

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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- N é c r o l o g i e -

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Jacques LARUELLE

1928 - 1967

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C'est avec stupeur que nous avons appris la mort accidentelle de notre ami Jacques Laruelle, survenue le 22 novembre 1967 au cours d'une mission au Liban.

Beaucoup d'entre nous avaient eu l'occasion de le revoir à Paris au début de novembre lors de la séance de notre Conseil exécutif. Il nous avait fait part de ses projets de voyage et avait travaillé comme à l'accoutumée pour le succès de la session. Puis il était parti vers le pays où il devait rencontrer la mort.

J'avoue que je n'ai pu tout d'abord croire à un sort si injuste. Et comme tous les membres de notre Fondation, j'en ai été très profondément et douloureusement peiné.

Il est presque inutile de rappeler ici ce que notre Fondation lui doit. Notre regretté Président Victor Van Straelen l'avait attiré vers notre institution, souhaitant que ce jeune et brillant pédologue belge soit chargé d'une mission aux Galapagos dont les sols, jamais étudiés, fascinaient son esprit inquisiteur. C'est ainsi que je fis la connaissance de Jacques Laruelle, qui rapporta de deux expéditions une moisson de faits nouveaux d'un intérêt capital en vue de la compréhension de la genèse des sols sous le climat particulier des Galapagos, et aussi en vue d'un aménagement futur de ces îles.

Puis sur l'insistance de Mr Van Straelen et de moi-même, il accepta des charges administratives au sein de la Fondation dont il devenait Secrétaire général en novembre 1963. Il ne devait quitter ses fonctions qu'en avril 1967, en raison d'occupations sans cesse plus astreignantes. Son activité cependant ne devait guère se ralentir, car il continua comme par le passé à s'occuper des affaires relevant du Siège, de la publication des Noticias de Galapagos et de multiples autres questions. Notre Conseil venait de projeter une réorganisation administrative de la Fondation pour redonner vie au Comité directeur, jadis si opérant, Jacques Laruelle devait y jouer un rôle essentiel.

Notre Fondation doit beaucoup à ce scientifique doublé d'un administrateur, circonstance rare dans nos institutions. Il savait s'attacher aux plus petits détails, mais les replaçait toujours dans leur cadre général. Travailleur acharné, dévoué à notre cause, il passait un temps considérable à la rédaction de rapports, à la correspondance, et envoyait conseils et instructions à ceux qui projetaient une mission à notre Station. Simultanément il préparait budgets et bilans et menait cette tâche à bien dans les plus brefs délais en dépit des difficultés à collationner des comptes

tenus aux Galapagos, aux Etats Unis et à Bruxelles. Econome de nos fonds, je crois encore l'entendre suggérer des économies, obtenir satisfaction et s'en réjouir, ayant si habilement manoeuvré que l'épargne réalisé ne nuisait en rien aux résultats pratiques obtenus.

Mais son oeuvre dans le cadre de notre Fondation ne représentait qu'une partie de ses activités. Jacques Laruelle était au début d'une carrière déjà brillante. Né à Anvers le 11 novembre 1928, il fait ses études à la Faculté des Sciences de l'Université de Gand où il obtient sa licence ès Sciences géologiques et minéralogiques en 1951; aspirant au Fonds national de la Recherche scientifique en 1953-55, il est chargé en 1955-56, d'une mission au Congo en vue d'une étude de la micromorphologie et la pétrographie des sols, notamment ceux du Parc national de la Garamba. Son doctorat ès sciences géologiques et minéralogiques, soutenu en 1958, porte sur une étude pédologique des sols de Belgique. Il repart la même année pour le Congo en vue d'étudier les sols des Parcs nationaux de la Kagera et Albert. Il supplée le Professeur Hacquaert dans son cours de minéralogie, pétrographie et géologie générale dès 1960, puis il est nommé Professeur associé au Laboratoire de Géologie générale et de Pétrographie de l'Université de Gand. Il vient souvent à Paris pour des réunions à l'Office de la Recherche Scientifique et Technique Outre-mer, dont il est conseiller pour la micromorphologie des sols, et bien entendu met ces voyages à profit pour le plus grand bien de la Fondation. Il nous représente au XIe Congrès scientifique du Pacifique à Tokyo en 1966. Enseignement, voyages et travaux administratifs ne l'empêchent pas de publier de nombreux mémoires et articles, la plupart en français, quelques uns en flamand ou en anglais. Il a à son actif un excellent ouvrage récent sur les Galapagos, où il présente les Iles et leur structure, résume les travaux modernes de multiples disciplines et expose ses propres conceptions d'une manière originale et synthétique.

