

N O T I C I A S D E G A L A P A G O S

G A L A P A G O S N E W S

N O U V E L L E S D E S G A L A P A G O S

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BIRD RINGING IN THE GALAPAGOS

by

M.P. HARRIS

Several workers attached to the CDRS have banded birds in the Galapagos. Lévêque (1962, 'The Ring' 32 : 126) published a summary of his activities and Snow (1968, 'Noticias de Galapagos' 9-10 : 15) gave details of six birds ringed in the islands and recovered elsewhere. The same recoveries are mentioned below. This note documents activities up to the end of 1971.

Under an agreement with the British Trust for Ornithology, rings issued by this society and inscribed 'Inform. Brit. Mus. London SW7' have been used in the islands. Also about 2,000 finches and 100 seabirds were marked with rings issued by the U.S. Fish & Wildlife Service. It has now been internationally decided that only rings issued by one scheme are to be used in any one area so in future only BTO rings are to be used in the Galapagos. An exception is made for penguins where flipper bands bear the address 'Avisé write Darwin Estacion, Galapagos, Ecuador'.

Totals of birds ringed with metal bands are given in table 1. In addition 191 Waved Albatrosses, 74 Flightless Cormorants, and some Hawks have been marked with numbered darvic colour-bands, which however have no return address.

Seabirds

Initially Lévêque and Brosset ringed seabirds in many areas but more recently the Snows and I have concentrated our activities on Plaza and Hood, mainly because our interests have centred around populations, rather than distant recoveries. Some interesting data concerning young birds and the oldest known Galapagos birds are given in table 2.

As realised by Lévêque, the Waved Albatross on Hood offers an excellent opportunity of 10,000 pairs makes it impractical to deal with anything but a sample. Luckily most effort has been concentrated on the birds breeding at Pta. Suarez and some chicks have been ringed there every year any have been raised since 1961. Much interesting data have come out of my intensive retrapping in this area during 1970-1971. The age of first breeding is much lower than any other albatross, post-fledging and adult survival are both very high, and the return of young birds to their natal colonies occurs at the end of a breeding season, which is unusual. Such information as this is essential if ever any conservation measures are needed in this species.

Also at Pta. Suarez, Blue-footed Boobies have been banded in a few years. This colony is now visited by many hundreds of tourists every month and it will be interesting to see whether or not young boobies will return to the area or breed elsewhere.

Potentially one of the easiest species to band in numbers is the Flightless Cormorant. However the leg is so large and flattened that it has been difficult to find a very suitable ring but the present modified swan-eagle ring seems satisfactory. It remains to be seen how well these rings stand up to the wear on the rough lava. Unfortunately the only cormorants ringed between 1962 and 1970 were five young I marked at Pta. Albemarle in 1966 - two of these survived to breed there in 1970 and 1971 respectively. At present about 500 cormorants are banded - a useful proportion of the population of only about 800 pairs.

This cormorant has a very restricted range (200 miles of coast around Fernandina and the north and western parts of Isabela) and it appears to be as sedentary as any bird can be. Birds were marked with coloured bands at Cape Hammond (red bands, 82 birds), Cape Douglas (blue, 49), Pta. Esponosa-Pta. Tortuga (green, 94), Pta. Mangle (white, 7), B. Urquina (brown, 4) and the north side of Isabela (yellow, 46). In 18 months, and from many sightings, no individual was recorded more than three miles from where ringed.

The seabirds studies on Plaza have been reported elsewhere (many papers by Snow and Harris) and the bird populations there are probably as well known as any other tropical seabirds. A young Swallow-tailed Gull colour-ringed on Plaza in 1963 was found breeding on Champion in 1970.

There have been no further distant recoveries since the list given by Snow (1968) - that is two young Waved Albatross recovered on the mainland of Ecuador within a few months after fledging, two Blue-footed Boobies also on the mainland, and two Red-billed Tropicbirds, one off Peru, the other off Panama. Although these recoveries are of great interest it is a matter of opinion whether they were worth the time and effort involved.

Landbirds

Quite large numbers of finches, mainly ground finches but including all species except the Mangrove Finch Camarhynchus heliobates, were banded by Curio & Kramer, and Snow. These were useful in the age of attainment of the fully adult plumage but otherwise no serious effort has been put into obtaining retraps. The oldest G. scandens and G. fortis are now more than seven years old.

Tj. de Vries marked many hawks and owls during his research 1965-71. One Short-eared Owl colour-banded on Barrington was found dead on Floreana - the first interestland recovery of any land bird.

These birds should give interesting information essential to the conservation of the hawks in future years.

A Lava Heron ringed as an adult at the CDRS was found there, killed by a Short-eared Owl, 4.6 years later.

The Future

The most pressing need is for the continuation of the population studies by the trapping of banded adults and the ringing of young. Due to the large numbers of young birds ringed during the last two years such retrapping should be done within the next year or so to obtain details of ages of first breeding of cormorants, hawks, etc.

As yet no frigatebirds have been banded, and the two species might make an interesting study. With great care it would be possible to colour band the young flamingos and it would then be easy to obtain evidence of inter-island wanderings and survival of one of the islands' rarest birds.

No population study has been made on any of the smaller Galapagos landbirds. Such a study would be very difficult for the larger islands have very large areas of uniform habitats where marked birds can quite easily be lost without trace, and most small islands are too near the larger for a high degree of isolation. However, the Floreana Mockingbird, now restricted to a few hundred birds on Champion and Gardner-by-Floreana would well repay systematic visits.

TABLE 1

Birds ringed in Galapagos 1960-1971 inclusive

	Full-grown	pulli	Total
Galapagos Penguin <u>Spheniscus mendiculus</u>	258	45	303
Waved Albatross <u>Diomedea irrorata</u>	3,381	2,529	5,910
Hawaiian Petrel <u>Pterodroma phaeopygia</u>	125	17	142
Audubon's Shearwater <u>Puffinus lherminieri</u>	661	112	773
Madeiran Storm Petrel <u>Oceanodroma castro</u>	1,637	264	1,901
Galapagos Storm Petrel <u>O. tethys</u>	86	36	122
Red-billed Tropic bird <u>Phaethon aethereus</u>	439	112	551
Brown Pelican <u>Pelecanus occidentalis</u>	2	14	16
Blue-footed Booby <u>Sula nebouxii</u>	336	245	581
Masked Booby <u>S. dactylatra</u>	102	150	252
Red-footed Booby <u>S. sula</u>	42	5	47
Flightless Cormorant <u>Nannopterum harrisi</u>	524	101	625
Yellow-crowned Night Heron <u>Nyctanassa violacea</u>	5	3	8
Lava Heron <u>Butorides sundevalli</u>	7	10	17
Galapagos Hawk <u>Buteo galapagoensis</u>	16	49	
Oystercatcher <u>Haematopus ostralegus</u>		2	2
Common Stilt <u>Himantopus himantopus</u>		2	2
Lava Gull <u>Larus fuliginosus</u>	25		25
Swallow-tailed Gull <u>Creagrus furcatus</u>	598	702	1,300
Brown Noddy <u>Anous stolidus</u>	20	13	33
Galapagos Dove <u>Zenaida galapagoensis</u>	2		2
Dark-billed Cuckoo <u>Coccyzus melacoryphus</u>	1		1
Short-eared Owl <u>Asio flammeus</u>	4		4
Vermilion Flycatcher <u>Pyrocephalus rubinus</u>	1		1
Large-billed Flycatcher <u>Myiarchus magnirostris</u>	1		1
Galapagos Mockingbird <u>Nesomimus parvulus</u>	26		26
Hood Mockingbird <u>N. macdonaldi</u>	47	3	50
Floreana Mockingbird <u>N. trifasciatus</u>	8		8
<u>Geospizinae</u>	2,242		2,242
Turnstone <u>Arenaria interpres</u>	1		1
Semi-palmated Plover <u>Charadrius semipalmatus</u>	1		1

TABLE 2

Species	No. of young		Youngest (years)		Oldest bird (years) (+ = ringed as adult)	Breeding cycle as shown by rings
	ringed	retrapped	at colony	breeding		
Penguin	45	0	too recent		10+	
Waved Albatross	2.529	491	3	4	11+	Annual - every year
Audubon's Shearwater	112	1	8	8	11+	Less than annual
Madeiran Storm Petrel	264	1	5		11+	Two different population both annual nesters
Red-billed Tropicbird	112	3	3.7		7.5	Varies with island
Flightless Cormorant	101	2	never leave	4	9.5+	Less than annual
Blue-footed Booby	245	13	3	3	9.5+
Swallow-tailed Gull	702	27	3	4	11+
Brown Noddy	13	0	No return		9.5+	Variable

L. cernuum sera étudiée prochainement dans le même optique.

L. thyoides est une espèce particulièrement intéressante car, en dépit de son abondance en Amérique du Sud, elle n'a fait jusqu'à présent l'objet d'aucune étude chimique. Au cours de la même mission, nous avons également récolté des échantillons de L. thyoides aux environs de Quito et au Pérou. Ici encore, la comparaison de la nature et de l'abondance des constituants de ces trois lots récoltés en des habitats très différents est susceptible de fournir des résultats intéressants.

