

NOTICIAS de Galápagos

No. 51 July 1992

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- CHARLES DARWIN FOUNDATION, 836 Mabelle, Moscow, Idaho 83843, USA. Attention: President, Charles Darwin Foundation.
- CHARLES DARWIN RESEARCH STATION, Isla Santa Cruz, Galápagos, Ecuador. Attention: Director.

While emphasizing that the continuing success of conservation in the Galápagos is directly dependent on the receipt of future contributions, we wish once again to state our deep gratitude to all those supporters whose generosity has made it possible to achieve so much since the establishment of the Charles Darwin Research Station and the Servicio Parque Nacional Galápagos.

Regular donors to Galápagos become “Friends of the Galápagos” and will receive *Noticias de Galápagos*, published twice a year.

NOTICIAS DE GALAPAGOS

A Publication about Science and Conservation in Galápagos,
the Galápagos National Park Service, and the Charles Darwin Research Station

No. 51 July 1992

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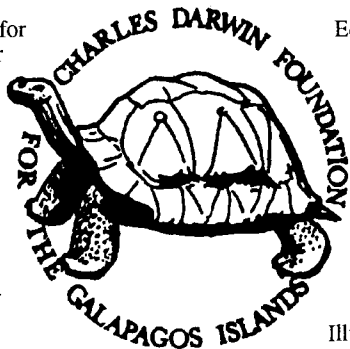
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NEWS FROM ACADEMY BAY

Change in Directorship at the Charles Darwin Research Station.—After 3 years as Director of the Charles Darwin Research Station (CDRS), Dr. Daniel Evans has resigned to pursue his career elsewhere. During his tenure as Director (February 1989 to January 1992), the Station and its sister organization, the Galápagos National Park Service (GNPS), have produced and overseen many notable accomplishments and advances in conservation, education, and science in the Galápagos. Many could be cited, but a few key ones follow:

—Completion of a long-term Master Plan for the development and management of the CDRS, which will provide guidelines for the Station's programs, development, and gradual growth to its full potential, to meet the demands of Galápagos conservation. We are almost unique among field research stations in the world having such.

—Preparation by a team of architects and engineers of a complete physical plant development plan, based upon the Master Plan.

—Raising of funds, planning, and initiation of a major addition to those facilities: the new Education and Science building, which will greatly improve laboratory and office facilities for staff, students, and visiting scientists; it should be completed by August 1992.

—A significant increase in training of staff: two associate scientists working on their Masters degrees in Costa Rican graduate schools; 15 GNPS and CDRS staff sent for short-term professional and technical training events in Costa Rica, Panamá, and the USA.

—Major improvements in the programs for breeding, raising, and restocking of endemic giant tortoise and land iguana populations; for example, mortality of young being raised in captivity has been reduced to less than 5% in tortoises and 2% in baby iguanas, incredibly low compared to results from all over the world with similar animals. Breeding and raising facilities at the Station have been substantially upgraded, including major new installations for improved display to visitors. New, separate facilities on Isabela are being completed for the tortoise program on that Island, which will also serve as a major educational facility for the local population and vis-

itors. Over 1,500 young tortoises have now been returned to six endemic populations since the program began in the mid-1960s; likewise over 350 land iguanas have been returned to their native areas on Santa Cruz and Isabela, and populations of predatory dogs and cats in those areas have been controlled. In the case of the tortoises, the program has come full circle: animals hatched in the 1960s and repatriated to their native population since the early 1970s on Islas Pinzón and Española, have matured and are now breeding and nesting!

—An important campaign to eliminate feral pigs on Santiago has progressed to the point that only a few hundred are thought to be left. This has resulted in major benefits to the tortoise populations: nests are once again surviving and young are being obtained for raising in safe captive colonies at the Station. Plans are underway to press the campaign to completion and then to begin removal of the huge goat populations on the Island.

—A major new effort has begun in late 1991 to design an effective control and quarantine system to drastically reduce the introduction of foreign species to the Islands. This will allow the Foundation to more effectively counsel the Ecuadorian authorities for establishing such a system.

Throughout his time at the CDRS, Dr. Evans received the support of his wife, Julia Tully, and their two lively, inquisitive, intelligent daughters, Mara and Sierra.

The CDF gives its full thanks to Dan Evans and his family for their 3 years of dedication and hard work in the Galápagos. We wish them the very best in their new endeavors.

After Dr. Evans made known his decision to leave the CDRS Director's position in the first trimester of 1991, a search and selection committee was established and the recruitment process began in earnest from May 1991 onwards. It took over 10 months to complete the full process. Announcements were placed in major international journals and newsletters in Europe, Latin America, and North America, and were sent to over 400 universities, research centers, and similar institutions worldwide and in

Ecuador. Over 45 candidates applied from 14 countries: Argentina, Austria, Australia, Brasil, Colombia, France, Germany, Georgia (Commonwealth of Independent States, formerly USSR), Nepal, Perú, Puerto Rico, Spain, the United Kingdom, and the United States. The final selection was difficult due to the numerous excellent candidates, but was finally made in March 1992 after several rounds of reviewing credentials and interviewing the top two candidates.

The new Director is Dr. Chantal Blanton, a native of Wisconsin in the USA. Dr. Blanton is an ecologist, with a Masters degree from the University of Florida and a Ph.D. from the University of Georgia's well-known Institute of Ecology. She has extensive international experience in research, teaching, conservation, and administration, particularly in several positions held in Costa Rica. Since obtaining her Ph.D. in 1989, she has been the Biology Program Coordinator at the University of Georgia, managing all graduate teaching assistants, developing courses and laboratories, and similar tasks.

Dr. Blanton will be joined in the Galápagos by her husband, James Pinson, a computer network specialist with the University of Georgia. Mr. Pinson also is a marine biologist by his original undergraduate training at Auburn University. He is an avid cave diver and certified divemaster.

Both of them are dedicated scuba divers and enjoy sailing, underwater photography, and other outdoor activities, of which there should be no shortage in the Islands.

We all join in welcoming them to the Islands and the new opportunities and challenges which await them in Galápagos. **Craig MacFarland, 836 Mabelle, Moscow, Idaho 83843, USA.**

H.R.H. Prince Henri of Luxembourg Visits Galápagos.—On 19 October 1991, the Galápagos had a very special visitor. Prince Henri of Luxembourg came to the Islands, at the invitation of the Charles Darwin Foundation, to learn more about the conservation work of the Charles Darwin Research Station and the Galápagos National Park Service. Prince Henri has agreed to help direct the European fund-raising efforts of the CDF and this visit was arranged so that he could learn more about the threats

to the unique species of the Galápagos and the specific actions being taken to protect them.

The Prince's trip, during which he visited Islas Santiago and North Seymour and the CDRS and GNPS facilities on Santa Cruz, was arranged so that he could see actual field projects in action. On North Seymour, he was able to observe the land iguana population and its nesting areas. This population was originally introduced from Isla Baltra, which saved the original race from extinction when the iguanas disappeared from Baltra. The Prince learned how human impact, as well as predation by feral cats and dogs, has decimated iguana populations in other parts of the Archipelago. Arturo Izurieta, who is now the GNPS Superintendent, led this portion of the field trip, as he spent over a year on North Seymour studying the ecology and reproduction of the iguanas.

From North Seymour, the Prince went to Santiago to inspect firsthand the GNPS's efforts to eradicate the wild pigs and to control the hordes of feral goats. He was able to see the incredible habitat destruction occurring as the goats ravage the native vegetation and change native forests into open grasslands. This destruction of native vegetation is particularly evident when the visitor can compare the open, grassed areas with the few samples of native vegetation that the CDRS and the GNPS have fenced in order to keep feral pigs and goats out. Inside these fences is seen a large number of native plant species, while only a few survive the grazing pressure outside. The fenced samples serve as living seed banks that preserve small remnants of the native vegetation and species. The GNPS officials were able to show the successes of the pig control program at protecting nests of giant tortoises and nesting Dark-rumped Petrels. CDRS scientists on the Island explained their various research programs, which are being conducted to better understand the impact of these introduced species and to develop strategies to protect the threatened Galápagos species. The Prince was able to observe repatriated tortoises in their natural setting and nesting colonies of Dark-rumped Petrels.

After a strenuous 3 days of hiking in the rugged terrain of Santiago, the Prince attended several social functions organized by the CDRS including a cocktail party to present Prince Henri to the local authorities and an informal barbecue with Station staff and GNPS

officials. His orientation in Puerto Ayora included a tour of the tortoise and iguana rearing facilities at the CDRS, a trip to the highlands to observe how introduced plants are rapidly invading large areas of the National Park, and an overview of the joint CDRS/GNPS forestry. This project attempts to promote noninvasive tree species as replacements for the noxious species found frequently on private land. Introduced species from private land often disperse into Park areas. Prince Henri also toured the urban areas of Puerto Ayora on bicycle, to observe the problems of introduced ornamental plants, waste management, and the impact caused by the rapidly expanding local population.

