

NOTICIAS DE GALAPAGOS

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NEWS FROM ACADEMY BAY

PRESIDENTIAL VISIT

The construction and equipment of the Van Straelen Hall at the Darwin Research Station has been completed and the preparation of the exhibitions is well under way. Already the Hall has been the scene of a dinner given in honour of the President of the Republic, his cabinet and high military advisors, when they visited the islands to plan the future development of the Province and the National Park.

ROYAL HONEYMOON

H.R.H. Princess Anne and Captain Mark Phillips called at the Research Station while on their honeymoon voyage. Following in the footsteps of H.R.H. the Duke of Edinburgh, Honorary Life Member of the Charles Darwin Foundation, the young couple explored the wildlife on Plaza, Bartholomew, Fernandina and Tower before beginning their official visit to continental Ecuador. On Santa Cruz they inspected the Station and its tortoise-rearing establishment and presented hospital equipment to the people of Puerto Ayora.

GIANT TORTOISES

The first group of the Hood (Espanola) tortoises raised at the Darwin Research Station have now been released on their ancestral island. All 19 of them are reported to be doing well and have had no apparent difficulty in adapting to life in the wild. It will be recalled that by 1965 the population – perhaps a total of 15 – was so depleted and scattered over such a wide area that boy no longer met girl. Moreover, a huge population of feral goats had utterly degraded the habitat, destroying much of the vegetation on which the tortoises feed; even the goats were beginning to die of starvation during dry seasons. No young tortoises had been seen for years and the race seemed doomed to extinction.

As a last resort the CDRS staff collected all the survivors they could find, one male and 12 females, and transferred them to the Station's pens where mating eventually took place. In 1974 a second male was discovered, which should significantly strengthen the breeding stock. Since the 1970-71 season, fertile eggs have been laid each year and hatched in the Station's incubators. Over 80 young have now been produced, thus multiplying the total population of the sub-species several times. Further batches will be released on Hood as soon as they are thought big enough to survive.

While this successful breeding experiment has been in progress, the number of goats has been drastically reduced. Even so, regeneration of the vegetation on this arid island will be slow and further hunting is urgently needed if a renewed expansion of the goat population is to be prevented and the island saved from erosion.

NATIONAL PARK BOUNDARIES

The Galapagos National Park occupies nearly nine tenths of the archipelago. Its boundaries with all the colonized zones have now been clearly and solidly marked along their entire length. This should prevent any future misunderstandings.

PUBLICATIONS IN SPANISH

Peter Kramer pointed out in Noticias No 22 that there were lots of good books on the natural history of the Galapagos – but not one in Spanish. With the financial support of the World Wildlife Fund, the Charles Darwin Foundation has been active in closing this gap during 1974-75.

5,000 copies of Juan Black's '*Galapagos, Archipiélago del Ecuador*' have been printed. This is a general natural history directed towards university and senior high school students as well as to a wider public. Some 1000 copies were distributed free to educational institutions.

The English guide book by Alan White, Bruce Epler and Charles Gilbert has been translated and published in Spanish under the title of '*Guía de Galapagos*'.

A new edition of Padre Victor Maldonado's '*Galapagos, Paraíso Encantado*', intended for the general public, has been put on sale at a very modest price.

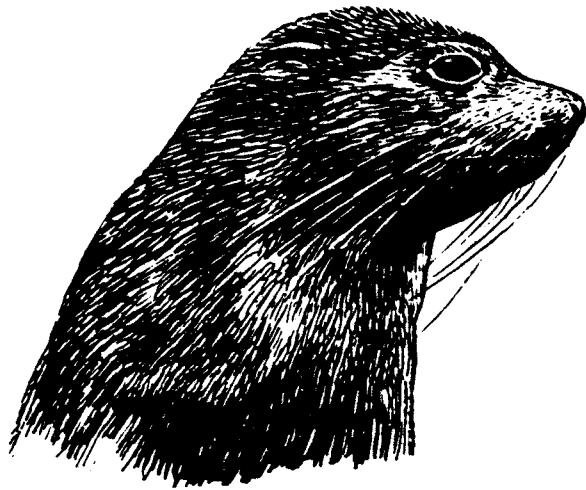
Finally, 10,000 copies of a popular Galapagos National Park folding leaflet have been distributed. All these publications are illustrated. Receipts from sales will be used to finance further editions.

CDRS HERBARIUM

The Station plant collection has received international recognition, having been accepted in *Index Herbarium* with the abbreviation CDS. Together with the other collections and the books and papers, it has been removed from the over-crowded laboratory to what used to be the Director's house and which now serves as library, reading room and museum. The herbarium is now being thoroughly overhauled and re-organized.

OCEANOGRAPHIC MONITORING

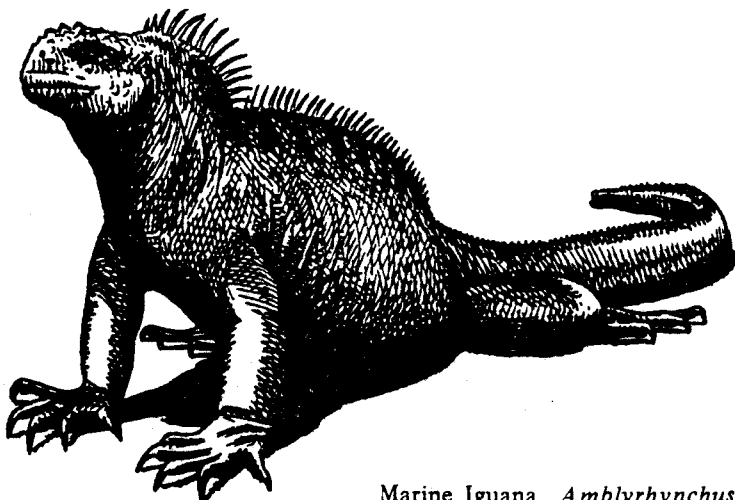
This being the International Decade of Oceanic Exploration, INOCAR (the Oceanographic Institute of the Ecuadorean Navy) is promoting studies in the Pacific, particularly in connection with the phenomenon known as "El Nino" (the warm current from the Gulf of Mexico that meets the cold Humboldt current in the region of the Galapagos), a subject which merited the attention of an International Symposium in Guayaquil in December 1974. Metropolitan Touring, which operates tourist ships in the Galapagos, and the Charles Darwin Research Station, have both agreed to co-operate with INOCAR by making regular observations of marine conditions in and around the archipelago. It is



Galapagos Fur Seal *Arctocephalus galapagensis*



Galapagos Sea Lions *Zalophus wollebaeckii*



Marine Iguana *Amblyrhynchus cristatus*

hoped that the results of these studies will be of value to the fishing industry and to the conservation of oceanic resources as well as to pure science. The information obtained will obviously be important in connection with the proposed extension of the Galapagos National Park to include a marine zone.

GALAPAGOS INFORMATION CENTRE

With financial support from the Frankfurt Zoological Society, the Galapagos Information Centre has been operating since July 1974 under the able direction of Sr Juan Black, a former National Park official. It is situated in the Central University of Quito which runs the centre jointly with the Darwin Research Station. Its facilities are open to all sectors of the public as well as to professors and students.

The intention is that it shall serve both as a library and as a point from which Galapagos information is disseminated throughout Ecuador and Latin America. One means by which the latter aim is being achieved is by the weekly broadcasts Sr Black makes over the powerful *Voz de los Andes* station, which reaches a large part of the continent. The library is growing – but too slowly. It needs as many old and new Galapagos scientific papers as can be assembled; it likewise needs all the books, articles, photographs and films on the Galapagos that it can get, as well as literature on conservation and national parks in other countries. Contributions to the library are badly needed and should be sent to Sr Juan Black, Centro de Informacion de Galapagos, Casilla 3891, Quito, Ecuador.