La mort de Jacques Laruelle est une perte très dure pour notre Fondation. Scientifique de grand mérite, administrateur de classe, esprit clair et méthodique, il était aussi un homme de coeur. Il voyait vite et juste, et nous pouvions compter sur lui en toutes occasions. Nous perdons en lui un de ceux sur lesquels reposait notre édifice.

J'entretenais avec Jacques Laruelle des rapports presque quotidiens. Simplement professionnels, ils devinrent rapidement amicaux. Le travail terminé, nos rencontres se poursuivaient par des entretiens sur des thèmes variés où l'on appréciait autant l'étendue de ses connaissances que le charme de sa conversation. Je perds un ami et je suis, comme tous ceux qui l'ont approché, affligé de cette disparition soudaine.

Au nom de notre Fondation, je voudrais assurer Madame Laruelle et sa famille de la douloureuse sympathie de tous ceux qui ont connu Jacques Laruelle et oeuvré à ses côtés.

Jean DORST.

## THE RESEARCH VESSEL "BEAGLE" II"

by

T.E. BARLOW,  
Secretary-General.

In previous issues of Noticias it has been possible to report on the full and invaluable use to which "Beagle II" has been put during the years in which she served the Station. Now it is necessary to report with great regret that we have had to dispose of her.

"Beagle II" had come to mean a great deal to the Station, and indeed to the whole Galapagos island group. Her presence in Academy Bay, or the sight of her transporting scientific expeditions to the scattered islands of the archipelago were visible symbols of the Station's growing importance. She opened up a new field for its activities, and she was in constant demand for passages and trips of many kinds.

It was therefore with dismay that we found her condition beginning to deteriorate, despite all that her Captain and crew could do to carry out repairs. Facilities for ship repairs in Santa Cruz are, to put it mildly, rather rudimentary. There is only one beach where a ship the size of the Beagle can be drawn out of the water, and the operation has to be done on the right tide. At the same time visiting scientists only have a limited time at their disposal in the Islands, and it is important to have transport available when it is needed. It can therefore easily be understood how maintenance was difficult, if not often impossible, to keep up to date.

A survey of her hull last summer showed that Teredo had taken a firm hold. Such repairs as were possible were undertaken to keep her seaworthy but by August she had to be confined to the waters around Academy Bay. When the President of the Foundation visited the Station in August he consulted with the Director and Mr Bernard Schreier, her Captain, and decided that it would be unsafe and dangerous to employ her any longer on the Station's business. She was making water at an alarming rate, even in harbour, and it was clear that she could not safely carry passengers between the islands. It had to be conceded that the sea, old age and the marine worm had won. Orders were given to dismantle her and sink the hull at sea. This was done in September.

"Beagle II" arrived at Santa Cruz on 7th May 1964, after a 5 month passage from England. She was originally a Cornish lugger, built at Looe in Cornwall in 1922 and called the "Swift". For forty years she fished the south and east coasts of England; during the 1939-45 war she was taken into naval service as a patrol boat. She could therefore fairly be called a veteran when she came into the Foundation's possession.

Between May 1964 and August 1967 she undertook 130 journeys for the Station, and in fact spent more than half of those three years and three months at sea. It took a very high standard of seamanship on the part of her crew to achieve this. She enabled the work of the Station to be spread to the whole archipelago. Scientists were taken to every island they wished to visit. The ship with the Tortoise ensign quickly came to be recognised as clear evidence that the Station was in business in the islands. It was a real tragedy that she could not stand the conditions and the arduous operations. Her loss is a serious blow to the Station's activities. "Beagle II" will be remembered affectionately by many scientists and visitors of many countries who travelled in her. Her replacement is urgent.

It would be appropriate also at this stage to note the debt which the Foundation owes to the men who sailed the ship for us; to Roger Jameson and his crew who fitted her out and brought her to Santa Cruz; to Carl Angemeyer, her first Captain, and to Bernard Schreier who took over the command in September 1966 and to all her crew throughout these three years.

We have plans in a fairly advanced state for a new Research vessel; one which will be built to our specifications, and taking advantage of the lessons we learnt with "Beagle II". It will be a costly affair, but it is essential for the work of the Station. We shall need all the support we can get, both financial and moral, if we are to have the Tortoise ensign flying at sea again.