Even though the Prince's visit was all too short, he left with a clear idea of the diverse activities being carried out by the CDRS and the GNPS to assure the conservation of the Islands. Prince Henri left committed to help support our efforts to protect the unique species found in Galápagos for future generations. He left behind renewed enthusiasm for many of us at the CDRS and the GNPS who saw his deep love for the Islands and their wildlife. It was a pleasure, as well as an honor, to have received such a distinguished and special guest as Prince Henri. We at the CDRS and the GNPS hope that he will be able to return soon to the Islands and we are deeply grateful for his support. **Daniel Evans, Charles Darwin Research Station, Isla Santa Cruz, Galápagos, Ecuador.**

25 MORE YEARS!!!—Agreement Renewed Between the Ecuadorian Government and the Charles Darwin Foundation to Operate the Charles Darwin Research Station.

The 28th of October 1991 was a historic day for the Charles Darwin Foundation. The Ecuadorian Government extended the agreement that allows the Charles Darwin Foundation to operate the Charles Darwin Research Station in the Galápagos Islands for 25 more years.

Ecuador's President, Dr. Rodrigo Borja, invited Foundation officials and Prince Henri of Luxembourg, who is a member of the CDF's Executive Council, to the Presidential Palace for a special ceremony to sign the extension of the current agreement that the CDF has with the Ecuadorian Government. The agreement was signed by the Charles Darwin Foundation

President, Dr. Craig MacFarland, and the Minister of Foreign Relations, Chancellor Diego Cordovez. Dr. Borja, Prince Henri of Luxembourg, and the CDF Vice President for Ecuador, Dr. Rodrigo Crespo, signed the document as honorary witnesses. The ceremony was attended by many top government officials and several Ambassadors from the European Economic Community. Following the signing, President Borja hosted a dinner for everyone attending the ceremony.

By extending its agreement with the CDF for such a long time, the Ecuadorian Government has shown its high degree of confidence in the scientific and conservation work carried out by the CDRS. For over 30 years, the CDRS has conducted research in the Galápagos and provided technical assistance to the Ecuadorian Government to help assure the wise management of the fragile Galápagos environment. And now, with the future for the Darwin Station assured for the next 25 years, it is possible to continue to develop the Station's many programs to help conserve the Galápagos environment. These programs principally include training Ecuadorian students in field biology and wildlife conservation; conducting field research on the rare, threatened species of plants and animals; and developing control programs to limit the impact and spread of the many introduced plants and animals. In addition, the CDRS will continue to play a crucial role, providing technical assistance to the Galápagos National Park Service, as well as other local and national institutions regarding the Galápagos and their protection. **Daniel Evans.**

A Dawn of Despair: Journey to Alcedo.—In a world of sun, stars, and cascading clouds live the giant tortoises of Alcedo, the central caldera of five which make up the vast bulk of Isla Isabela.

The walk to reach that unique world, where, in the early morning, the summits of the great shield volcanoes stand out like blue-black islands amidst a vast, white sea of clouds tinged pink in the dawn, was a hot and dusty one. The pumice crunches under every step. The surrounding, low, dry vegetation is, however, punctuated by the yellow and white composite flowers of *Macraea* and the silvery-gray palo santo trees. Higher, the ground vegetation is still tinder-dry, but its drier aspect is enlivened by the evergreen *Scalesia*

plants, a delicate relief in this shimmering landscape.

The last hour of the walk is the most exhausting, as it ascends the steep outer wall of the caldera. Still, before that climb, one can contemplate it from the shade of a few pega-pega trees that lie at the confluence of several steep-sided gullies, which descend from the caldera rim. Life is not abundant on these scorched plains. I have not made this climb for 8 years, but the memory of the giant tortoises urges me on.

Choking with yellow dust that rises from the narrow, steep gully, I slowly ascend. The dust settling around one glues to the perspiring skin, leaving dark patterns down the legs. Halfway up, I stop in surprise at hearing a familiar sound, familiar, yet strange to this place—the shrill bleat of goats. This information, received through senses choked with heat and dust, depresses the mind, for these animals, intelligent and good-looking, have been a major factor in the degradation of the Galápagos habitat and biodiversity over the dozens of years since their introduction to the Archipelago.

I am not really sure that these facts registered in my mind at that time, for my objective was to reach the summit and remove my sweat-soaked pack as soon as possible! I achieved this about 20 minutes later. As I returned down the slope to help some of the others, I came across a small tortoise, about 1 foot long, in the shade of a small shrub. The back of the carapace was a composite of intricate growth lines. What really caught my mind were two things. The one was the amazing panorama from this viewpoint across the channel to the east, where Santiago lay, to the northeast, where Marchena and Pinta hovered blue on the horizon, and to the north, where the massive blue-black slopes of the volcanoes Wolf and Darwin ran into the sea. I could not help but wonder whether this tortoise child ever contemplated the magnificence of its home. But perhaps it is just as we consider home, a place of familiarity. A place to rest, a security. Nothing special. But to us as visitors, this is something extraordinarily special. It is unique. The volcano, the plants, the animals, the waves breaking on the shore, and the cooling breezes from the southeast that release their moisture in the cascading plumes that descend into the caldera interior. Here is the ambiance of Galápagos.

My eyes returned to this small child of the volcano.

The second thing that I noticed was that it was slowly eating small blades of grass at the base of the shrub whose foliage cast a spangled light on the brown-gray, dusty carapace, which still has another 150 years to grow. The eating movement is slow, deliberate, but not so precise. Maybe the thought process is thus... Well, if I don't get the grass into my mouth this time, I will the next. It's not going anywhere My mind saw the goats, saw their voracious appetites, saw their quick, nimble movements, saw the thousands if not millions of years of competitive thrust and parry that evolved the sure-footed mammalian form that grazes a few hundred meters down the slope.

I heard the weary crunch of feet on that dusty gully and awoke from my thoughts. Soon everyone was up on the rim, admiring the scene before them. Really living in the majesty of Galápagos.

The next morning we went for a walk along the rim under the moisture-laden clouds, where tortoises graze under trees alive with epiphytic growth. Ancient carapaces, smoothed with time, glisten in the cool dawn as the giant reptiles move out from the night's refuges into the fresh, wet wind. They drink from pools whose moisture is gained from millions of raindrops falling from the sky or from the condensation of wet air on the leathery leaves of epiphytic ferns or the succulent forms of *Peperomia* and orchids. A small snail, no more than 1 cm long, moves slowly over the huge, blackish dome of an ancient tortoise grazing in this humid landscape. A snail as unique as the tortoise itself, its trail, shell, and protruding antennae sparkle in the rare rays of sunlight that ephemerally flicker across the dark convex carapace that is its pathway, its home for the moment.

We were under constant attack from the ticks that abound on Alcedo. One must certainly admire them for their efficiency, for we were covered by their bites. However annoying this might be, it gave us another opportunity to see the uniqueness of this place, for the tortoises are also plagued by these small, blood-loving animals, yet they have reached a symbiotic relationship with the ubiquitous ground finches. Raising themselves up on tip-toe with neck and legs extended as far as they are able, the tortoises stand stock still. Finches then wander over these exposed areas in search of the small, annoying parasites, extracting and eating them as they go.

We returned from that other world. Down the slopes, across the plains to the gray, pebble beach. A wonderful drink of beer whilst cooling one's sizzling feet. Food and conversation are the fare of the evening on our return to Puerto Ayora, to the rush and bustle that has nothing to do with the high rim of Alcedo.

My mind keeps returning. I see a unique landscape. I fear that I am looking into the face of extinction. I feel an anguish at the thought of losing something unbelievably valuable. I have visited Alcedo before, years ago when there was no sight or sound of goats. Today, they are within a stone's throw of that delicate landscape of evergreen *Scalesia*, within a moment of a small tortoise seeking a few blades of grass under a crystal-blue sky.

There are many deserving causes in Galápagos that urgently need attention, but few can equal the imminent destruction, not just of a species, but of the

essential ambiance of the Enchanted Islands. I believe that it would be worth the clattering roar of helicopters, the chatter of guns, the movement of many people, and the endless inversion of money to ensure the survival of this milieu Galapagueño before it is too late. Alcedo is also the gateway to the volcanoes to the north, Darwin and Wolf. Is their uniqueness to be lost as well?

To my mind, however, there is something very special and intangible about Alcedo. Young and old tortoises amongst the fumaroles, the obsidian, the pumice, in the pools, under the clouds. Vermilion Flycatchers, hawks, and finches. These are tangibles, as is the air rushing up from Antarctica to temper the equatorial sun. What is so utterly intangible is the totality of the environment, which has a value incomprehensibly higher than the sum of its parts. **Godfrey Merlen, Isla Santa Cruz, Galápagos, Ecuador.**

VISITORS AND EVENTS

March 1991-March 1992

March 1991

—Luciana Sola, University "La Sapienza," Rome; zoogeography of the mullet *Mugil cephalus*.