Nous avons également l'intention de récolter L. dichotomum et L. taxifolium qui constituent également des espèces non encore étudiées du point de vue chimique; toutefois, pour éviter des prélèvements importants d'espèces peu abondantes, ainsi que nous avons pu le constater, ce projet n'a pas été réalisé.

Deux espèces de cactus très abondants aux abords immédiats de la Station Charles Darwin (Opuntia echios var. gigantea et Jasminocereus thouarsii var. delicatus) et une Euphorbiacée (Hippomane mancinella) ont également été récoltées. La littérature renseigne une étude préliminaire des fruits de H. mancinella où il est fait état de la présence possible de physostigmine. Comme cet alcaloïde dihydroindolique a fait l'objet de travaux dans ce laboratoire (3), nous avons l'intention de reprendre ce travail.

Dans le cadre des travaux actuellement en cours, réalisés en collaboration avec le Dr. B. Tursch et son équipe nous avons récolté une espèce de coccinelle. (Cycloneta sanguinea). Récemment, un alcaloïde nouveau a été isolé de la coccinelle commune, Coccinella septempunctata (4): la coccinelline, qui constitue une substance de défense; la présence d'autres alcaloïdes a été mise en évidence dans des espèces différentes. Un examen tout a fait préliminaire de C. sanguinea montre la présence d'un ou de plusieurs alcaloïdes dans cette espèce.

(1) C. Van Moorleghe, thèse de doctorat, ULB.

(2) D.B. MacLean, "The Lycopodium Alkaloids" in "The Alkaloids" Volume X, Edité par R.H.F. Manske (1968), Pergamon Press.

(3) C. Hootelé, Tetrahedron Letters, n°32, 2713 (1969).

(4) B..Tursch, D. Daloze, M. Dupont, C. Hootelé, M. Kaisin, J.M. Pasteels et D. Zimmermann, Chimia 25, 307 (1971).

MAPPING OF LAVA TUNNELS ON SANTA CRUZ ISLAND

by

D. BALAZS

During my geomorphological survey on Galapagos Islands, I have visited several lava tunnels on Santa Cruz Island/Indefatigable and completed the maps of two of them (Fig. 1). These maps can make easier the further geological and other investigations.

Cueva de Kübler

The tunnel is accessible at about 2,5 km NNW from the center of Puerto Ayora, on the new road to Bellavista. The name of the cave originates from the German settler by the name of Karl Kübler, who came to the island in 1936. He visited several times the tunnel and has shown it for others.

Synonyms are : Cueva de Puerto Ayora, Cueva de Accidente, El Tunnel etc.

The lava tunnel is formed in dark greyish porphyritic olivine basalt. The height of the entrance is about 80 meters above the sea-level. Of the deposits found in the cave the gypsum, present in some places in layers of 1 to 2 m³, is worth mentioning (de Paepe, 1965). It is of tectonic significance, that at measuring point 16 (See : Ground plan, Fig. 2), a structural fault is intersecting the tunnel. Between the lava walls, separated by 25-30 cm, soil was washed in the tunnel and on drying formed a clayey powder layer of about 30 to 40 cm. A fault of similar size intersects the tunnel at measuring point 23 and a smaller fissure at point 21.

The Cueva de Kübler is almost completely dry, only in the rainy season there are seepages to be found in some places. At the time of the visit the temperature of the internal section was about 24°C.

The cave was mapped with the aid of a measuring stick and compass, without any human help, therefore an error of + 2 or 3 % is justified. The length of the tunnel between measuring points 1 to 29, not counting the collapsed section between points 2 and 3, is 852 meters. The average height of the tunnel is 5,9 m and the width 5,5 m. The average cross-section is 27 m², much larger at the entrance and gradually narrowing along the lava flow. The vertical ellipsoid shape is characteristic of the first section going over into a horizontal ellipsoid in the later section, with a flat floor. The volume of the tunnel is about 21.000 m³.

Cueva de Bellavista

This lava tunnel is in the interior of Santa Cruz Island, about 7 air kilometers north of Puerto Ayora (Fig. 3). At both end of the tunnel there is one collapsed entrance each. The northern entrance lays in a - by trees and shrubs thickly overgrown - landscape about 1,2 km NE from the center of the small farmer settlement, Bellavista. The southern entrance is E of the settlement at a distance of about 1 km, in a coffee plantation. The northern entrance is at a height about 300 m above sea level.

The local inhabitants know the lava tunnel simply by the name "Tunnel", or more exactly "Cueva de Gallardo". Senor Gallardo is the teacher of the settlement and the owner of the land where the tunnel lays. After an exchange of views with the members of C.D.R.S. we decided to use the name "Cueva de Bellavista" for the tunnel.

The lava tunnel is formed in the same olivine basalt as the Cueva de Kübler. In contrast to that, Cueva de Bellavista is humid with water dripping in many places from the roof. There are small temporary underground rivers (water flows) and small pools during the rainy season, particularly between January and April. The micro-climate of the tunnel is highly affected by the fact that at both ends it is open and this permits of air circulation. At the time of visit the temperature in the cave was 23°C.

The lava tunnel visited is only a section - between two collapses - of a longer tunnel. According to the measurements this section is 669 m long with an average height of 5,6 m and average width of 6,6 m. The cross-sectional plan is on the average 29 m². The cubic capacity of the cave is 19 000 m³.

Among the two above reviewed lava tunnels, Cueva de Kübler, due to its favourable location, is suitable to be made accessible for tourists visiting the island. The development of the entrance and the removal of the blocks from the tunnel may be carried out at a low cost.

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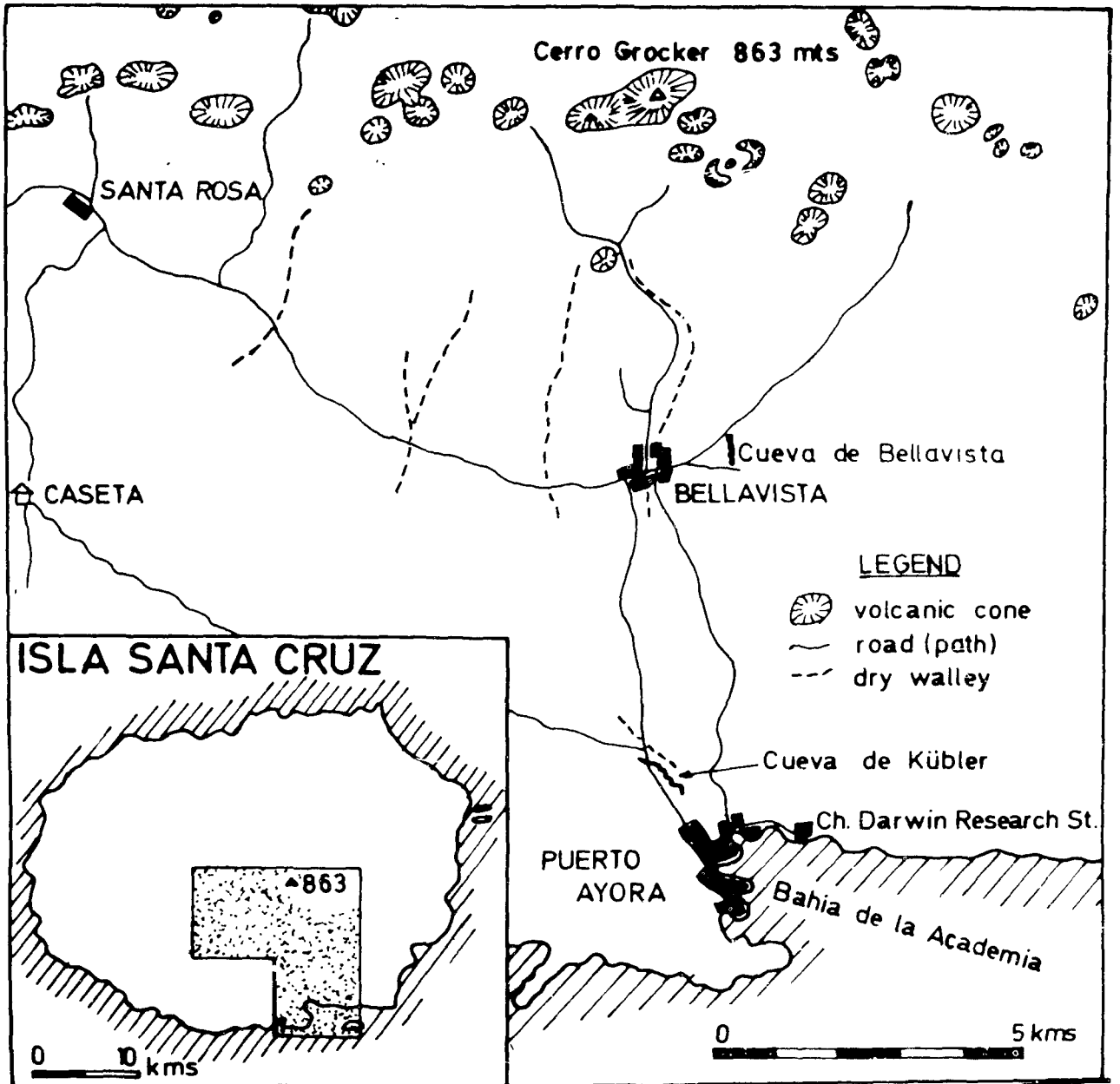


