

Crabhole Breeding Mosquitoes:  
News of a Project for Study of the Biologies of Land Crabs  
and their Burrow Associates

Charles L. Hogue  
Los Angeles County Museum of Natural History  
and  
Donald B. Bright  
California State College, Fullerton

### Background

Several species of crabs have evolved the terrestrial habit and live, not in the sea like their relatives and ancestors, but on land in the supratidal zone of the tropical coasts throughout the world. Here they dig deep tubular burrows which they inhabit most of the time, leaving only to feed, mate and, in the case of females, spawn. Water accumulates in the bottom of the burrow from rainfall and ground seepage and provides the crab with moisture to keep its gills wet and supply its other water needs. These crabs primarily belong to the family Gecarcinidae--"Tropical Land Crabs"--but many Ocypodidae --"Fiddler and Ghost Crabs"--and certain Grapsidae--"Lagoon Crabs"--also fit this pattern. Non-burrowing land crabs such as the Hermit Crabs (Coenobitidae) and those species of the preceding families that habitually live below the high tide mark, are excluded.

Since 1967, the authors have combined their respective interests in mosquitoes (and general aquatic insect ecology) and land crabs, in studies on the crabhole habitat. The project is broadly titled "Biologies of Land Crabs and their Burrow Associates" (LCBA) and seeks to (a) discover and classify all burrow inhabiting arthropods taxonomically and according to their ecological role within the burrow ecosystem (b) learn as much as possible about the host crab behaviorally and ecologically, particularly to understand its functions in providing a niche for itself and its burrow mates.

To date, no comprehensive study of the land crab burrow as a definitive ecosystem has been undertaken. Our project represents the first of its kind.

Associated with the crab itself, intimately as parasites or commensals, or simply coinhabiting the burrow, are many arthropods belonging to diverse taxa. Best known of these are mosquitoes, some especially adapted to the crabhole as a breeding site, e.g. Deinocerites and Aedes (Skusea, Canraedes, Geoskusea, Levua), but one also finds ceratopogonid midges (Culicoides), aquatic beetles (Dyticidae) and mites (Arrenurus), drosophilid flies (Drosophila), helodid beetles, Cyclops and others commonly in crabhole water or upper chambers.

### Work accomplished to date

The authors collaborated in 1967 on the first phase of the present study with field studies in Costa Rica, San Andres Island, Colombia and other points in Central America. This initial trip has been followed up by joint investigation again in Baja California, Mexico, Peru, Ecuador and again in Costa Rica in 1968 and 1969. Independently, data and specimens have been gathered in Kenya, East Africa and Baja California (Hogue) and Costa Rica, Mexico and Australia (Bright).

Analysis of the collections and correlative investigations are presently in active progress. The following relevant articles have been published or are now in press or near completion:

1. The land crabs of Costa Rica. *Revista de Biología Tropical*. 14:183-203 (D. B. Bright, 1966).
2. A new Central American sand fly breeding in crab holes (Diptera, Ceratopogonidae). *L.A. Co. Museum Conts. Sci. No. 152*, 7pp. (C.L. Hogue and W.W. Wirth, 1969).
3. A list of the land crabs of the world and their known symbiotic and bio-coenotic associates. in ms. (C.L. Hogue and D.B. Bright). [An extensive paper containing a list of all published references to mosquitoes recorded from crabholes.]
4. Ecologies of gecarcinid land crabs and their burrow associates, especially Deinocerites mosquitoes, in Costa Rica. in preparation (D.B. Bright and C.L. Hogue).
5. Two new Microvelia from crabholes in Costa Rica (Hemiptera, Veliidae). *loc. cit.* in ms. (J.T. Polhemus).
6. A new moth fly of the genus Psychoda from crabholes on the Kenya Coast (Diptera: Psychodidae). in ms. (C.L. Hogue).
7. Observations on the biology of land crabs on the Kenya Coast. in ms. (C.L. Hogue and D. B. Bright).
8. Two new species of crabhole mosquitoes (Deinocerites) from Costa Rica (Diptera: Culicidae). *Trans. Amer. Ent. Inst.* in ms. (A. Adames and C.L. Hogue).

#### Support

Financial support to date has come from two grants by the American Philosophical Society and from our respective institutions and some private sources. Additional aid is being sought from other granting agencies and individuals.

#### Future Plans

The project has been very rewarding so far and the participants feel that they may continue study for many years. Field work is planned for all tropical shores especially those poorly known in respect to the present problem, e.g. along the Arabian Sea and Bay of Bengal, Indomalaya and Atlantic South America. In these areas even preliminary collecting is needed. We also see the need for continued detailed measurement of ecological variables at representative stations in order to ascertain ecosystem kinetics.

The cooperation of all interested culicidologists, ecologists and medical entomologists is solicited. We would appreciate receiving field observations relating to the phenomenon from anywhere in the world and references to published matter that may be unknown to us. Identification of host crabs involved in the studies of others will be made on request.