—Freddy Ehlers, Ana María Varea, and Enrique Bayas, of the television program "Primer Plano;" video films on the main problems of Galápagos.

—Max Eriksson, Folke and Johanna Larsson, and Ola Jennersten, University of Uppsala, Sweden; the reproductive biology of the carpenter bee, *Xylocopa darwini*, as a pollinator of *Passiflora foetida galapagoensis*; assisted by María Teresa Lasso, Central University of Ecuador, Quito.

—Peter Glynn, Joshua Feingold, Sheila McKenna, and Tiffany Woodworth, University of Miami, Florida; coral reef communities.

—Peter and Rosemary Grant, Princeton University, New Jersey; taught a short course on finches for students at the CDRS.

April 1991

—Hal Whitehead, Dalhousie University, Canada; sperm whales.

—Leon Baert, Jean Paul Maelfait, Konjev Desender,

and Johan Boonefaes, the Royal Belgian Institute of Natural Sciences; invertebrates; assisted by María Teresa Lasso, Central University of Ecuador.

—Stewart and Jarmila Peck, John Heraty, and Claus Vogel, Carleton University, Canada; the distribution, ecology, and evolution of insects and other terrestrial arthropods.

May 1991

—Tanya Nolivos, Angeli Hernández, Pablo Avilés, and Sandra Mora, University of Guayaquil; finished their volunteerships in the different areas of sciences.

—Craig MacFarland, President, and Alfredo Carrasco, Secretary General, CDF.

—Gladys Santacruz, Central University of Ecuador; volunteer assistant in the Area of Terrestrial Plants.

—Howard and Heidi Snell, Alexis Schubert, Paul Stone, Lee Fitzgerald, and Don Miles, University of New Mexico; land iguanas and lava lizards; with Marco Altamirano, University of Guayaquil.

—Mario Piu, University of Guayaquil; volunteer assistant in the Marine Laboratory.

—Richard Podolsky, Island Institute; the attraction

of Dark-rumped Petrels with taped vocalizations; assisted by Edwin Ortiz, Central University of Ecuador.

—Linda Delay and Mike Guzy, University of Missouri; evolution of cooperative breeding in tropical raptors; assisted by Jenny Naranjo, of the Catholic University of Quito.

—Joël Bonnemaïson, Head of the Department of Urbanization and Development of ORSTOM; to establish a research agreement with the CDF.

June 1991

—Fernando Rivera, University of Guam; the genetic variability between allopatric populations of *Pocillopora damicornis*.

—Priscila Martínez, University of Guam; histocompatibility and genetic relationships of black coral.

—Rafael Menoscal, Higher Polytechnical School of the Littoral; volunteer assistant in the Area of Herpetology.

—Sally Walker, Oregon State University; preliminary evaluation of the distribution and population status, use of shells, and ecology of the hermit crab *Coenobita compressus* on Isla Santa Cruz.

—Joshua Feingold and David Obura, University of Miami; the effects of water temperature on the loss of color and survival of the white coral community.

—Fabrizio Barahona, Martha Véliz, Danilo Urbina, and Diana Vinuesa, University of Guayaquil; volunteer assistants in the Area of Introduced Mammals.

—Félix Cruz, University of Guayaquil, and Cecilia Machado, Technical University of Ambato; volunteer assistants in the Area of Environmental Education.

—Rosa Murillo, Higher Polytechnical School of Chimborazo, and Patricio Clavijo, Technical University of Ambato; volunteer assistants in the Area of Terrestrial Plants.

—Johanna Soriano, University of Guayaquil; volunteer assistant in the Area of Invertebrates.

—Gary McCracken and John Hayes, University of Tennessee, and Jaime Zevallos, the National Polytechnical School; status, distribution, and genetics of bats.

—Cleveland Hickman, Scott and Paty Herderson, and Rosie Bolen, Washington and Lee University; field guide to the coastal invertebrates of the

Galápagos.

—Max Cajas, Central University of Ecuador; finished his volunteership in the Area of Environmental Education.

—Gay Ver Steeg, USA; volunteer in the Area of Environmental Education.

July 1991

—Sam Bower, Quito; volunteer artist in the Area of Environmental Education.

—John and Andrew Brierley, Amanda Sutcliffe, Rachel Pears, John Walker, Simon Jennings, and Graham Saunders, Cambridge University, and Jorge Gómez-Jurado, the Higher Polytechnical School of the Littoral; diving sites in Galápagos.

—Franceso Alberty, American University in the United States; research for his thesis on national parks in the Third World, specifically the protected areas of Botswana and Ecuador.

—Gerald Kooyman, Scripps Oceanographic Institute, and Markus Horning and Víctor Carrillo, the Max Planck Institute; the daily activity and diving velocity of diving birds in Galápagos.

—Luis Sánchez and Bernardino Chancusig, National Polytechnical School; dynamics of systems in the Galápagos.

—Linda Cayot, CDRS; attended the Annual Meeting of the Society for the Study of Amphibians and Reptiles and the Herpetologists' League in the US.

—Edgar Muñoz, CDRS; participated in a course on Management of National Parks at the University of Colorado.

—Sid Kane, journalist with the United Nations Development Program; accompanied by Alfredo Carrasco, Secretary General, CDF.

—Kyra Mills finished her volunteership in the Area of Herpetology.

August 1991

—Luis Alulima, Galapagueño student of the Ecuadorian Armed Forces; practical experience in accounting.

—The 18th Session of the National Institute of Superior Studies.

—Carol Shumway, US-AID.

—Rodrigo Crespo, Alfredo Carrasco, and Mario Hurtado, CDF; participated in the evaluation of the 1991 Operation Plan of the CDRS and the GNPS.

—The Minister of Energy and Mines, the Secretary General of Public Administration, the Undersecretary of Forestry of the Ministry of Agriculture and Livestock, and functionaries of Petroecuador and Petrocomercial.

September 1991

—Johanna Barry, CDF fund-raiser, USA; to learn about the Station and its work.

—A group of paleontologists of the Universities of Pisa, Firenze, and Camerino, Italy; Plio-Pleistocene sediments in the Islands.

—The GNPS, with the assistance of the CDRS, began training courses for Naturalist and for Auxiliary Guides.

—Bernardo Beate, Geology Faculty of the National Polytechnical School, gave lectures in the guides courses.

—Howard and Heidi Snell, Paul Stone, and Alexis Schubert returned to the USA.

—David Obura, assistant to Joshua Feingold, returned to the USA.

—José Calvopiña left the Station.

—The group of divers from Cambridge University returned to England.

—Bernardo Beate, Faculty of Geology, the National Polytechnical School, and Mario Hurtado, the National Fisheries Institute; lectured in the guides courses.

—The group of paleontologists from the Universities of Pisa, Firenze, and Camerino returned to Italy.

—Edwin Ortiz finished his volunteership and returned to the continent.

—Gonzalo Cerón and his family visited the Station during his vacation.

—Washington Tapia, CDRS scholarship student from Galápagos; volunteer in the Area of Herpetology.

—Olav Oftedal, USA; advised in the Area of Herpetology.

—Alejandra Mejía, Quito; drawings for the book *¿Dónde Vivo Yo?*.

—Participants in the CDF's First Seminar for Journalists.

—Joshua Feingold, USA; coral studies; with the assistance of Graham Saunders.

October 1991

—Jorge Palacios, Quito; censuses of penguins, cormorants, and lagoon birds.

—Lucía de Yáñez joined the Station as temporary assistant in Accounting.

—Eduardo Amador and Eliecer Cruz, Guayaquil; discussed administrative matters.

—Luis Duque, temporary assistant in the Computer Center, left the Station.

—Martha Romo Leroux; assistant in Public Relations.

—Washington Llerena, CDRS; participated in a course in dBase in Quito.

—Graham Saunders, participant in the Cambridge University diving group and field assistant for Joshua Feingold, left the Station.

—With Craig MacFarland, Rodrigo Crespo, and Ole Hamann, H.R.H. Prince Henri of Luxembourg arrived to learn about the work of the CDRS and the GNPS.

—H.R.H. Prince Henri, Craig MacFarland, Rodrigo Crespo, Ole Hamann, Daniel Evans, Pablo Larrea, Pádraig Whelan, Fionnuala Walsh, David Sutherland, and Sandra Abedrabbo attended the 58th Meeting of the Executive Council of the CDF in Quito.

—Ricardo Pincay took a course in Guayaquil on preventative maintenance.

—Martin Wikelski, Victor Carrillo, Eileen Connors, and Dolores Schutz, Germany, with field assistants Martha León and Eduardo Espinoza of the University of Guayaquil; foraging behavior and population dynamics of the marine iguana.

—Cecilia Betancourt, Galapagueña; volunteer assistant in the Area of Terrestrial Plants.

November 1991

—Pádraig Whelan, principal investigator for the control of introduced plants and the development of a quarantine program.

