

NOTICIAS DE GALAPAGOS

Published by

THE CHARLES DARWIN FOUNDATION FOR THE GALAPAGOS ISLES

An International Organization

Created under the auspices of

THE GOVERNMENT OF ECUADOR

UNESCO

THE INTERNATIONAL UNION FOR CONSERVATION OF NATURE

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<i>No. 33</i>	<i>1981</i>

Published with the financial assistance of UNESCO

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NEWS FROM ACADEMY BAY

DEDICATION OF THE CRISTÓBAL BONIFAZ BUILDING

The long-felt need for adequate offices for the administrative staff of the Research Station, who were inefficiently housed in cramped quarters at the back of the laboratory, was at last met when the Cristóbal Bonifaz Building was dedicated in January.

Cristóbal Bonifaz Jijón was a life-long devotee of conservation and began his advocacy of a Galapagos National Park in the 1930's. He became a Founder Member of the Charles Darwin Foundation in 1959, when he was Ecuador's Ambassador to France and Delegate to UNESCO. He remained an active member of the C.D.F.'s Executive Council and its Vice-President until his death in 1979. His devotion to conservation (in mainland Ecuador as well as in the Galapagos) in those early days when it was anything but a popular cause, will now have its permanent memorial on the islands he loved so deeply.

After an introductory address by Dr. Alfredo Luna Tobar, who succeeded Don Cristóbal as Vice-President of the Charles Darwin Foundation, Dr. Mario Alemán Salvador, Under-Secretary in the Ministry of External Relations, formally inaugurated the administrative building on behalf of the Government of Ecuador. Biologist Neptalí Bonifaz then delivered a tribute to his father's memory, the text of which is printed elsewhere in this issue.

CHANGES AT THE DARWIN STATION

The new Director, Dr. Friedemann Koester, assumed office in January. He will enjoy the support of a larger number of staff scientists than the C.D.F. has hitherto been able to afford. Dr. David Duffy, who unexpectedly was called upon to take up the duties of acting director in 1980, has resumed his position as staff ornithologist. Dr. Robert Reynolds is already in charge of herpetology. Dr. Yael Lubin will take up the post of staff entomologist as soon as she has wound up her current researches in Papua-New Guinea. Señora Olga MacBride has taken charge of all educational activities and it is hoped that her husband, Dr. Bruce MacBride, will soon join the station as staff botanist. Dr. Hugo Loza of the Central University in Quito has been asked to fill a completely new niche, that of "eco-development". The working party which reported in 1980 on "Twenty Years of Conservation in the Galapagos" concluded that deliberate planning to reconcile the interests of conservationists, scientists, settlers and tourists was already overdue. This will be Dr. Loza's function. Finally, Gary Robinson has just been chosen for the post of marine biologist and Margaret Mary Espinoza will be the new librarian.

These new appointments will greatly strengthen the conservation efforts of the Station and the Park Service as these depend so largely on scientific advice. While welcoming the newcomers, we must also regret the departure of Warwick Reed, the director's aid, Steven Shemeld, the librarian, and Ulrike Eberhardt who, among other duties, looked after the herbarium and edited the annual report.

GIANT TORTOISE PROTECTION IN THE FIELD

In the last century, man was the tortoises' worst enemy. More recently, at least since the organization of the Darwin Foundation and the Galapagos National Park Service, man has become less and less of a danger and by far the greatest damage has been done by rats, pigs and marauding dogs. However, the human predator is not yet extinct and the worst evidence of vandalism for a long time has just come to light. A National Park Service team, while monitoring tortoise populations on the northern volcanoes of Isabela, found near Punta Albemarle no less than 27 carcasses of female tortoises, presumably slaughtered when they came down to the arid coast to lay their eggs. These are not the most endangered sub-species but the loss of so many adult tortoises, when the CDRS and GNPS are slowly and expensively breeding and rearing young ones in captivity, is a serious disappointment.

There are ways of checking vandalism, which have been used with relative success. One is education, perhaps the best method in the long run, but slow. Another is policing. The Park guards are constantly on patrol but they have not yet enough boats to do the job adequately. The Galapagos may be only pin-points on the map but their land area is 3,000 square miles and they are scattered over 30,000 square miles of ocean. The Master Plan for the National Park stipulates that seven vessels are needed to patrol the archipelago effectively because they cannot all be at sea all the time, owing to the need to rest crews, renew supplies and service the boats. Thanks largely to the Frankfurt Zoological Society, the Park Service now has four vessels and a fifth is under construction. This is still not enough to meet the multifarious duties of the patrols and remote areas of both land and sea still remain vulnerable to acts of vandalism. However, this year a guard will be stationed permanently at Punta Albemarle during the nesting season.

THE TORTOISE BREEDING CENTRE

Efforts to save the endangered sub-species of tortoises by captive breeding began in 1965. The original, very primitive installations (converted bird-cages) were replaced by the present elegant tortoise house, thanks to the support of the San Diego Zoological Society. In 1980 considerable renovation and a number of structural improvements were carried out, financed this time by the Frankfurt Zoological Society. These included newly designed incubators; better sanitation, ventilation and heating (yes, even on the equator tiny hatchlings can contract "pneumonia" on cool nights!); better protection against rats and trespassers; better corrals for the older animals.



No sub-species of giant tortoises has become extinct since the Darwin Foundation was set up. As the following table shows, every year healthy youngsters of the most endangered races are being raised at the Station and in due course returned to their respective ancestral islands. Owing to the late age at which these long-lived creatures begin to breed, there is no prospect of a population explosion for many years to come and it is therefore particularly painful when breeding adults are slaughtered for food.

Years	Duncan	Hood	James	Chatham	Inde- fatigable	C.Azul	S.Negra	Wolf
1965-66	29	—	—	—	—	—	—	—
66-67	20	—	—	—	—	—	—	—
67-68	23	—	—	—	—	—	—	—
68-69	10	—	—	—	—	—	—	—
69-70	29	—	—	—	—	—	—	14
70-71	11	17	50	—	—	—	—	—
71-72	17	5	16	—	—	25	—	—
72-73	18	12	15	17	—	25	—	—
73-74	14	23	20	23	—	14	—	—
74-75	11	13	14	—	—	—	—	—
75-76	10	9	66*	5*	—	37	—	—
76-77	3*	24*	—	—	—	—	—	—
77-78	6*	10*	18*	—	5*	17*	4*	—
78-79	1*	15*	—	7*	—	16*	—	23*
79-80	26*	19*	—	—	18*	18*	3*	2*
Totals	228	147	145	52	23	162	7	39

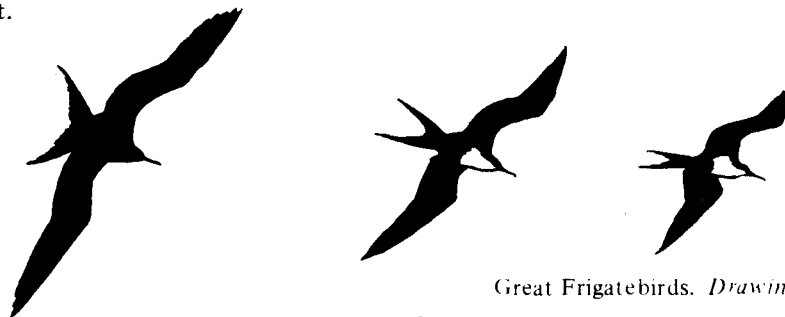
* Still kept at the rearing centre (1980)

HONOUR FOR FORMER DIRECTOR

At the concluding banquet of the Third World Conference on Breeding Endangered Species, held at San Diego, California, Craig MacFarland was awarded the Conservation Medal of the San Diego Zoological Society. Dr. MacFarland spent six years in the Galapagos, first as a research herpetologist and later as Director of the Darwin Research Station. Much of the success in breeding the endangered Giant Tortoise sub-species was due to his achievements in both capacities.

A NEW FRIGATEBIRD COLONY

Señorita Maria José Campos has reported the discovery of a large breeding colony of *Fregata minor* (oddly known in English as the Great Frigatebird) on North Seymour Island, where she was working in September-October 1980. The colony, which she found only a kilometre away from the usual tourist trail, numbered about 500 birds and was apparently a recent development as the Great Frigatebird is not mentioned as nesting on North Seymour by M.P. Harris in his "Birds of the Galapagos" (1974). The colony also included small groups of Magnificent Frigatebirds, but these are no novelty on North Seymour. It would be interesting to know the cause of this population movement.



Great Frigatebirds. Drawing by Peter Scott

CHARLES DARWIN PORTRAIT HEAD



Dan Clapp, whose giant bronze of "Lonesome George", the only known survivor of the Abingdon (Pinta) Tortoises, was unveiled at the San Diego Zoo in October, 1980, has also made a bronze head of Charles Darwin. Dan is seen in the photograph at the Smithsonian Institution presenting his bust to Dr. David Challinor (left), C.D.F. Secretary for the Americas. It is now on view in the Van Straelen Hall at the Darwin Research Station.