## "THE ENCHANTED ISLES"

Anglia Television, an English company which makes a speciality of fine films about wildlife under a general heading "Survival", has produced one on the Galapagos Islands called "The Enchanted Isles". Alan Root was the photographer, and the results which he and his wife have produced give probably the most revealing and intimate picture of the Galapagos scene which has yet been made on film.

The commentary is spoken by H.R.H. the Duke of Edinburgh.

The film had its first showing in London on 27th November 1967 before Her Majesty Queen Elizabeth and Prince Philip. The President and Senor Jaramillo were amongst the members of the Foundation who were present.

Mr Aubrey Buxton and Sir Robert Adeane had gone to great lengths to attract support for the occasion. It was decided that the showing should be given in aid of the Stations new Research Vessel, and thanks to their efforts, and the work of the Committee which they set up to handle the matter, they were able to present the Foundation with a sum of over £ 10,000 towards the boat.

The Foundation appreciates fully how much the cause of Conservation in the Galapagos owes to the interest which His Royal Highness has taken in the islands' wildlife, and in our Research Station. We are very grateful and hope we can show our appreciation by increased activity.

We are most grateful, too to Mr Buxton and Sir Robert Adeane for enriching the Foundation by such a considerable addition to our funds.



UNA EXCURSION DE LA ESCUELA POLITECNICA DE GUAYAQUIL  
A LAS ISLAS GALAPAGOS

por

Dr. Marcelo E. DENAEYER,  
de la Real Academia de Ultramar (Bélgica),  
Profesor emérito de la Universidad de Bruselas.

Contratado para cumplir en el verano de 1.967 una misión de enseñanza de la Petrografía y de la Volcanología en el Ecuador, el que suscribe tenía el propósito de ilustrar sus lecciones con una visita al Archipiélago de Colón.

El Comité Ejecutivo de la Fundación Charles Darwin le había manifestado con una gran amabilidad su aprobación, en su sesión del 11 de Abril de 1.967. El autor queda muy agradecido del acogimiento que le han reservado con este motivo el Presidente de la Fundación, profesor Jean Dorst, y su Secretario General, profesor Jacques Laruelle.

Ha sido durante su estancia en la Escuela Superior Politécnica del Litoral de Guayaquil que este proyecto se ha formalizado, gracias al sumo interés manifestado por el entonces Director de la Escuela y Director del Departamento de Geología, Minas y Petróleos, el Ingeniero Sergio Aguayo. Para realizarlo económicamente, el Director obtuvo de la Comandancia General de Marina y por la amabilísima mediación del Comandante Ingeniero Guillermo Albán, profesor de la Escuela Politécnica, la autorización de viajar a bordo del BAE Tarqui en ocasión de uno de sus cruceros logísticos.

La expedición estaba compuesta de cuatro profesores de la Escuela : el Ingeniero Sergio Aguayo, el Doctor Jorge Kraglievich, geólogo, el Ingeniero-geólogo Pierre Allard (Nancy), el que suscribe (Bruselas) acompañado de su esposa, Señora Fernández Aguilar de Denaeyer y ocho alumnos de Quinto y Sexto años del Departamento de Geología, Minas y Petróleos. Durante el viaje se habían agregado a nuestro grupo dos jóvenes científicos franceses : la señorita Marie France de Kerledec, microbióloga (Paris) y el señor René Bodmer, geofísico (Berkeley, California).

Nuestro crucero partió de Guayaquil el 25 de Agosto y se terminará mañana 7 de Septiembre. Aprovechando las escalas del Tarqui en las islas de San Cristóbal, Floreana, Isabela, Baltra y Santa Cruz, y considerando también los aspectos morfológicos de las islas e islotes que cruzábamos, fué posible comentar para los alumnos algunos de los caracteres fundamentales del volcanismo sin contar la recolección de muestras de lavas, de las arenas conchíferas que cubren las caletas y la observación de la fauna y la flora.

En San Cristóbal, después de las visitas de cortesía a las autoridades del Archipiélago, hemos efectuado la ascensión del gran volcán-escudo de San Francisco que ocupa la mitad de la isla, hasta una caldera que lo

domina aproximadamente a 500 m de altitud. Esta caldera de 150 a 200 m de diámetro contiene una laguna de agua dulce, llamada "Laguna del Junco". Esta laguna parece alimentar las fuentes que proporcionan el agua potable a la población de Puerto Baquerizo.