—Jim Wurz, Colorado State University, and José Cárdenas and assistant Julia López, Central University in Quito; conducted, through interviews at the Baltra and San Cristóbal airports, a study on the management of visitors to Galápagos National Park with an analysis of visitor motivation, expectations, and preferences.

—Oscar Cevallos, Quito; architectural guidance on the Tomas Fischer Science and Education Building.

—Oswaldo Cervantes, Dean of the Faculty of Agricultural Sciences, the Technical University of Esmeraldas (UTE), and Abel Tobar, UTE; presented a course on forestry nurseries and held discussions about the agreement between the CDRS and the UTE and the program of scholarship students and

volunteers.

—Raúl Marcillo, University of Guayaquil; volunteer assistant in Marine Biology.

—Lucía Pérez joined the Station as temporary secretary for the Manager.

—Patricia Bertero attended a course in Quito on personnel evaluation.

—Mario Piu ended his volunteership and returned to Guayaquil.

—Hugo Valdebenito, Sandra Abedrabbo, Juan Ruiz, Milton Freire, and Patricio Clavijo attended the 15th National Biology Symposium in Guayaquil.

—Félix Cruz, volunteer in Environmental Education, went to San Cristóbal to help in the preparation of radio programs.

—David Sutherland and Pedro Ponce, participated in a seminar in Patate on the elaboration of environmental education strategies for Ecuador, organized by Fundación Natura.

—David Anderson and Christa Budde, University of California, with field assistant Ilonka von Lippke; ecology, reproduction, and feeding of boobies in Galápagos.

—Linda Cayot travelled to Atlanta; invited to participate in the live programs of the Jason Project.

December 1991

—Volunteers Gladys Santacruz, Fabrizio Barahona, Diana Vinuesa, Martha Véliz, and Félix Cruz finished their volunteerships and returned to the continent.

—William Revelo, field assistant to Martin Wikelski; marine iguanas.

—Beatriz Guarnizo, Technical University of Ambato; volunteer assistant in the Area of Environmental Education.

—Vinicio Remache, Central University; field assistant for David Anderson.

—Miriam Steinitz-Kannan, Ramamurthi Kannan, Geetha Kannan, Michael C. Miller, Mark Brenner, and Melanie Riedinger, Northern Kentucky University; with field assistant Lynda Carrasco, Pontifical Catholic University of Ecuador; changes in precipitation during the Late Holocene in the equatorial Pacific through the record of lagoon sediments in Galápagos.

—Sandra Abedrabbo participated in the Entomological Meeting in Quito.

—David Anderson and Ilonka von Lippke left the

Station.

—Gila von Hegel, Germany, and Fabrizio Barahona, Guayaquil; marine iguanas.

—Gonzalo Vargas joined the Station as Assistant in the Stockroom.

—Linda Cayot returned from Atlanta, after participating in the Jason Project.

—Carlos Caiza, Technical University of Ambato; volunteer assistant in the Area of Introduced Mammals.

—After working as field assistant in several projects, Jorge Gómez-Jurado returned to the continent.

—Rosa Murillo and Patricio Clavijo finished their volunteerships and returned to the continent.

—Joshua Feingold returned to the USA.

January 1992

—Sylvia Gaviláñez, Technical University of Ambato; volunteer assistant in the Area of Invertebrates.

—Peter and Rosemary Grant, Princeton University; finches and mockingbirds.

—Lucía Pérez joined the Station as secretary for the Assistant Director and the Manager.

—Marcelo Mantilla, Technical University of Ambato; volunteer assistant in the Area of Environmental Education.

—Charles Huttel and Andrés Intes, ORSTOM, Quito; discussed possibilities of providing a marine biologist for the Station.

—Alan White, University of Rhode Island; examined the possibility of undertaking a project oriented towards helping community development.

—Christa Budde, assistant to David Anderson, returned to the USA.

—André Morocco, ORSTOM; discussed and finalized the agreement to conduct socioeconomic studies in Galápagos.

—Fanny Jarrín resigned from her position as Sales Assistant in the CDRS kiosk.

—Frank Wheeler, Ambassador from Great Britain.

—Volunteer Raúl Marcillo left the Station.

—Jens Wahlstedt, President of WWF-Sweden, and his wife Kerstin, with representatives of his organization, visited and brought a donation from WWF-Sweden.

—Apolinario Pincay left the Station after working as watchman-concierge.

—Daniel Evans ended his period as Director of the

CDRS.

February 1992

- Ruediger Schultz, Switzerland; book on penguins of the world.
- Agnes Tark and Michaela Hau, Germany; assistants for the study of marine iguanas.
- Alexandra Guerrero, Galápagos National High School; began practical studies in the CDRS Accounting Department.
- Seizo Handa, Executive Director of WWF-Japan; visited the CDRS to learn about its work and to investigate possibilities of giving economic support.
- Daniel Evans and his family returned to the USA.
- Bernard Gall, assistant for Martin Wikelski, returned to Germany.
- A group of Ecuadorian Naval cadets, and a group of retired IESS workers formed the group *The Third Age*.



—Javier Yépez, the Museum of Natural Sciences, Quito; helped in the CDRS Museum.

—Dolores Schutz, field assistant for Martin Wikelski, returned to Germany.

—Amada Altamirano, National Galápagos High School; practical studies in the Area of Administration in the CDRS.

—Alexandra Carrión began work as Sales Assistant in the CDRS kiosk.

—Pedro Castañeda, University of Guayaquil; volunteer assistant in the Marine Laboratory.

—Hernán Guarderas and Eduardo Calderón, Director and Assistant Director of Protocol of the Foreign Office of Ecuador.

—Hernán Bonilla, Quito; Assistant in Accounting.

—César Mora began work as watchman-concierge.

—Ruediger Schultz returned to Switzerland.

March 1992

—Rosemary Andrade, CDRS scholarship student from Galápagos at the University of Guayaquil; volunteer assistant for the Areas of Terrestrial Plants and Advice on Resource Management.

—Ricardo Palma, part of Stewart Peck's group, arrived.

—Stewart Peck, Bernard Landry, and Joyce Cook, Carleton University in Canada, with assistant Elvia Inca; distribution, ecology, and evolution of insects and other terrestrial arthropods in Galápagos.

—Jesko Patschke, Germany; assistant for Martin Wikelski.

—Janeth Olmedo, Central University; scholarship student in the Area of Herpetology.

—Alfredo Carrasco, Secretary General of the CDF, arrived from Quito.

—Lonesome George, the last individual of the race from Isla Pinta, was transferred with the two females from Wolf Volcano to their new corral.

—Peter and Rosemary Grant returned to the USA.

—Marcelo Mantilla, Pedro Ponce, and David Sutherland taught a course in Locution and Radio Programming.

LAND IGUANAS RETURN TO BALTRA

By: Linda J. Cayot and Rafael Menoscal

After over 40 years of absence, land iguanas (*Conolophus subcristatus*) were returned to Isla Baltra, the first step in an effort to repopulate the Island with direct descendants of the large iguanas native to that arid and inhospitable place.

Historically, Baltra had a thriving population of land iguanas, the largest individuals of the species. However, the population began to decline near the beginning of this century, apparently due to habitat destruction by introduced goats (*Capra hircus*). Then, following World War II, the land iguana population on Baltra disappeared, most likely an unfortunate result of habitat destruction not only by the introduced goats but also by the construction of a large U.S. Army Air Base (Woram 1991).

Fortunately, in 1932-33 and prior to their extinction on Baltra, 70 iguanas had been transferred from there to North Seymour, a small island a half mile to the north (Perkins 1932, Banning 1933). Members of the Hancock Expedition, noting that the land iguanas on Baltra were skinny and the vegetation was scarce due to devastation by the goats, decided to make the transfer as an experiment. Although the two Islands are similar in terrain and vegetation, land iguanas were not native to North Seymour, neither were there introduced goats, and as a result, the vegetation was much more abundant. Following the transfer, the iguanas were left on their own for nearly 40 years. [Editor's Note.—See accompanying article by John Woram this issue.]

Meanwhile, sometime in the 10 years or so following the end of World War II, the land iguanas on Baltra disappeared.

In the mid-1970s, personnel of the Galápagos National Park Service (GNPS) and the Charles Darwin Research Station (CDRS) began occasional checks of the population on North Seymour (Reynolds 1981a, Snell 1984, Werner 1984, Hoyos 1987). They found only the original large adults and no juveniles. It was not until the Niño event of 1982-83 that juveniles were seen on the island.

In 1980, due to the lack of recruitment in the population on North Seymour, a pair of adult iguanas was

transferred from there to the GNPS/CDRS Breeding and Rearing Center in Santa Cruz (Reynolds 1981a, 1981b). By 1985, eight more iguanas were transferred to the Center. The immediate objective was to reproduce the iguanas in captivity in order to save a portion of the gene pool of the Baltra population. A second, but equally important, goal was the eventual repopulation of Baltra with descendants of the original natives.