fig: 1

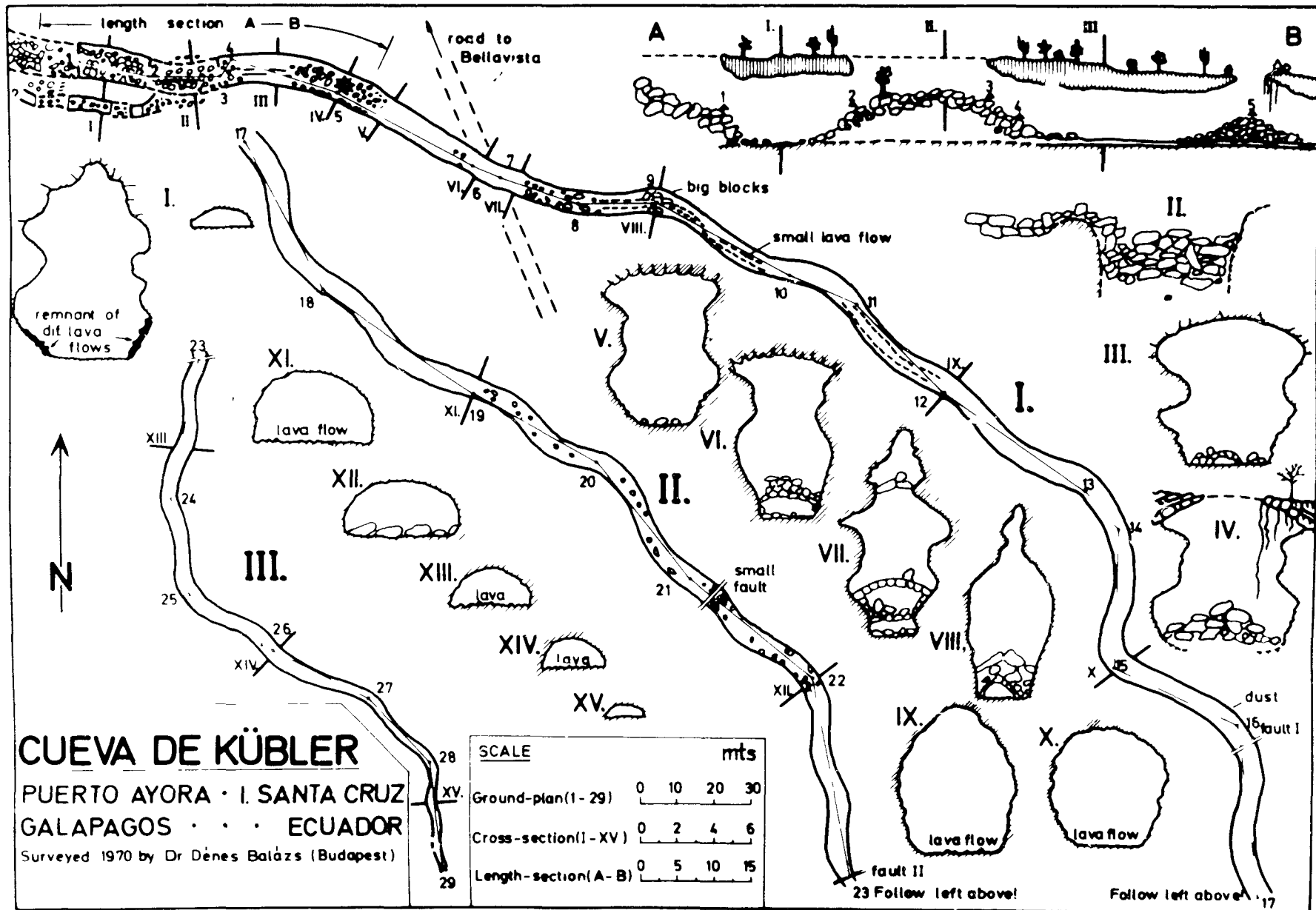


fig: II

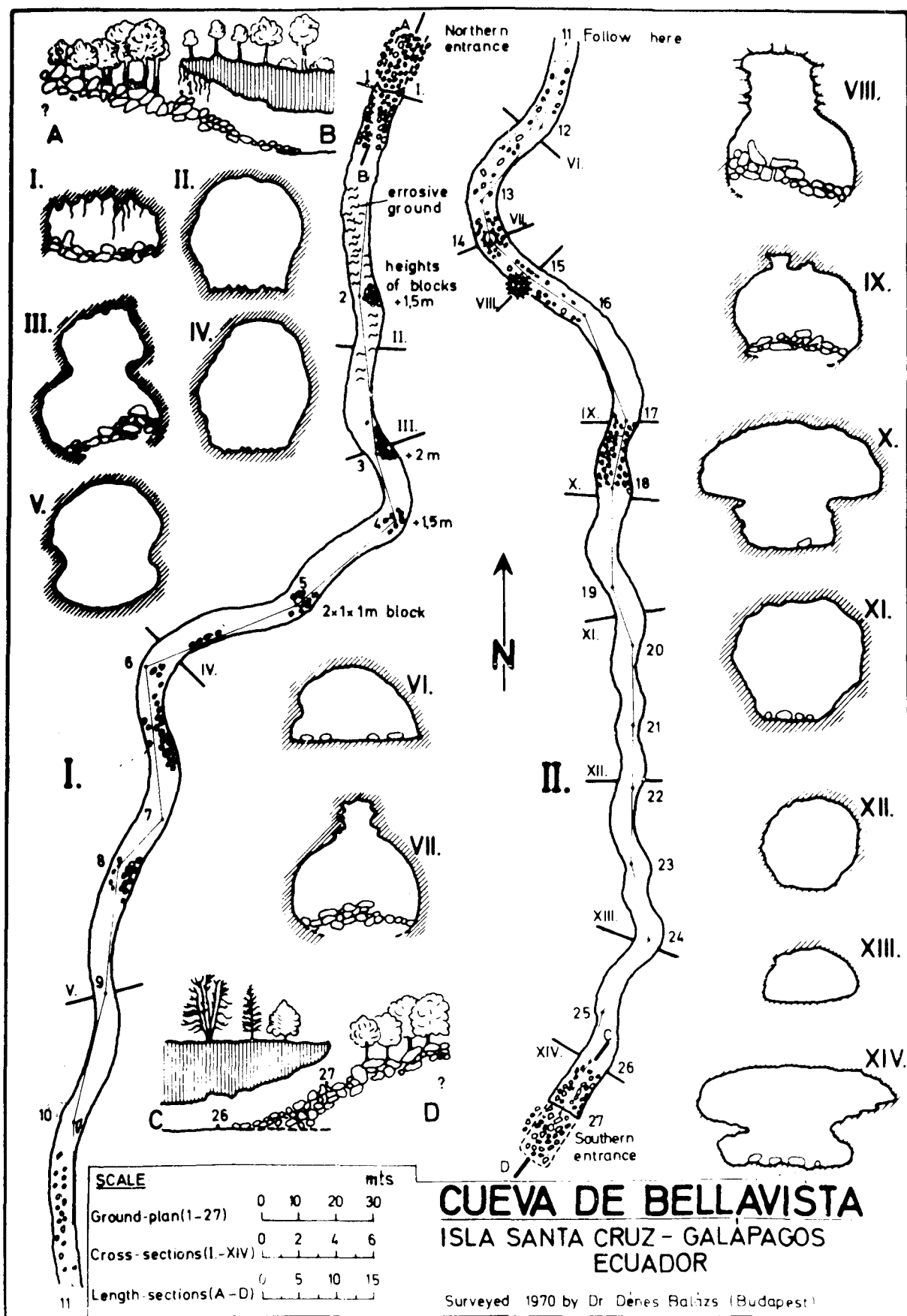


fig: III

THE "LITTLE FIRE ANT," WASMANNIA AUROPUNCTATA,
A SERIOUS PEST IN THE GALAPAGOS ISLANDS

by

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Biologists who spend one or more nights camping in the old tortoise reserve area or in the cultivated regions of Santa Cruz soon become painfully aware of a small pestiferous ant. This species, Wasmannia auropunctata (Roger)(°), is a well-known tropical "tramp" species. Found throughout Central and South America and the West Indies, it is frequently encountered in international quarantine and has become established in Florida and California, and even in the warm greenhouses at Kew. Although referred to in the islands as the "fire ant", it is not a species of Solenopsis, the genus to which the well-known imported fire ant belongs. Wasmannia auropunctata has been called the "little fire ant" in the United States and the "abayalde" in Puerto Rico. It is only one of several "tramp" ants that have followed man to the Galapagos Islands, but its impact upon the Galapagos terrestrial invertebrate fauna appears to be the most serious of any introduced animal.

While not previously reported from the Galapagos(°°), Wasmannia is now known to occur on Santa Cruz, San Cristobal, Santiago and Isabela. On Santa Cruz it ranges from the coast to the upper edge of the Miconia belt, being most abundant in the cultivated parts of the moist zone. On San Cristobal it has been recorded from the farms at El Chino, but it is probably widely distributed through the cultivated regions. It is also likely to be present on Floreana.

(°) Determined by E.O. Wilson, Harvard University.

(°°) Wasmannia auropunctata was not among the collections of the Academy expedition (1905-1906). But in the highlands of Santa Cruz in 1905, Slevin (1931) reported that "ants and mosquitoes made sleeping rather impossible." It is likely that this ant was Wasmannia.

Under good conditions, Wasmannia auropunctata forms enormous, extensive colonies that spread slowly with time. Although the queens are winged, they are not known to fly to new sites to establish new colonies, as do most other ants. (Winged adults of most ant species found in the region of Academy Bay were taken at light by the author, but not a single winged specimen of Wasmannia turned up over the entire six-month period.) Instead, queens remain with the colony, which forms a complicated interconnected network over the ground, with chambers under stones, under bark, and in the soil occupied by queens, workers, and brood. The colony spreads into new contiguous areas, except when portions with reproductive forms are transported - as happens for example when firewood or plants with soil are transferred to a new area or island by man. Kastdalen (1964?) suggests that the "fire ant" was probably introduced to Santa Cruz sometime between 1924 and 1934; when he arrived in 1935, "it existed only in a small area about half way between the farms and the beach. Since then it has spread through most of the humid zone, where it has become a terrible nuisance." It has crossed the Miconia belt only in about the last five years.

As a conservation problem, Wasmannia auropunctata is serious for three reasons :

(1) It replaces part of the indigenous ant fauna. For example, in coffee groves on Puerto Rico, it has been reported to kill or displace colonies of Myrmelachista ramulorum Wheeler (Spencer, 1941, and references therein). On Santa Cruz, Kastdalen (1964?) reports that "where it spreads all native ants disappear, and it becomes far more abundant than were all the others put together." The author's collecting supports this statement. For example, a species of Cylindronymex was found on Fernandina, where I had but a few hours to collect; on Santa Cruz, where I collected extensively at Academy Bay over a six-month period, none were seen (although the Academy expedition collected Cylindronymex at Academy Bay). However, all native ants do not disappear; Camponotus in particular does not seem to be affected. The indigenous fauna has been only briefly described, and contains several interesting forms, as well as radiations of "subspecies" in the subgenera of Camponotus.