VISITORS AND EVENTS AT THE DARWIN STATION JULY—DECEMBER 1980

JULY

- Dr. W. Banta (American Union, Washington D.C.) and 3 students to collect Bryosoa.
- Bill Hennemann (Univ. of Florida) arrived to study the spread winged posture of Flightless Cormorants.
- Howard Snell (Staff Herpetologist) and Heidi left after more than 3½ years at CDRS.
- M. Deloz (Belgian Ministry of Education) and son arrived for a brief stay at CDRS.
- Dr. T. de Vries (U.Católica, Quito) arrived to continue longterm Frigatebird study on Genovesa.
- "BEAGLE IV" arrived from Panamá, captained by Tom Borges (STRI).

AUGUST

- Dr. F. Trillmich (Max-Planck Inst.) and assistant arrived to continue longterm sea lion and fur seal studies on Fernandina.
- National Park Guards' Course held at CDRS.
- First Charter of BEAGLE IV to Isabela and Fernandina.
- Auxiliary Guides' Course.
- Dr. P. Grant and family departed after continuing studies of finches, mockingbirds and doves.
- Mario Hurtado returned to CDRS as co-ordinator with INP (Nat. Inst. of Fisheries).

SEPTEMBER

- Dr. G. Kooyman (Scripps Inst. of Oceanography, San Diego, USA) arrived to study feeding behaviour of sea lions and fur seals on Fernandina.
- SPNG Patrol boat "Petrel" launched. Financed by Frankfurt Zoological Society.
- Dr. J. Treherne (Cambridge Univ.) and 2 assistants arrived for a 3 week study of behaviour of Halobates.
- Derek Green (Principal Investigator, Green Sea Turtle Programme) returned to England after nearly 8 years in Galapagos (including 2 years as guide).
- Angél Nárvaez (Univ. Central, Quito) arrived to study Blue Footed Boobies.
- Naturalist Guides' Course began.
- Colombian Naval Training Barque "Gloria" visited CDRS.
- Gunther Reck (Advisor to the Sub-secretary of Fisheries) visited CDRS to lecture guides and discuss INP/CDRS Programs.
- Foundation Council Meeting in Paris, Dr. Friedeman Köster appointed Director, to begin January 1981.

OCTOBER

- D. Steadman (Smithsonian Inst.) and 2 assistants returned to collect more fossils.
- Srta. Chela Vázquez (Univ. Guayaquil) returned to continue her Albatross study.
- Lucho and Fabiola Calvopiña attend VIII Congreso Latinoamericano de Zoología in Venezuela.
- Visit by Carlos Iguago and Gladys Travez (Centro de Información de Galápagos, Quito) and Priscila Martinez (C.I.G. Guayaquil).
- Dr. Ruth Baker left Galapagos after completing Dark-rumped Petrel census on Santa Cruz and search on Fernandina and Pinta.
- Luis Olmedo Andrade ("Johnson") died after brief illness. Memorial services held in Guayaquil and Puerto Ayora.

NOVEMBER

- Sr. Jorge Sotomayor started work as CDRS Manager.
- Dr. Rauch (Max-Planck Inst.) and family began two year study of marine iguanas.
- Dr. R. Reynolds and wife arrived to take up position as Staff Herpetologist.
- NOAA Group (Seattle, USA) cruise to retrieve data from sea-bed monitors and establish a 4th station at Pta. Pitt.
- Lcda. Aurora Pazmino (U. Central, Quito) arrived to supervise student Sr. Angel Narvaez and continue her own studies of Flightless Cormorants.
- IX Seminario Técnico y VIII Asamblea General de la Asociación Panamericana de Instituciones de Crédito Educativo held at Station.
- Catalina de Salcedo, CDRS Secretary, leaves.
- US Geological Society tour led by Dr. T. Simkin (Smithsonian Inst.)
- Visiting Committee (Dr. T. de Vries) at CDRS 5 days.
- Prof. Ernest Mayr (Harvard Univ.) visited station.
- Presidential Commission on Tourism visited the Islands.

DECEMBER

- Gunther Reck (Subsec. INP) returned to Galapagos for the inauguration of the new INGALA boat.
- Lcdo. Galo Vargas, Dr. del Pozo. Ing. Rodrigo Cisneros visited Station.
- Dr. T. Simkin and party left for Fernandina volcano to relevel tilt stations and monitor caldera activity.
- Drs. George Stanley and John Armentrout surveyed marine fossil deposits on Isabela with Maria José Campos.
- INGALA Gerente, Sr. I. Alvarado, Sub – Gerente, Sr. Ramádan, and advisor, G. Reck, at CDRS for discussions.
- Mercedes Ramos began work as Director's Secretary.
- Dr. U. Eliasson and family began 3 months' study of Scalesia and other vegetation.
- Dr. Eliasson was last in Galapagos in 1966/67.
- Iñes Mackay and Priscila Martinez (incoming and outgoing Information Center Directors from Guayaquil) arrived for a brief visit.
- Fiona Bass left after completion of Hawaiian Petrel breeding success study on Santa Cruz.
- Dr. Paul Martin and wife arrived to supervise David Steadman (paleontologist).
- M. Konecny left after 12 month study of feral cats.
- Howard and Heidi Snell returned to continue longterm study of land iguanas.
- General Torrijos of Panamá visited the CDRS.
- Lynn Fowler (Univ. of Florida, Gainesville, USA) left after 12 month study of feral burros on V. Alcedo, Isabela.



His Majesty King Juan Carlos of Spain,
signing the Visitors' Book in the Van Straelen Hall.
In the background are Miguel Cifuentes,
Superintendant of the Galapagos Nation Park (right)
and David Duffy, acting Director of the Darwin Research Station.

Photograph by Ernst Ludwig Koch

CRISTOBAL BONIFAZ JIJON

Aunque habíamos oído y leído acerca de los extraordinarios recursos de fauna y flora silvestre lo que pudimos observar rebazó ampliamente nuestras expectativas. Declaración de Galápagos. Puerto Ayora 8 de Diciembre de 1970.

Palabras secas y frías, que encierran el pensamiento de la comunidad científica internacional, y aún más encierran el tácito agradecimiento al Gobierno Nacional, a la Fundación Charles Darwin, y a Don Cristóbal Bonifaz Jijón, artífices de que estas palabras de Diciembre de 1970, sean similares a las palabras que pronunciaron hace tres siglos Fray Tomás de Berlanga al descubrir las islas para España, a las palabras del General Villamil al incorporar las islas al Ecuador, y a las palabras de Charles Darwin al descubrirlas para el mundo, a inmortalizarlas, al encontrar en ellas clara evidencia del proceso de la evolución, teoría expresada en su libro "El Origen de las Especies" obra científica filosófica que cambió para siempre el rumbo del pensamiento universal.

Mi padre, Cristóbal Bonifaz Jijón, dedicó gran parte de su vida a la conservación de las Islas Galápagos. Fué presidido en esta obra por los gobernantes Ecuatorianos de la década de los treinta, quienes al conmemorar el centenario de la visita del Naturalista Inglés firmaron los primeros decretos de protección a la fauna y flora del Archipiélago, y así el 14 de mayo y 11 de Junio de 1936 se dieron los primeros pasos en la larga lucha por la conservación de la Fauna y la Flora de las Islas Galápagos.

En 1958, a los cien años de la publicación del Libro de Darwin, el mundo científico realizaba la mayor empresa de cooperación entre naciones: El Año Geofísico Internacional. A principios de ese año, varios delegados de la UNESCO, que visitaron Galápagos recomendaron en su informe la expedición de leyes efectivas tendientes a la protección de las especies de las islas. Mientras tanto, la Comisión Nacional del Año Geofísico Internacional, del Ecuador, presidida por Cristóbal Bonifaz Jijón, formuló un proyecto de ley, reformando los decretos del año de 1936 y declarando Parque Nacional a estas Islas.

El 20 de Julio de 1959 terminó el largo trámite y la propuesta original de mi padre de crear el Parque Nacional Galapagos, se convirtió en Ley de la República.

El 12 de Octubre de 1959, día de la Raza, se crea en la sede de la UNESCO en PARIS la Fundación Charles Darwin con el objeto de proteger la fauna y flora de las Islas.

Desde fines de 1960 por el lapso de cuatro años siendo mi padre Embajador del Ecuador en Francia y Delegado ante la UNESCO, presentó varias conferencias sobre las Galápagos en los círculos científicos y sociales de París. Su entusiasmo y conocimientos sobre la materia fueron muy apreciados, despertándose un gran interés por conocer y estudiar este pequeño paraíso perdido en la inmensidad del océano.

El Decreto de la declaración de Parque Nacional, y el organismo fundado en París abrieron finalmente el camino que nos ha traído donde ahora estamos, y que han colocado al Ecuador y a sus islas encantadas en un lugar preponderante dentro del mapa científico internacional.

Para los Bonifaz Andrade el sueño del Parque Nacional Galápagos, ahora una realidad viviente, era un asunto natural desde que eramos muy niños. Recuerdo, con toda emoción y cariño, como se hablaba de las maravillas aquí existentes, y como se sufría cuando se recibían informes de los daños que los hombres, pasajeros en este mundo, estaban causando a la eterna naturaleza, reflejo de la cara de Dios. Esa conciencia es la que impulso a mi padre a luchar y promover, a no rendirse y a continuar sembrando sus ideas, y absorbiendo los reveses y frustraciones, las que no lograron desanimarlo, peor hacerlo abandonar su lucha incansable por las islas Espíritu que conservó hasta los últimos días de su existencia.