Reproduction in captivity was a success and, by 1991, approximately 80 young Baltra iguanas were housed at the Center. Unfortunately, the adults were very old and, over the years, most of them died; those remaining were weak and the females had difficulty recuperating after nesting. The last three adults in the Center were returned to North Seymour in 1989.

THE REPATRIATION

The repatriation of land iguanas to Baltra consisted of five phases: 1) the development of an official agreement regarding the repatriation among the various institutions, 2) environmental education for the personnel of the Ecuadorian Armed Forces working in Baltra, 3) poisoning the cats (*Felis catus*) in the area designated for the repatriation, 4) repatriation of iguanas, and 5) follow-up studies.

Unlike the other Islands of the Galápagos Archipelago, Baltra does not belong to the National Park; instead it is owned by the Ecuadorian Armed Forces and houses both an Air Force and a Navy Base (Fig. 1).

Prior to repatriating land iguanas, it was necessary to reach an agreement with the Ecuadorian Armed Forces. Negotiations started in 1985, and, on 22 April 1991, an agreement was signed between the Ecuadorian Air Force (FAE), the Ministry of Agriculture, and the Charles Darwin Foundation, permitting the repatriation of land iguanas to Baltra and allowing for follow-up studies, future repatriations, and necessary management of the population.

The repatriation site, in the southeastern corner of the Island, was chosen primarily based on biological considerations (Fig. 1). In the early 1930s, the iguanas in this area were in better condition than elsewhere

on the Island (Perkins 1932, Snell et al. 1986). A review of the Island in 1986 indicated that the south-eastern corner had the highest concentration of plant species important in the diet of land iguanas, such as *Opuntia* and *Castela* (Snell et al. 1986). In addition, the area has more soil, an important factor for the construction of burrows.

In the 2 months prior to the repatriation, visits were made to Baltra by personnel of both the GNPS and the CDRS to give talks to the Armed Forces personnel and to control cats and dogs (*Canis familiaris*) present on the Island. Two control trips were made, focusing primarily on the repatriation site, but also on the two military bases.

On 19 June 1991, 35 5-year-old iguanas were taken from the Breeding and Rearing Center on Santa Cruz and transferred to Baltra. There, they were carried in cloth sacks to the repatriation site, a series of small rock hills to the south of the airstrip (Fig. 1).

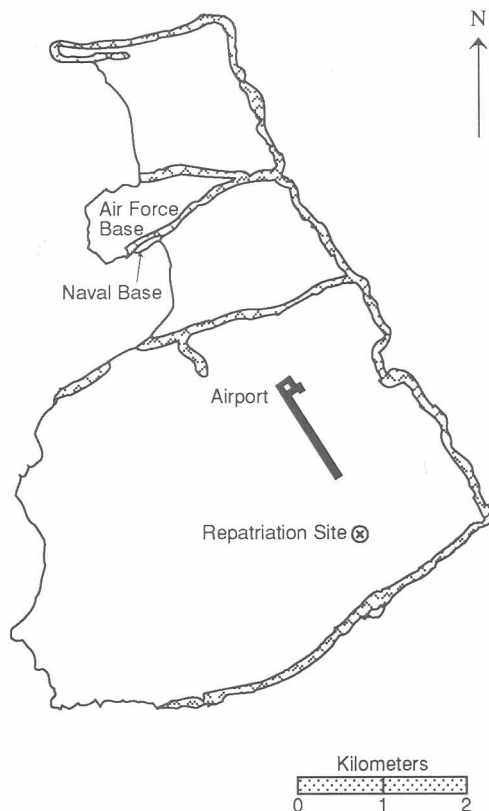


Figure 1. Map of Isla Baltra showing the repatriation site, the airport and active airstrip, and the two military bases.



Figure 2. Repatriation of land iguanas to Baltra, 19 June 1991, showing Linda Cayot, Head of Herpetology, CDRS, handing an iguana to Fernando Rodríguez G., Port Captain of Baltra; Edgar Sierra R., Chief of Baltra Airport (FAE), releasing an iguana; and Daniel Evans, Director, CDRS, and Oswaldo Sarango, Acting Head of the GNPS, looking on.

Given the historical importance of the repatriation, more than 40 people participated, including personnel of the GNPS, the CDRS, the FAE, and the Ecuadorian Navy. The officials of each institution spoke in a short ceremony. Personnel of the four institutions assisted in the liberation of the young iguanas, which soon dispersed throughout the nearby rock outcrops (Fig. 2).

During the first year following the repatriation, several monitoring trips were made to the Island, four for 3-6 days each (June and September 1991, and January and April 1992), as well as four 1-day trips (June, July, and August 1991).

Results of the monitoring trips since September 1991 indicate a survivorship of at least 40%. In April, the remains of an iguana, apparently consumed by a cat, was found. However, iguanas and iguana sign indicate dispersal from the repatriation site. The repatriates are still relatively small and not easy to locate. Therefore, it is likely that several of the surviving iguanas were missed. A census of the population has not yet been done.

In April 1992, 12 more iguanas, aged 8-10 years, were repatriated to Baltra (Fig. 3). These were the first Baltra iguanas hatched in the Breeding and Rearing Center and several of them had already reproduced in captivity.

An additional 32 Baltra iguanas (4-5 years old)



Figure 3. Alberto Jaramillo, iguana caretaker at the Breeding and Rearing Center, releasing a land iguana on Baltra, 10 April 1992.

are still at the Center. In 1992, three pairs of adults will be brought to the Center from North Seymour in order to continue the Breeding and Rearing Program for this population and thus provide more individuals for repatriation to Baltra. A study of the iguanas in North Seymour in 1989-90 (Izurieta 1991) provides the knowledge needed to select the most fit individuals.

The reestablishment of a population will ultimately be judged on documentation of successful recruitment into the population. The importance of introduced mammal control cannot be forgotten. A management plan for continual control and monitoring of these species (particularly cats and goats), or better yet their complete eradication, must be developed.

We hope to repatriate iguanas to Baltra until the

population is well established. The existence, after so many years, of land iguanas on Baltra, descendants of the native population, and the valuable collaboration among the different institutions, have achieved a historical step forward in the conservation of the Galápagos Islands, giving us more hope for the future of the Archipelago.

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- Linda J. Cayot and Rafael Menoscal, Charles Darwin Research Station, Isla Santa Cruz, Galápagos, Ecuador.**

GLOBAL WARMING AND THE GALAPAGOS

By: Peter R. Grant and B. Rosemary Grant

The idea that organisms evolve was transformed during the last century from conjecture to fact. As the present century draws to a close, we are experiencing another transformation. The conjecture that the world's temperature is gradually rising has become widely accepted as a demonstrated fact. A warming trend took place from 1880 to 1940. There followed a slight reversal, but from 1975 onwards the warming has resumed, and the 1980s were undoubtedly the warmest decade of the century (Fig. 1).

There has been much discussion about the exact role of human activity in producing this effect, through, for example, the large-scale cultivation of rice and domestication of cattle and sheep, combustion of fossil fuels, destruction of forests, the alteration of gases in the atmosphere such as carbon dioxide

and methane, and by all this the creation of a greenhouse effect. It is still too early to be sure if the human influence is substantial and increasing, in which case global warming will continue well into the next century; or if it is minimal, in which case the trend may once again be reversed. Effects of global warming are likely to be more severe in parts of the temperate zone than in tropical Galápagos. Nevertheless, we should be thinking about the implications of global warming for Galápagos.

We should not wait until we can be sure that Galápagos is affected. Change is already underway. A global rise in sea level over the last 100 years from the melting of polar ice has been estimated at 10-30 cm. A measured 6% decrease in the extent of arctic ice occurred over the comparatively short time of 15 years, from