En Floreana (o Santa María), visita tradicional a la autora de "Floreana, oficina de correos" y luego, excursión a la colada de lava que forma un cabo pequeño a un km aproximadamente al Sur de Black Beach y observación de varias cúpulas de basalto, ciertas cúpulas están agrietadas o derrumbadas.

Después de un desembarco un tanto difícil en el puerto de Villamil, isla Isabela, y de una visita a los Flamencos rosados, progresamos por un camino de mulas sobre lavas acordonadas hasta un "granero" o sea una especie de gran poza, de suelo esponjoso y herbáceo limitado al Norte por una inmensa colada de lavas escoriáceas sobrepuesta a las primeras. El contraste entre las lavas fluídas de superficie continua ("pahoehoe") y las lavas brutalmente degasificadas ("aa") es violento.

El día siguiente desembarcamos en la base aeronaval de Seymour, en la isla Baltra. Dos grupos van a reconocer, el uno el canal del Norte (North Channel), el otro el canal del Sur (South Channel) que separan Baltra de la isla Seymour y de la isla Santa Cruz. Mientras tanto un tercer grupo visita las instalaciones de la base.

Por fin se verificó la visita a la Estación de Investigaciones Charles Darwin, en la isla Santa Cruz. Fuimos acogidos con la más calurosa cordialidad por el Presidente de la Fundación y la señora Jean Dorst y por el Director de la Estación, el señor Roger Perry. Después de haber recorrido el laboratorio, la biblioteca, el pequeño museo y visitado el parque de las Tortugas gigantes Galápagos y de las Iguanas terrestres, el profesor Dorst nos llevó hacia los túneles superpuestos que se abrieron en las coladas de lava a unos 3 kilómetros al Noroeste de la Estación. Las numerosas preguntas de mis colegas y de los alumnos han subrayado el interés por este fenómeno volcánico particular, descrito por G. Stoops (Noticias de Galápagos, N°5/6, 1965) y con el cual mis exploraciones en los volcanes de África Central me han acostumbrado. El suelo de dichos túneles está sembrado con un depósito harinoso de yeso (G. Stoops, ibidem).

Al anochecer, el señor y la señora Dorst nos hicieron el honor de presidir una cena que tomamos en común con el Director y los investigadores de la Estación.

Es con un sentimiento de suma admiración por la obra emprendida y perseguida con un éxito que suscita el interés de los naturalistas del mundo entero, que me hago el portavoz de mis compañeros de viaje para expresar a la Fundación Darwin nuestro agradecimiento por su calurosa acogida.

La República del Ecuador posee en la Reserva de las islas Galápagos y a pesar del aspecto a primera vista desértico y desolado de aquéllas,

un patrimonio de una riqueza insuperable de información biológica y volcanológica y de una importancia tal que tiene la obligación de mandar allá su juventud universitaria y politécnica. En esta reserva podría iniciarse a los grandes problemas de la evolución y de la actividad interna del globo. La avalancha de preguntas de toda clase de los estudiantes de la Politécnica en el curso del viaje prueba hasta que punto esta juventud estudiosa acogería con entusiasmo el privilegio de estudiar el Archipiélago de Colón y de trabajar allá bajo la tutela de la Fundación Darwin. Varias mesas de investigación están a su disposición con la condición de que hayan adquirido previamente una especialización seria en las ramas elegidas.

Al terminar estas líneas, quiero formular el deseo de que esta excursión de la Escuela Politécnica tenga una amplia resonancia y abra el camino de los Galápagos a los naturalistas y geólogos ecuatorianos.

A bordo del Tarqui  
6 de Septiembre de 1.967

SEA-BIRD RESEARCH IN GALAPAGOS 1965-67

by

M.P. HARRIS

Edward Grey Institute of Field  
Ornithology, Oxford, United Kingdom

It is only in recent years that the significance of the Galapagos Islands in sea-bird research has been realized, but so much has been learnt since the foundation of the Charles Darwin Research Station that the archipelago must now be considered one of the most interesting areas in the equatorial regions. It was for this reason that my wife (acting as my assistant) and myself spent from November 1965 to July 1967 inclusive based at the station at Academy Bay on Santa Cruz.