(2) Wasmannia attacks insects and other terrestrial invertebrates. I have found them eating the darkling beetles (Tenebrionidae) that live under stones and are so abundant on many other islands but are less so on Santa Cruz. They often enter the nests of the endemic bee, Xylocopa darwini, but are only able to destroy larvae in cells which are damaged or incompletely sealed. It is possible that its activities may be in part responsible for the scarcity of giant centipedes (Scolopendra galapagensis) on Santa Cruz, although this is speculative. They are not known to attack vertebrates, but helpless, hatchlings may be vulnerable to them.

(3) Wasmannia is well-known as a tender of a wide variety of honeydew-secreting insects; especially whiteflies, aphids and scale insects. Besides being plant pests in their own rights, some of these Homoptera are capable of transmitting several plant diseases. The presence of this ant is a potential avenue of spread for introduced honeydew-secreting bugs and their diseases.

Control. The state of the art of insect control being what it is, it is unlikely that this species could be eradicated without seriously endangering other insects and wildlife - if it could be eradicated at all. (One remote possibility is the use of poisoned baits.) The only suggestions that can be made at this time are (1) monitoring, and (2) quarantine. The lack of effective quarantine in the archipelago is a serious matter. Even some biologists, who should be better acquainted with the problems of inter-island transport, have been guilty of transporting samples of litter from other islands to the Darwin Station, to be sorted or run through open Berlese funnels. There is at present no control over the importation of soil and plants into the islands. The list of insects of the islands (Linsley and Usinger, 1966) contains many pests associated with man, including most of the cockroach fauna, and many flies and moths associated with man or his crops. Until effective quarantine procedures are established and effectively employed, we can only expect the eventual spread of Wasmannia to the other islands and the introduction of still more pest species.

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I n f o r m e

Sobre un viaje a las islas Galápagos en el periodo del
15 de Julio de 1971 al 4 de Noviembre del mismo año

presentado

a la Fundación Charles Darwin y la Sociedad de Zoología
de Frankfurt.

Motivación de nuestra expedición científica a las islas Galápagos fueron observaciones hechas por conocedores de este grupo insular, sobre el peligro de exterminación de la fauna autóctona; debido a la introducción de animales domésticos hace ya decenios, que han llegado a tomar carácter salvaje.

Ya que estas observaciones nos habian sido transmitidas deseabamos investigar el problema. No es necesario profundizarse en la problemática, pues existen sobre la temática fuentes de información refiriendose al caracter destructivo de animales domésticos salvajes; asi por ejemplo apareció ultimamente un articulo de Daniel WEBER en la revista Biological Conservation, con el titulo : "Pinta une île à sauver."

Nuestras observaciones solo pueden acentuar la certitud de dichas fuentes de información.

La Finalidad de nuestro viaje seria, profundizar conocimientos sobre particularidades de animales domésticos de distintas especies que han tomado caracter salvaje, sobre todo investigar la posibilidad de que estos animales lleguen a recobrar su estado de predomesticación, es decir su estado primitivo salvaje. De estas investigaciones es posible obtener referencias para solucionar problemas de dinamica de población, que serian de interés para tomar medidas en lo que se refiera a limitación o aniquilamiento. Cabe la posibilidad de que el proceso de retrevolución de los animales domésticos lleve con si una menor cuota de reproducción, a la demuestran que los animales domésticos hoy en dia.

Nosotros no visitamos todo el grupo insular, sinó que seleccionamos islas segun propociones del Dr. Peter Kramer, de acuerdo a las cuales se aclararon los puntos cardinales de la problemática, nosotros hicimos observaciones y reunimos material en las islas Espanola, Floreana, Isabella, James y Santa Cruz.

Apoyo recibió nuestro viaje en forma financiera de parte de la "Deutsche Forschungsgemeinschaft" (Sociedad Científica Alemana), la "Sociedad de Zoología de Frankfurt", la "Escuela Superior de Medicina Veterinaria de Hannover" y de la "Universidad de Kiel". La Fundación Charles Darwin nos dió su ayuda en todo momento, como las mejores recomendaciones; en especial, estamos muy agradecidos a los miembros de la Estación Científica Charles Darwin, bajo dirección del Dr. Peter Kramer.

Animales domésticos que han tomado carácter salvaje están uniformemente distribuidos en todas las islas.