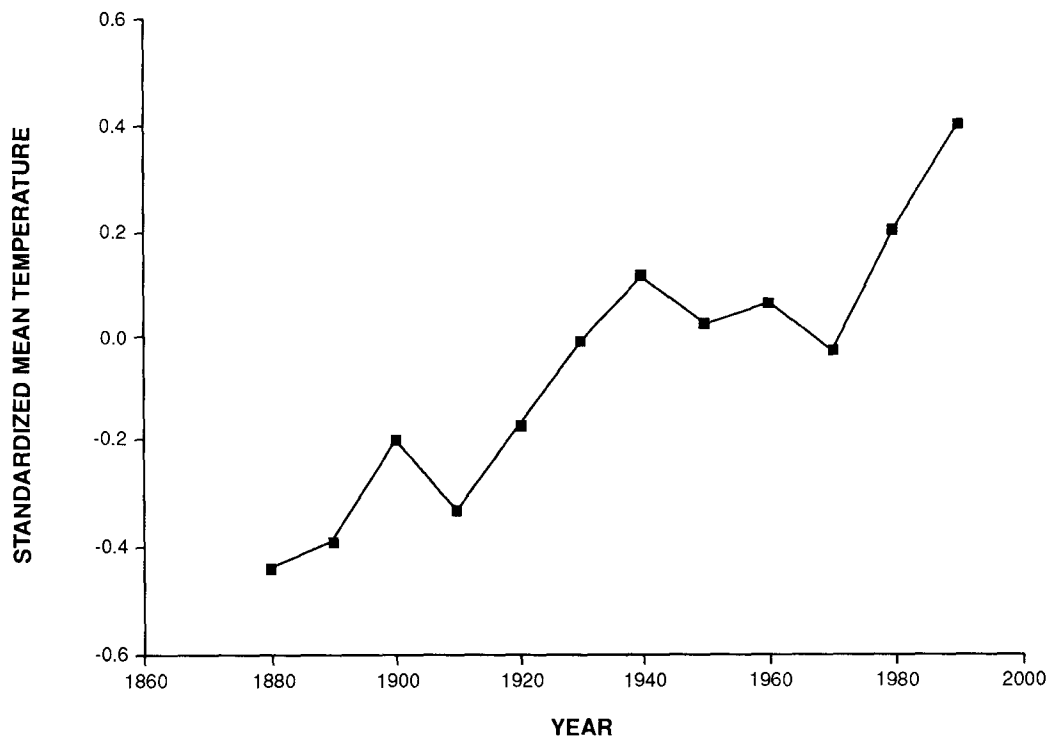


Figure 1. Global warming over the last 100 years. Adapted from the National Science Foundation (USA) publication *Mosaic* (1989, volume 20, number 4).

1973 to 1988. Projecting these trends into the future is hazardous of course, but by one calculation a global warming of 4°C to 5°C will occur by the year 2050, and much more arctic ice will have melted as a result. As reported in the April 1991 issue of *Ecology* (72:373-412), predicted temperatures for the next century will be higher than any experienced by the earth's biota during the last several million years, and the projected rates of change may be more than an order of magnitude faster than any global change in the past 2 million years!

The extraordinary El Niño event of 1982-83 (Robinson and del Pino 1985, Glynn 1988) gives us some basis for estimating the effects of a general warming on life in Galápagos. Glynn (1990) has speculated that effects of El Niño might mimic on a very short time scale what could happen over a much longer time period through global warming. Given the widespread decimation of corals during 1982-83, Glynn suggested that they are in danger of being eliminated. If sea temperatures increase markedly over a century, it is doubtful if natural selection could act fast enough to be effective in molding an adaptive response in long-lived species like these to stressful thermal conditions. A rise in the sea level as a result of polar ice melting, decreased salinity, and increased turbidity could exacerbate the stress. The combination of all these factors and other physicochemical changes would kill corals and cause extinctions, as happened off the Pacific coast of Panamá during the 1982-83 El Niño event (Glynn and de Weerd 1991). The proportions and numbers of organisms associated with them, like damselfish and sea urchins, would change, perhaps drastically, as a consequence.

A possible key to predicting the future lies at the interface of the ocean and the atmosphere, for it is here that interactions determine the occurrence of El Niño-Southern Oscillation events, their severity, duration, and frequency (Philander 1990). The atmosphere is more thermally labile than the oceans, hence the climate will undergo change more rapidly than will the sea.

The most likely effect of global warming on Galápagos is higher average temperatures, with perhaps greater contrasts between the warm and wet El Niño years and the cool and dry intervening years. After the 1982-83 El Niño event, several populations

of animals, land-based entirely or in part, suffered crashes. These included various species of sea birds (Rosenberg et al. 1990), land and marine iguanas (Laurie 1990), and sea lions and fur seals (Limberger 1990). Most recovered fairly quickly, possibly more quickly than much of the vegetation (Grant and Grant 1990). Their recovery was helped by the more moderate effects of the next event in 1987. Nevertheless, it is not difficult to envisage major and long-lasting effects of severe events like the 1982-83 one if they were repeated every 4 years. Populations of plants and animals will have altered distributions in the Galápagos. Some will be driven extinct by a combination of direct and indirect effects: by the direct effects of high temperatures, high rainfall, and high annual variation in both, and the unpredictable indirect effects arising from predators, parasites, competitors, and various interactions in the community food web.

The prediction of high temperatures and rainfall is not certain however. This is underlined by the fact that global greenhouse warming could intensify along-shore windstress on the eastern Pacific Ocean surface, leading to greater coastal upwelling (Bakun 1990). This, in turn, would cause a cooling of the ocean surface and an amelioration of dailing heating of the ocean offshore, with the possible result of reduced convective cooling and precipitation on Galápagos. However, alongshore windstress has been increasing during the last 40 years, and so have trade winds (Bakun 1990), without a noticeable drop in precipitation recently.

In the issue of *Ecology* referred to above, a committee of the Ecological Society of America confronted the task of planning globally for an uncertain future. Several key points were made about the possible effects of global warming that are as relevant to Galápagos as elsewhere. For example, it was pointed out that a challenge for ecologists is to understand processes which link species and ecosystems with climate and to predict ecological responses under *climates that do not presently exist*. Evolutionary responses are important too (Grant 1991). It is known that natural selection favoring tolerance to heat or desiccation can lead to the rapid evolution of general stress-tolerant genotypes which are resistant to a variety of environmental stressors and which have

altered life history characteristics like growth and reproductive rates.

Planning for an uncertain climatic future in the Galápagos should start now. The few long-term studies currently being conducted need to be multiplied to provide the necessary baseline data for assessing the effects of a gradually altered environment. Attention should be given to the design of environmental and biotic monitoring and the analyses of data that will serve the needs of the 2040s as well as the 1990s. A conference of experts would be helpful.

The *Ecology* article concluded by raising many research questions which cannot be answered (fully) at present, and which should guide future research activity. These include:

- 1) How does climate change affect plant and animal dispersal and colonizing ability?
- 2) What are the key species whose presence or absence can critically alter the composition of local communities?
- 3) How does genetic structure affect the long-term evolutionary responses of populations that are becoming rare and in danger of extinction?
- 4) How are demographic parameters of species and interspecific interactions affected by evolutionary changes in physiological tolerance?
- 5) How rapidly does the likelihood of extinction increase with a change in climate? How rapidly can species respond evolutionarily to a change in climate?

Studies on Galápagos can contribute more than most studies to answering these and a host of related questions because long-term studies have already been conducted for many years as has environmental monitoring. More importantly, several Galápagos communities are in a natural state, having been unaffected by human activity; and the interpretation of any changes that are documented should be unambiguous, providing that those communities are preserved in their natural, unmanipulated, state.

Climate change should be anticipated, measured, and understood, as it clearly impinges on long-term plans for biological conservation in Galápagos.

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NESTING BEHAVIOR OF THE LARGE-BILLED FLYCATCHER ON ISLA SANTA CRUZ

By: Stephen Ervin

Little published information exists for a number of the Galápagos land birds. However, birds are easily observed, and even visiting scientists primarily occupied with other studies have opportunities to contribute to the knowledge of Galápagos birds. As former Ornithologist of the Charles Darwin Research



The Large-billed Flycatcher (*Myiarchus magnirostris*).

Station David Duffy noted, information on many Galápagos birds will be best collected by "outside investigators" without major investment of resources by CDRS (Duffy 1981). During my sabbatical leave from California State University, Fresno, I undertook a short-term study of the Large-billed Flycatcher, or *Papa Mosca*, on Isla Santa Cruz in the spring of 1987. The Large-billed Flycatcher (*Myiarchus magnirostris*) is endemic to the Galápagos. Its habit of collecting nest material along roadsides, at clotheslines, and even from a person's head are well known, and it rapidly becomes familiar to visitors. The flycatcher is common in Puerto Ayora, unlike Darwin's Finches, which do not seem to tolerate the urban environment.

Most published information on the species is anecdotal. Brief field notes and collection information have been published by Rothschild and Hartert (1902), Ridgway (1907), and Gifford (1919). Swarth (1931) provided limited anatomical data based on specimens collected by the 1905-06 California Academy of Sciences expedition and commented on the taxonomic position of the species. The species was confirmed as a *Myiarchus* using skull morphology, recordings of

vocalizations, and field observations of behavior (Lanyon 1978, 1985). A separate monotypic genus (*Eribates*) was originally proposed for the species (Ridgway 1893).

During a 4-month stay at CDRS, I netted, color-

banded, and observed 23 flycatchers. Sex was determined on the basis of cloacal characteristics and by evidence of a brood patch. I located 18 nests and noted interaction between flycatchers as well as interactions with other birds.

The Large-billed Flycatcher, like other members of the genus, is a cavity-nesting species. Cavities in the native vegetation are not rare; nearly every mature *Opuntia* or *Jasminocereus* has a hollow pad or dead branch. Of the 18 nests located from February through March 1987, 10 were located in cactus (*Jasminocereus* 6, *Opuntia* 4) and 7 were in electric poles. One nest was located inside a house. Entrances to the nest cavities of nine of the natural nests ranged from 3 m to 5 m (average = 3.75 m) above the ground. Lanyon (1978 and pers. comm.) observed four similar nests with entrances from 1.5 m to 3 m high (*Jasminocereus* 2, *Opuntia* 2). Gifford (1919) reported the use of cavities in citrus as well as flycatchers using Darwin's Finch nests. Entrances were as high as 6 m.