SCIENTISTS PLEASE NOTE:

One of the conditions for permission to do research in the National Park is that 8 copies or reprints of all publications, including books, must be submitted to the Charles Darwin Research Station, together with summaries in Spanish. One of these copies is for the Information Centre, which with proper support, can play an important role in the development of scientific studies in Ecuador.

THE SEA LION EPIDEMIC

As previously reported, there was a major outbreak of a disease, apparently a type of pox, between October 1970 and July 1971 and a secondary outbreak from late 1972 until May 1973. During the first outbreak and to a lesser extent during the second, large numbers of sea lions died and many beaches where hundreds had been present became deserted. Since these outbreaks, only very small numbers of individuals have been seen with the disease symptoms and few, if any, seem to be dying. All the major sea lion beaches have been reoccupied and the population seems to be back to its previous level. Whether or not the disease is a new phenomenon (we have no previous records of it), or whether it is a natural form of population control is still uncertain. The Station hopes that further research will clarify the position.

While thousands of sea lions died, particularly during the first outbreak, the fur seals were only affected to a minor extent.

A CHANGE OF PRESIDENT

PROFESSOR JEAN DORST formally tendered his resignation as President of the Charles Darwin Foundation to the General Assembly held at Unesco Headquarters in Paris in December, 1974. He had given two years notice of his intention, basing his decision on his purely personal opinion that the Foundation needed new blood. Certainly he had rendered long service; in fact it is impossible to think of the Foundation without Jean Dorst. He was the first Secretary-General and held the post from 1959 to 1964. When our founding President, Victor van Straelen, died on his return from the inauguration of the Darwin Research Station in 1964, Jean Dorst was immediately chosen as his natural successor and served for ten years in that capacity.

These ten years of his presidency have seen enormous changes in the Galapagos. The little Station has grown and its activities have been enlarged almost beyond recognition. The number of scientific missions using the expanded facilities has increased and is still increasing, as is the long list of the published papers on Galapagos subjects. From the early exploratory investigations, the Station has moved forward to successful positive operations in the field of conservation, such as the rearing of endangered races of giant tortoises and the control of destructive introduced animals. Best of all, a Galapagos National Park Service has been created and works in close co-operation with the Darwin Station to preserve the Galapagos for posterity.

Of course, success has created new problems. Before the Station was inaugurated few tourists visited the Galapagos, whereas now they come in their hundreds; but with an active Park Service it should be possible to prevent adverse effects on the wildlife and, at the same time, to give pleasure and instruction to the many visitors.

All these changes, startling to those who knew the wild Galapagos a dozen years ago, have been carried out during Jean Dorst's tenure of the post of President. Throughout this period the burden of administration has grown heavier each year — and this has fallen principally on Jean's broad shoulders. Under his leadership the Darwin Foundation has flourished and will fortunately continue to have the benefit of his wise advice as he has agreed to remain a member of Executive Council. All lovers of the Galapagos will remain for ever in his debt.

The one consolation for the resignation of Jean Dorst is that we were immediately able to find a worthy successor. DR PETER KRAMER is admirably qualified to take up the reins as he knows the Galapagos Islands and their problems as few other scientists can. He went there first on an ornithological research mission and later served as Unesco expert and Director of the Research Station from 1970 to 1973. Under his guidance the Foundation can face with confidence the varied challenges, old and new, that the archipelago presents and can look forward to many years of progress in the fields of conservation and science.

G T C S

UNA CARTA DE JEAN DORST

Con profunda emocion y pesar me veo en el caso de abandonar la Presidencia de la Fundacion Charles Darwin en la que, luego de haber desempenado las funciones de Secretario General desde su creacion en 1959, me toco suceder al Profesor Victor van Straelen en 1964 cuando su muerte repentina nos privo de ese gran naturalista y administrador sin par.

Tuve asi, durante diez anos, el honor de dirigir la Fundacion con la ayuda y colaboracion de todos sus miembros. El camino recorrido es considerable: El Gobierno de la Republica del Ecuador creo el Parque Nacional bajo la responsabilidad de una administracion sacrificada y competente, el invalorable patrimonio natural de las Islas Galapagos ha sido en esa forma salvado de la destruccion y preservado para las generaciones futuras; la Estacion Charles Darwin ha crecido hasta el punto de permitir a numerosos cientificos procedentes del mundo entero trabajar en buenas condiciones explorando las fantasticas flora y fauna de las Islas y siguiendo, al mismo tiempo, investigaciones sobre su evolucion y ecologia; las numerosas publicaciones demuestran el desarrollo de estas investigaciones en las que ya participa un numero creciente de ecuatorianos. Cabe subrayar, por otra parte, que gracias a los esfuerzos de los miembros de la Estacion, tanto los colonos del Archipiélago, como los demas ecuatorianos estan ahora convencidos del interes cientifico de las Galapagos y participan concienzudamente en su proteccion.

He tenido, pues, la satisfaccion de contribuir a esta obra colectiva y sera mi orgullo el haberla dirigido durante diez anos.

Mis agradecimientos se dirigen, ante todo, a las Autoridades ecuatorianas con quienes mantuve relaciones estrechas y entusiastas, y agradezco tambien a los miembros del Consejo, a los del Comite cientifico, a los representantes de las grandes Organizaciones: UNESCO, UICN, WWF y a tantos otros que nos han permitido alcanzar nuestros objetivos con su ayuda generosa. Debo manifestar, especialmente, mi gratitud a todo el personal de la Estacion, a los que la construyeron con sus manos y han realizado esa gran obra internacional y ecuatoriana, en medio de innumerables dificultades, entre las que la falta de dinero era la menor. Los Directores que se han sucedido han sido en gran parte los factores del exito, pero querria agradecer, por igual, a todos los colaboradores ecuatorianos, cientificos, marinos, guardianes, contadores, mecanicos, ayudantes, etc, porque gracias a ellos se dispone en un lugar tan retirado y alejado, pero unico en el mundo, de una Estacion bien equipada en donde se puede trabajar en excelentes condiciones.

Habiendo permanencido en varias ocasiones en las Islas Galapagos deseo regresar para ver nuevamente esos rincones privilegiados y encontrar una vez mas a todos aquellos que trabajaron a mi lado durante estos diez anos.

Mi sucesor, el Doctor Peter Kramer, ha sido uno de nuestros mas brillantes directores y conoce las Galapagos y la Fundacion mejor que nadie. Tengo la conviccion que nuestros intereses estan en buenas manos. Le deseo pleno exito y se que el lo alcanzara con la ayuda de todos aquellos que en las Galapagos, como en al mundo entero trabajan en esta gran obra digna de los mejores esfuerzos.

Jean Dorst

Nombres y Titulos de los Empleados de la Estacion Biologica Charles Darwin

Andrade, Luis	Cocinero (Desayuno) y Supervisor del Comedor
Black, Juan	Representante, Quito y Director del Centro de Informacion de Galapagos
Calapucha, Camilo	Ayudante de Campo
Calvopina, Luis	Cientifico Asistente
Carvajal, Mercedes	Cocinera (Asistente)
Cedeno, Jorge	Jefe de Mantenimiento
Cedeno, Aquiles	Marinero
Chavez, Jose	Albanil Auxiliar
Cifuentes, Miguel	Asistente del Director y Oficial de Educacion
Cordova, Luis	Ayudante General de Mantenimiento
Freire, Flavio	Marinero
Farfan, Dolores	Cocinera
Gallardo, Miguel	Mecanico
Gordillo, Jacinto	Representante, Isla San Cristobal
Jarrin, Carlos	Guardia de Galapagueras
Jaya, Guillermo	Guardia de Galapagueras
MacFarland, Craig	Director
Maenz, Erwin	Representante y Agente, Guayaquil
Palacios, Julio	Marinero
Ramos, Luis	Bodeguero y Lancharo
Robalino, Carlos	Asistente General de Mantenimiento
Rosero, Abraham	Carpintero
Rosero, Jose	Albanil
Schreyer, Bernard	Capitan del <i>Beagle III</i>
Sievers, Rolf	Gerente
Sotomayor, Jorge	Contador
Tupiza, Arnoldo	Representante, Isla Isabela
Velez, Maria	Encargada del Bienestar de los Dormitorios
de Vries, Tjitte	Subdirector y Cientifico Residente

1 Enero de 1975

OBITUARY

SIR JULIAN HUXLEY, Honorary President of the Charles Darwin Foundation since its earliest days, died in London on 14 February at the age of 87. Both as a grandson of Charles Darwin's foremost champion, T H Huxley, and as a leading authority on evolution, it was inevitable that he should take a great interest in the Galapagos. On the centenary of Darwin's visit to the archipelago (1835 – 1935) Sir Julian headed the London Committee for the Galapagos in an effort to set up a scientific station and to begin conservation work there. The Government of Ecuador declared the archipelago to be a National Flora and Fauna Reserve and passed far-seeing laws for the protection of its wildlife; but in those days conservation raised even less enthusiasm than now and adequate international support for effective action was not forthcoming by the time the second world war had begun.