Este homenaje nacido de los personeros de la Fundación Charles Darwin es el que mi padre Don Cristóbal Bonifaz Jijón, más hubiera agradecido que su nombre sea recordado aquí en esta estación de Biología, en este Parque Nacional al que dedicó tanto esfuerzo y tantos años de su vida. Agradezco a nombre de él y de su familia esta deferencia que nunca será borrada de nuestra memoria.

Para todos nosotros que en alguna forma u otra estamos ligados a la conservación, su memoria seguirá siendo una guía para que nunca las palabras de la Declaración de Galápagos dejen de tener vigencia real, estoy seguro que su vida será un ejemplo para las generaciones futuras, un ejemplo de lo que con dedicación y sacrificio se puede hacer cuando hay desinterés personal, y amor por la patria, y por sus habitantes para los cuales siempre se desea mejores días.

Gracias señores por este honor que inmerecidamente me ha tocado agradecer, sólo he hablado a través de la memoria de mi padre, al que trataré de imitar en sus ideales y en su obra.

Neptalí Bonifaz



“Adios”, fotografía por Fritz Pölking

A FAREWELL TO TWO PIONEERS

by

Peter Kramer and David Duffy

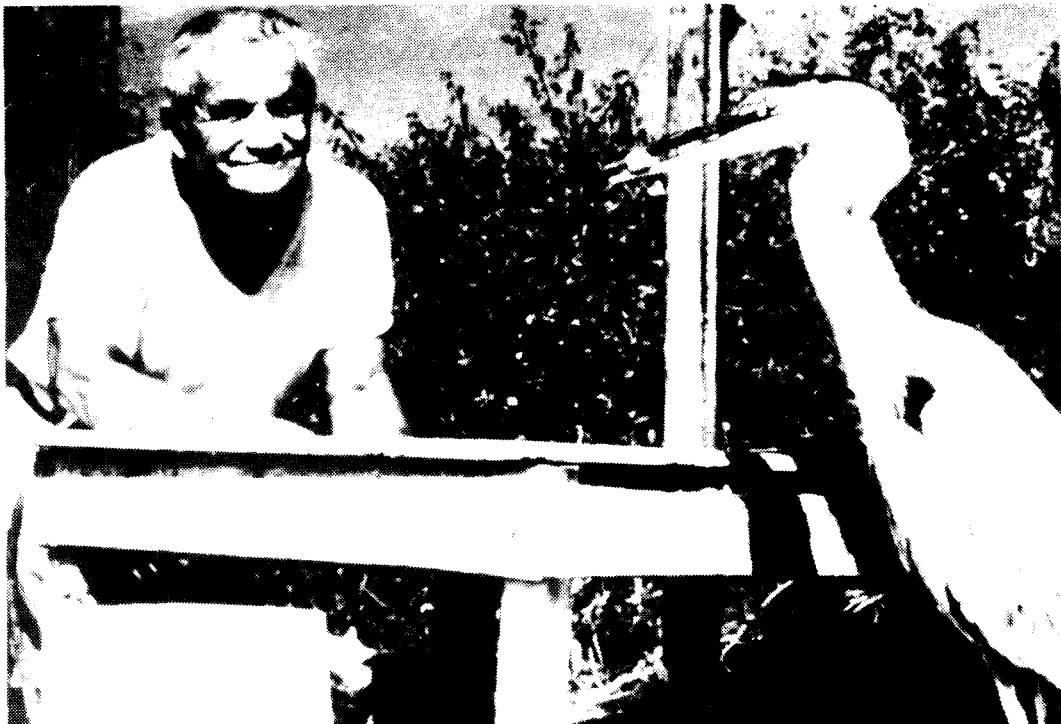
LUIS OLMEDO ANDRADE

12 JUNE 1911 – 20 OCTOBER 1980

We mourn the death of Luis Olmedo, known to all of us as “Johnson”. Johnson was employed by the Darwin Station from its earliest days. Twenty years ago he helped to lay out the first paths and to build the laboratory and the workshops. These will be a memorial to him and to the little group of hardy Galapagos settlers, who were responsible for the basic structure of the Research Station. He and his fellow workers were reliable, creative, incredibly tough and enduring. Johnson played an important role among them. He was no longer a young man but he was recognised as the strongest in the group. He was not always easy to work with because he refused to perform like a machine: he had his own ideas and never accepted orders automatically. It was because of, not in spite of, these characteristics that the CDRS became a functioning and a hospitable field station in those early years.

When he grew still older, Johnson took on less strenuous duties and from 1971 he presided over the dining room. During the second world war he had catered for the U.S. military base on Baltra – which is where he acquired his nick-name of “Johnson” and his command of English. This also explains his legendary breakfasts, which combined strong North-American influences with tropical and local Galapagoan traditions. His luscious and abundant meals played a major role in bringing together Park and Station staff and visiting scientists, trading information and discussing problems between cracking jokes with Johnson.

Johnson, as a person, kept us aware that the CDRS is not simply the creation of those who conceived and financed it: it is to a large extent the product of the endurance, reliability and craftsmanship of the Galapagos people whose efforts built it and still today sustain it. Without Johnson the Station would not have become what it is. He will be remembered with both gratitude and respect.



Johnson with his favourite Heron *Photograph Heidi Snell*

ANDERS RAMBECK

One of the earliest settlers on Santa Cruz Island, Anders Rambeck, died in August 1980, aged 83. He was a member of the large but ill-fated Norwegian expedition in the 1920s, misled by a rascally promoter into believing that the Galapagos were islands flowing with milk and honey. The disillusioned colonists soon realised that this "earthly paradise" was better suited to tortoises than to human beings and within a year over a hundred of them had died or left. By 1929 there were only three survivors. One of these was Rambeck. He struggled on obstinately as a subsistence farmer.

When the Darwin Foundation arrived in 1960, Anders Rambeck helped to build the Research Station. Later, when Roger Perry began the captive breeding programme in 1965, he put Rambeck in charge of the giant tortoises. Rambeck lived in a cottage just outside the Station and continued as tortoise keeper until 1972, when his wife died and he returned to Norway. He contributed greatly to the success of this important conservation project, which earned world-wide fame for the Darwin Foundation. When he left he gave his cottage to the Station and it is now used by the National Park Service. Early visitors to Academy Bay will remember him with affection.

Over the last half-century life on Santa Cruz has changed almost beyond recognition. Few people can now remember how much we owe to these hardy pioneers who served the Charles Darwin Foundation with such devotion from its earliest days: but our debt will remain for ever.

LUIS OLMEDO ANDRADE

12 de JUNIO de 1911 – 20 de OCTUBRE de 1980

Ahora lamentamos la muerte de Luis Olmedo, conocido por todos nosotros como "Johnson". Johnson ha sido un empleado de la Estación Darwin desde su inicio en 1959 – 1960, cuando el laboratorio, los talleres y los primeros senderos y caminos fueron construidos. Aunque ya no era un hombre joven integró el grupo de trabajadores que construyeron las instalaciones básicas de la Estación Darwin en los años 60. Estas construcciones son monumentos para estos colonos galapagueños que decidieron trabajar para la Estación Darwin en aquellos tiempos. Estos hombres fueron creativos, dignos de confianza e increíblemente fuertes y decididos. Johnson desempeñó un papel importante dentro de este grupo. Fue conocido como el más fuerte de todos ellos y no siempre fue fácil trabajar con él. Él nunca trabajó como una máquina, tuvo sus propias ideas y nunca aceptó las órdenes automáticamente. Fue debido a estos talentos que la Estación Darwin llegó a ser un campo funcional y hospitalario en aquellos años.

Cuando Johnson estuvo de edad, en la que muchos de nosotros tendríamos dificultades para caminar desde Puerto Ayora a la Estación Darwin, entonces aceptó un trabajo más duro. Fue conserje por varios años y empezó a cargo del comedor en 1971. Él había trabajado en la base militar Norteamericana en Baltra durante la segunda guerra mundial donde él adquirió su conocimiento inglés y su nombre de Johnson. Su legendario desayuno fue por lo tanto una mezcla única de elementos norteamericanos y típicos galapagueños. Sus comidas tuvieron un rol importante en reunir al personal de la Estación y del Parque Nacional y científicos visitantes, para intercambio de información, bromas y leyendas entre sí y con Johnson.

