

spiders, and carabids (ground beetles) were among the first to begin the process. Later, with regeneration of the vegetation, the recuperation began for the herbivorous insects such as homopterans (aphids) and larval lepidopterans (caterpillars).

The recuperation of many invertebrates is related to the recovery of the vegetation and the layer of organic material on top of the soil. In isolated

refuges, this fauna was almost unaltered; and these refuges can be considered like islands, which help in the reestablishment of the invertebrate community. The recuperation of the burnt area of Sierra Negra has proceeded rapidly, with the plants as well as with the insects. **Sandra Abedrabbo, Estación Científica Charles Darwin, Isla Santa Cruz, Galápagos, Ecuador.**

INTERNATIONAL SYMPOSIUM ON THE BIOGEOGRAPHY AND EVOLUTION OF THE MOLLUSCAN FAUNA OF THE GALAPAGOS ISLANDS

By: Matthew J. James

On 18 July 1988, an international symposium on the biogeography and evolution of the molluscan fauna of the Galápagos Islands was held during the 21st Annual Meeting of the Western Society of Malacologists (WSM). As president of WSM for 1988, I organized the symposium to bring together researchers with interests in the taxonomy, biogeography, and evolutionary history of the living and fossil molluscan fauna of the Galápagos. WSM maintains a long-standing tradition of emphasis on eastern Pacific molluscan faunas, both in its symposia and contributed paper sessions. The symposium was held in Darwin Hall on the campus of Sonoma State University in northern California, and consisted of 10 speakers who presented 12 papers in a daylong session.

Jack Stein Grove (Los Angeles County Museum of Natural History) spoke on "El Niño 1982-83 and new records of Indo-West Pacific fishes at the Galápagos." He reported that following the 1982-83 El Niño Southern Oscillation (ENSO) event, five species of Indo-West Pacific fishes were reported for the first time in the eastern Pacific at the Galápagos. These records indicate the importance of the El Niño phenomenon as an eastward transport mechanism across the equatorial Pacific.

Matthew J. James (Sonoma State University) spoke on the "Geological setting and Cenozoic molluscan paleontology of the Galápagos Islands." He outlined reasons why the volcanic nature of the Galápagos would not make them likely sites for fossilization, although scattered sedimentary deposits containing

molluscan remains provide a record of the ancient shallow-water marine fauna of the Islands.

William D. Pitt (California Academy of Sciences) and Lois J. Pitt (Sacramento, California) presented "Notes on the marine molluscan fossil deposits of the Galápagos Islands." They reported verifying the correct location of an important limestone deposit on Isla Santa Cruz which had been incorrectly relocated by workers subsequent to its initial report by Ochsner following the 1905-06 California Academy of Sciences expedition. Also of historical interest, they reported on the possible location of Charles Darwin's fossil locality at Cerro Brujo on Isla San Cristóbal which had not been previously relocated following Darwin's visit in 1835.

Sally E. Walker (University of California, Berkeley) spoke on the "Taphonomy of two Pleistocene terrace localities on the Galápagos Islands." She reported that molluscan fossils from Isla Isabela and Isla Santa Fé reveal different taphonomic histories and explained how evidence from clionid sponge borings and predatory snails, octopods, and crabs can be used to reconstruct the taphonomy of molluscan fossils.

Mitchell M. Colgan (University of California, Santa Cruz) spoke on "The Urvina Bay uplift: Biological and paleontological implications." He explained how the shallow-water invertebrate fauna stranded during the 6 m vertical uplift of a segment of ocean floor in 1954 provides a unique opportunity for study of not only "fossils in the making" but also the record of several previous El Niño events as

revealed through isotope analyses of thick scleractinian coral skeletons.

Yves Finet (Muséum d'Histoire Naturelle, Genève, Switzerland) had a paper read on his behalf entitled "Recent molluscan fauna in the Galápagos: Taxonomic composition of the fauna." He provided an update of the faunal list he published in 1985, taking into account the biogeographic distribution of species and a newly revised estimate of the percentage of endemic species.

Donald R. Shasky (Redlands, California) reported on an "Update on mollusks with Indo-Pacific faunal affinities in the tropical eastern Pacific - VII." This update included records of taxa previously unreported in the Panamic province. Shasky also presented a second paper on "Additions and emendations to the preliminary faunal list of the marine mollusks of the Galápagos Islands by Yves Finet, 1985." In this paper he documented species occurrences that both increase the total number of known Galápagos mollusks and decrease the percentage of endemic species from 26% to 23.2%.

Frank R. Bernard (Pacific Biological Station, Nanaimo, British Columbia, Canada) spoke on the "Living Bivalvia of the Galápagos and other eastern Pacific offshore islands." He used a large compilation of biogeographic information to show that the Galápagos bivalve fauna consists of 187 species, of which only 4 species (or 0.02%) are endemic to the Archipelago.

Eugene V. Coan (California Academy of Sciences) spoke on "Unscrambling some Galápagos bivalve records." He examined several taxa in the bivalve families Bernardinidae, Semelidae, and Thraciidae in order to clarify distributional records and to pose several provocative biogeographic questions concerning such topics as the wide distribution from California to Perú of some brooding bivalves.

Shi-Kuei Wu (University of Colorado Museum, Boulder, Colorado) presented a paper coauthored with Syuzo Itow (Nagasaki University, Nagasaki, Japan) on "Distribution of land shells and plants on Santa Cruz and Santa María Islands, Galápagos." They found that while land snail distribution was related to altitude and plant zonation, it was more closely correlated with lichens and mosses covering tree trunks rather than with the shrubby plant species

themselves.