In 1958 another centenary, that of the publication of Darwin's and Wallace's papers on the theory of evolution, was celebrated by an International Zoological Congress at which Julian Huxley was invited to deliver the main address, as his great book, *Evolution, the Modern Synthesis*, was recognised as the most comprehensive work on this subject. A Galapagos Committee was set up at the congress with Sir Julian as chairman and this became the organizing committee of the Charles Darwin Foundation.

Sir Julian has also helped the Charles Darwin Foundation enormously in indirect ways. He was the first Director-General of the United Nations Educational, Scientific and Cultural Organization and, in that capacity, his proudest achievement was the creation of the International Union for Conservation of Nature; later he played a creative role in the organization of the World Wildlife Fund. These three bodies, UNESCO, IUCN and WWF, have been, and remain, stalwart supporters of the Charles Darwin Foundation.

Sir Julian Huxley was one of the outstanding scientific personalities of his generation. As *The Times* summed up his achievement:

'He set a seal on his age for the same qualities of mind, and for the same reasons, as did his famous grandfather, Thomas Henry Huxley, before him – insatiable curiosity in almost all intellectual fields; an irrespressible creative urge; a powerful memory; an inexhaustible capacity for work; and an unfaltering courage in stating views.'

PROFESSOR JEAN-GEORGES BAER, the distinguished Swiss parasitologist, died in Neuchatel on 22 February. He was a founding member of the Charles Darwin Foundation and remained on its Executive Council until the month before his death. His services to the Foundation, particularly in its early struggling days, were of vital importance to conservation in the Galapagos. His contributions to conservation throughout the world were likewise immense as he served as President of the IUCN and of the WWF in its formative stage.

The loss of two founders in two weeks has left a grievous gap in the ranks of the little band of far-sighted men who built the Charles Darwin Foundation, but their achievements in the field of conservation and not least in the Galapagos Islands, will provide them with a lasting memorial.

G T C S

THE DISQUIETING OUTLOOK FOR GALAPAGOS CONSERVATION

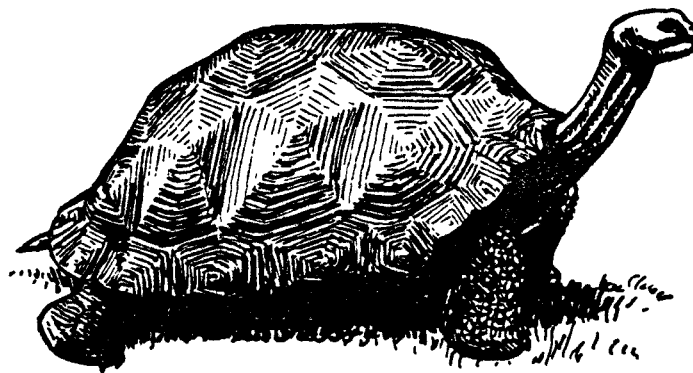
Like so many other institutions dependant on the generosity of its supporters, the Charles Darwin Foundation is suffering from the current economic depression which has harshly reduced its income. The obvious defensive measures have been taken. New capital expenditure – for instance, the building of much-needed accommodation to house visiting scientists and staff – has simply been suspended until better days. The long delayed overhaul of Beagle III has been postponed yet again. No start has been made on the construction of a marine laboratory although this is now even more urgently required than before, in view of the current proposals to include in the National Park a large marine zone, which could prove as important as the terrestrial zone.

All this is obviously regrettable, as it means postponing highly desirable projects – standing still instead of moving forward. But what is much more serious is that the lack of funds is actually forcing us to lose hardly won ground on several vital fronts. Unless more support is forthcoming for the general running of the Research Station we shall be unable to maintain some of the essential services we have been successfully performing in recent years, such as checking the damage done to wildlife and vegetation by rats, pigs, dogs and goats; breeding the endangered races of giant tortoises; promoting education in natural history and a sympathetic public understanding of the need for conservation.

It is doubly unfortunate that this financial crisis should come at the moment when we were hoping to see the vitally important “Master Plan” put into effect. In short, there has not hitherto been a time when the Foundation was in such urgent need of help from its devoted supporters.

Peter Kramer

President of the Charles Darwin Foundation.



Giant Tortoise *Testudo elephantopus*

THE MASTER PLAN

The publication of The Master Plan for the Protection and Use of the Galapagos National Park is the latest in a series of major steps taken to save the unique resources of the archipelago from degradation.

The centenary celebrations in 1935 of Charles Darwin's visit in *HMS Beagle* led to the islands being declared a National Flora and Fauna Reserve but no administrative measures were taken to implement the decree; nor did international efforts to set up a scientific station produce any positive results.

In 1959, the centenary of the publication of Darwin's *Origin of Species*, the government of Ecuador declared all unoccupied lands in the archipelago to be a National Park; and the Charles Darwin Foundation for the Galapagos Islands was created under the auspices of UNESCO and the IUCN to promote research and conservation.

In 1964 the Charles Darwin Research Station was authorised to recommend Park boundaries, exterminate introduced species and make regulations for wildlife conservation.

In 1968 the Department of National Parks and Wildlife was created and charged with the administration of the Park.

The Master Plan carries on from here and makes a number of highly significant recommendations for the future. It is a considerable document of nearly a hundred pages, in Spanish and English, and includes not only bold new projects for the management of the Park but also a great deal of descriptive matter and administrative and financial detail. It was drafted in 1973 by a small team from the Department of National Parks and Wildlife and the National Planning Board together with experts from FAO and UNESCO. The UNESCO representative was Dr Peter Kramer, at that time Director of the Charles Darwin Research Station and now President of the Charles Darwin Foundation. The first draft was subjected to careful revision and an illustrated edition was finally published by FAO in 1975 with a covering note from the responsible Ecuadorean ministry. Some of the Plan's proposals will require legislation but it is understood that the authorities have accepted the Plan as a broad basis for future policy, to be applied flexibly as its authors suggest.

The Plan takes as its starting point the conclusion of an earlier government commission of enquiry: that the Province of Galapagos needs to be developed along different lines from other provinces as 88% of its land area is National Park, where tourism and scientific research are the predominant interests. It is recommended that:

- a) The present Park boundaries, as delineated in 1969, should be staunchly defended. They encompass all the uninhabited islands and almost all the unsettled areas of the other islands – a total of some 690,000 hectares;
- b) legislation should be passed to include a two-mile marine zone around the Park's shores, which would increase the Park's area by a further 430,000 hectares. (This would make a grand total of nearly 2,800,000 acres.)

To simplify management, the Park is to be divided into zones:

Primitive-Scientific Zones are areas that have remained essentially free from introduced species. They require the strictest protection to ensure their ecological integrity. Access permits will normally be granted by the Park authorities only for scientific research under strict supervision.

Primitive Zones comprise much the largest area of the Park. Although somewhat altered ecologically by introduced species, the maintenance of their primitive character is necessary to guarantee the preservation of the Galapagos ecosystems. One of their essential functions will be to serve as buffers between the Primitive-Scientific Zones and the more frequented areas.