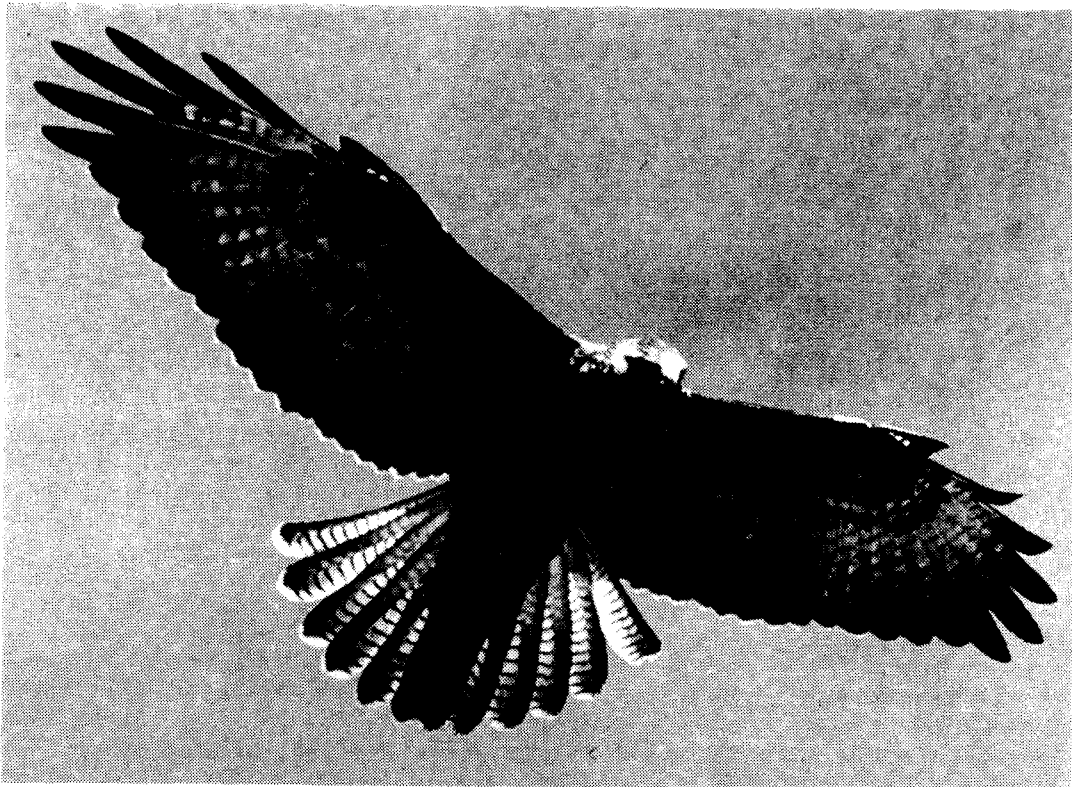
Johnson como persona nos hizo conscientes de que la Estación Darwin no es simplemente el trabajo de aquellos que la concibieron y financiaron. En gran parte es la constancia, aptitud y confianza de aquellos colonos galapagueños que han trabajado y trabajan para su existencia. Sin Johnson la Estación no hubiera llegado a ser lo que es ahora. Nosotros le recordaremos siempre con gratitud y respeto.

ANDERS RAMBECK

En Agosto de 1980, a la edad de 83 años, murió Anders Rambeck, uno de los pioneros en la colonización de Santa Cruz. Rambeck en los años de 1920, fué miembro de una expedición noruega grande pero desafortunada, mal conducida por un promotor falso bajo la creencia de que Las Galapagos eran unas islas donde fluia leche y miel. Los colonos desilucionados pronto se dieron cuenta de que este "paraíso terrenal" era mas apto para tortugas que para seres humanos y en un ano más de cien de ellos habian muerto o retornado. En 1929 habian solamente tres sobrevivientes. Uno de ellos era Rambeck. El persistio obstinadamente como un granjero de subsistencia.

Cuando la Fundación Darwin arribó en 1960, Anders Rambeck, ayudó en eregir la Estación de Investigaciones. Más tarde en 1965 cuando Roger Perry inició el Programa de Crianza en cautividad, puso a Rambeck a cargo de las tortugas gigantes. Rambeck vivia en una casita adyacente a la Estación y continuó como guardian de las tortugas hasta 1973, cuando su esposa murió y el retornó a Noruega. Rambeck contribuyó notablemente al éxito de este importante proyecto, el cual dio fama mundial a la Fundación Darwin. Los primeros visitantes a Bahía Academia le recordarán con afecto.

En la ultima mitad del siglo la vida en Santa Cruz ha cambiado casi más allá de lo imaginable. Poca gente puede ahora recordar cuanto debemos a estos duros pioneros que sirvieron a la Fundación Darwin con tal devoción desde sus días iniciales. Pero nuestra deuda permanecerá para siempre.



Galapagos Hawk *Photograph by Fritz Pölking*

POPULATION FLUCTUATIONS, TREE RINGS AND CLIMATE

by

P. R. Grant

University of Michigan, Ann Arbor, MI 48109, USA

Professor Grant is the leader of a team of scientists engaged in long-term research on Darwin's Finches (Noticias 30, 31, 32), a subject which continues to present fascinating problems. The team have approached the subject from a number of angles: this particular project was one that failed to produce positive results but it could serve as a starting point for further research. As Professor Grant explains:

"This is neither a scientific paper nor an essay but something in between. It presents an account of how and why I measured tree rings to age the trees and to estimate past rainfall on the Galapagos. The verdict on whether the trees can be aged accurately must be suspended until more information is available. On the matter of estimating rainfall it is a failure. Principally for this reason, no scientific journal would want to publish it. But that is no reason to bury the results unpublished.

At the Galapagos Symposium at the California Academy of Sciences in 1977, I talked briefly about my tree ring work. After the session Paul Colinvaux and Bob Bowman came up to me, separately, and told me that they had done similar but more limited work. They did not know I had done mine; I did not know they had done theirs. To prevent a recurrence of this duplication, they encouraged me to publish my work in Noticias since mine was more thorough, so that everyone working on the islands and interested in research progress could be informed of what I had done and found. That is one reason for writing this paper and for writing it in its particular form.

The second reason is more specific. Ole Hamann and Tjitte de Vries have done some nice studies on the effects of goats on the vegetation, but have stumbled upon serious problems of trying to distinguish between normal changes in vegetation and goat-induced changes. It seems crucial that we encourage more systematic monitoring of environmental factors. In this paper I am drawing attention to some very basic base-line studies that are needed and can be done; in this case it is the study of growth and aging in a common tree, and it could be done near the research station by visiting students or staff.

I am raising some questions which I hope will stimulate someone to try and find answers. And I am using two illustrations and a table of data that will allow anyone to see how far I have got and to use my results in planning their own programme."

INTRODUCTION

Conservation and basic research on the Galapagos involve studies of individual animal and plant populations. Many populations fluctuate in size, sometimes enormously, and so the question often arises as to whether the fluctuations we observe are typical or exceptional. For example, J. Gordillo (1969) recorded 512 adult and juvenile Greater Flamingos (*Phoenicopterus ruber*) in a survey of 22 sites in 1968, whereas Bob Tindle (1977) recorded only 442 at 24 sites in 1976. Is the apparent decline in numbers just one of several that occur each century, a small deviation from a long-term average, or should we pay particular attention to it because it is unusual? Long-term studies are needed to see changes in numbers such as these in proper perspective. Except for some studies of seabirds (Harris 1979), the hawk (deVries 1975) and some plants (Hamann 1979 a.b.), long-term studies have been neglected on Galapagos.

If numerical fluctuations occur regularly, what are the causes? Do atmospheric and marine conditions fluctuate in a manner that would allow us to explain the changes in numbers of animals

and plants in terms of, say, changes in temperature or rainfall regime? We know there are very wet years, when heavy and extensive rainfall is associated with an El Niño phenomenon, and there are very dry years. Rainfall records for the period 1950 to 1979 from San Cristobal and Santa Cruz show that the 1950's were distinctly wetter than the 1960's (Grant and Boag 1980), the 1970's being intermediate between these two (unpublished records, CDRS). However, we need records over a much longer time period than 30 years before we can properly characterize the obviously variable Galapagos rainfall.

TREE RINGS AND CLIMATE

In the arid regions of the southwestern USA the widths of the woody rings laid down annually by certain long-lived tree species provide a fairly sensitive indicator of annual rainfall. This fact has been used to estimate annual rainfall in early times before meteorologists measured rainfall (Fritts 1972).

In the hope that the same technique could be used on the Galapagos to estimate annual rainfall prior to 1950, I took cores from at least 10 *Bursera* trees (palo santo) at each of five study sites in July and August 1975. The sites were on Santa Cruz, at (a) CDRS, Academy Bay, (b) 2 km south of Bella Vista in the transition vegetation and (c) 200 m inland from Borrero Bay on the north shore, (d) on Isabela at Cerro Ballena, 10 km north of Vilamil, and (e) on Daphne Major. I followed the procedures recommended by Stokes and Smiley (1968) for recording, standardizing and analyzing the tree ring widths.

ANNUAL VARIATION IN TREE RING WIDTHS

Although rings were evident in the cores and obviously varied in width, precise measurement was difficult because the wood is the diffuse-pore type and the edges to the rings were not sharp. M. L. Parker (personal communication) kindly confirmed this for me by carrying out an X-ray analysis of one core. Despite this problem, widths were measured to the nearest 0.25 mm with a micrometer, and analyzed in the knowledge that measurement error was appreciable.

Unfortunately, analysis on a ring-by-ring basis gave negative results. No two trees had the same pattern of ring widths. Statistically, the variation in widths among cores at a given site were not correlated ($P > 0.1$) in all cases. So it was not possible to set up a reliable master chronology for aging purposes on the basis of corresponding patterns of ring widths in cores from different trees (Stokes and Smiley 1968). Nor was the variation in ring widths in any one core from Santa Cruz (CDRS) or Isabela correlated significantly ($P > 0.1$ in each case) with the annual rainfall recorded at nearby weather stations in the period 1965-1975. There are many possible reasons for the failure of the tree ring width patterns to faithfully match the pattern of rainfall. Fritts (1972, 1974) discusses them in detail. One worth mentioning here is the erratic occurrence of double rings (two per year) and missing rings (none per year). Double rings might be produced by some trees in a year when there are early and late rains. Rings may not form in dry years.

