuscript) of species richness of insects of the California Channel Islands, based on the statistical techniques of path analysis and correspondence analysis, suggest that the fauna is incompletely known overall (because of both sampling and research effort), although some groups such as orthopteroids, butterflies, and bees are reasonably well censused. Level of knowledge (as measured by publications per island) is the most important causal interaction in explaining patterns of species richness for insects overall, but is replaced by habitat diversity for the better known insect groups.

Early Exploration by Naturalists

The early history of entomological collecting is difficult to reconstruct because of limited data associated with the few extant specimens (e.g., usually labeled only "Santa Rosa Island" without a date or collector) and the fact that most of whatever specimens may have existed were probably destroyed in the 1906 fire at the California Academy of Sciences. However, many of Gustav A. Eisen's Santa Rosa Island beetle and spider specimens remain intact at the Museum of Comparative Zoology, Harvard University (via the Henry C. Fall and Nathan Banks collections, respectively).

The earliest scientific insect collections on Santa Rosa Island were probably made by William G.W. Harford and his associates between 1872 and 1874 (Junak, this volume; Orr, 1968: 150, 177). Harford was a general naturalist who accompanied the United States Coast Survey to the island in 1872. On this and subsequent trips in 1873 and 1874, he was joined by other naturalists who might also have collected insects. It appears that at least some of these insects were passed on to another resident of San Francisco, Henry Edwards, who in turn passed some on to other prominent entomologists of the time, such as Samuel Scudder.

Although the United States Geographical Survey of 1875 (the "Wheeler Survey") did not visit Santa Rosa Island (Orr, 1968), Scudder's report on Orthoptera (Scudder, 1876: 289), includes one species of grasshopper (*Camnula atrox*, now *Camnula pellucida*)

(Scudder); Acrididae) from Santa Rosa Island, evidently acquired via Henry Edwards. Subsequently, Scudder (1900) included a specimen from Santa Rosa Island, also provided by Henry Edwards, in the original description of *Leprus glaucipennis* (now *L. intermedius* Saussure; Orthoptera: Acrididae).

The moth *Melitia gloriosa* (Lepidoptera: Sesiidae) was described by Edwards (1880: 71) from a specimen collected by a "Mr. S. Brannan" (presumably Samuel Brannan, Jr., an associate of Harford) on Santa Rosa Island, evidently between 1872 and 1880. It is likely that he participated in a trip with Harford.

Hubbell (1936: 478) notes specimens of *Ceuthophilus californianus* Scudder (Orthoptera: Rhaphidophoridae) collected by "Dr. G. Bower" in the Smithsonian Institution. It is possible that this was a misspelling referring to Stephen Bowers, an anthropologist who visited the island in 1877 (Bowers, 1878).

Gustavus A. Eisen, a naturalist of very broad interests associated with the California Academy of Sciences, visited Santa Rosa Island in May 1897 (beetles described by Fall, 1897) and July of an unknown year (spiders described by Banks, 1904). Eisen also collected earthworms (Eisen, 1900) and other invertebrates (Montgomery, 1898) on Santa Rosa Island. The full extent of his collections is not known, because most were destroyed in the 1906 San Francisco fire.

Between the World Wars

Edward P. Van Duzee, an entomologist at the California Academy of Sciences collected 218 insect specimens on Santa Rosa Island between May 15-21, 1919 (Van Duzee, 1919; Evermann, 1920: 375, 396). These were the first collections made on Santa Rosa by a professional entomologist.

The first extensive, and perhaps still the broadest, entomological survey of Santa Rosa Island was undertaken during the three visits by the Los Angeles County Museum's Channel Islands Biological Survey (Comstock, 1939, 1946). Lloyd M. Martin was the primary entomologist during the first visit, August 5-10, 1939, but Jack C. von Bloeker and George Kanakoff also collected insects. Chris Henne was the primary entomologist for the second visit, March 29 to April 9, 1941, again assisted by Jack C. von Bloeker and George Kanakoff. John A. Comstock collected insects on the third visit, November 8-15, 1941. The survey program was unfortunately curtailed by the entry of the United States into World War II in December 1941.

The California Institute of Technology group studying the genetics of the fruit fly *Drosophila pseudoobscura* Frolova (Diptera: Drosophilidae) made at least two collecting trips to the "oak and pine

grove near top of central mountain peak" of Santa Rosa Island, in October 1939 (Theodosius Dobzhansky and Carl C. Epling) and June 1941 (Epling) (Dobzhansky and Epling, 1944: 80; see also Harshman and Taylor, 1978).

After the Second World War

Knowlton (1949) recorded the insects in gut contents of two species of lizards collected on Santa Rosa Island by Chapman Grant on August 10-11, 1948, during a visit by the *Orca* expedition sponsored by the Sefton Foundation and San Diego Natural History Museum. Cunningham (1956) recorded insects from the gut contents of another set of alligator lizards from Santa Rosa Island, but the collector and year was not stated.

A few insects were collected by Phil C. Orr and colleagues at the Santa Barbara Museum of Natural History, during Orr's extensive archaeological and paleontological work on Santa Rosa Island from 1947 to 1968 (Orr, 1968).