Active nests in native vegetation on the CDRS grounds were all over 100 m apart. Nest loss was common. Only one nest was observed to have fledged

young on the CDRS grounds in the spring of 1987 (Nest #14 described below). Nests with entrances lacking protection were abandoned following heavy rains. Marked individuals from one abandoned nest were detected at a new nest within 85 m of the first nest. In at least one case, a switch in mate was detected after a nest was abandoned. A marked female was observed with a new mate at a nest 140 m from the initial nest location. The first nest (located on 31 January) was abandoned immediately after heavy rains. The subsequent nest was located on 11 March and was active through 7 April but did not fledge young.

The tolerance of urban conditions by flycatchers was unexpected. Nests were located in electric poles in Puerto Ayora. These concrete substitutes for cactus had a vertical cavity throughout their 9 m length caused by casting the pole around a cylindrical skeleton of reinforcement bar. Poles were erected with a buried base of approximately 1 m. The entrances, 8 m high at the top of the poles, were higher than any of the natural nests in this study. Nests in poles were

impossible to observe directly, and the vertical distance within the pole was not determined. The central chamber was sufficiently rough to allow the birds to wedge sticks and fibers across the cavity at any level. In *Jasminocereus*, the nest appeared to be located at constrictions, a joint or the base of the branch, below the entrance. Active nests were observed in poles adjacent to other poles with nests. The distance between poles was typically 30 m, much closer than distances between simultaneously active natural nests. Aggression between pairs seemed more frequent than at natural nests although I gathered no quantitative data to confirm this.

The most unusual nest observed was constructed in the hood of a raincoat that had been draped over the interior half-wall of a residence in Puerto Ayora. The flycatchers gained entrance to the house through open eaves and carried the construction of the nest to completion. Two eggs were laid before the nest was abandoned. The nest was constructed of plant fiber collected from the roadside and of chicken feathers collected in the adjacent yard. The extensive use of chicken feathers is an apparent substitute for the more typical mammalian hair. *Myiarchus* typically use hair in nest construction on the mainland (Lanyon 1978). This unusual nest was collected and is now cataloged as #V-1011 in the collections at the CDRS. Collection of plant fiber from the roadside was frequently observed. Small sticks, particularly of Salt Bush (*Cryptocarpus pyriformis*), were pulverized by vehicle traffic on the road between Puerto Ayora and the CDRS, and these macerated fragments were collected frequently by flycatchers as nest material.

Only one "natural" nest was directly observable. The nest was constructed in a tube of *Jasminocereus* vascular bundles (xylem) that had rotted away on one side, allowing me to view the nest. I enlarged the opening and covered it temporarily by tying on a patch section of similar-sized xylem from a downed cactus. By periodically examining the nest through the opening, I gathered information on the eggs and nestlings. This nest was constructed from fiber and small twigs and was lined with human hair. Flycatchers from this and other nest locations were seen collecting hair from the walkway of the dormitory at the Station. Feathers were also present, but not to the degree noted in the "coat" nest.



A Large-billed Flycatcher's nest in a concrete pole.



The five pinkish-white eggs in the accessible natural nest were measured and weighed on 28 February, 1 day after discovery. They averaged 1.85 by 1.50 cm (range = 1.88-1.83 cm by 1.52-1.50 cm). All weighed 2.0 g on a scale accurate to 0.5 g. Incubation had already commenced when the eggs were examined. Hatching occurred on 7 or 8 March. Two of three nestlings were weighed on 15 March. Weights were 6.0 g and 9.5 g. Two eggs did not hatch. Fledging occurred before 24 March while I was away from the Station. This nest was the only nest known to have fledged young during the months of January through April. All other sites appeared to have been unsuccessful.

Considering the problems generated in the past for the Galápagos avifauna by urbanization and introduced organisms, it is heartening to see flycatchers acclimatize to the urban setting. Perhaps flycatchers could be encouraged further by the construction of small caps for the electric poles. Hopefully, some native wildlife will remain and flourish in Puerto Ayora and other Galápagos villages rather than be replaced by introduced species so common elsewhere.

I hope that this brief report will spark further interest in the species, and will encourage other biologists (visitors and residents alike) to undertake long- and short-term studies, which will allow the monitoring of populations and provide a basis for minimizing

impacts of the human population on the avifauna of the Galápagos Islands. Attention to the small and common species is no less significant to the future of the Galápagos ecosystem than studies on more spectacular species.

ACKNOWLEDGMENTS

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THAT FIRST IGUANA TRANSFER

By: John M. Woram

Elsewhere in this issue of *Noticias de Galápagos*, Dr. Linda Cayot describes the November 1991 repatriation of land iguanas to their ancestral home on Isla Baltra, where we may hope they will fare better than did their predecessors (Fig. 1). However, were it not for a little scientific serendipity that took place some 60 years ago, the recent repatriation would have been impossible. In 1932, G. Allan Hancock stopped at Isla Baltra—then known as South Seymour Island. If he hadn't done so, there would have been no iguanas available for repatriation last year.

The wealthy California industrialist had recently taken possession of his 195-foot *Velero III*, a brand new diesel-powered cruiser suitably appointed for the comfortable transport of its owner and guests on scientific expeditions in the Pacific. After a few shake-down cruises along the California coastline, *Velero III* was ready for its first full-scale Galápagos expedition. Captain Hancock had three collection projects in mind: he sought recent and fossil mollusks for the California Academy of Sciences, live vertebrates for

the San Diego Zoological Gardens, and fish for the Steinhart Aquarium.

In addition to his crew of about 20 officers and men, Captain Hancock invited seven scientists to join the expedition. Among their number were Mr. (now Dr.) John Garth and Drs. Edwin Palmer and C.B. ("Cy") Perkins. On subsequent voyages, George Hugh Banning, Waldo LaSalle Schmitt, and Harry Wegeforth joined the *Velero* party, and it is from their various diaries, memoirs, papers, and photographs that the first iguana transfer of 1932-33 is reconstructed here.

Thursday, 14 January 1932.—After an early-morning cruise past Guy Faulkes and the *Daphnes*, *Velero III* made a 0930 anchorage off South Seymour, also known then as iguana headquarters. Once on shore, John Garth spotted the first land iguana, which Dr. Palmer asked him to capture for the benefit of his movie camera. The job was done with such ease that Palmer (perhaps Galápagos' first film director) had him repeat the scene for the benefit of the production. Whatever satisfaction Garth may have

had with his bring-em-back-alive skills was short-lived: Cy Perkins pointed out that the catch of the moment was half-starved, and thus not up to the task of eluding its captor. This proved the case with most of the animals in the surrounding area. Perkins noted that all but a few were quite thin, and at least two were little more than living skeletons.

Soon enough the explorers found themselves in serious iguana country, with an animal basking under every second or third tree. When the few healthy ones were at last



Figure 1. November 1991—Déjà vu? National Park Warden Cirilo Barrera escorts the descendents of the Hancock transfer across Itabaca Channel, on their way back "home" to South Seymour Island—better known today as Isla Baltra (photograph courtesy of Roger Torda).

discovered, they more than made up for the lethargy of their frail brothers and sisters. Nevertheless, by day's end about 15 reasonably healthy specimens had been collected for the zoo.

Saturday, 16 January.—On visiting North Seymour Island, Garth thought the terrain appeared more favorable for iguanas than on South Seymour, yet not one could be found here. And this gave Captain Hancock an idea. Today the same idea would get him tossed off the Island, but if it hadn't occurred to him then, there would be nothing to write about now. For better or for worse, the Captain's idea was to capture 20 or so land iguanas on South Seymour and release them on North Seymour. Then he would come back in a year or so to see what happened to them. "A good idea I believe. No harm anyhow, as far as I can see," wrote Perkins in his diary entry for this day. And so it was decided.

Sunday, 17 January.—Notwithstanding the usual Sabbath observances on board *Velero*, a 17-man landing party was dispatched to the north end of South Seymour to round up about 40 more iguanas. The afternoon release of the animals on North Seymour was as well recorded as any Hollywood opening, with both motion-picture and still-camera coverage (Fig. 2). Nevertheless, the stars of the day did not much care for their spotlight, and many needed a gentle prodding to induce some motion for the cameras. Once coaxed out of the transport cage, the saurian celebrities ignored their admiring public and beat a hasty retreat to shelter under the nearby cactus plants.

Monday, 18 January.—Cy Perkins went back to South Seymour to catch another six iguanas, taking his pick from among the dozens of candidates he saw there. This part of the catch was destined for San Diego, and quickly adjusted to a diet of shipboard delicacies, including cabbage and raisin nut bread.