En algunas islas han sido estos expuestos con propósito, en otras es tanto son estos restos de anteriores tentativas de colonización, o de animales domésticos de colonos que han logrado evadir y se han tornado salvajes. Hoy en día es el número animales domésticos, salvajes en las regiones pobladas relativamente pequeño. Estos animales, hoy salvajes, de diversas islas juegan un papel importante como suplementos de alimentación de los habitantes de estas islas. Acciones dirigidas a exterminar estos animales no encuentran apoyo, de parte de los colonos y son criticadas muy seriamente. Es por tanto, que no se deberá pasar por alto problemas sociales, en cuanto haya que tomar medidas en contra de los animales domésticos salvajes. En estos casos habrá que balancear los diferentes puntos de vista. La mayor propagación y el mayor número alcanzan caprinos domésticos salvajes, quizás debido a que estas no son necesariamente dependientes de agua dulce. Sus enemigos acérrimos son perros domésticos salvajes. Vacunos salvajes encontramos es manadas en la isla Isabella. Los terneros son decimados en gran número por perros domésticos salvajes. Cerdos domésticos salvajes se encuentran sobre todo en James en grandes manadas. Estos se reparten sobre todo con las cabras domésticas salvajes en extensas regiones el espacio vital; tienen pero otro ritmo de vida que estas. También en Floreana y en Santa Cruz se cree que hay porcinos domésticos en estado salvaje. En Floreana encontramos bastantes ejemplares de asnos domésticos salvajes. Fuimos informados que en San Christobal también existen ejemplares de los por último nombrados. Perros domésticos salvajes son ya nativos en Isabella, donde viven en grandes manadas. Estos viven aquí sobre todo de terneros recién nacidos leones marinos adolescentes. También en Floreana y Santa Cruz existen según informaciones perros salvajes domésticos. Gatos domésticos salvajes han sido encontrados en algunas islas. Nosotros recibimos material de Floreana, Isabella y de Santa Cruz.

Singularmente se veía que las cabras domésticas salvajes demuestran toda clase de matices en la coloración de su pelaje. Se encuentran casi todas las coloraciones conocidas. Relativamente similar es la forma de los cuernos. En los cabros son estos muy macizos. El comportamiento de las cabras domésticas salvajes es en general igual al de cabras domésticas de cría extensiva. Era sorprendente el rápido contacto que se establecía con cabras juveniles recientemente capturadas. Exámenes anatómicos, como también mediciones de peso de los órganos, así por ejemplo del cerebro, órganos del sentido, corazón, riñones y de glándulas inductorias;

demostraban, que la proporcionalidad de los órganos de cabras domésticas de carácter salvaje de las islas Galápagos no tienen diferencias en cuanto a las europeas. Las cabras serriles tienen una pubertad precoz. Hembras que no tenían más de medio año de edad presentaban ya embriones. Mellizos son casi la regla y trillizos no son muy raros. Debido a que se veían animales juveniles en todas las etapas de adolescencia, es posible declarar que no existe un ritmo estricto reproducción anual. La cuota de propagación es por tanto muy alta. Muy notable era el óptimo aprovechamiento de alimentos; aun en inmediaciones áridas se encontraba animales bien cebados. Fuimos informados sobre capacidad del aprovechamiento de líquido, en forma de agua salada. Los vacunos serriles demostraban también una gran variabilidad de coloraciones, como también de aspecto y apariencia. Existen animales con los matices del uro, así también blancos con manchas, negras, blancos manchas rojas otros de unicoloración. El ganado se presentaba de la misma maneja que en explotaciones extensivas en grupos. Se podía observar grupos grandes vacas con terneros y pocos toros, así como también un par de "aydantes". Algo alejados se encontraban grupos con un mayor número de toros. En sotos permanecían pequeños grupos de vacas, como también animales solos con terneros recién nacidos. Los rebaños son atacados por perros domésticos en estado salvaje, quienes aniquilan un gran número de terneros tiernos y por tanto limitan el número de integrantes del rebaño. No se realizaron estudios anatómicos. El ganado vacuno vive en regiones, que parecen ser pastizales de montañas. Es indudable la contribución de los vacunos a la configuración del panorama. Los puercos domésticos serriles demuestran características de los cerdos serrilexs primitivos del continente sudamericano. Son animales de extremidades extremadamente largas y con cabezas alargadas. Las coloraciones en forma de líneas negras congruentes de la espalda al pecho; algunos animales poseen los colores característicos de los puercos silvestres, otros son negros, otros rojos o rojos con manchas negras, o negros manchados de rojo y blanco. Las medidas de peso demostraron, que la proporcionalidad era en principio la misma, que la de los cerdos domésticos europeos. Los puercos domésticos serriles son general tan solo activos en la vespertinidad. Durante el día duermen en nichos y otras depresiones del terreno. Las camadas tienen un gran número individuos y son independientes de las estaciones. Los lechones recientemente capturados tenían rápido contacto con las personas; caso que según experiencias nuestras hechas con quercos salvajes de igual edad, no sucede igual medida. De principio igual, son las observaciones y verificaciones anatómicas hechas en asnos domésticos serriles. Los diferentes matices de coloración, las proporciones orgánicas y la reproducción demuestran igualdad con las de porrinos europeos domesticados. El Sr. Rodolfo Wittner nos informó, que asnos capturados en su etapa juvenil se domestican muy fácilmente. En Isabella pudimos observar perros domésticos en estado salvaje. Se trata de animales de tamaño mediano, musculosos, que se presentan en todas las coloraciones conocidas de perros domésticos europeos. También en la proporcionalidad orgánica no existen diferencias. Los perros cazan en grupos. También observamos animales solos. Se veían

cachorros de todo tamaño y en gran número. Cachorros capturados recientemente, así como animales juveniles hasta de 1/4 de año tomaban contacto rápido con personas, caso que no tiene comparación con nuestras experiencias entabladas con lobos de una misma edad. Los perros se alimentan sobre todo de vacunos, pero también atacan leoches marinos y otros animales. Los gatos domésticos son iguales a los semejantes de Europa. Debido a la complicada biología de reproducción de los gatos - tanto europeos, como los domesticados en estado silvestre - los cuales no son criados con estrictas premisas zootécnicas, cae muy difícil, hacer limitaciones de comparación en cuanto a los gatos domésticos, que son mantenidos en estado doméstico en las islas Galápagos.

En conclusión, es posible afirmar que los animales domésticos serriles; que en parte hace siglos han tomado carácter salvaje, a pesar de haber existido notables fluctuaciones dinámicas de población en las manadas, debido a decaimientos luego de propagaciones extensas de su especie - de las cuales existen informes -, no han perdido el carácter de animales domésticos. Consecuencias genéticas de población no pueden ser comprobadas. Tampoco se presentan otras variabilidades domésticas en estado salvaje de las islas Galápagos. Las condiciones del medio ambiente han sido por tanto favorables. No existe una selección debida a enemigos naturales. De esta manera ha sido posible, que pequeños contingentes de animales domésticos que todavía tenían su estado primitivo de cría campesina - es decir que no tienen el material genérico fijo - no solo se han mantenido, sino que han llegado a propargarse en tal forma, que se han hecho concurrentes y enemigos de la fauna autóctona de las islas Galápagos. Estos animales trastornan considerablemente el balance biológico. La conservación de estos animales no tendría sentido. Claro que estos hoy en día suplementan la alimentación de los habitantes de las islas Galápagos, los cuales deben enfrentarse a una austera naturaleza para obtener sus medios de subsistencia. El aprovechamiento de los animales domésticos de carácter salvaje por parte de los habitantes no es óptimo. Los animales machos, en especial tratándose de cerdos y cabras, pero también de vacunos, no son aprovechados debido a particularidades desagradables al gusto, por tanto son rechazados. Debido a las condiciones de transportes poco óptimas, sobre todo en las condiciones de transportes poco óptimas, sobre todo en la maleza, no es aprovechado todo el animal, de manera que tan solo las mejores porciones alcanzan su destino. Es por esto que también desde el punto de vista biológico, la renta de los alimentos naturales es ínfima. Estos naturales ya han sido sustraídos a la naturaleza y tanto a la fauna autóctona.