I have to conclude that *Bursera* is the wrong tree for estimating past rainfall regimes. Is there a better one? *Bursera* was originally chosen because it is drought-adapted (Porter 1971) and common, and because tree rings have been reported in a Costa Rican relative, *B. simaruba* (Janzen 1975). It is possible that other common, water-stressed, arid zone species will give positive results. *Cordia lutea* and *Croton scouleri* would be good candidates.

ANALYSIS BY DECADES

Undeterred by these failures, I have grouped the widths into classes of 10 on the assumption that each class represents approximately one decade of growth. Three regularities can be seen in the numbers shown in Table 1. First, on the south side of Santa Cruz the mean widths are consistently smaller and less variable at the transition zone site than at CDRS. This presumably means that trees

TABLE 1.

Standardized ring width characteristics of *Bursera* cores at five sites. On the assumption that one ring is laid down each year, ring widths have been grouped into tens (decades), and the mean width in millimeters for the decade and one standard error are shown. The number of cores from which the mean and standard error has been calculated is given in brackets, and the coefficient of variation is in italics.

	1960's	1950's	1940's	1930's	1920's	1910's
SANTA CRUZ						
Academy Bay, coast	3.14±0.61(8) <i>53.66</i>	2.93±0.60(8) <i>52.88</i>	3.21±0.89(4) <i>53.71</i>	—	—	—
Academy Bay, transition	3.03±0.47(8) <i>40.14</i>	2.79±0.48(8) <i>44.17</i>	2.58±0.50(6) <i>48.66</i>	2.72±0.71(3) <i>44.93</i>	—	—
Borrero Bay	2.92±0.41(12) <i>45.24</i>	3.22±0.48(12) <i>46.82</i>	3.46±0.62(10) <i>51.92</i>	3.94±1.11(4) <i>55.82</i>	3.77±1.21(3) <i>55.65</i>	3.95±1.85(2) <i>65.26</i>
ISABELA						
Cerro Ballena	2.95±0.42(11) <i>42.32</i>	2.96±0.45(11) <i>44.79</i>	2.70±0.45(9) <i>47.70</i>	2.34±0.52(5) <i>46.82</i>	2.23±0.59(4) <i>47.94</i>	—
DAPHNE MAJOR						
	2.92±0.43(11) <i>43.89</i>	3.28±0.51(11) <i>50.91</i>	3.03±0.81(6) <i>60.21</i>	2.65±1.28(2) <i>62.79</i>	—	—

are less often water stressed in the transition zone than at the coastal site. Second, the older the rings the narrower they get at the Isabela site; this is the usual pattern found in trees (Stokes and Smiley 1968). Third, the exact opposite is found at Borrero Bay on Santa Cruz; here the oldest rings are the widest. Does this mean that more rain fell at Borrero Bay in the early part of the century than now? This question must remain unanswered until a detailed study of *Bursera* growth is undertaken.

THE MAXIMUM AGE OF TREES

The oldest tree, as classified by assigning one ring per year, was 68 years. Even if this is only approximately correct, it is unlikely that there are any *Bursera* trees still standing which Charles Darwin gazed upon 146 years ago.

ESTIMATING AGE FROM TREE CIRCUMFERENCE

Repeated coring of a series of trees in successive years is necessary to establish the correspondence between number of rings and age. This can be done without permanent damage in robust trees like *Bursera*. Once the correspondence is established it will be possible to readily obtain a reasonably accurate estimate of the ages of trees just by measuring their circumferences. This is because there is a strong association between maximum tree circumference and number of rings (Figure 1). Correlation coefficients (r) were statistically significant ($P > 0.01$) at each site, and ranged from 0.89 (Daphne) to 0.99 (CDRS). As the Figure shows, for a large range of trunk circumferences the number of rings can be estimated to within 5. The relationship varies slightly at the different sites, so ideally it should be established at each site with a sample of 10 to 20 trees before it is used as an age estimator on the rest.

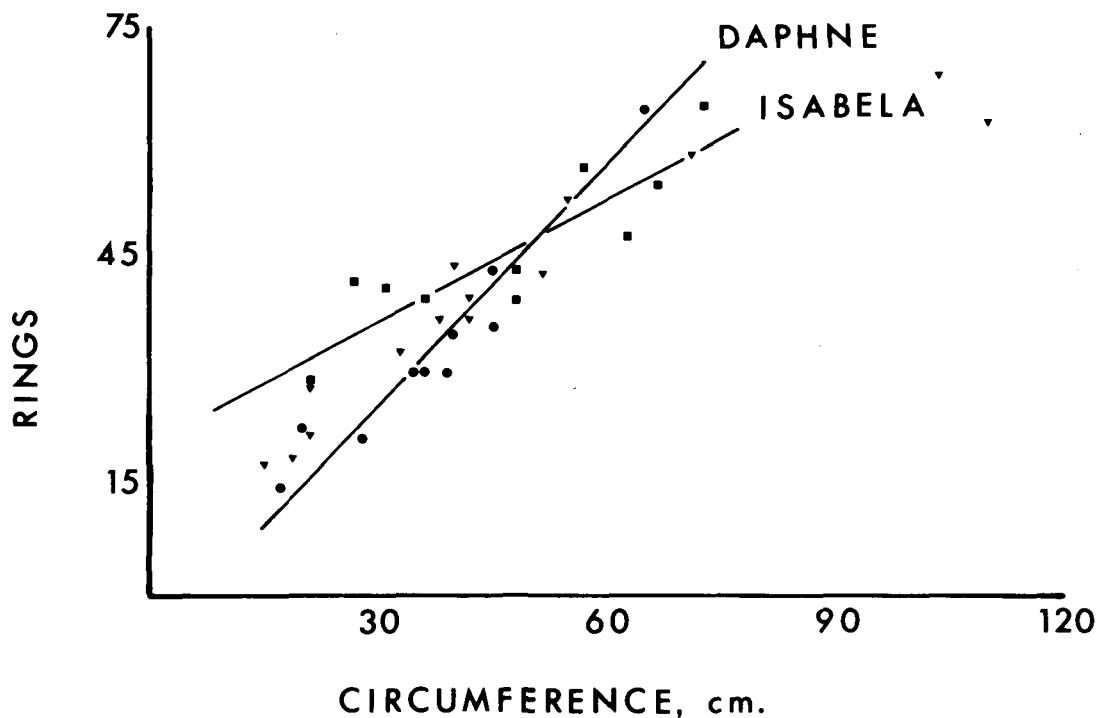


FIGURE 1.

The relationship between the number of tree rings and the maximum circumference of the trunk. Symbols: Daphne solid circles, Borrero Bay open circles, Isabela crosses. The regression for the Daphne points has been drawn: $Y=0.96X-3.22$. The regression line for the Borrero Bay points (not drawn) is almost the same but notice the rate of addition of rings declines as circumference increases in this sample. In fact a polynomial regression best fits these points: $Y=2.10+1.06X-0.01X^2$. Very roughly one ring is equivalent to one centimeter of circumference. However in the Isabela sample the number of rings increases more slowly with circumference. $Y=19.93+0.53X$; or to put it the other way round, circumference increases faster with number of rings (and age?).

RELEVANCE TO CONSERVATION

Another thing to be noticed in this Figure is that circumference increases with number of rings, and hence presumably with age, more slowly on Daphne than on Isabela. One factor responsible for this difference, among the many possible, is goats. Goats may have knocked down the weaker trees on Santa Cruz and Isabela and left the robust ones standing. Certainly goat damage to the bark of every tree was conspicuous at the Isabela site. Daphne lacks goats.

A further indication of goat damage and the effects of goats upon the age structure of *Bursera* population can be seen in Figure 2. The frequency distribution of circumferences of 100 trees on Daphne can be taken as the natural state, i.e. no goat influence. At the other two sites there is a relative paucity of small trees, and this can be attributed to goats since they are known to eat young *Bursera* (deVries 1977, Hamann 1979). Because small trees have few rings (Fig. 1), and few rings indicate youth, the goat-damaged populations of *Bursera* have an unstable top-heavy age-structure. Without control of the goats the *Bursera* populations will eventually collapse. A study of individual *Bursera* growth patterns will be helpful in assessing the long term health of *Bursera* populations.

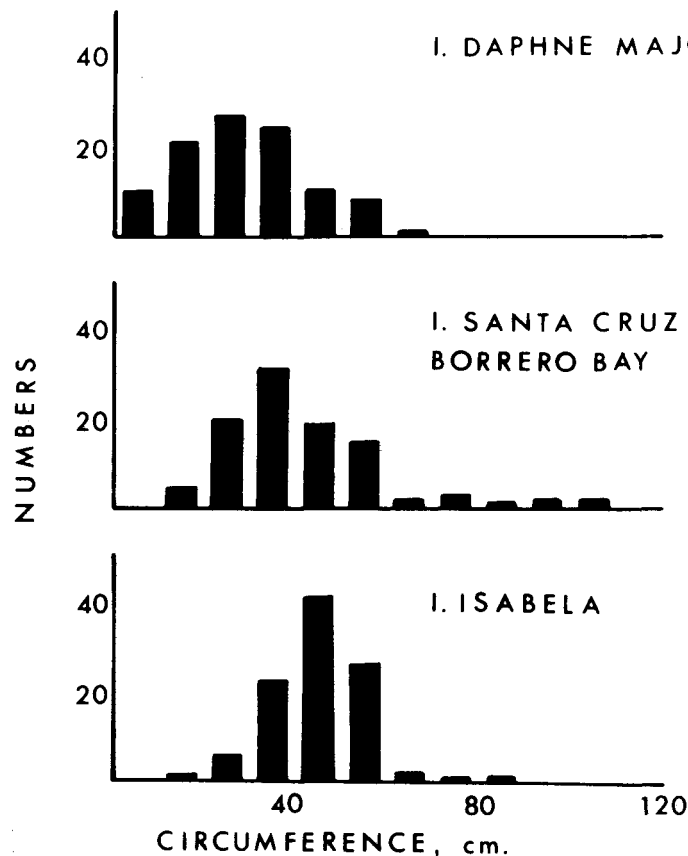


FIGURE 2.