The main aim of the proposed research was to study the three species of storm petrels found in the area - the Madeiran Storm Petrel Oceanodroma castro, the Galapagos Storm Petrel O. tethys and Elliot's Storm Petrel Oceanites gracilis. Unfortunately the breeding colonies of the latter species have yet to be discovered although they must be within the archipelago as the species is a well marked endemic race and appears to be resident. Ecologically however this species is quite distinct from the two species of Oceanodroma, which are truly oceanic, as it is mainly an inshore feeder. While in the archipelago I became interested in the breeding seasons of the other sea-birds and embarked on studies of their breeding biology and breeding cycles, some of which had previously been described by Dr. David Snow.

The main studies were undertaken on Plaza Island off the eastern tip of Santa Cruz which was within three hours journey in the 'Beagle' or one hour in the Zodiac Rubber Boat. My wife and myself spent an average of ten days a month on the island and, with very few exceptions, the island was visited every 8-10 days so that observations were reasonably continuous. About a similar time was spent visiting other sea-bird colonies, taking plankton samples and making general observations. The remaining time was spent at Academy Bay, either working in the laboratory, visiting the highlands or preparing for trips. So much information was collected that it will be some time before analysis will be complete and the remarks given below should not in any way be treated as final.

It was known from the work of the Snows that Oceandroma castro on Plaza nests both during the warm and the cold seasons and they thought that the same birds were involved in both seasons. However in our study, by the marking of about a thousand breeders and non-breeders it was shown that there are two distinct, apparently morphologically identical, populations breeding in the same nest-sites but six months out of phase so that any individual bird breeds annually. Indeed it would seem impossible for a successful breeder to breed in successive seasons as a pair needs at least a month to take up residence in a burrow prior to producing an

egg, the incubation period is about six weeks, the young is fed for up to three months and the birds must fit in a complete moult of wing and tail feathers. It was however surprising that failed breeders and non-breeders remained faithful to the cycle, so much so that in the four seasons studied there was not a single bird caught both in a warm and a cold breeding season. This situation may well be unique among birds and could potentially give rise to two separate sub-species or even species.

A cursory examination of data on nesting success, feeding rates, sizes of feeds, etc., suggests that neither season is especially advantageous for breeding and it would therefore seem possible for birds to breed at any time of year. However it appears that, at least on Plaza, there is competition for the better nest-sites so that any very small young from late layings in one season may be ejected or killed by the returning adults from the next season, and some few young were known to have perished in this way. This could explain the seasonal breeding but social factors such as display are probably also important.

This species was also found nesting on Daphne, Guy Fawkes, the islet just north of Bartholomew, Cowley, Onslow and Tower and it seems possible that they might also nest on Hood, Baimbridge Rocks and Caldwell. On all these islands they are heavily preyed upon by the Short-eared Owl.

Unlike O. Castro, which is widespread both in the Pacific and the Atlantic, O. tethys is endemic to the Humboldt Current with distinctive races occurring in Galapagos and off the coast of Peru. In Galapagos it nests on Tower, Isla Pitt off the eastern tip of San Cristobal and probably also on Redonda Rock off the north of Isabela. The breeding season of this species is reasonably uncomplicated in that both Tower and Isla Pitt have a well defined breeding season in the colder months. The colony at Redonda Rock was not visited. However whereas the birds are entirely absent from Isla Pitt during the non-breeding season, some birds were always present at the much larger (perhaps one million birds) Tower colony whenever it was visited and there were a very few eggs laid in the hot season. If these few layings were more successful over many seasons it would be easy to see how the situation found in O. castro might arise. Difficulties in transportation when the 'Beagle' was laid up for new masts and essential engine repairs prevented as detailed a study being made as was possible on castro but basic breeding data were obtained.

The most widespread Procellariiform in Galapagos in Audubon's Shearwater Puffinus lherminieri and the colony on Plaza was estimated at 400-500 pairs. The results showed that there were always some birds breeding but there was a marked peak every nine or ten months which fits in with each successful pair relaying about every nine or ten months. However birds which failed to rear a young would return to breed after a shorter time, in fact on average an unsuccessful pair laid  $4\frac{1}{2}$  -  $5\frac{1}{2}$  months after the loss of an egg or a young. Circumstantial evidence points to this being the time needed for a bird to undergo a complete moult. As the nesting success is only 50 - 60%, it would be expected that any regular cycle would break down and there would be random breeding throughout the year. During the study there were three periods when the birds were obviously extremely short of food which brought about a sharp decline in

breeding success; in the extreme case no young were produced from eggs laid in five consecutive months. Associated with this was an almost virtual cessation in laying, four eggs being laid in two months when 70-80 might have been expected. Delays in laying such as this, when presumably females cannot find enough to produce the proportionately very large egg, mean that when conditions improve there will be a very pronounced laying-peak, which in turn would be repeated 9-10 months later if many pairs were successful.