Algunos colonos capturan los animales machos, por ejemplo verracos y los castran. Estos son luego devueltos a la naturaleza; estos sin embargo agotan los medios naturales y no es seguro que los mismos vuelvan a ser capturados. Debido a todos estos hechos deberá ser primaria la protección de la flora y fauna autóctona, ya que existe un interés mundial en salvar estas unidades biológicas en su forma original. Un turismo bien planeado, que fomente y ayude a apoyar este interés ofrece mucho mejores recaudaciones para los habitantes, que lo que ofrecen los animales domésticos

en estado silvestre. Es por esto que es aconsejable exterminar a estos animales, pero si, deberá ser una exterminación total. La realización de este proyecto no sería nada fácil, debido al escabroso terreno, sobre todo en el interior de las islas. Los animales son además mucho más ágiles que los cazadores y encontrarían muchos escondrijos. No sería aceptable dar un solo tiro incontrolado. Una lucha en contra de los nambrados animales en la cual este establecido el número de disparos, que un cazador deberá dar no tendra gran éxito. Se deberá por lo menos dar en estos casos siertas reglas, como ser que los disparos certeros sean comprobados por partes del cuerpo, como ser las 2 orejas. Nos parece que una lucha en masa tendria mucho éxito, aunque esta sea quizas mas costosa, estas deberian continuar durante un tiempo para luego ser trabajo de cazadores individuales. Es naturalmente también posible dejar las manadas que los animales domésticos de carácter salvaje se sigan propagando, en la creencia de que en un futuro próximo debido a su rápida reproducción lleguen a un colapso de población, mediante el cual por un tiempo determindando los danos causados serian pequenos; pero no se debe olvidar que en casos de total colapso de población, los danos son muy grandes y llevarian consigo la perdida o por lo menos una cierta decimacion de la población autoctona y originaria. Es por esto que conviene como solución la eliminacion de los animales no originarios, para asi poder manteer el balanze biológico original de las islas Galápagos. El ganado vacuno serril debera también ser ofrendado, debido a que las ganancias que esta especie ofrece, no tiene comparación con los cambios naturales que llega a establecer.

NEWS FROM THE CHARLES DARWIN RESEARCH STATION, GALAPAGOS

Conservation and Scientific Report - March 1972.

A NEW BASIS FOR THE CONSERVATION PROGRAMMES OF THE NATIONAL PARK SERVICE

The range and effectiveness of the conservational work of the Park Service's greatly increased recently by a series of accomplishments :

- The Ecuadorian Government published a national park law (Executive Decree N°1306) which gives an outline of the regulations the Ministry of Production will publish for the Galapagos National Park. The law provides for the post of an intendant of the National Park Service, who will direct all activities of this institution. Ing. agr. Jaime Torres has been nominated to this post. Furthermore, the law deals with the activities of visitors to the National Park and it establishes an entrance fee.
- The Ecuadorian Government released through the Forestry Service 115.000 Sucres as a first allotment toward the construction of the new headquarters building of the Galapagos National Park Service. This building will be constructed by the Park Service in Academy Bay.
- Financial support by the World Wildlife Fund, the Zoological Society of Frankfurt, the San Diego Zoological Society and many private donators has greatly increased the possibilities for activity of the National Park Service. The programmes concentrate on the control of introduced mammals, protection of breeding areas of the tortoises and breeding and raising of endangered tortoise subspecies under controlled conditions.

Expansion of this urgent conservational work has been undertaken relying on the continued support of a great number of conservationists from all parts of the world in the forthcoming years.

RAISING AND REPATRIATION OF TORTOISES

September to March is the time when special attention is given to this programme. Nesting areas are surveyed, eggs are brought to the raising center and young from the raising center to their home island. Of the eleven surviving subspecies of the Galapagos Tortoise seven are presently bred, raised or procted with special care by the Park Service :

- After years of searching the Park service was now successful in discovering the area where the surviving females of the San Cristobal Tortoise (G.e. chathanensis) build nests and lay eggs. In December

16 eggs were taken from the few nests that had not been destroyed by feral dogs and brought to the raising center on Santa Cruz for hatching.

- The breeding group of Santa Cruz Tortoises (G.e. porteri) kept at the raising center has produced a number of eggs, as in previous years. The young are hatching presently.

- Another 52 young Pinzon Tortoises (G.e. ehippium) have been reintroduced in their home island. They were distributed to three different areas of the Island. During the same visit all 20 animals released in December 1970 were checked. They are in fine condition and have grown considerably during the first year spent on their home island.

Soon the Pinzon population will be enlarged by one adult female G.e. ehippium which is coming back to its native grounds after a 43 year visit to New York. It had been taken from Pinzon by animal collectors in 1928 and has now been sent back by the New York Zoological Society in order to strengthen the efforts to preserve the various subspecies of the Galapagos Tortoise.

- The Santiago Tortoise (G.e. darwini) is included in the raising programme for the second time this year. Presently young are hatching from eggs that were brought from Santiago in December. National Park wardens have observed that also on the native nesting grounds young are hatching now. Because of the pigs few of these hatchlings will survive. But the fact that some eggs reach the hatching stage at all may indicate that the control of pigs on Santiago during the last two years has had an effect on the survival rate of the tortoises.

- Special emphasis has been given during the last year to investigations on the status of the tortoises of Southern Isabela. It is believed that the scarcity of tortoises on Sierra Negra is mainly due to killing by settlers in the past. But in the very restricted area where the last animals of this subspecies occur now there seems to be no immediate threat to them or to their offspring. According to recent observations, reproduction does not seem to be limited by introduced mammals in this area. This population and its breeding grounds are patrolled and protected with special care by the wardens stationed in Isabela.

- On Cerro Azul reproduction is almost totally impeded by feral dogs. Recently small tortoises have been found on this vulcano that were crippled by dogs trying to crush their carapace. At the raising center young from two locations on Cerro Azul are presently hatching.

- The breeding group of the almost extinct Espanola Tortoise (G.e. hoodensis) has been increased recently by one female, which was brought from its native island to the raising center. The posterior slope of its carapace is covered with lichens, and indication that it has not reproduced for decades. This brings the total to ten females and one male. Last years offspring, 19 out of 20 that hatched, is in good condition. We are anxious to see what the result will be this year; several young hatched from the 42 eggs which are stored in the incubator.

A greater number of tortoises calls for additional raising facilities. Close to the tortoise house ten additional pens for small tortoises are being completed presently. The pens inside the tortoise house have been enlarged by outside "Balconies", which give the animals more access to sunlight.

THE STRUGGLE TO CONTROL INTRODUCED MAMMALS

In the past months goat control has been continued on Espanola, pig control on Santiago and dog control on Cerro Azul. The latter is being done only in conjunction with surveys of the tortoise areas on this vulcano. It is not believed that shooting has a great effect on the feral dog population. Other possibilities should be investigated soon. The dogs on Cerro Azul live mainly on cattle in the higher parts of the vulcano, but predate heavily on marine iguanas, sea lions and possibly sea birds in the coastal zones.

The extermination of goats on Santa Fe and a higher number of staff encouraged the National Park Service to tackle one of the most pressing problems in mammal control on Galapagos ; the goats on Pinta. They have been introduced to this island in the fifties and exploded in roughly fifteen years to an estimated 12 - 20.000 animals which have destroyed vast parts of the vegetation right up to the summit where a unique type of highland forest was to be found. It is believed that this destruction is not irreversible since it mainly took place in recent years and the soil coveris not affected yet.

The extension and intensification of these programmes calls for continued financial support.

TORTOISES ON PINTA

While shooting goats on Pinta, the Park Service employees rediscovered G.e. abindoni, which was believed to be extinct. Tracks of two or three animals have been seen in different parts of the island and later one middlesized animal has been found. There is hope that both sexes still survive. Like in the case of G.e. hoodensis the appropriate policy will be to collect the remaining scattered animals and try to breed them under controlled conditions on Santa Cruz.

HOW IS GALAPAGOS WILDLIFE AFFECTED BY THE INTRODUCED MAMMALS

The World Wildlife Fund is supporting a project which is aimed at a better understanding of the destructive influences of introduced grazers and predators on the native ecosystems. Every component of this research is being combined with conservational action. Knowledge

acquired through these investigations will directly improve conservational techniques. During this year a major part of this project is carried through by Mr. Ole Hamann, Unesco Associate Expert in Ecology applied to Wildlife Conservation, assigned to the Charles Darwin Research Station. Mr. Hamann, a plant ecologist, will specifically document the influences of grazers on plant communities.

THE TORTOISE SUBSPECIES OF THE VULCANOS WOLF AND DARWIN

The two northern vulcanos of Isabela have been visited in September. It has been found that tortoises are occasionally still slaughtered in those areas, where they come down close to the shore. Carcasses of animals that had been broken up with axes or machetes not more than one year ago have been recorded.

THIRD NATURAL HISTORY AND CONSERVATION COURSE FOR TEACHERS WORKING IN GALAPAGOS

In late October and early November 40 teachers from primary and secondary schools on Galapagos took part in a course of lectures, demonstrations and excursions in the field of general biology and geology and their special relation to the Galapagos Archipelago. Part of the course was dedicated entirely to discussions on the quality of human environment, to the concept of National Parks, and to the Galapagos National Park and its particular conservational problems.