From 1960-1963 Santa Rosa Island hosted a successful experiment to control heel flies, the larvae of which are cattle grubs (*Hypoderma lineatum* (Villiers) and *H. bovis* (Linnaeus); Diptera: Oestridae), with Ruelene insecticide. This experiment was undertaken by L.A. Riehl of the University of California at Riverside and Harold W. Lembright and Paul D. Ludwing of Dow Chemical Company (Batterson, 1963; Riehl *et al.*, 1965).

As part of a survey of mosquitoes and other biting flies by the United States Department of Health, Richard D. Spadoni visited Santa Rosa Island on April 17-19, 1969 (Spadoni *et al.*, 1973).

The Last Twenty-five Years

David B. Weissman and David C.F. Rentz, then associated with Stanford University and the California Academy of Sciences, visited Santa Rosa Island July 3-6, 1971 and August 9-11, 1974, as part of an extensive study of the orthopteroid insects of the Channel Islands. This work resulted in a series of publications on the systematics, biogeography, and biology of the grasshoppers, crickets and relatives (Rentz and Weissman, 1973, 1982; Weissman and Rentz, 1976; Weissman *et al.*, 1980).

Stephen A. Maskel, a student at the University of California at Santa Barbara, visited Santa Rosa Island to make acoustic recordings of *Gryllus* crickets for his unpublished masters thesis (Maskel, 1975; see Weissman *et al.*, 1980).

Charles L. Remington from the Peabody Museum of Natural History, Yale University, visited Santa Rosa Island for general

entomological collecting in 1973 and 1975 (noted in *Discovery* 9(1): 53, 1973 and 11(1): 38, 1975).

F.G. Hochberg participated in Santa Barbara Museum of Natural History trips in 1977 and 1978 trips, along with another week in May 1986. Hochberg did general invertebrate collecting targeting snails and crustaceans including isopods, amphipods and branchiopods (Garthwaite *et al.*, 1985).

Arnold S. Menke, Douglass R. Miller and Richard W. Rust, with the United States Department of Agriculture's Systematic Entomology Laboratory, visited Santa Rosa Island June 5-10, 1978, focusing especially on bees and wasps (Hymenoptera) and scale insects (Homoptera) (Rust *et al.*, 1985). The specimens they collected are in the Smithsonian Institution.

The weevil *Rhinocyllus conicus* (Froelich) (Coleoptera: Curculionidae) was introduced to Santa Rosa Island in 1979 for biological control of the pest thistles *Carduus pycnocephalus* L. and *Silybum marianum* L. Five hundred individuals of the weevil from Montana were provided by the U.S. Department of Agriculture's Biological Control of Weeds Laboratory in Albany, California (unpublished USDA records; see also Goeden and Ricker, 1977). It is not known if the weevil became established on Santa Rosa Island or not.

Martin G. Ramirez, then a student at the University of California at Santa Cruz, sampled sand dune dwelling spiders at Southeast Anchorage on July 1, 1987 (Ramirez and Beckwitt, 1995).

Chad R. Soiseth and Jennifer Dugan sampled insects and other invertebrates in freshwater, coastal lagoon, and sand beach habitats from 1989 to 1991 as part of a project for the National Park Service (Soiseth, 1994; J. Dugan, pers. comm.).

John F. Emmel and Thomas Emmel collected butterflies (Lepidoptera) in May 1989 and March 16-19, 1990 (J. Emmel, pers. comm.).

Robin W. Thorp, University of California at Davis, sampled native bees on April 21-24, 1989, and accompanied by John Bartell and Chris Spohrer on June 3-5, 1994 (Thorpe, pers. comm., 1996). Adrian Wenner, University of California at Santa Barbara, also visited Santa Rosa Island in the 1980s and 1990s, as part of his research with Thorpe and others on interactions between feral honey bees and native bees on Santa Cruz Island.

Jerry A. Powell, University of California at Berkeley, collected moths (Lepidoptera) and other insects from April 26 to May 1, 1995.

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NOTES

Batterson, M. 1963. Stamping out the cattle grub on Santa Rosa Island ranchers achieve over 99.8 per cent with Ruelene 25E Insecticide. *Diamond* (Dow Chemical Company, Midland, Michigan) 26: 20-23.

Bowers, S. 1878. Santa Rosa Island. *Annual report of the Board of Regents of the Smithsonian Institution, showing the operations, expenditures, and condition of the Institution for the year 1877*. pp. 316-320.

Comstock, J.A. 1939. Contributions from the Los Angeles Museum-Channel Islands Biological Survey. 33. Brief notes on the expeditions conducted between March 16, 1940 and December 14, 1941. *Bulletin of the Southern California of Sciences* 45: 94-107.

Cunningham, J.D. 1956. Food habits of the San Diego alligator lizard. *Herpetologica* 12: 225-230.

Dobzhansky, T. and C. Epling. 1944. Contributions to the genetics, taxonomy, and ecology of *Drosophila pseudoobscura* and its relatives. *Carnegie Institution of Washington Publication* 554: 1-183.