The other non-annual breeding sea-bird examined in any detail on Plaza was the Swallow-tailed Gull Creagrus furcatus which also has a peak of breeding every ten months or so, but the breeding is more synchronised, partly due to better nesting success and partly due to greater social factors. Food shortages appear to be less important in this migratory species as a direct control of synchrony of breeding. Interesting results were obtained on the significance of the single-egg clutch which is unique among gulls.

During the short stays in Academy Bay and effort was made to study the breeding biology of the Hawaiian Petrel Pterodroma phaeopygia because it was obvious from the reports of the long-established settlers that, at least on Santa Cruz, this was a declining species mainly, it was thought, due to land clearance. Lack of time, the inaccessibility of the nesting burrows and the difficulties involved in being based on the shore and checking nests in the highlands meant that the study was fragmentary but it did show that, at least in 1966, the breeding success was so low that it is doubtful if a species could survive. Less than ten per cent of the eggs laid gave rise to fledged young, the loss being almost entirely during or just after hatching when apparently the young were killed by the introduced Rattus rattus.

The Hawaiian Petrel is restricted to the Hawaiian Archipelago, where it is apparently very rare, and the Galapagos where it probably breeds on Santa Cruz, San Cristobal, Floreana, Cerro Azul, Santo Tomas, Alcedo, James and just possibly Fernandina. Excepting Alcedo and Fernandina, it is suffering from land clearance and/or introduced rats, dogs and pigs. At present this species is still a reasonably common member of the eastern Tropical Pacific avifauna but it is unlikely to remain so if present land clearances continue on Santa Cruz and southern Isabela and the reproductive success is as low as shown in the single years results.

During each visit to Hood as many ringed albatrosses as possible were caught and notes made on their breeding state. No birds ringed as young were caught breeding in 1966 despite a reasonably thorough search but in 1967 at Punta Suarez, a bird ringed as young in 1961 by Mr Raymond Lévêque was found incubating an egg. This is the first known-age Waved Albatross Diomedea irrorata to have been found breeding.

It would be impossible for my wife and myself to thank all those people who helped us during our stay but special mention must be made of Prof. J. Laruelle who helped arrange the trip, to the Director Mr. Roger Perry and his associates Mr. Tj. de Vries and Mr. Rolf Severs who put the full resources of the Charles Darwin Research Station at our

disposal. The Captain of the 'Beagle', Mr. Bernhard Schreyer, put himself out in all ways in order to make our work possible. Sincere thanks are due to the Charles Darwin Foundation for permission to work at the Station, to the Royal Society whose research chair I occupied, and to the British Research Council who kindly supplied financial support.

## MOVEMENTS OF GALAPAGOS SEA-BIRDS

by

Dr. D.W. SNOW

British Trust for Ornithology,  
Tring, Hertfordshire, United Kingdom

Many hundreds of sea-birds - mainly albatrosses, boobies, tropic birds, shearwaters and swallow-tailed gulls - were ringed by R. Lévêque, the first Director of the Charles Darwin Research Station, with rings supplied by the British Trust for Ornithology; and the ringing programme has subsequently been maintained by A. Brosset, D.W. Snow and others. Up to the time of writing (3 July, 1967) there have been six recoveries of these birds outside the Archipelago. It takes a long time for significant results to accumulate from a programme of sea-bird ringing in an out-of-the-way part of the world such as the Galapagos, and so it is satisfactory to be able to record even the modest success achieved so far. The details of the recoveries are as follows :

### Waved Albatross (Diomedea irrorata)

Nestling, Hood Island, ringed 29 November 1961; recovered (shot) off Manta, Ecuador, early February 1962.

Nestling, Hood Island, 4 December 1966; found dying on the beach at Muisne (Esmeraldas), Ecuador, 8 January 1967.

### Blue-footed Booby (Sula nebouxi)

Nestling, Hood Island, 12 July 1962; found exhausted on the beach near Santa Elena, Ecuador, 20 October 1963.

Nestling Daphne Island, 24 May 1963; killed near La Tola (Esmeraldas), Ecuador, February 1967.