BIOLOGY TEACHING IN SCHOOL

Miss Nancy Jo, scientific assistant at the Darwin Station, has taken over biology classes at the local high school during the last year. We believe that promotion of biological education has a high priority and that conservation of the wilderness areas left in the Galapagos depends in the long run on the understanding and initiative of the inhabitants. The Charles Darwin Station plans to offer its services to schools on Galapagos as far as its very limited staff can possibly find the time for it. Miss Jo's biology classes are being followed up by a special vacation course for high school students interested in getting acquainted with the work of the Galapagos National Park Service. The students have a chance to accompany the Park wardens on their field trips to various islands.

THE DELIMITATION OF THE NATIONAL PARK

In June the Ecuadorian Government has taken decisive steps to defend the delimitation between the National Park and the agricultural area in the Islands. These boundaries had been drawn on San Cristobal, Santa Cruz and Isabela by the Ecuadorian Institute for Land Reform and Colonization in the years 1968-1971.

Traditionally settlers that came to Galapagos went up to the highlands, looked for a piece of land that was not occupied by anybody else yet and started clearing it with the machete. In these last years the customary way to let people know that some piece of land is claimed was the establishment of a fence around it. The more barbed wire one could afford the more land one could claim.

Already in 1968, after the limits were drawn, some settlers started to cut, burn and plant grass within the last undisturbed Scalesia forest areas on Santa Cruz, which belong to the National Park area. At that time it was not possible to stop this development. Recently there was a total of 15 farmers involved in this spreading.

Only in recent decades have we started to understand that not all land on this earth that seems suitable for agriculture and cattle-raising should be used for these purposes. Some land can be used for these purposes only for a limited time and then remains sterile, some other land from the beginning is too valuable to be used for these purposes and should be kept in its virgin state. Galapagos definitely belong to this latter category. But the idea that it is most profitable in the long run to leave land as it is, always has been difficult to understand, particularly for industrious farmers.

The Ecuadorian Government has demonstrated that it is determined to preserve the unsettled areas of Galapagos in its original state as a National Park and not to tolerate any transgression of the Park boundaries. This is expressed in the National Park laws of 1959 and of 1971. In the latter it says : "The National Park areas may not be utilized for agriculture, cattled-raising, forestry, hunting, mining, fishing or colonization. They are to be utilized only for touristic and scientific purposes".

In June action was taken in favor of the integrity of the Park. The Ecuadorian Institute for Land Reform and Colonization finished the process of registering and surveying all legal claims of land within the colonization areas of Santa Cruz. Subsequently a special delegation from the Land Reform Institute came to Galapagos in order to solve once and for all the proplem of illegal land claiming within the Park. All 15 farmers have been ordered to leave. They are given financial help for settling elsewhere, proportionately to the investment they had made. Several families decided to leave Galapagos and to join colonization projects in other parts of the country.

The National Park Service consequently will have to decide on the best methods to confine and push back the grass that has been introduced to these areas, particularly the elephant grass (Pennisetum purpureum).

Problems were not nearly as difficult in other areas examined by the delegation. On Isabela the boundaries have been pointed out clearly to the settlers and they are not violated, on San Cristobal the National Park area consists only of the north-eastern arid parts of the island which are of no interest to farmers and cattle-men.

TORTOISE CONSERVATION IN THE FIELD AND UNDER CONTROLLED CONDITIONS

There is more hope than ever that the slow but steady decline of the number of tortoises on Santa Cruz can be stopped. Reproduction had been severely cut down in this subspecies since domestic pigs were turned loose on this island about 45 years ago. The control of pigs therefore has high priority on Santa Cruz. Constant hunting by the settlers and the Park Wardens has brought down the numbers considerably in the last years. But we made the experience that only one single pig may destroy a great part of a years egg production. Therefore all nests are protected by temporary rock walls to keep the pigs from digging out the eggs. The rocks are removed again when the young hatch. This twofold protection effort this year led to the most successful hatching season ever observed. 115 nests were protected with rock walls and close to 700 young tortoises hatched. These hatchlings of course subsequently still are very seriously endangered by the pigs. But we are confident that a considerable proportion will survive. No particular efforts are made any more to breed this subspecies under controlled conditions. But the few large animals that still remain in one of the perns regularly reproduce.

The National Park Wardens found that the reproduction of tortoises on Cerro Azul is severely limited by pigs in the area of San Pedro and by dogs in the areas of Las Tablas and Iguana Cove. Nests were protected with temporary rock walls in San Pedro the first time this year. In Las Tablas the dogs do not dig out the eggs, but they kill the majority of the young after hatching.

On San Cristobal the dogs got the habit of digging out the tortoise eggs. In this season the wardens tried to protect the nests from the dogs with rock walls, but this did not keep them away. The few eggs the dogs left were taken to Santa Cruz for hatching. But it turned out that they had been laid very late in the season and were damaged by the transport. Only one young hatched. Normally eggs should be transported as shortly before hatching as possible in order to avoid damage to the embryo. We learned from this that on San Cristobal the dogs can be kept away from the tortoise eggs only with wire netting and we shall act accordingly next season.

On Pinta the Park Wardens found one large good looking G.e. abingdoni and they brought it to the Tortoise Raising Center on Santa Cruz. They are now searching for a mate. If it is found, there is a chance of survival for this subspecies.

The following numbers of hatchlings from the breeding season 1971/72 are presently kept at the Tortoise Raising Center :

<u>Subspecies</u>	<u>Number</u>
Santa Cruz	6
San Cristobal	1
Santiago	20
Espanola	6
Cerro Azul	28
Pinzon	23

BEAGLE III NOW UNDER ECUADORIAN FLAG

The Ecuadorian Defense Minister, other high governmental officials and the Ambassadors and Consuls of various countries were present when the Darwin Station's new research vessel was changed over from British to Ecuadorian registry on 29th March. The event was widely published in Ecuador by the press and by television.

THE ART TO ESTIMATE NUMBERS OF GOATS

It is a well known fact that exotic animals, once they are introduced to a favorable environment, will build up tremendous population. If there is no other factor controlling them, food scarcity will bring the population to a crash, as soon as the resources are depleted. By that time the indigenous ecosystem will be seriously damaged.

The goats on Galapagos are one of many cases of this kind of destruction. We are experienced a horrible example on Pinta, where the goats have been introduced only 15 years ago. In the last issue of this bulletin we published an estimate of 12-20.000 goats, which we thought lived there at the end of 1971. Readers who are not acquainted with this kind of phenomenon may have thought that this is an incredibly high number. Professionals who may know the difficulty of such estimates in an environment like Galapagos probably were sceptical. They have good reason to be sceptical, if the estimate is not based on careful long term surveys involving marking of animals and observation of all parts of the population.

Our estimate was just a rough guess. In the last eight months three visits have been made to Pinta and we carefully estimate now that the number of goats on this island at the end of 1971 was not below 20.000. It is below that number now after the elimination of

a great part of the population by the National Park Service. But the Park Service will have to return again and again in order to bring the goats at least close to extermination.

TOURISM AND CONSERVATION

The World Wildlife Fund is presently financing a long term project with the aim to detect as early as possible any influence on Galapagos wildlife which may be due to the increasing flow of tourists to the Archipelago.

Of course everybody agrees that one of the functions of a National Park is to serve as a center for scientific and educational enlightenment and that it therefore should be wide open to the public. But we have experienced in other National Parks of the world that badly controlled tourism and sometimes the sheer number of visitors may lead to the deterioration of those areas that attract people in the first place. Galapagos no doubt is one of the most valuable National Parks of this world, a capital jewel so to speak. Therefore a great number of scientists and conservationists were alarmed when they heard about the increasing numbers of tourists visiting the Islands.

Under this WWF project the areas that are most visited are checked regularly for signs of the tourists. So far the general impression is that the disturbances by visitors are limited. In some areas, where it almost was expected that visitors would influence wildlife negatively, like Punta Suarez, Punta Espinosa and Plazas, there was no change detected in these first years, except some trampling of vegetation in very limited areas. Some animal species became extremely tame, like the Blue-footed boobies on Punta Suarez and the Land Iguanas on Plazas.

But there is one type of environment that seems to be susceptible to this kind of influence : the colonies of tree- and bush-breeding seabirds. Dr. M.P. Harris was the first one to point out half a year ago that the number of breeding Frigate-birds and Red-footed Boobies on Genovesa and of Frigate-birds on Seymour had decreased in the last years specifically in those areas that were most visited.