The frequency of *Bursera* trees of different sizes at three sites. At each site all trees were measured within 10 m of a line transect until 100 trees had been measured. Note the scarcity of the smallest size classes at the sites where goats are present, Borrero Bay and Isabela.

ACKNOWLEDGEMENTS

I thank Duncan Innes for much of the core preparation, measurement and analysis, M. L. Parker of the Forest Products Laboratory, Vancouver, B.C., Canada for the X-ray analysis and C. W. Ferguson and T. Blasing of the Tree-Ring Research Laboratory, Tucson, Arizona for discussion.

REFERENCES:

- Gordillo, J. 1969. "Galapagos Scientific and Conversation Report", No. 16.
- deVries, Tj. 1975. The breeding biology of the Galapagos Hawk *Buteo galapagoensis*. Le Gerfaut 65, 29-58.
- deVries, Tj. 1977. Como la-caza de chivos afecta la vegetación en las islas Santa Fé y Pinta, Galápagos. Revista de la Universidad Católica, Quito. No. 16, 171-181.
- Fritts, H.C. 1972. Tree rings and climate. Scientific American 226, 92-100.
- Fritts, H.C. 1974. Relationships of ring widths in arid-site conifers to variations in monthly temperature and precipitation. Ecological Monographs 44, 411-440.
- Grant, P.R. and P.T. Boag. 1980. Rainfall on the Galapagos and the demography of Darwin's Finches. Auk 97 (in press).
- Hamann, O. 1979a. Regeneration of vegetation on Santa Fe and Pinta Islands, Galapagos, after the eradication of goats. Biological Conservation 15, 215-236.
- Hamann, O. 1979b. Dynamics of a stand of *Scalesia pedunculata* Hooker fil., Santa Cruz Island, Galapagos. Botanical Journal of the Linnean Society 78, 67-84.
- Harris, M.P. 1979. Survival and ages of first breeding of Galapagos seabirds. Bird-Banding 50, 56-61.
- Janzen, D.H. 1975. Behavior of *Hymenaea courbaril* when its predispersal seed predator is absent. Science 189, 145-147.
- Porter, D.M. 1971. Buttressing in a tropical xerophyte. Biotropica 3, 142-144.
- Stokes, M.A. and T.L. Smiley. 1968. An Introduction to Tree-Ring Dating. University of Chicago Press, Chicago.
- Tindle, R.W. 1977. The status of the Greater Flamingo in Galapagos. Noticias de Galapagos, No. 26: 15-17.

THE GREEN SEA TURTLE PROJECT IN GALAPAGOS: PAST, PRESENT AND FUTURE

by Derek Green

Derek Green, who has wide experience of sea turtles, spent the years 1975–1980 studying their status in the Galapagos. During this period the main threat came from feral pigs and scarab beetles rather than from man. But conservationists remember the huge numbers of turtles taken in 1971 and 1972 by a Japanese refrigeration ship. Such depredations are not at present permitted by the Government of Ecuador but efforts will doubtless be made to persuade the authorities to renew the practice. It is therefore of the highest importance to establish authoritative facts and figures regarding the population situation. In devoting five years to this most arduous task on the Galapagos beaches, Derek Green has rendered yeoman service to the conservation of sea turtles, which today are persecuted in every ocean. His scientific results will be awaited with keen interest.

THE PAST:

“Pour yourself a whisky, we’ve got the grant” were the instructions in a telegram I received in England early in 1975 from Dr. Craig MacFarland, then director of the Charles Darwin Research Station. The National Geographic Society had just approved his proposal for a study of the east-Pacific green sea turtle, *Chelonia mydas agassizi*, in the Galapagos Islands. I cheated and poured myself two or three. Little did I realize at the time that this telegram and ensuing project were to keep me from spending Christmas with my family until 1980.

Objectives of the study, methods and materials

The three main objectives were to determine the status of sea turtle populations in Galapagos; to collect sufficient scientific data upon which to base recommendations for future management policies both in Galapagos and mainland Ecuador; and to incorporate Ecuadorian university students into the programme with the aim of extending the study to mainland Ecuador. The detailed objectives and methods may be summarized as follows:

A: TO PROVIDE AN ESTIMATE OF POPULATION SIZE:

Turtles were tagged with numbered plastic and metal tags, counted, measured and weighed on seven selected nesting beaches and four feeding grounds. On the nesting beaches, where we worked mainly with females, the turtles were tagged at the termination of oviposition. At the feeding grounds where the research involved males, subadults and juveniles as well as females, the turtles were caught in the water, either by nets or by hand (diving with tanks, snorkelling or diving from a *panga* – a specially constructed dinghy). They were usually taken on board the *panga* and shortly after tagging were released safely into the water. All methods used for capturing the turtles proved highly successful. The work at the feeding grounds was conducted at periods throughout the year, whereas on the nesting beaches it was restricted to the nesting season (December to June). By using volunteer tagging crews of up to 20 people during the nesting season, it was possible simultaneously to tag turtles on six nesting beaches and two feeding grounds.

B: TO STUDY THE BREEDING CYCLES AND NESTING BEHAVIOUR OF INDIVIDUAL TURTLES:

Turtles, once tagged, can be individually recognized. Regular nightly patrolling of the beaches, logging and observing each turtle during its time ashore, provided the required data.

C: TO MEASURE REPRODUCTIVE POTENTIAL OF THE GREEN TURTLE; ALSO TO MEASURE HATCHING SUCCESS AND HATCHLING SURVIVORSHIP RATES PRIOR TO REACHING THE SEA:

By marking the exact position of the nests with a numbered stake during egg-laying; by inserting a cylindrical wire cage over the nest in order to catch emerging hatchlings; and by digging down to the nest, counting and examining unhatched eggs after emergence of the young, it was possible to determine the hatching success.

Excavation of fresh nests in order to count, measure and weigh eggs, together with measurement of the nesting females furnished data on female size/clutch size relationships and size variation in multiple clutches laid by a female as the season progressed.

Observation of the hatchlings as they made their way to the sea during the night provided data on their survivorship rates at this stage of their life cycle. By recording the total number of nests, by knowing how often a turtle nests, and by knowing the hatching success for the given beaches, it was possible to determine the reproductive potential.

D: TO STUDY MIGRATIONS AND INTER-ISLAND MOVEMENTS OF TURTLES:

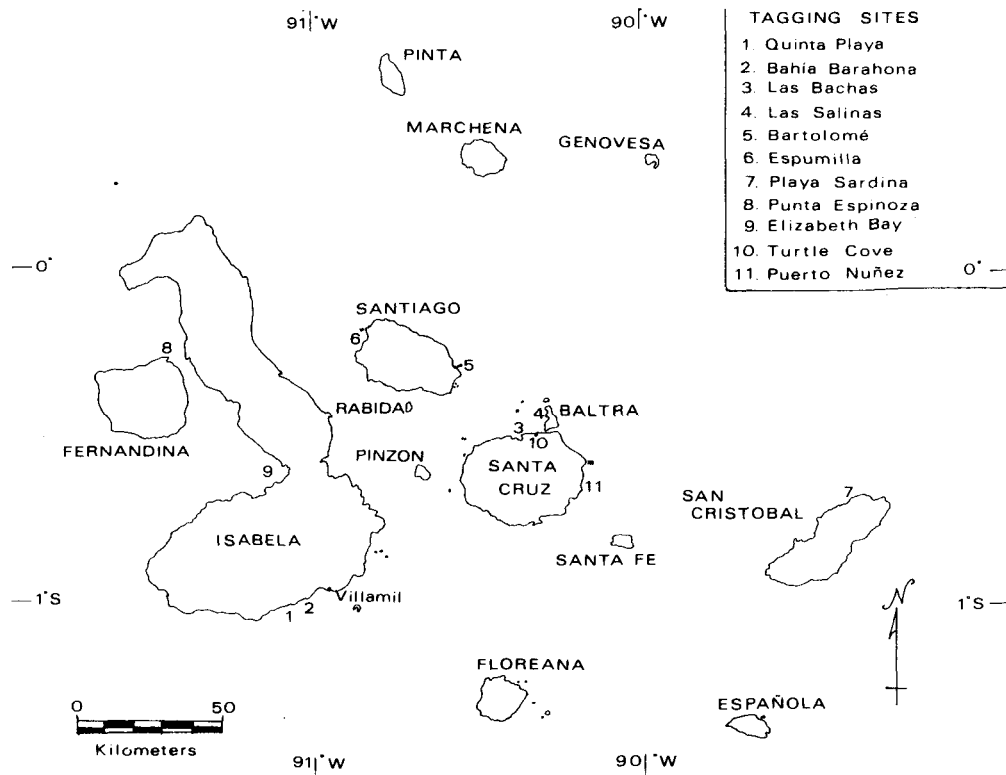
The tagging and recapture programme furnished data on this. In order to facilitate the detection of inter-island movements, turtles captured at each study site were tagged with numbered coloured plastic tags on their right rear flipper in addition to the usual metal tag on the right front flipper. A different colour was used for each site. This meant that turtles bearing a coloured tag now no longer had to be recaptured (although they were whenever possible) in order to provide data on inter-island movements.