Extensive Use Zones are areas containing features of high interest to visitors but which cannot support heavy visitor loads for physical, biological or aesthetic reasons. No interference with nature will be allowed here apart from unobtrusive trails, small camps and a minimum of conservation and research facilities which do not intrude unduly on the wilderness.

Intensive Use Zones are a considerable number of carefully selected areas, small in extent, but of prime interest to visitors. They are deemed capable of withstanding relatively constant visitor use and the necessary minimum of visitor and administrative facilities will be permitted. Usually, scientific research will not be allowed here except for the regular monitoring of tourist impact on the flora and fauna. If the pressure of visitors exceeds the carrying capacity of the environment and deterioration is detected, access will be limited or suspended until the resources have regenerated.

Special Use Zones are lands bordering on the settled areas outside the Park, which have suffered substantial alteration. They have traditionally been used by settlers for the supply of water, firewood, sand, salt, etc, and, for the present, these usages will continue on a permit basis. These zones have not the same high quality as the rest of the Park but they nevertheless need careful management.

Similar zoning will be needed in the proposed marine extension of the Park. (Since 1973 the Park Service and the Darwin Station have been at work on provisional underwater zoning but years of exploration and research will be required before an adequate census of the rich and varied marine resources of the Galapagos can be completed.)

Guidelines for Park management lay stress on the preservation of the ecosystems by the protection of endangered species and the control or elimination of introduced species of mammals, plants and invertebrates. This will involve measures to prevent the introduction of alien organisms and the transfer of pests (such as rats) to hitherto unaffected islands; controls at the airport and seaports will be necessary to prevent both the import of undesirable organisms and the export of protected species.

Visitors and tourist agencies will be expected to observe the regulations strictly, both for the protection of the Park's resources and for their own safety. To this end the Park staff should be increased and supplied with adequate accommodation, ships and equipment.

Guards will be posted at sensitive points, usually on board small vessels which will be serviced by a supply ship. Exceptions are the Intensive Use Zones on Santa Cruz, Genovesa, San Salvador and Espanola, where there is sufficient natural cover for the resident guards to be housed discreetly in two-roomed structures. No other buildings will be allowed inside the Park. (The Park Service Headquarters and the Charles Darwin Research Station are situated outside.)

Tourist parties will be accompanied by trained guides and not more than 60 will be permitted at any one time in any Intensive Use Zone. It is thought that, with these controls, up to 12,000 visitors a year could be accepted without serious damage to the Park's resources, though this must be proved by constant monitoring of tourist impact. While the great majority of visitors (90% at present) will continue to be accommodated aboard ships, overnight camping will be allowed in two areas – Post Office Bay and James Bay. Inexpensive hotel accommodation, youth hostels and camping grounds are also proposed but only outside the Park Boundaries.

A reception centre will be built near the airfield and port on Baltra Island (which remains a military reserve) where visitors will have access to full information about the islands and where their travel and other enquiries can be answered.

Transport facilities between the continent and the archipelago and between individual islands, both for visitors and for residents, should be increased. There are detailed proposals for the improvement of the water, sewage, refuse and electricity systems.

The Department of National Parks and the Charles Darwin Foundation will collaborate in an expanded programme of environmental education – locally, nationally and internationally – through the press, radio, television and a new series of publications about the Galapagos. Local residents, teachers and students will be kept informed of the Park's activities and purposes. In mainland Ecuador, responsibility for publicity will lie chiefly with the new Galapagos Information Centre in Quito. Internationally, the task of publicizing the importance of the islands to the world will be undertaken largely by the Charles Darwin Foundation.

Scientific research in the National Park will be managed by the Darwin Station under its agreement with the Ecuadorean Government. The National Park Committee will determine what research may be undertaken in accordance with conservation imperatives. Preferentially, support will be given to research needed to defend the integrity of the Galapagos ecosystems. The Government will also promote socio-economic research with the aim of harmonizing the interests of the local population and the conservation of the Park's unique resources.

It is proposed that the increased cost of the staff and equipment necessary to carry out this plan should be met by charges for licences to operate tourist services, Park entrance fees and donations.

The implementation of the Master Plan for the Galapagos National Park will require legislation on the following lines:

“All aspects of management, administration, and development of the national park shall be the exclusive responsibility of the National Parks Department.

Within national parks, the National Parks Department and local law enforcement authorities will have concurrent law enforcement jurisdiction.

Any use of a national park for financial gain shall only be granted through written authorization of the National Parks Department. Concessioners shall pay a fee determined by and remitted to the Department.

Income derived from user fees and concessions of the national parks shall be applied directly to their management and development.

The boundary of Galapagos National Park shall be extended up to two miles out to sea from the present terrestrial Park areas.”

NEW COUNCIL MEMBERS

At the Eighth General Assembly of the Charles Darwin Foundation, held at UNESCO in Paris, two new members of the Executive Council were elected.

RICHARD DARWIN KEYNES is Professor of Physiology at Cambridge University and a Fellow of the Royal Society. His great-grandfather visited the Galapagos in 1835.

M F MORZER BRUYNS is Professor in the Nature Conservation Department of the University of Wageningen. He was formerly Director of the Netherlands State Institute for Nature Conservation Research and for several years served as Vice-President of the IUCN.



Galapagos Hawk and Giant Tortoise. *(Photo Tjitte De Vries)*

THE GALAPAGOS HAWK

*Based on a lecture given during the fifth course on conservation at
the Charles Darwin Research Station*

by

DR. TJITTE DE VRIES

The endemic Galapagos Hawk or Buzzard (*Buteo Galapagoensis*) is the only diurnal raptor in the archipelago. It still survives on nine islands but half the total population of about 130 pairs is now concentrated in two islands – Santiago and Isabela. The remainder are divided between Espanola, Pinzon, Santa Fe, Santa Cruz, Fernandina, Pinta and Marchena. They have been exterminated by man on San Cristobal, Floreana, Daphne, Seymour and Baltra and their numbers greatly reduced on Santa Cruz. There were never populations on the northern islands of Genovesa, Wolf and Darwin.

At first sight there seem to be two kinds of hawks but this is entirely due to plumage differences between young and adult birds: adults are dark brown to sooty black while the young are mottled cream and dark brown. Hawks can be seen anywhere from sea level to the highest peaks but they nest only in arid zones. Often they choose a site in a *Palo Santo* (*Bursera graveolens*) a typical arid zone tree; at other times they nest in rocks. They lay clutches of up to three eggs but rarely rear three young, either because one egg does not hatch or because one chick dies from lack of food. Incubation is from 37 to 38 days and fledging lasts from 50 to 60 days. The Galapagos Hawk probably takes three or more years to reach maturity.

My studies of the hawk were made between September 1965 and February 1971. I was particularly interested in observing what food the parents brought to the young and to this end I built a hide from which I could watch without disturbing the birds. Usually I was in the hide from 8 am until 4 or 4 30 pm. Each nest was observed for 12 days, a total of 100 hours, so that I was able to compare the prey brought to the different nests.

The Galapagos Hawk is a versatile hunter and takes any prey upon which it can pounce. It seems to prey chiefly on the indigenous rice rats and ground doves, also on lizards, Darwin's finches and centipedes; but in areas where these are lacking it rears its young on marine iguanas and the placenta of sea-lions – rarely on snakes. It also feeds on dead goats and other carrion and at times groups of over 40 hawks can be found at a carcass.

During a single breeding season different pairs took different prey in their respective territories. Moreover, prey taken in the same territory and brought to the nest by the same pair varied from one breeding season to another. The differences in most cases reflected the availability of prey species in the territory but this was not always an adequate explanation, as the hawks did not always take the prey that was most abundant or easiest to catch.

