

NOTES ON THE COLEOPTERA OF WRACK

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The early stages of a number of beetles of intertidal rock crevices and salt marshes in southern California have been studied (Moore 1956, 1964a, 1964b; James *et al.* 1971). The coleopterous fauna of wrack is much more conspicuous and abundant than that of the habitats mentioned. Nevertheless, in spite of considerable investigation, the biologies of most of the insects of wrack remain unknown.

Seaweed cast up on the beach and left unwetted by seawater for a few days is usually teeming with adult beetles of many species which are indigenous to decaying kelp. Only occasionally are larvae encountered and those are of a few species only. When the wrack is again wetted by a high tide the adult insects leave; the action of the rare larvae is not known. The interval between highest tides which is the interval during which the insects gradually appear and suddenly disappear, is of about 16 to 20 days at most. This interval is too short for the development of most of these beetles. Their breeding sites must, therefore, be elsewhere; there are several possible sites. Three are discussed here.

Tiger beetles (*Cicindela* spp.) are often common on sandy beaches. It is known that larvae of such species occur on salt marshes of bays and estuaries (W. D. Sumlin, III, personal communication). It is possible that some

species of beetles found in decaying seaweed also breed in salt marshes and that the adults fly to decaying seaweed for food. Although I have investigated salt marsh insects without encountering any wrack inhibiting species, the matter still needs further investigation.

The intermittent streams of coastal southern California are more numerous than the salt marshes. The mouths of these streams are usually closed by sand bars behind which are often ponds or lagoons of fresh, slightly brackish or occasionally highly saline water. The insect fauna at the margins of such ponds is distinctive but it includes species found at the margins of streams and ponds inland. Since larval forms of only a few of these insects are known, some insects of the wrack might breed here and be unrecognized.

A third possibility is that some of the insects of the wrack develop in the damp sand of beaches. We know it to be true of at least some species of *Cafius* (James *et al.* 1971). This hypothesis could be tested, laboriously, by trenching the beach at intervals and extracting the arthropods with a berlese funnel. Sample digging with sea water floating for extraction was unsuccessful on several occasions but the insects might have been so widely dispersed that they were overlooked.

Certain species of Coleoptera are often so abundant in wrack that it seems incredible that the early stages are still unknown in spite of years of searching.

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