E: TO STUDY FEEDING HABITS, QUANTITIES EATEN AS COMPARED WITH FOOD AVAILABILITY:

By repetitive recapture and reweighing of the turtles (especially the subadults and juveniles) at the feeding grounds, it was possible to determine growth rates. Numerous underwater observations and stomach analyses furnished data on quantities eaten and food selectivity.

RESULTS

During the first year (of which I spent 10 months in the field), two nesting beaches (Quinta Playa on Isabela and Las Salinas on Baltra) and three feeding grounds (Elizabeth Bay, Isabela; Punta Espinoza, Fernandina; and Turtle Cove, Santa Cruz) were monitored and 970 green turtles (674 females, 178 males, 87 subadults, 25 juveniles and six of the mysterious "yellow turtles") and one hawkshill turtle were tagged. This first year had been a complete success and Güitig corks could



be heard popping in the turtle camp for several days (and nights). Then came the crunch – the hoped-for funds for the second year of the study failed to materialize. As sorely tempted as I was to make good this deficit by selling to tourists pieces of driftwood and claiming them to be parts of the original *H.M.S. Beagle* or carving and selling wooden busts of Charles Darwin, I tried a less desperate, if also less lucrative, approach. All in all it was a long, hard and frustrating year. Instead of expanding the project as planned, it had to be whittled down; Punta Espinoza was dropped. Even so, 956 turtles were tagged bringing the total to 1,926 greens and one hawksbill.

During 1978, the third year, the National Geographic Society renewed its sponsorship and the nesting beach of Bahia Barahona was added to the itinerary. Also during this year a promising young Ecuadorian biologist, Mario Hurtado, joined the turtle study in Galapagos via a tripartite scholarship scheme between the Charles Darwin Research Station, the National Fisheries Institute of Ecuador and the University of Guayaquil.

During 1979, with the help of grants from the National Fisheries Institute and the National Geographic Society and a donation by Mr. Feodor U. Pitcairn through the Smithsonian Institution, the project really took off and the nesting beaches of Las Bachas on Santa Cruz, Espumilla on James, Playa Sur on Bartolome and the feeding ground of Puerto Nuñez, Santa Cruz, were annexed. More important was the fact that many of these beaches were now being monitored by Ecuadorian students from the University of Guayaquil. In 1980, Playa Sardina on San Cristobal and Bahia Borero on Santa Cruz were added at the expense of Bartolome.

In September of 1980, after five years of research during which time almost 100 assistants of 15 different nationalities had taken part, I left the Galapagos knowing that the project was in the capable and enthusiastic hands of Mario Hurtado. As I sat on the plane bound for Guayaquil, I looked back in pride at the total of turtles tagged during my long, often arduous yet thoroughly rewarding stay: 6,743 greens (5,529 females, 619 males, 511 subadults, 61 juveniles, 23 yellow turtles) and four hawksbills. My only regret was that the problem of feral pigs remained unresolved. Feral pigs live in the vicinity of several nesting beaches where they dig up numerous nests and eat both the eggs and the hatchlings. This problem reaches its peak on Espumilla beach, James Island, where pigs destroy almost every turtle nest – only 1% of all eggs laid on this beach during 1979 hatched and in 1980 the hatch rate was even less.

THE PRESENT

I decided that five years in Galapagos had furnished sufficient data to satisfy the original objectives. However, because turtles tagged in previous years were now returning to nest, it was thought prudent to monitor at least the two most important beaches *viz.*, Quinta Playa on Isabela and Las Salinas on Baltra, but during the peak of the season only. This allows Hurtado and his team of volunteers to concentrate on the beaches of the Ecuadorian mainland where very little regarding the nesting of sea turtles is known and where the olive ridleys, *Lepidochelys olivacea*, are still being slaughtered in large numbers (100,000 during 1979 alone) and their skins exported to countries such as Japan. I am now based, due to the courtesy of its director, Dr. William G. Reeder, at the Texas Memorial Museum at the University of Texas at Austin, where I am analysing my data. The results will be submitted for publication as a series of papers over the next year or so.

THE FUTURE

This is the shortest section. Mario Hurtado and others like him will keep fighting on the mainland of Ecuador to make sure that their country contributes as little as possible to the potential extinction of the ridley turtle. Meanwhile in the Galapagos Islands, the green turtle can enjoy (for the time being anyway) a well deserved spell of peace and quiet.

POSTSCRIPT

For anyone interested in a more detailed account of sea turtles in Galapagos and Ecuador, I would recommend the following literature:

- Cifuentes, Miguel. 1975. La reproducción y varios aspectos de la ecología de la tortuga negra, *Chelonia mydas agassizi*, de las islas Galapagos. Thesis for Licenciado, Universidad Católica, Quito. 83pp.
- Green, Derek. 1977. Tagging of green turtles in the Galapagos. *Marine Turtle Newsletter*, 2:5,6.
1978. The east Pacific green sea turtle in Galapagos. *Noticias de Galapagos*, 28:9-12.
1978. Investigación sobre las tortugas marinas en las costas del Ecuador continental. Report to the National Fisheries Institute (INP), Guayaquil, Ecuador. 66pp.
1979. Double tagging of green turtles in the Galapagos Islands. *Marine Turtle Newsletter*, 13:4-9.
- Green, Derek and Mario Hurtado.
1978. Ecología de la población de la tortuga verde del Pacífico este (*Chelonia mydas agassizi*). Paper presented at the Segundas Jornadas Ecuatorianas de Biología, Guayaquil, Ecuador, 13-18 November, 1978. On file at the National Fisheries Institute (INP), Guayaquil, 5pp.
1980. Ridleys in Ecuador – a ray of hope? *Marine Turtle Newsletter*, 16:1-5.
- Green, Derek and Fernando Ortiz-Crespo. In press. The status of sea turtle populations in the Central Eastern Pacific. *Proceedings of the World Sea Turtle Conference*, 26-30 November, 1979, Washington D.C. Gartland STMP Press.
- Pritchard, P.C.H. 1971. Galapagos sea turtles – preliminary findings. *Jour. Herpet.*, 5(1-2):1-9.
1971. Sea turtles in the Galapagos Islands. IUCN Publ. N.S. Suppl. Paper, No. 31:34-37.
1972. Galapagos sea turtles – research and conservation. Progress report on WWF Project No.606, 19pp.
- Pritchard, P.C.H. 1975. Galapagos sea turtles. Progress Report on WWF Project No. 790. 231.

In addition, information is available in the various annual and bi-annual reports submitted to the Charles Darwin Research Station and my final five-year report submitted to the National Geographic Society, copies of which are on file at the Charles Darwin Research Station.

I would like to thank Gayle Davies of Puerto Ayora, Galapagos, for drawing the map of the tagging sites.

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Galapagos Sea Lions Photograph by Fritz Pölking

FERALS THAT FAILED

by

David Cameron Duffy

In the 19th century it was man himself who was the most direct threat to Galapagos wildlife, as he slaughtered whales, fur seals, giant tortoises, iguanas and anything else that moved. Today the greatest danger comes from the foreign animals that man has introduced (rats, cats, dogs, pigs, goats, mice, cattle, donkeys, fire ants, chickens) and potentially from animals and organisms that may be imported in future, whether deliberately or accidentally.

The threats presented by these pests vary in intensity both because by no means all of them have been introduced into every island and because some of them have not prospered in some areas or have simply died out. It is a minor comfort to consider these failures and partial failures.

GOATS

If goats are the perfect feral animal, highly prolific, able to eat almost anything and to survive in the semi-deserts they create, then it is a pleasure to report that the northern volcanoes of Isabela seem to be tougher than the goats. A goat skull has been found on Volcan Wolf but no living animals. Presumably the vast lava fields proved too much for them and either they died out or were hunted out by fishermen: they never became numerous. Likewise, though goat droppings have been reported at Tagus Cove, the goats themselves have never been seen, so there cannot be many of them. On Volcan Alcedo there are certainly some goats and the Park Service is prudently trying to eradicate them but they show no signs of a population explosion such as produced the tens of thousands which devastated the vegetation of James or Pinta. Is northern Isabela too dry? Do these three volcanoes lack a moist area to which the goats can retreat during dry spells, as they do on James? The researches of CDRS staff scientist, Lucho Calvopiña, may provide the answer.

SHEEP

In the temperate zone, sheep have a reputation for over-grazing and damaging fragile island vegetations. Sheep were introduced in the Sierra Negra area of southeastern Isabela in 1962 and were mentioned in CDRS reports for 1964. They now appear to be extinct, perhaps because of predation by the feral dogs, which are otherwise the greatest single threat to wildlife on Isabela.