Male and female take different prey during the breeding season but, as the female is mainly employed in looking after the young at this time, the data obtained refer mostly to the male and so do not give a clear indication of the relative hunting efficiency of the two sexes. The females take large prey, such as marine and land iguanas, carrion if easily obtainable, and sea-lion placenta; they take fewer rats, doves and lizards but they do take centipedes, although these are normally hidden. In contrast, the males go for smaller prey; doves, rats, finches and lizards; placenta, carrion and occasionally small marine iguanas and centipedes.

Poliandry (one female with two or three males) is very common. I had the luck to observe how the two males of one such family constantly brought different prey to the young.

Data on the reproductive period were collected for various years. 1966, 1967 and 1968 were relatively dry and in those years the hawks nested in every month. 1969 had heavy rain in March and in consequence many finches and doves nested early, thus increasing the amount of prey available. The hawks took advantage of this to start nesting and in such wet years their breeding is correlated with the rainy season.

The Galapagos Hawk is sedentary and an adult may possibly never leave its island. Moreover it is territorial and may keep the same territory year after year; during my five year study, one pair was always found in the same territory.

In the field it is very unusual to see a hawk in the act of capturing prey. On one occasion I watched a hawk chase a grasshopper, catch it and eat it – all in the air. On the Alcedo volcano (Isabela) I observed two hawks collecting caterpillars from the leaves of the *Datura*. Another time I saw a young hawk chasing a finch through the branches of a *Palo Santo*, but it failed to catch it. During goat-hunting trips I noted how the hawks attacked very small kids. At Punta Espinosa (Fernandina) I watched a hawk attack and eat a marine iguana; there were many other iguanas at this place but they appeared to pay no attention whatsoever to the incident.

The Galapagos Hawk is considered to be closely related to the Red-backed Hawk (*Buteo polyosoma*) of mainland South America. The voice, the colour of the downy young and the wing formula of both species are all similar.

Buteo species are the only diurnal raptors in other oceanic islands such as Hawaii and the Azores, which suggests that *buteos* are well adapted for the colonization of remote islands. In islands where there are few species of predators, sexual dimorphism with respect to size tends to increase. This differentiation seems to be related to ecological factors (the occupation of different niches) rather than to social factors (domination of the females over the males).

The Galapagos Hawk is very tame. A man can easily approach one and catch it with his hands. During one of my expeditions on Santiago Island I was able to ring 71 hawks in three days, attracting them with goat meat. They were so tame that one of them tried to eat the meat we were frying on the camp stove. We grabbed it and took it to the place where its comrades were feeding.

Finally I have to ask, what is the future of this fine hawk – one of the rarest birds in the world? My studies have shown that on the uninhabited islands there is sufficient food and the species is not threatened with extinction. One real danger is the feral cat, especially on Isabela; but it is man himself who is the greatest menace, who persecutes and kills the hawks because they occasionally take a chicken. The problem is therefore most acute where man has settled and unfortunately we must expect that in a few years the Galapagos Hawk will have disappeared from yet another island – Santa Cruz.



Hawk's nest at Buccaneer Bay.

(Photo Alan Root)

RESEARCH PRIORITIES

Recommendations of the Galapagos Science Conference

A major conference of distinguished scientists with experience of the Galapagos was held at the Smithsonian Institution, Washington DC, in October 1972. Its object was to establish priorities both for conservation research and for fundamental scientific investigation. As most pure research work in the Galapagos is undertaken by visiting scientists, funded by outside sources, with the Darwin Station providing a base, services and advice, it was hoped that these priorities should serve as guidelines to such visitors in their choice of projects. The number of scientists using the Station's facilities is still increasing and this year the 100th mission was received.

The published account of the conference's proceedings is too long to be reproduced in *Noticias* but copies are still available from Dr Simkin, Museum of Natural History, Room E419, Washington DC 20560, for a fee of \$3.50 to cover printing costs. For convenience, the editors – Tom Simkin, William G Reeder and Craig MacFarland – made the following summary of the recommendations for future scientific work. (The section of the conference's proposals dealing specifically with conservation was published in full in the last number of *Noticias*.) Order of presentation in no way implies greater or lesser importance of the various recommendations; these are all considered priority needs.

Ecuadorian Science

The Conference strongly approved the present CDRS programs involving Ecuadorian students, recommending that their number be increased by actively matching visiting scientists with students to further the well known symbiosis between field assistant and experienced researcher. Duplicate collections for Ecuadorian universities are another of the many ways in which foreign scientists can "put something back" into a country that has been kind enough to permit scientific access to the Galapagos.

Money for basic research is rarely available in Ecuador. Research funds for Ecuadorian scientists to study in the Galapagos (and for comparative studies on the mainland) should be sought from international sources; this would include encouraging Ecuadorian students who are pursuing advanced degrees in other countries to do their research in Galapagos.

Geology

The Galapagos are among the more active oceanic volcano groups, their setting is important in the global tectonic framework, and their geologic history is critical to evolutionary and other studies of island flora and fauna. Geologic studies in the Galapagos are few, however, and the most urgent need is for basic geologic mapping of each island. Work now in progress is filling this need but can be facilitated by co-operation of other Galapagos workers in supplying documentation of eruptive activity,

locations of burned organic matter that might date lava flows by C^{14} , etc. Chronological studies, of course, are a major need, as are structural studies attempting to place island growth in a regional tectonic framework, but such investigations develop from basic geologic mapping. The extreme regional climate variations, coupled with lack of strong seasonal changes, make the area well suited to rock weathering studies, and the spectacular pyroclastic deposits of the islands are worth special study. Inter-disciplinary studies of soils, groundwater, ash revegetation, and the like have both practical and scientific value in Galapagos. See also recommendations under *Geophysical Monitoring*, *Paleontology*, *Marine Science* and *Aerial Photography*.

Marine Science

Shallow water littoral studies have been badly neglected in the Galapagos. Bio-geographical and ecological studies are needed in order to assess micro-evolution and endemism, particularly for littoral invertebrates and algae. Museum collections should be searched and inventoried for specimens reflecting change of environmental conditions. Likewise, older data from oceanographic transects and sampling should be located and studied. Measure of littoral productivity, with free-diving study of feeding in marine iguanas and shore-feeding birds, is needed to provide a baseline against future changes affecting the populations. Permanently marked transects, quadrats, and reoccupiable photography stations must be established and visited regularly.

Productivity of a small number of potentially valuable marine resources (eg: spiny lobster, sea turtles, and edible fish) should be studied immediately in order to provide data to aid in decisions on catch, fishing limits, etc.

Fresh collections of selected mollusc species are required for chromosome preparations.

Marine geology and geophysics within the archipelago have been virtually ignored. Marine sediment cores NW and W (downwind) of the major volcanoes should record explosive ash chapters in volcanic growth and may be datable by interlayered fossils. Dredging and bottom photography on the remarkably steep scarps W and S of the Galapagos platform offer clues to the development of these volcanoes. Detailed bathymetry and seismic reflection profiling are needed to relate submarine to sub-aerial features and to provide the baseline documentation necessary to recognize the new submarine faults and lava flows certain to occur in the future. Colonization studies on their submarine extensions might assist in at least relative dating of young, featureless lava flows while providing useful data for marine biology. None of these, or any similar, studies appear now to be under way in the Galapagos. They should be.

Vegetation Mapping, Sampling, and Productivity

Accurate vegetation maps are needed by most Galapagos workers and their preparation should have high priority. Such maps require (1) collation of data from previous transects and qualitative descriptions; (2) continuation of walking transects and subjective basic delineation of gross community boundaries or gradients, but most critically, (3) aerial photographic coverage (standard, false color, infra-red; see aerial

photo recommendations), and (4) careful quantitative study of presence, densities, and pattern of plant distribution along most critical transects of important islands such as Santa Cruz, Fernandina, and Tower. The need for detailed, quantitatively-controlled vegetation maps is urgent not only for many current investigations, but also to provide baseline data permitting later evaluation of vegetation changes through succession, manipulation, or natural physical events.