### Red-billed Tropic Bird (Phaethon aethereus)

Adult, Daphne Island, 7 July 1961; caught on a ship and released, west of Casma, Peru, mid-January 1964.

Nestling, South Plaza Island, 15 December 1965; landed on a ship in Gulf of Panama, 100 miles south of Balboa, 19 September 1966; later flew off.

These recoveries confirm the importance of the coast of Ecuador as a feeding area for the Waved Albatross and Blue-footed Booby, and show that the young albatrosses move away to the coast of the mainland very soon after fledging. The more strictly pelagic tropic birds apparently scatter in diverse directions. As more such recoveries accumulate, a much clearer picture should emerge of the relationship between the breeding and feeding areas of Galapagos sea-birds.



THE SYSTEMATIC POSITION OF SCALESIA FROM THE  
VIEWPOINT OF CHROMOSOME NUMBER

by

Dr. Mikio ONO,  
Makino Herbarium, Tokyo  
Metropolitan University,  
Fukasawa, Setagaya, Tokyo.

The genus *Scalesia* is known as an endemic genus of the Galapagos Islands. It is the largest genus among the vascular plants of the archipelago, including eighteen species accepted by Howell (1941).

As for the systematic position of the genus, it was originally described by Arnott (in Lindley 1836) as to be referred to the Heliantheae - Heliopsidae of the Compositae. After that, it was considered uncertain for long period until Benthum and Hooker fil. fixed it to be between *Mirasolia* (now included into *Tithonia*) and *Wulffia* in the subtribe Verbesiniinae of the tribe Heliantheae. Hoffman referred it also to the Heliantheae - Verbesiniinae but placed it between *Rudbeckia* and *Tennolepis* which was an endemic genus of Madagascar. On the other hand, Howell casted a doubt upon the Benthum and Hooker's opinion that recognized a close relationship between *Scalesia* and *Tithonia* (*Mirasolia*). He assumed that *Scalesia* and *Wulffia* might have a common ancestral group which might have resembled the present day group of genera which center in *Wedelia* and *Aspilia*. These opinion were mainly based on the morphological characters of head and achine. Besides, the embryological and palynological criteria also support the position of *Scalesia* to be included in the Heliantheae (Harling 1963).

But concerning the chromosome number, there has been reported no datum about *Scalesia*. The chromosome numbers of other genera related to *Scalesia* in the subtribe Verbesiniinae (now called Helianthinae), have been reported so variously as follows :

<i>Helianthus</i>	n = 17, 51	<i>Viguiera</i>	n = 17, 34
<i>Rudbeckia</i>	n = 16, 17, 51	<i>Wedelia</i>	n = 11, 12, 20, 29 ± 1
<i>Tithonia</i>	n = 17	<i>Wulffia</i>	n = 30 ± 1

In the beginning of March, 1966, I had a chance to visit some Islands of the Galapagos. It was my second visit to the Islands and this time fortunately, I could collect matured seeds of some species of *Scalesia*. The collection were made on the following species and localities :

<i>Scalesia affinis</i>	Santa Cruz, Academy Bay
<i>S. pedunculata</i> var. <i>Svensonii</i>	Santa Cruz, near Bella Vista
<i>S. pedunculata</i> var. <i>parviflora</i>	Floreana, on the way to Wittmer's farm
<i>S. villosa</i>	Floreana, Cormorant Bay.

These collected seeds were germinated and cultured in a green-house in Tokyo, except *S. villosa* which did not germinate at all. On these material I could count the chromosome number of root-tip cells as  $2n = 68$ , in all species examined. The karyotypes of these species were very similar and they could be expressed as  $K(n) = 34 = 26V + 8J$ . The length of the chromosomes were rather short and even the longest one was less than  $\mu$  long.

To compare this chromosome number with that of the other genera considered to be related to *Scalesia*, it is suggested that *Scalesia* might be a tetraploid ( $4x$ ) which has  $x = 17$  chromosomes as the basic number. Within the subtribe Helianthinae (Verbesininae), the same basic number  $x = 17$  is found in such genera as *Helianthus*, *Rudbeckia*, *Tithonia* and *Viguiera*. But in habit, the species of *Helianthus* or *Rudbeckia* are all herbaceous, while in *Scalesia* all species are known as shrubby or arborescent. In this connection it is difficult to consider a direct relationship between *Scalesia* and these two genera. However the other two genera, *Tithonia* and *Viguiera* have several members of half-shrubby species respectively.