MONKEYS

There is a record of three monkeys (species unknown) on Floreana in the 1930s but they all died. The cause of their death is not clear.

DEER

A male and a female were introduced on San Cristobal in 1966. Deer have become major pests in other countries but this pair had disappeared within the year.

RABBITS

In 1965, and probably before that, there was a small colony of rabbits on the San Cristobal pampa, where they might have become a scourge as in Australia, Laysan and other dry habitats. J. Gordillo, Darwin Station representative in San Cristobal, reports that there is no longer any evidence of survival. Was the area too moist or the colony too small?

GUINEA PIGS

A CDRS report of 1965 pointed out pessimistically that guinea pigs run free in highland households on Santa Cruz and San Cristobal and might well join the other prolific feral species. However there is no evidence that this has yet happened, perhaps because they are too domesticated to survive outside the farmhouse.

ANIS

As recently as 1980, a group of five Anis was reported on Santa Cruz. Rumour has it that these birds were deliberately introduced in the vague hope that they might control ticks on cattle. M.P. Harris (*Field Guide to the Birds of the Galapagos, 1974*) lists three previous records and states his conviction that such notoriously feeble fliers could not have flown the 1000 kilometres from the continent. Did these earlier introductions fail because the colony was too small? If the Ani became established it could compete seriously with the Galapagos Mockingbird and become a major predator on nesting landbirds; so to be on the safe side the National Park Service is trying to remove these invaders before they can spread.

DOMESTIC HENS

While there is so far no firm evidence that the chickens have gone feral, they have certainly transmitted their pox-virus to the wild birds. The domestic fowls are little troubled by this infection but it cripples and kills the native finches and mockingbirds which have not developed immunity.

While it is cheering to record that some ferals have failed, the CDRS is highly conscious of the fact that too many have succeeded in the past and that there is a constant threat for the future. C.S. Elton (*The Ecology of Invasions by Animals and Plants, London 1958*) suggests that most of the world is already so altered that humans must cease thinking in terms of "natural" habitats and instead plan the altered ones. But one of the special features of the Galapagos is that so many of its habitats are still more or less intact. Of the larger islands, only Fernandina can claim to have no known introduced species whatsoever but, taking the Galapagos as a whole, it can be said that "no other archipelago is at the same time as extensive, as isolated and as undisturbed by man" (*P. Kramer in Noticias No. 31*). Still Elton's point is valid at least in the sense that we must plan to manage what has been miraculously preserved. Goats have been eliminated from Plaza, Santa Fe, Rabida, Espanola and Marchena. Active studies and campaigns are under way in 1981 to control rats, dogs, cats, pigs, fire ants. Nobody likes these programmes, quite apart from their great expenditure of manpower and funds, but man has upset the balance of nature and only man can restore it – even partially. There may be no way of completely eradicating some of these pests but, given sufficient support, they can all be brought under an adequate degree of control.

Perhaps the worst danger is something no-one has yet thought of – some unknown organism that would wreak destruction among the flora or fauna, so vulnerable because isolation had given them no immunity. Therefore we need a strong team of scientists of various disciplines to detect dangers and take action before they get out of hand. In the Galapagos the price of conservation is eternal vigilance.



Little Ground Finch (*Geospiza fuliginosa*) Photograph by Peter Grant

PARTICIPACION EN EL VIII CONGRESO LATINOAMERICANO DE ZOOLOGIA REALIZADO EN MERIDA, VENEZUELA

por

*Luis Calvopiña y Fabiola de Calvopiña
(delegados de la CDRS)*

Con el auspicio y financiamiento de la CDRS fue posible nuestra participación en el desarrollo del VIII Congreso Latinoamericano de Zoología, que se llevo a cabo en la ciudad de Mérida, Venezuela entre el 5 y 11 de Octubre de 1980. Al trascendental evento concurrieron más de 400 delegaciones de los países del area Latinoamericana y ademas representaciones de Estados Unidos, Canadá y también varios países europeos.

En el desarrollo del congreso se destacaron varios aspectos relevantes de Biología y particularmente de Zoología, pero tambien debemos anotar que se discutieron varios temas relacionados con la Ecología y el conservacionismo, brindandonos la oportunidad de conocer e intercambiar experiencias comunes y mecanismos inherentes en pro del futuro conservacionista latinoamericano. Nuestra contribución estuvo orientada a la investigación ecológica aplicada a las poblaciones de chivos salvajes, como organismos exóticos de gran preocupación por su impacto en los ecosistemas insulares. Se destacaron los resultados hasta ahora obtenidos, las medidas de conservación adoptadas particularmente a la vegetacion de la isla Santiago y la proyeccion futura de las investigaciones de estos organismos. Vale mencionar que en el contexto latinoamericano, a parte de las Galápagos, existen solamente pocos lugares, particularmente islas con poblaciones de chivos cimarrones como por ejemplo, las islas Robinson Crusoe en Chile e isla Guadalupe en Mexico, en las cuales aparentemente el impacto ecológico de los chivos toma un contexto diferente a las Galápagos. Finalmente ha sido nuestra preocupación, dar a conocer varios de los programas de investigación que se realiza en la CDRS y tambien la labor conservacionista que despliega el Servicio del Parque Nacional Galápagos en beneficio de las islas ecuatorianas.

Nos alienta grandemente la satisfacción de haber contribuido en representación de nuestro país y de la CDRS y por eso es nuestro deseo, dejar constancia de agradecimiento a las personas que colaboraron en la realización de nuestro viaje: al Dr. David Duffy, Director (encargado) y al Sr. Jose L. Villa Sub-director (encargado) de la Estación Científica Charles Darwin respectivamente.

Para finalizar queremos felicitar en nombre de nuestra Institución al Dr. Pedro José Salinas, Presidente del VIII Congreso Latinoamericano de Zoología por la organización y el éxito total que se alcanzó en el desarrollo del congreso. Asi mismo a los miembros de las comisiones organizadoras, profesores y estudiantes de la Universidad de los Andes, facultad de Ciencias Forestales de Mérida, Venezuela, sede del Congreso.

SUMMARY

Licenciado Luis Calvopiña (staff scientist) and his wife, Fabiola, attended the 8th Latin-American Zoological Congress at Merida, Venezuela, as representatives of the Darwin Research Station. They express their gratitude for being given this exciting opportunity to take part with 400 other delegations in discussing the scientific and conservation problems of the continent. For their part, they were able to report on the campaigns to control the feral goats (their special subject) and thereby to protect the vegetation of the Galapagos, and also to give an account of the general work of the CDRS and the National Park Service.

THE SIGNIFICANCE OF THE PERRY ISTHMUS

by

G. T. Corley Smith

The Perry Isthmus is the narrow neck of lava that links the northern with the southern volcanoes of Isabela (Albemarle Island) (Please see map on inside back cover).

The origin of the name is uncertain but it appears in the H.M.S. Beagle map of 1835 and obviously has no connection with Roger Perry the CDRS Director, who made the first known crossing in 1966 together with the Station Manager, Rolf Sievers. It was a difficult and dangerous journey as the isthmus is a broad belt of abominable a.a. lava, which cuts boots to shreds. The two explorers found no evidence of animals succeeding in crossing this fierce, waterless barrier, a matter of great importance for the future of Galapagos conservation. The southern part of the island has been colonized since 1897 and, although the human population has never been large, a number of domesticated animals have gone wild, have proliferated and are damaging the environment. The northern volcanoes have not been colonized and are far less afflicted by introduced pests. There are some goats, a lot of donkeys (introduced by the hunters who used them to carry the oil they extracted from the giant tortoises) and far too many cats: but the greatest menace, the packs of wild dogs, are not there at least, not yet.

In 1979 Hendrik Hoeck and Howard Snell repeated the east-west traverse and found that goats had managed to cross the desert of lava. That was bad enough, but if goats could cross then so might the fierce dogs that had recently extended their range and had come near to exterminating the Land Iguanas south of the isthmus. They had already reached the southern edge of the lava belt. If they penetrated into northern Isabela they could do incalculable harm as this is in many respects the most precious part of the archipelago. Because of the fierceness of its terrain it has remained uninhabited by man, its ecosystems are relatively undisturbed and its enormous volcanoes are the home of five races and the largest numbers of Giant Tortoises. It would be a tragedy if the dogs got loose among the young tortoises as they have done on other islands. Then there are the Flightless Cormorants and the equally flightless Galapagos Penguins, (such easy prey for the dogs), and the baby fur-seals and sea-lions, the Marine and Land Iguanas, and the nesting seabirds.

The suggestion that a fence should be built across the isthmus to keep the dogs out was ruled impracticable owing to the extent and the nature of the terrain. The only workable solution seems to be the eradication of the wild dogs in southern Isabela. Difficult though this may prove, it is the only sure protection for the ecologically invaluable species north of the isthmus. If successful it will also make possible the re-introduction of the populations of Land Iguanas that the dogs exterminated, apart from the few survivors in safe custody at the Station. These last are fortunately breeding so successfully that it will before long be difficult to house and feed them all, but there is no point in returning them to their normal breeding places in southern Isabela while the dogs are still at large. So 1981 will see the beginning of a vigorous dog-control campaign.