The final talk of the symposium was by Matthew J. James (Sonoma State University) entitled "Charles Darwin's contribution to the molluscan fauna of the Galápagos Islands: Historical perspective on endemism and biogeography." He analyzed a short passage in Darwin's *Journal of Researches* (1839) for insights into the biogeographic affinities of the fauna known in Darwin's time and also for an indication of Darwin's predilection to attribute unique status to the Galápagos as revealed 20 years later in the *Origin of Species* (1859).

A very strong desire expressed by symposium participants and other Galápagos workers in the audience was for specific documentation of species records (museum number or citation of published occurrence) for workers who compile lists of molluscan taxa found in the Galápagos. Such lists are often of little use without supporting information. In addition to indicating if a species is endemic or widespread in a molluscan species list, it was felt necessary to indicate the information source in order for later workers to verify or refute species occurrences in the Galápagos. Another recurring theme of the symposium was that too much emphasis has been placed on documenting the degree of endemism of the Galápagos molluscan fauna because apparent endemism is so strongly a function of collecting bias and taxonomy. Ongoing research in both the waters of the Galápagos Islands and Cocos Island (Costa Rica) has reduced estimates of endemism merely through more thorough sampling and taxonomic vigilance.

Several participants and attendees having familiarity with the present state of Galápagos ecosystems (which includes sentiments expressed in a letter to symposium participants by William C. Banta of the American University, Washington, D.C.) voiced grave concern over the possible alteration and/or destruction of both terrestrial and marine habitats in the Islands. These habitat changes are largely the result of increased human habitation of the Islands. Although the Islands are considered hallowed ground by biologists and geologists (as the result of Darwin's visit and publications), the pressures of increasing tourism, growing resident populations, and economic development create the

potential for environmental changes in the Islands. The symposium participants voiced their support for programs aimed at increased environmental awareness and conservation.

Copies of symposium abstracts may be obtained free of charge from M.J. James at the address below following publication of the Annual Report of the Western Society of Malacologists (Volume 21) in early 1989. **Matthew J. James, Department of Geology, Sonoma State University, Rohnert Park, California 94928, USA.**

Editor's Note.—A book entitled *Galápagos Marine Invertebrates* edited by Matthew J. James is planned for publication by Plenum Publishing Corporation as part of the Topics in Geobiology Series. Topics to be included are Taxonomic Composition, Biogeographic Affinities, Evolutionary Relationships, Stratigraphic Distribution, and Ecological Interactions. Any specialist interested in participating in this publication should contact Dr. James.

DESPLAZAMIENTO NOCTURNO DE LAS TORTUGAS TERRESTRES EN LA ISLA SANTIAGO

Por: Cruz Márquez y Solanda Rea

Toda la información publicada sobre las tortugas terrestres (*galápagos*) *Geochelone elephantopus* se refiere principalmente a comportamientos diurnos como: alimentación, desplazamientos, y copulación. El único compartamiento nocturno mencionado con frecuencia se refiere a las hembras en tiempo de excavación de sus nidos, que los hacen durante algunas horas de la noche y en ocasiones durante toda la noche. En general, los galápagos de los ambos sexos duermen todo la noche sin moverse.

En la presente nota nos referimos a galápagos de Isla Santiago observados en el año 1981 y 1982 en dos de las zonas más importantes: la Trágica, Zona II ubicada al Sur, uno de los lugares de mayor concentración de galápagos en la Isla, y los Guayabillos, (Zona D de anidación) ubicada al Norte de la Isla. Fue en estos lugares donde se presentaron los casos de galápagos observados en comportamientos nocturnos.

En octubre de 1981 los bebederos naturales usados para refrescarse los galápagos estuvieron secos, y particularmente la poza en la Trágica donde la mayoría de los galápagos se sumergen cuando la poza contiene agua. Pero aunque la poza estuvo vacía los galápagos vivían en los alrededores noche y día esperando que llueva y vuelva a llenarse. Es así como ocurrió el siguiente.

En la noche del 30 de octubre de 1981 dormíamos en nuestras carpas muy cerca a la poza sin agua, cuando a las 2230 empezó a caer una garúa. Después

de 30 minutos empezaron a oírse ruidos de galápagos que se desplazaban desde diferentes direcciones hacia la poza. Los ruidos producidos por el desplazamiento de las tortugas que ingresaban a buscar agua al lugar continuaron hasta unos minutos antes de las 2400. De estos animales registramos algunos parámetros de medidas durante la mañana y la tarde del día anterior. En la mañana del día 31 de octubre, amanecieron pequeños charcos entre el pedregal dentro de la poza seca y los 14 galápagos junto a ellos, por lo que procedimos a medir la distancia que había recorrido cada uno, revisando su número y posición al anochecer. Fue fácil determinar la distancia recorrida por cada uno de los animales; las distancias fueron de 25 hasta 60 metros. Tres de los 14 animales que amanecieron en la poza no fueron registrados por nosotros el día anterior, por lo tanto no conocemos su posición original o la distancia recorrida.

Los días 5, 6, y 8 de diciembre de 1981, en el campamento de La Poza Trágica se observó movimiento nocturno de tres galápagos diferentes, uno por cada noche. Los tres galápagos anochecieron no mas lejos de 12 m de nuestra carpa, pero en este caso, el desplazamiento de los tres no ocurrió por lluvia. En cambio, después del anochecer se los escuchaba iquietos; es decir, se movían dentro de su dormitorio cada media hora hasta que el galápagos No. 13.233 se trasladó 35 m hacia otro dormitorio donde amaneció. Durante la noche siguiente, el galápagos No. 13.137 se desplazó 30 m amaneciendo