Velero III departed South Seymour the following morning, and after several more weeks of exploration, returned home on 27 February 1932. Before the end of the same year, Allan Hancock was ready to take *Velero III* back to Galápagos, and to look in on the newly tenanted North Seymour.

The second voyage of the *Velero III* began on 29 December, and after a lengthy cruise along the Central and South American coasts, reached Galápagos on 24 January. On arriving at North Seymour a few weeks later, writer George Hugh Banning expressed



Figure 2. 17 January 1932—Captain Allan Hancock (left) supervises the release of the land iguanas on North Seymour Island. The crew member holding the cage is unidentified (photograph courtesy of the Allan Hancock Foundation).

some reservations on what had taken place here the previous year. "The practice, and, especially, the irresponsible practice, of rearranging the island fauna, might lead the investigations of others somewhat afield. Hear ye, therefore, and be it known nevertheless, that some seventy iguanas (*C. subscristatus* [sic]), including a second transport, have been carried across the channel from the southern to the northern Seymour, investigations having shown to our utmost satisfaction that the emigrants of last year were still there and doing splendidly." Banning's "second transport" referred to an 18 February 1933 transfer of another 26 iguanas between the two Seymours. The animals were collected in the morning by Drs. Perkins and Harry Wegeforth, and brought to their new home later the same day. In a hasty North Seymour reconnaissance, John Garth saw about six of last year's iguanas, all apparently well adjusted to their new home.

The third cruise of the *Velero III* brought the Hancock party back to Galápagos, and to North Seymour on 22 January 1934, where Garth recorded seeing numerous iguana burrows, though the animals them-

selves kept out of sight (fearing perhaps yet another ride in a cage?). On this trip, Dr. Palmer recalled that "We had removed to North Seymour 72 land iguanas in 1932 for lack of food, but today the vegetation [on South Seymour] was very fair and there seemed to be no dearth of iguanas of which we took many pictures, and several were taken for mounting." It is tempting to speculate that if this had been Captain Hancock's first encounter with the iguanas of Seymour, it might not have occurred to him to intercede in their affairs, and our story might have ended on a much sadder note.

Again in 1934, December 13th saw the *Velero III* back at North Seymour for another site inspection. The event was somewhat overshadowed by their visit a few weeks earlier (2-3 December 1933) to the hastily christened "Dead Man's Beach" on Isla Marchena, where the Hancock team found and photographed the remains of Rudolf Lorenz and Trygve Nuggerud.

But to return to happier circumstances, once on North Seymour Captain Hancock went off scouting for his charges, finding two in excellent condition, an old egg, and an Island generally honeycombed with fresh burrows. From all evidence, it was judged that the colonists were doing quite well. And the rest, as they say, is history.

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ECUADORIAN WHALE REFUGE

By: Godfrey Merlen

I am disposed to believe that we were at the general rendezvous of the spermaceti whales from the coasts of Mexico, Peru, and the Gulf of Panama, who came here to calve.

— Captain James Colnett, 1794

Thus began the slaughter of the sperm whale population around the Galápagos Islands, first by the British, then by the New England whalers. By the 1860s, the Galápagos grounds were destitute of whales, the ships moving on to new grounds to harvest the valued spermaceti oil used in the manufacture of smokeless candles. While the whaling industry rampaged through the oceans of the world, the Islands reeled from the ecological wounds, some of which would never heal: several tortoise populations became extinct from the depredations by the whalers, the fur seals were butchered for their skins to the point that the species was near extinction in the early 20th century, and the sperm whales were gone.

It was a black period, but slowly, throughout the years of the 20th century, the world, and especially Ecuador, which owns the Galápagos Islands, began to realize that the Islands were a priceless treasure of wildlife and natural processes, the magnificent shield volcanoes, unequaled in their symmetry of form, being home to a unique flora and fauna. From the 1930s onward, a series of decrees and regulations came into effect to offer ever increasing protection to the Archipelago. One of the greatest acts was the creation of the Galápagos National Park in 1959, limiting such damaging activities as uncontrolled access to breeding colonies of seabirds and instituting the removal of introduced animals that were competing with and excluding native ones.

As time went by, it was realized that, although the terrestrial ecosystem was protected, the marine environment, on which so many of the native animals depend, was not. This environment not only contains a high degree of endemism amongst its fishes (about 24%), but also represents an extraordinarily rich oceanographic setting amidst the generally low productivity of tropical waters. As more observers

travelled between the Islands, a knowledge of the cetacean was slowly gathered. An intensive study, begun in 1985, rediscovered the sperm whales off the western Islands. The sight of many young animals has given credence to Captain Colnett's observation of Galápagos as a breeding ground for this species. But it is more than this, for it is also an important feeding ground for many species of cetacean, large and small.

Although the interrelationships of organisms within the oceanic realm are not clearly understood, the importance of maintaining a balance between predators and prey, whether planktonic or mammalian, was recognized as being a fundamental factor in the well-being of the ecological system. Thus, in 1986, the Galápagos Marine Resources Reserve was created precisely to help reach this goal and still allow traditional fishing to occur in and near the Archipelago.

During these years of increased protection in Galápagos, the whaling industry had done enormous damage to whale populations worldwide. Mostly, it was a greedy, short-term boom, which burst in the 1970s and 1980s when it was realized that, even after the International Whaling Commission was established in 1946 to regulate the whaling industry through research, monitoring, and management plans, whale numbers were still sliding to ever new depths. Some populations, perhaps, would never recover.

Because of the lack of useful research resulting in reliable methods of estimating whale numbers and because of increasing worldwide discontent with killing techniques and the whaling industry in general, a moratorium was declared in 1985. It was to last 5 years and cover all whale species. Through a loophole called "scientific whaling," the whaling industries of several nations did not die and as the end of the moratorium in 1990 approached, some of these nations expected to continue whaling, although the "scientific whaling," which should have given reliable new data on whale populations, has failed to do so.

However, during this period of relative peace, while the sperm whale gave birth in the tranquil waters of

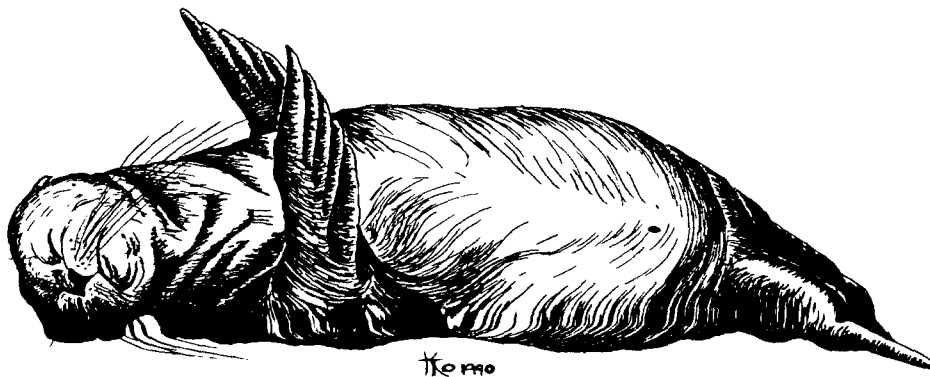
Galápagos, the dolphins delighted the many visitors with their exuberance displayed in superb acrobatic capers, and the humpbacks cruised off the low desert coasts of Ecuador with their calves, an uneasiness about the future of the many cetacean species that occur in all Ecuadorian waters began to emerge. Japan's interest in the rich Eastern Pacific waters and in its whaling fleet is of grave concern, the fear of further ruthless exploitation of whale resources paramount. With this in mind, a document was prepared and presented to the Ecuadorian Government of Rodrigo Borja requesting that a whale refuge be created to protect cetaceans against an unknown future.

The Government, in the face of the terrible destruction that is occurring within the ecosystems of South America, is receptive to new initiatives and itself declared the 1990s as a Decade of "Ecodesarrollo" (undertaking any new development plan with an attentive eye to compatibility with environmental preservation). Thus, the presentation of the proposed whale refuge was received with enthusiasm and immediately was accorded the approbation of the Government. The refuge offers protection to all spe-

cies in all Ecuadorian waters, that is, 200 miles from the coast of continental Ecuador and 200 miles from the periphery of the Galápagos Archipelago, a considerable body of water.

That the Ecuadorian Government can give its time to consider the well-being of its whale species is an extremely meritorious act when there are so many financial and logistical problems facing this equatorial country. It is a symbol of mounting concern over the fate of these remarkable marine mammals. Ecuador is not a member of the International Whaling Commission for economic reasons, so that this independent move is made without the influence of other nations and rejects the advances that could be made by pelagic whaling fleets.

It is known, however, that many cetacean species have oceanic migration patterns, many of which are poorly known, but, no doubt, some will cross the borders of neighboring countries. Perhaps this action by Ecuador could help to create a consensus of opinion by west coast American countries to protect their rich marine ecosystems against indiscriminate harvesting and influence from marauding outside nations. **Godfrey Merlen, Isla Santa Cruz, Galápagos, Ecuador.**



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