Primary productivity should be measured at selected sites along sampling transects; this must be done seasonally and annually and repeated as required. When combined with detailed vegetation maps and quantitative descriptions of the structure of plant communities, primary productivity studies will provide a basis for evaluating

- (1) cropping and foraging by invertebrates and vertebrates (native and introduced),
- (2) carrying capacity for the variety of animals inhabiting the plant communities, and
- (3) the overall dynamics and economy of the various biotic communities.

Terrestrial Invertebrates

In recognition of the large and still poorly known invertebrate fauna, it is strongly recommended that "alpha-level" systematic studies be continued, with systematic collection, study, and description of invertebrate species and their variants. Such studies, basic to understanding of evolution within each group, should be made where possible by specialists also working on equivalent groups from mainland South and Central America. Evolutionary studies, using modern tools of analytical genetics (eg: electrophoretic analysis of enzyme polymorphism), should be undertaken immediately, using, in particular, the more systematically diverse insects (eg: the tenebrionid beetles) and molluscs.

Basic autecological studies of invertebrates, including developmental and population biology, food requirements, and microenvironmental relationships, should be encouraged. Community studies, dependent on the above, but comparing faunae of different vegetation types and climatic regimes through time, are urgently required for basic understanding of the Galapagos ecosystem.

Study of pollination biology at the level of the plant community, with support of genetic studies of endemic plants, would permit testing of general theories of plant-insect co-evolution. Such studies in the Galapagos have the advantage of relative simplicity, compared with those of the tropical mainland;

It has been strongly recommended that a systematically arranged file (perhaps in computer format) be established to include literature references, as well as currently obtained data summaries (eg: phenology, trophic and pollination ecology, symbiotic observations) for each species. Included also should be information on specimen deposit and identification authorities. In view of the complexity, this task should not initially be recommended for the CDRS, but rather a co-operating institution.

Terrestrial Vertebrates (excluding Birds)

The native mammals and reptiles, almost all of which are endemic, are an important natural resource, all the more so since tourism is clearly becoming the major economic activity in the Galapagos. The exotic mammals are at present the greatest threat to native Galapagos environments. Their great variety and broad distribution in fragile Galapagos ecosystems present an ideal opportunity to study their population ecology and methods of control and elimination.

Top priority should be given to detailed autecologies, the bio-energetics, and long-term population studies of the land iguanas and snakes and the most destructive exotics: goats, pigs, cats, dogs, and black rats. Recent and current investigations of the tortoise and rice and black rats should be continued.

Community level studies, including these vertebrates, are needed to obtain a holistic understanding of the Galapagos ecosystem. These will be valuable both for conservation purposes and for testing theoretical models by comparison with continental areas.

These studies will require extensive integration with the following investigations and data-gathering services: (1) environmental monitoring, (2) vegetation and geological mapping, (3) quantification of the structure, successional relationships and productivity of plant communities.

Birds

Birds are easily the most thoroughly studied group on Galapagos. Because of their importance to tourists, the Galapagos birds are a major natural resource and should be treated as such. Basic ecological field studies are needed only for a few species of water and sea birds, such as the brown pelican (the pelican is particularly important because of its known sensitivity to pesticides and other pollutants). Monitoring of populations, including banding, mapping, and censusing studies already in progress, should be continued and expanded, with priority given to the flightless cormorant, penguin, frigate birds, Hawaiian petrel, and waved albatross. Long-term population studies and general monitoring of the avifaunas of different islands are badly needed for the land birds; it is highly desirable to continue, at least at intervals, population and ecological studies such as those on the Galapagos Hawk and owls by T de Vries. Attention should be paid to the local extinctions and inter-island colonization which seem to be a feature of the various species of finches. A variety of interdisciplinary services and studies in other areas would contribute greatly to future bird studies, eg: meteorological monitoring, physical and biotic oceanographic data, mapping and phenology of vegetation, and distribution, abundance, and phenology of invertebrates.

Paleontology

The evolutionary importance of the Galapagos stands in marked embarrassing contrast to the paucity of paleontological work in the islands. The work that has been done

shows great promise, but the top paleontological priority at the moment is simply getting a paleontologist to the Galapagos. Other field workers and local residents should be encouraged to report the locations of lava tube caves, fissures, other possible former habitats, limestone deposits, peat bogs, or any other situation in which evidence of former life might be preserved. However, excavation of deposits must be done by a trained paleontologist lest invaluable specimens be accidentally destroyed or otherwise lost to science.

INTERDISCIPLINARY NEEDS

Aerial Photography

One of the strongest needs discussed by the Conference was increased aerial photography of the Galapagos. Aerial photography and the topographic maps obtained from it are vital, not only to the mapping requirements of all scientists, but also to officials concerned with land use. Existing air photographic coverage misses the populated highland regions of San Cristobal, Santa Cruz, and southern Isabela, as well as several important uninhabited regions. But we need more than a filling of existing gaps in air photo coverage: tripling of the human population of the Galapagos and five major volcanic eruptions since the last air photo mission (1959 - 1960) emphasize the importance of periodic photography of changing islands. In addition, improved technology now permits real and false color photography and infra-red sensing from the aircraft doing the usual photography, and these techniques offer vegetation and thermal mapping of great importance to many disciplines. Records of water temperature variation are of value to fishery and marine biologists and provide, through indications of productivity, important data for bird investigators. Geothermal areas are known in at least ten different parts of the Galapagos and aerial infra-red work would both refine this mapping and, by periodic repeated surveys, indicate the migration or intensification that warns of impending volcanic activity. Aerial coverage during and after an eruption is critical to mapping its products with time (and thus understanding its dynamics). Vegetation mapping has been singled out as vitally important to all Galapagos biologists and modern aerial surveys are essential to good vegetation maps. Close co-ordination will be necessary between the aerial surveys and ground observations; close radio communication with the islands will be required to avoid the cloud cover that is responsible for existing gaps in aerial coverage. After an initial thorough study, follow-up flights would be valuable as frequently as every two months (used in NE Pacific fisheries studies), but flights at any frequency would improve on the present situation.

Environmental Monitoring and Conservation

Discussion of the considerable conservation damage done by small yachts without guides on board led to the conclusion that wardens, stationed on boats at critical locations, offer the best hope of effective control. At the same time there was full agreement on the importance of remote meteorological/geophysical monitoring

stations with observers to complement, maintain, and protect the instruments. Both science and conservation can be well served by stationing "warden-observers" at critical locations. Two prime locations, from both considerations, are Isla Genovesa and Punta Espinoza (Fernandina). Additional sites considered for future monitoring stations are Punta Albemarle, Villamil, and Iguana Cove (all Isabela), Hood, and North Seymour. Brief descriptions of the monitoring needs follow :

Meteorological Monitoring: Published accounts of Galapagos meteorology are restricted largely to Baltra airbase records during World War II, and thus give information on but one part of the widely variable climate of the islands. An accurate description of this climatic variation is perhaps the most important single requirement of most biological work in Galapagos and is critical for informed guidance of the local population addressing hydrologic and agricultural problems. The Conference commended the Meteorological Service of Ecuador for maintaining a well-equipped station on San Cristobal; CDRS gathers some meteorological data from selected highland sites on Santa Cruz and Southern Isabela as well as at Academy Bay. Summary and publication of existing data, which include daily radiosonde records, are of top priority, but it is also clear that further data from additional sites are required to provide an adequate meteorological record of the islands.

Automatically and systematically recorded data should be taken regularly under standard conditions by semi-portable instrument packages which will permit climate description, heat budget and thermal flux calculations, and minimal microclimatic detail. Desirable measures, with equipment, are :

- (1) radiation, incident and net (by radiometers and flux plates),
- (2) temperatures at standard height in air, soil surface, and deep constant soil (thermocouples and flux plates),
- (3) relative humidity (wet-bulb depression and thermocouple),
- (4) rainfall and garua (large area tipping bucket and accumulator),
- (5) wind speed and direction (integrated measure per short time period),
- (6) tidal gauging and ocean temperatures (surface to depth) are desirable at some sites,
- (7) clouds (see below).