We have observed tourists and have seen what happens : in order to fill the frame of their view-finder with the pouch of a Frigate-bird, they may walk clear through the colony, chasing up breeding birds right and left. In these instances a man with a camera may be just as destructive as a man with a gun. The scared parent often knocks the egg or small young off the nest when leaving. On the ground the egg or young is lost. If it does not fall, the sun may kill it. Moreover, an unoccupied nest immediately serves as a source of nest-building material to other Frigates who come swooping down and rip the nest apart in a matter of minutes. But also just chasing up non-breeding birds may have an effect. They subsequently abandon

the area and will not breed there. All this leads to thinning out of the colonies and destruction of the very features the visitors came for in the first place.

As a rule of thumb it was established that Frigates on Seymour should never be approached closer than 40 m (130 feet) and Frigates and Boobies on Tower not closer than 6 m (20 feet). But this will be followed only under strict supervision. The National Park Service is presently working out systems to guarantee the observance of these rules.

The following scientific missions completed their work and left the Station in the months from March to June 1972 :

Mr. Daniel Weber, Avenue du Premier Mars N°24, CH 2000 NEUCHATEL, Switzerland : Ecology and systematics of the Galapagos orchids. In the course of the six years which Mr. Weber spent on Galapagos he assisted the Station and the National Park Service in many ways : He expanded the Station's herbarium considerably, he designed a series of buildings and he made new maps of southern Isabela and Santa Cruz. He left on 7 March.

Sr. Hipolito Ronquillo Sanchez, Facultad de Ciencias Naturales, Universidad de Guayaquil, GUAYAQUIL, Ecuador : Breeding density and breeding behaviour of Frigate-birds and Boobies on Genovesa. Was killed in an accident on 16 March.

Sr. Manuel Cruz Padilla, Facultad de Ciencias Naturales, Universidad de Guayaquil, GUAYAQUIL, Ecuador : Food ecology of goats. Left on 28 April.

Dr. M.P. Kahl, 661 Rudder Road, Naples, Fla. 33940, U.S.A. : Survey of the Flamingos on Galapagos. Left on 4 April.

Second Galapagos cruise of R/V Searcher. Scientific Directors :

Dr. John W. Wright, Curator, Section of Herpetology, Los Angeles County Museum of Natural History, 900 Exposition Boulevard, Los Angeles, Cal. 90007, U.S.A., and Dr. James L. Patton, Assistant Curator of Mammals, Museum of Vertebrate Zoology, University of California, 2593 Life Science Building, Berkeley, Cal. 94720, U.S.A. : Evolution and Biogeography of lizards and mammals of Galapagos, ecology of Galapagos ants, distribution and systematics of members of the Phylum Tardigrada. Left the Archipelago on 30 April. The research-vessel was destroyed completely by a fire and sank shortly after leaving Galapagos. There were no casualties. All scientific material, including all notes, was lost.

Dr. Peter C.H. Pritchard, Zoology Dept., University of Florida,
Gainesville, Fla. 32601, U.S.A. : Population study of the Pacific
Green Turtle. Left on 2 May.

Drs. R.I. Bowman and N. Cohen, California University, San Francisco,
1600 Holloway Avenue, San Francisco, Cal. 94132, U.S.A. : Experiment
on food selection of Darwin's Finches. Left 16 June.

Wiggins, Ira L. & Porter, Duncan M. (1971) - Flora of the Galapagos.
Stanford, California : Stanford University Press - 998 pp., \$ US. 37,50.

This is a remarkable book covering an area that has needed much more comprehensive treatment than it has hitherto received. It will be particularly useful to students of ecology, and will assist in many of the conservation programmes now planned or under way in the islands.

The book falls into two parts : a lengthy and useful introduction; and the main bulk which is devoted to the descriptions of the plants, including the ferns. An excellent glossary of botanical terms, more than 200 literature references, and a superb index complete the work.

The introduction describes the area studied - 45 islands and rocks and groups of islands (more than 3000 m² in surface area) that comprise a total area of 7856 km². Both the English and Spanish names of all the islands are given and their major characteristics are described. There is a section on the settlement pattern of the few inhabited islands, but some comments are unnecessary - and sometimes unqualified. For example on p.7 : "(San Cristobal) island has perhaps the greatest agricultural potential of all the islands in the group, for the soil is good and the lake at EL Junco (the Place of the Sedges) might support limited irrigation if careful schedules for its use are developed". Even though employed 'in passing' such statements may have dangerous consequences. Have the authors considered alternative uses for the islands, some which do not involve agricultural expansion and might contribute much more to the welfare of the local people, Ecuador and the cause of science, education and even economic growth ? For instance, those based on carefully regulated tourism ? Obviously such loaded commentaries, applied to areas where conflicts of land-use are prevalent, should not be made or repeated by scientists for a field that is not their own.

Short sections on physiography, climate and soil, lead to the main part of the introduction, the broad description of the vegetation of the area complemented by 96 colour photographs, some of them landscapes and animals. The photographs are beautiful, but some of the captions are clearly incorrect. Plate 3, for example, shows the view one has of the Charles Darwin Station (on the right) near Puerto Ayora on Santa Cruz, and not Wreck Bay, San Cristobal. In Plate 26, referred to in the text (p.277) as illustrating Avicennia germinans, it is not clear which this species is.

The authors divide the islands into six vegetation zones, of which the last five are principally climatically determined : littoral, arid, transition, Scalesia, Miconia, and fern sedge.

A brief section on the fauna is included. It might have been improved by deleting sentences such as "They (the land iguanas Conolophus) move more rapidly than the marine iguanas, and were not observed swimming by any of our groups in either 1964 or 1967".

The threat from feral animals is correctly stated; in fact important action has been taken in the last few years by the Charles Darwin Foundation, largely due to World Wildlife Fund support. A very useful section on the history of botanical collections and the arrangement of the work, as well as, the names of the specialists who contributed, completes this remarkable introduction of 52 pages.

The systematic treatment is detailed, with keys to the families, genera and species, and handsomely complemented by drawings as well as selected distribution maps. One may wonder why balsa Ochroma pyramidale, a tree introduced not long ago in Santa Cruz, was honoured with a distribution map. Unfortunately, local common names have been completely ignored.

It should be noted that out of a total of 702 taxa, including 60 subspecies and varieties and 77 recently introduced taxa "that have escaped from cultivation and are reproducing themselves spontaneously", 228 or 32,5 % are endemic. It is of course this high percentage of endemism which makes the Galapagos Islands so unique. The authors themselves are responsible for 42 new records.

The basic groundwork has now been laid for a variety of derived studies, one of which must surely be a bilingual popular illustrated pocket-book on the most common plants of the Galapagos with, hopefully, some notes on their relationship with the unique fauna.

Reviewed by Gerardo Budowski, Director General, International Union for Conservation of Nature and Natural Resources (IUCN), 1110 Morges, Switzerland.

Roger Perry. - The Galapagos Islands. Dodd, Mead and Co. New York, 1972, 92 pp., photos, 1 carte. US. \$ 4.00.

On saura gré à Roger Perry, qui fut Directeur de la Station Charles Darwin pendant une période cruciale, d'avoir rédigé cette très attrayante introduction au monde des Galapagos. La chronologie historique en a fourni le plan. L'auteur évoque d'abord la formation géologique de l'archipel, qu'il suit jusqu'à l'époque contemporaine, décrivant notamment l'effondrement de la caldera de Fernandina en juin 1968 dont il fut le témoin. Puis il rappelle la manière dont s'est effectuée la colonisation par les plantes et les animaux, ce qui lui permet de décrire les espèces les plus marquantes. Les chapitres suivants sont consacrés à l'action de l'homme, depuis le temps des boucaniers, corsaires et autres pirates jusqu'à celui des colons actuels. Il retrace ensuite le développement du mouvement de conservation ainsi que le principal des activités des responsables équatoriens et des membres de la Fondation. Ce raccourci permet de mesurer l'étendue des progrès réalisés grâce à la collaboration internationale, l'établissement du parc national en étant un des grands achèvements.

Ce petit ouvrage, illustré avec beaucoup de discernement, est destiné au grand public auquel il apporte une information claire et très vivante, basée sur les recherches menées récemment à la station. Ceux qui connaissent les Galapagos le liront avec plaisir car ils y retrouveront l'ambiance si particulière de ces îles. En en prenant connaissance, j'ai éprouvé le même plaisir que quand je parcourais les pentes des volcans ou naviguais d'une île à l'autre en compagnie de l'auteur dont ce livre reflète la science et l'humour.

Jean DORST.

FUNDACION CHARLES DARWIN PARA LAS ISLAS GALAPAGOS
CHARLES DARWIN FOUNDATION FOR THE GALAPAGOS ISLANDS
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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 Galapagos 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 Galapagos 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.