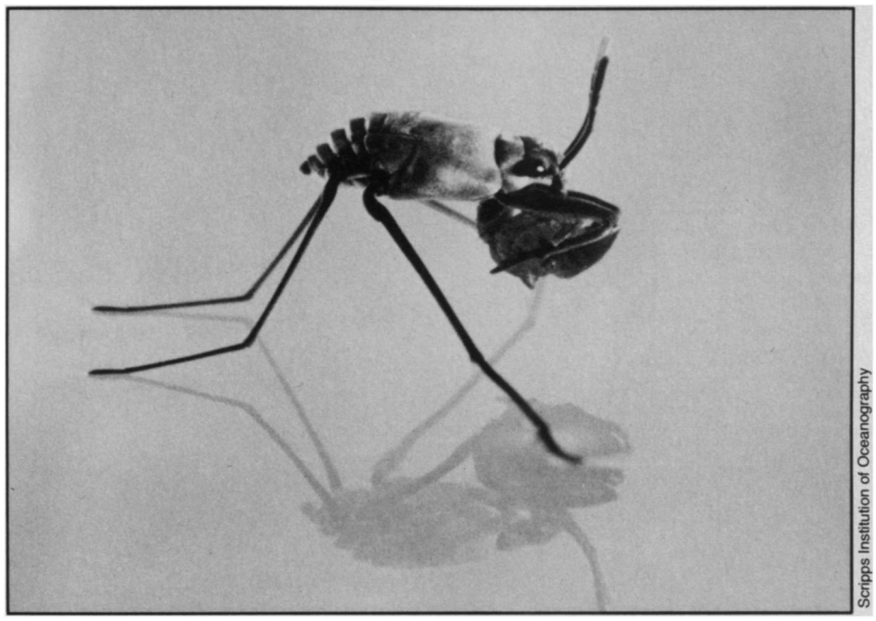
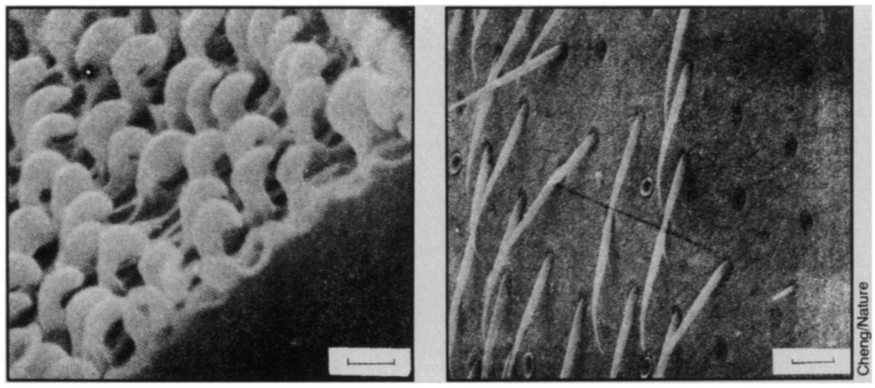
A Day in the Life of
THE SOLE INSECT OF THE SEA

Why has *Halobates* managed to survive on the open ocean where other insects have not? Some reasons are surfacing.

BY JOAN AREHART-TREICHEL



The 5 millimeter Halobates *assumes its unique "standing" posture, holding prey with its front legs while balancing on its rear legs, which have a 50 mm span.*



Halobates *has a coat of close-set hairs shaped like thick hooks (l.), whereas its fresh and brackish water cousins have a coat of fewer, straighter hairs (r.),*

Considering all the insects on earth is mind-boggling, to say the least! Our planet's insect load is estimated to weigh 12 times more than its human load. In one summer season the offspring of one pair of houseflies, if they all lived and reproduced in usual numbers, would total 191 billion billion. Nearly 800,000 different insect species have been named and each year 7,000 more are described for the first time.

But only five of these species, all belonging to the same genus, live on the open ocean rather than on or near land. They are called water striders, or *Halobates*. What special biological features have allowed these insects to survive on the ocean? Some answers to this question are being provided by Lanna Cheng of the Scripps Institution of Oceanography in La Jolla, Calif., who has been studying *Halobates* for some years now.

First off, visualize a tiny insect stranded thousands of miles away from land in the tropical and subtropical waters of the Atlantic, Pacific and Indian oceans. That is *Halobates*, destined never to visit land because it has no wings to fly there. How did *Halobates* end up in the middle of the oceans? Researchers aren't sure, but *Halobates* presumably originated from freshwater ancestors capable of invading salty habitats and must have altered its biology in many ways in order to live and breed on the open ocean. In fact, several of its adaptive mechanisms have been pinpointed.

For one, *Halobates* can skate across the surface of oceans with great speed and agility, about one or two miles an hour. This is faster than its freshwater cousins can move. For another, it has a special water-repellant coat, which consists of close-set hairs shaped like thick hooks with tips bent at a 90 degree angle. *Halobates's* freshwater and brackish water relatives, in contrast, have a coat of fewer, straight hairs, which provides less protection against water. A third feature that helps *Halobates* survive in the open ocean is its ability to lay eggs on floating objects rather than on submerged rocks, mud banks and plant roots, as do its fresh and brackish water counterparts. Still another adaptive feature is its diet. Whereas fresh and brackish striders eat terrestrial insects, *Halobates* feasts on zooplankton, small fish, fish eggs and even Portuguese men-of-war and jelly fishes, although the latter two, being mostly water, could not provide *Halobates* with much nutrition. *Halobates's* dexterity while feeding probably also helps it survive the rough, open ocean. It can balance itself on tossing waves like a surfer, its mid legs and back legs serving as surf boards and its front legs holding prey well above the water surface. Ordinarily it uses all six of its legs to float on the water. This standing position also helps it avoid competition for food, because it keeps its victim from struggling and, hence, drawing the attention of other hungry *Halobates* or other kinds of predators.

Still, much remains to be learned about those biological features that allow *Halobates* to survive in the open ocean. For instance, if it is forced under water, it can survive there for one or two hours. How does its water-resistant coat allow it to remain under water for so long? How does it breathe and regulate body water under water? In fact, how does it breathe and regulate body water on top of the water? Is there a seasonal variation to its life cycle that helps it survive in the open ocean? What is *Halobates's* role in the air-ocean food chain? (It has been found in the stomachs of several species of sea birds and in anchovy larvae; otherwise its predators are unknown.) Does this role have any bearing on its ability to survive on the open ocean?

Such questions are hard to answer because *Halobates* has not yet been successfully raised in the lab. Yet such questions should be answered, Cheng believes, not only because *Halobates* is the only truly oceanic insect, but because it is the only marine invertebrate living on the sea-air interface. □