It is urged that redundancy be built into the data accumulator. Where possible, data should be recorded both as paper chart printout (Brown recording potentiometer) and as telemetered to the CDRS for storage on magnetic tape. The magnetic tape can be read directly by computer, decreasing errors of data transcription and providing immediate compilation and processing.

As the peripheral instrument packages are placed in the archipelago, regular servicing by a trained technician, capable of moderate trouble shooting, must be provided approximately monthly. Regular monitoring of the telemetered data at CDRS advises of a malfunctioning instrument, which can then be sought out and repaired.

Time-lapse photography at these same sites would yield valuable data for several fields. Single frame cinematography in the 5-30 min interval range, using wide-angle lens and automatic

exposure devices, would require maintenance on only a monthly basis and a well-chosen format would provide inexpensive records of (1) cloud incidence and movement, (2) volcanic eruption dynamics with timed development from the earliest visible phase of activity, and (3) occasionally, faunal behavior from photo foreground.

Geophysical Monitoring: Monitoring of earthquakes and other physical changes in the Galapagos is essential to understanding the past growth and development of these volcanoes. The ability to predict future volcanic activity depends on this understanding, but it further requires geophysical monitoring to provide direct warning of changes.

The CDRS presently operates a unit of the Worldwide Seismic Station Network (NOAA) and provides valuable records of local and regional seismicity. However, accurate location (with depths) of the frequent Galapagos earthquakes requires two additional seismographs well-placed for triangulation within the archipelago. Portable seismographs should be included in two of the environmental monitoring packages described above. The recommended sites of Espinoza and Genovesa, together with the CDRS, are well-placed to locate local events; additional units on any of the suggested Isabela sites would significantly strengthen the monitoring.

Microbarographs should be a part of these monitoring packages; these instruments might read directly on the same time recorder as the seismographs. Documentation of airwaves generated by future Galapagos volcanism would be valuable and the instrumentation is inexpensive.

Monitoring of the inflation (and deflation) undergone by active volcanoes has proven to be an effective guide to subsurface migration of magma, with the possibility of providing warning of some eruptions. Sensitive tiltmeters should be installed on active volcanoes, particularly those such as Sierra Negra, that are a real hazard to human populations. A simple and inexpensive alternative to tiltmeters is the periodic releveling of three permanently established benchmarks arranged in a 60 m triangle. Six of these tilt stations were established in Fernandina in 1970, but this program should be extended to other volcanoes and the frequency of releveling increased.

Thermal monitoring of an area as logistically difficult as the Galapagos is best done by aerial surveys and is recommended under that heading.

Standard Photo Stations

Photographs of the same scene through seasons and years provides efficient and valuable documentation of changes. Some photo stations have been reoccupied by individual specialists, but their locations (and existence!) is known to few. A photo station map, annotated with descriptions, should be compiled by CDRS, starting with obvious existing stations such as Daniel Weber's caldera panoramas and expanding to include other positions where change can be expected (eg: settled regions, areas visited heavily by tourists, recent ash deposits or uplift areas, active fumaroles), as well as selected stations where stability seems apparent (eg: forest floor, rocky shore, tidepools). Some stations should be permanently marked. Panoramas by field workers passing near these stations, and possibly systematic reoccupation by CDRS/NPS personnel, would be an easy way of capturing data for a variety of studies. A basic slide set

from these stations should be deposited and curated at CDRS.

Charles Darwin Research Station

The clear consensus of the participants was that the basic Station facilities are in large part adequate for the support of visiting scientific missions. Specifically:

- (1) the Station should not increase greatly in size; the present capability of supporting 12-15 scientists at a time is both adequate and desirable;
- (2) it should continue to supply only basic laboratory facilities such as refrigeration, scales, basic glassware, a few microscopes, a drying oven, distilled water, etc; each mission should bring all its own expendable supplies and specialized items of capital equipment.

The entire area of marine studies has been almost untouched in the Galapagos. It is strongly urged that a small, relatively inexpensive marine laboratory be constructed at the Station as soon as possible. This should be approximately the size of a one to two car garage, situated just above sea level, supplied with constantly running sea water (plastic hose and plastic-lined pump), and with basic equipment such as a water table, aquaria, work tables, microscopes, and a 50-100 gallon overhead tank with feeder lines to the water table.

The following improvements in Station facilities are strongly recommended:

- (1) additional storage facilities for scientific missions, in the form of individual compartments within a larger building;
- (2) a simple wooden cabinet, heated by light bulbs, for drying botanical specimens (an inexpensive, tried-and-true method which avoids the danger of fire);
- (3) although the library contains many of the monographs and papers on Galapagos, basic reference texts to most fields of Galapagos science are almost completely lacking in the collection. The participants and other interested scientists will draw up a list of such references, to be used by the Darwin Foundation for improving the library collection. Many of the major monographs on Galapagos are no longer readily available; these should be microfilmed and a microfilm reader purchased by the Station;
- (4) because of the increasing number of scientific missions, and the inherent dangers of travel in the islands, communication between the Station and field parties and among individuals of the latter are vitally important for safety reasons. The Station should have 3-5 two-way radios (compatible with those owned by the Park Service) and a half dozen walkie-talkies. These could be used by Station personnel on field trips and rented to scientific missions for short periods. Missions requiring radios and/or walkie-talkies for extended periods should provide their own (compatible with CDRS equipment);
- (5) since adequate storage space will soon be available, basic reference collections of specimens should be improved and carefully curated. It is the responsibility of individual investigators making collections to provide duplicates for the reference collections, and to assist with authoritative identifications. For invertebrates, difficult to preserve at CDRS, a group of authoritatively identified color photographs should be accumulated as an aid to field identification.

Scientist Movement Map

Most Galapagos workers appreciate the value of notes, photographs, and collections made by other workers. The Conference discussed several suggestions such as maintaining a photo log at CDRS and requesting copies of field notes for filing at CDRS. While encouraging these approaches, the Conference strongly recommended the simple measure of requiring rough maps with descriptions, showing the routes followed by each scientific party in the Galapagos. If sketched on common base maps provided by CDRS, these could be periodically combined on a transparent overlay, which would provide a valuable record of who was where at what time. Photographs and notes could then be solicited directly by any investigator needing information on a particular locality.

Interdisciplinary Instruction Sheets

Galapagos field workers are often in a position to make observations and collections of great value to workers in other disciplines. Good communication is required, however, and the group strongly endorsed the suggestion that scientists prepare and duplicate succinct descriptions of their needs that can be distributed at CDRS to scientists starting field work in the islands. Extensive and overly detailed requests are likely to be ignored by busy field workers and too little instruction may result in useless data, but well-worded instructions (possibly including sketches or photos) have a strong potential for increasing the effectiveness of all of our work. Most scientists doing field work in the Galapagos understand the value of co-operation and a supply of request sheets at CDRS is an excellent way of fostering that co-operation. For example, a standard phenology recording card, guiding the uninitiated in taking proper note of blossoming, fruiting, bird fledging, insect emergence and other seasonal events, should be prepared and made available for distribution at CDRS.

Short-Lived Event Communication

The Galapagos are dynamic islands and rapid investigation of events such as volcanic eruptions, shoreline uplifts or animal epidemics is essential to understanding how such events have affected the islands in the past. The Smithsonian Center for Short-lived Phenomena (60 Garden Street, Cambridge, Mass, USA, 02138) has proved to be an effective communication center in these situations, but it is important:

- (1) that they be alerted of the addresses and interests of Galapagos scientists and,
- (2) that they be notified immediately of any short-lived event in Galapagos.

Scientific Bibliography

The scientific literature of the Galapagos is scattered through many years, many languages, and frequently obscure journals. To benefit from the important observations of earlier workers, an extensive Galapagos Bibliography is needed. This has been under preparation by Tom Simkin and Lana Everett and should soon be ready for publication. It consists now of over 2500 references, with cross-indexed keywords stored in computer format. Publication will be by photo-reduction of computer print-out. The Conference urged co-operation of all interested

scientists in supplying the additions and corrections that will make this a more valuable document for all Galapagos researchers.