Edwards, H. 1880. Descriptions of some new forms of Aegeridae. *Bulletin of the Brooklyn Entomological Society* 3: 71-74.

Eisen, G. 1900. Researches in American Oligochaeta, with special reference to those of the Pacific Coast and adjacent islands. *Proceedings of the California Academy of Sciences (series 3), Zoology* 2: 85-276.

Evermann, B.W. 1920. Report of the director of the museum of the year 1919. *Proceeding of the California Academy of Sciences (series 4)* 9: 367-396.

Harshman, L. and C.E. Taylor. 1978. Gene frequencies of an isolated population of *Drosophila pseudoobscura*. *Journal of Heredity* 69: 197-99.

Knowlton, G.F. 1949. Insect food of the red-backed alligator lizard. *Herpetologica* 5: 46-47.

Maskel, S.A. 1975. An analysis of field cricket (*Gryllus* spp.) calling songs recorded along coastal Southern California. Unpublished M.A. thesis, University of California, Santa Barbara.

Miller, S.E. 1985a. The California Channel Islands—Past, present, and future: an entomological perspective. pp. 3-27 In A.S. Menke and D.R. Miller (eds.), *Entomology of the California Channel Islands: Proceedings of the First Symposium*. Santa Barbara Museum of Natural History, Santa Barbara, California.

Miller, S.E. 1985b. Entomological bibliography of the California Islands. Supplement I. pp. 137-169 In A.S. Menke and D.R. Miller (eds.), *Entomology of the California Channel Islands: Proceedings of the First Symposium*. Santa Barbara Museum of Natural History, Santa Barbara, California.

Miller, S.E. 1993. Entomological bibliography of the California Islands. Supplement. pp. 171-187 In F.G. Hochberg (ed.), *Third California Islands Symposium: Recent Advances in Research on the California Islands*. Santa Barbara Museum of Natural History, Santa Barbara, California.

Miller, S.E. and A.S. Menke. 1981. Entomological bibliography of the California Islands. *Santa Barbara Museum of Natural History Occasional Paper* 11: 1-78.

Montgomery, T.H., Jr. 1898. The Gordiacea of certain American collections, with particular reference to the North American fauna. II. *Proceedings of the California Academy of Sciences (series 3)*, *Zoology* 1(9): 333-344, pl. xix, xx.

Orr, P.C. 1968. *Prehistory of Santa Rosa Island*. Santa Barbara Museum of Natural History, Santa Barbara, California. xxi + 253 pp.

Ramirez, M.G. and R.D. Beckwitt. 1995. Phylogeny and historical biogeography of the spider genus *Lutica* (Araneae, Zodariidae). *Journal of Arachnology* 23: 177-193.

Rentz, D.C. and D.B. Weissman. 1973. The origins and affinities of the Orthoptera of the Channel Islands and adjacent mainland California. Part I. The genus *Cnemotettix*. *Proceedings of the Academy of Natural Sciences of Philadelphia* 125: 89-120.

Rentz, D.C. and D.B. Weissman. 1982. Faunal affinities, systematics, and bionomics of the Orthoptera of the California Channel Islands. *University of California Publications in Entomology* 94:xiii + 20.

Riehl, L.A., H.W. Lembright and P.D. Ludwig. 1965. Area population control of heel flies by Ruelene pour-on application annually to cattle. *Journal of Economic Entomology* 58: 1-4.

Rust, R.W., A.S. Menke and D.R. Miller. 1985. A biogeographic comparison of the bees, sphecid wasps, and mealybugs of the California Channel Islands (Hymenoptera, Homoptera). pp. 29-59 In A.S. Menke and D.R. Miller (eds.), *Entomology of the California Channel Islands: Proceedings of the First Symposium*. Santa Barbara Museum of Natural History, Santa Barbara, California.

Scudder, S.H. 1876. Report on the Orthoptera collected by the United States Geographical Surveys West of the One Hundredth Meridian, under the direction of Lieutenant George M. Wheeler, during the season of 1875. Ann. Rept. Chief Engineers 1876, Appendix JJ: 278-295.

Scudder, S.H. 1900. Note on the Orthopteran genus *Leprus* Saussure. *Psyche* 9:75-76.

Santa Cruz Island Foundation, Santa Rosa Island Chapter

Spadoni, R.D., V.I. Miles and R.O. Hayes. 1973. Mosquitoes collected on California offshore islands. *Mosquito News* 33: 94-101.

Weissman, D.B. and D.C. Rentz. 1976. Zoogeography of the grasshoppers and their relatives (Orthoptera) on the California Channel Islands. *Journal of Biogeography* 3: 105-114.

Weissman, D.B, D.C. Rentz, R.D. Alexander, and W. Loher. 1980. Field crickets (*Gryllus* and *Acheta*) of California and Baja California, Mexico. (Orthoptera: Gryllidae: Gryllinae). *Transactions of the American Entomological Society* 106: 327-356.

Van Duzee, E.P. 1919. [Comments in proceedings of September 20, 1919 meeting]. *Proceedings of the Pacific Coast Entomological Society* 1: [unpaged].

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