Survey of Existing Galapagos Collections

With the present and valid restrictions on collecting in the Galapagos, it is particularly important to know the whereabouts of valuable material collected in the past. Ultimately, a detailed survey of existing collections, possibly in computer format similar to that used for the bibliography, should be prepared, but a simple listing of present location of material from major expeditions could be easily prepared by a small number of veteran Galapagos workers and published in The Darwin Foundation's journal, *Noticias de Galapagos*. A list of existing collections would also be valuable in assessing future research proposals that involve collecting.

Satellite Observations

Weather satellite photographs of the Galapagos area proved very helpful to investigators of the 1968 Fernandina eruption, and today's improved satellite technology offers considerable potential for Galapagos workers. Studies of cloud development, volcanic eruption, fires, sea temperatures, season defoliation, telemetered movement of large animals (eg: whales) and other investigations can all profit from existing and future satellites, but NASA must be made aware of both collective and individual interests in Galapagos.

TWO BOOKS

Since that pirate and pioneer naturalist, William Dampier, and those other surprisingly literary buccaneers careened their ships in the islands in the 17th century, the remote Galapagos have never been "out of print" for very long. Scientific publications received a boost from the visit of HMS Beagle in 1835 and went on increasing gradually for a century; but since the Charles Darwin Research Station was inaugurated in 1964 the output of learned papers, magazine articles and books has expanded spectacularly. By 1972 the computerized *Galapagos Bibliography* at the Smithsonian Institution already included over 2,500 references.

Noticias cannot attempt to review the current flood of publications, particularly as the appeal of many of the scientific papers is confined to very restricted circles of specialists. However, an exception may be made for two books which have appeared in recent years; while rigorously scientific they are at the same time of great help to the ever-increasing numbers of amateur naturalists visiting the islands.

Flora of the Galapagos Islands

by Wiggins, I L and Porter D M.
998 pages. Stanford University Press (1971).
US \$37.50.

The publication of *Flora of the Galapagos Islands* brought to a climax an important phase in classifying and documenting the vascular plants of the islands. Setting a remarkably high standard even among the classic floras of the world Professor Wiggins, Dr Porter (who replaced the late Dr E Yale Dawson as co-author) and their collaborators have drawn together details of the 642 native and introduced species known to occur in the archipelago. Some 228 of these — a high percentage — are regarded as endemic to the islands; and 42 of the plants described are new records for the Galapagos.

For each species detailed notes are given on synonymy, morphology, habitat and present-known geographical range and subspeciation with additional data on variation, relationships and ecology. Identification keys and line drawings cover the main taxa represented. The principal collections of Galapagos plants throughout the world, including that of the herbarium of the Charles Darwin Research Station, were examined in the preparation of the manuscript the initial planning for which began during the Galapagos Islands Scientific Project of 1964.

Introductory chapters cover aspects of the islands' history, their demography, economy, physiography, geology, climate, soil and vegetation zones, and the history of botanical collecting since the 1825 visit of the British naturalists Douglas and Scouler. The book concludes with glossary, bibliography and index. It is illustrated with more than a thousand individual line drawings, 170 distribution maps and 96 photographs in colour.

Ira L Wiggins is Emeritus Professor of Biology at Stanford University and a former President of the Scientific Advisory Committee of the Charles Darwin Foundation. Duncan M Porter is on the staffs of the Missouri Botanical Garden and Washington University.

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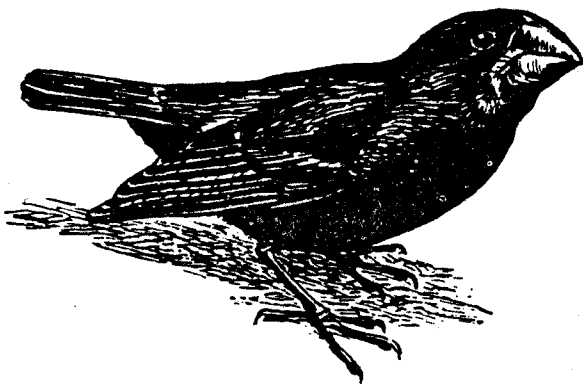
A Field Guide to the Birds of the Galapagos by Michael Harris, 160 pages, with 12 plates and 68 illustrations by Barry Kent Mackay. Collins, London (1974). £3.50.

Although so much has been written about the peculiar birds of the Galapagos, this is the first time that every recorded species, resident or migrant, has been described within the covers of a pocket guide book. Every breeding species is illustrated and all but the rarest accidentals.

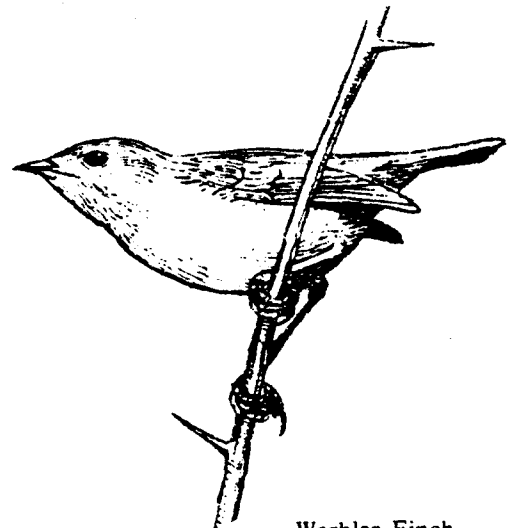
Many of the migrant waders will be familiar to birdwatchers from the American continent but even for them it is convenient to have every land, shore or sea bird they are at all likely to see pictured in a single, slim volume. Most of us can manage to recognize the penguin or the albatross; where this field guide is particularly helpful to the visitor is in identifying the more confusing species, such as the petrels and mockingbirds and above all in distinguishing between Darwin's thirteen finches. Even with the detailed descriptions and illustrations, some borderline cases can still baffle the tourist but he has a better chance of sorting out the difficult ones than anyone ever had before.

Finally, any temptation to skip Dr Harris's concise introductory chapters should be firmly resisted; they are full of valuable information on such matters as climate, ecology, breeding seasons and where you are likely to find the various species in relation both to altitudinal zones and to the individual islands. His years as ornithologist and conservationist at the Darwin Research Station have given him an unsurpassed knowledge of the birds of the archipelago.

GTCS



Large Ground Finch
Geospiza magnirostris



Warbler Finch
Certhidea olivacea

FUNDACION CHARLES DARWIN PARA LAS ISLAS GALAPAGOS
CHARLES DARWIN FOUNDATION FOR THE GALAPAGOS ISLANDS
FONDATION CHARLES DARWIN POUR LES GALAPAGOS

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Buts et objectifs de la Fondation Charles Darwin pour les Galapagos
(Art 2 des Statuts, Bruxelles, 23 juillet 1959)

L'Association est chargée de l'organisation et de la gestion de la Station de recherches "Charles Darwin", dont le gouvernement de la République de l'Ecuador a autorisé l'établissement dans l'archipel des Galápagos à l'occasion du centenaire de l'énoncé de la doctrine de l'évolution (1858-1958).

L'Association propose aux autorités compétentes toutes mesures propres à assurer, dans l'archipel des Galápagos et dans les mers qui l'entourent, la conservation du sol, de la flore et de la faune, et la sauvegarde de la vie sauvage et de son milieu naturel. Elle arrête le programme de recherches de la Station biologique et la charge de toutes études scientifiques en rapport avec les objets ci-dessus.

Elle recueille et gère les fonds destinés au fonctionnement de la Station et à la promotion des recherches qui y ont leur base.

L'Association veille à la diffusion, par tous moyens appropriés, du résultat des travaux de la Station et de toutes informations scientifiques relatives aux réserves naturelles.