Based on these facts, I assume that the genus *Scalesia* might have been differentiated from a certain continental ancestral group which probably well resembled the recent *Tithonia* or *Viguiera*, that have  $2n = 34$  chromosomes. And in process of migration of *Scalesia* to the Islands, the occurrence of polyploidy might have played an important role. The details of this study is published on the Journal of Japanese Botany, Vol.42, No.12, 1967.

In addition, more detailed investigation on the other genera related to *Scalesia* of Central and South America, as well as the cytotaxonomical analysis on the speciation within the genus *Scalesia* in the Islands, will throw light on this problem. For this purpose, the aids in collecting materials within the Islands are eagerly expected. I would greatly appreciate if a scientist helps me by collecting and sending some matured seeds (heads) of any species of *Scalesia* from any locality of the Islands, by chance of his visit to the Galapagos.

I wish to express my hearty thanks to Dr. Roger Perry, the Director of the Darwin Research Station of the Galapagos for his kind aids for my collecting trip, and also to Dr. Jacques Laruelle, the editor of the *Noticias de Galapagos*, who gave me the chance of publishing this paper.

## SOME FINDINGS ON GALAPAGOS LIZARDS

by

Charles C. CARPENTER

Department of Zoology, University of Oklahoma,  
Norman, Oklahoma 73069, U.S.A.

When one visits the Galapagos Islands, one can not help but be intrigued by the unique lizards which abound on many of the islands.

Previous to my visits, I had read what information was available to me on these lizards. However, words read thousands of miles away cannot substitute living with these animals. Though I believe I have learned much about the lizards of the Galapagos Islands, I feel that I have just "opened the door" to the many possibilities afforded for research with these fascinating reptiles.

My first trip to the Galapagos Islands in 1962 was sponsored by a grant from the National Science Foundation, and lasted about four and one half months. My second, in 1964, was as a member of the Galapagos International Scientific Project, with five weeks spent on the islands.

My primary interest in the Galapagos Islands grew out of my researches with the behavior of iguanid lizards in the United States. Here I had established that the various species in this family each performs a species-specific territorial display--a sequence of pushups, head nods or bobs, to a particular cadence. I went to the Galapagos to use the iguanid lizards as a check on my theory that these species-specific display patterns had evolved interisland differences.

In Oklahoma, most of my observations on lizards displays were made and photographed in large metal enclosures. Since such metal enclosures were not practical for the Galapagos, I devised a method of using polyethylene sheeting, erecting two such enclosures near the Darwin Research Station at Academy Bay. They proved to work very well.

Thus much of my time in 1962 was spent acquiring samples of the lava lizards (Tropidurus) from the different islands and observing and recording their behavior in the enclosures.

I used the collecting technique of noosing the lava lizards. Sometimes the lizards were so abundant that by sitting in one place and waiting, I could noose as many as ten individuals. They showed little fear and would approach as if curious about my presence. I was continually amazed, as I visited a new island, at the differences I would encounter in the new lava lizard present. Why had these differences

arisen ? How are they an expression of a particular island ?

My reasons for wanting to observe the lava lizards proved to be profitable, and the fruit of many hours of watching and photographing very rewarding. The only two populations of Tropidurus which had the same apparent display-action-patterns were those on Pt. Vincente (Albermarle) and Pt. Espinosa (Narborough). All other populations from all the ten other large islands where they occur, had distinct patterns. There are, in my belief, more than the seven described species - at least an Albermarle-Narborough form and a James-Jervis form, distinct from the Indefatigable-Barrington form. I suggest that these differences in display-action-patterns are the product of genetic drift. One of the many problems for the future with Tropidurus will be the significance of the sexually dimorphic color patterns in most forms, in particular, the presence and position of the orange color of the females. I was quite successful in maintaining these lizards in my laboratory in Oklahoma, where they continued to breed and display as they had on the Galapagos.

I spent most of my time in 1964 marking and observing marine iguana populations at Pt. Espinosa (Narborough) and Pt. Suarez (Hood). My findings have been published in the Proceeding of the California Academy of Sciences 30(6):329-376, 1966. To summarize what I believe to be some of my interesting observations, I would first mention that there is approximately one month difference in the breeding seasons at opposite ends of the archipelago. The females on Pt. Espinosa are laying eggs, while the males on Pt. Suarez are establishing territories (late February). The largest populations appear to be closely associated with open sandy beaches, used for nesting, though females will ascend high cliffs and move into cactus to find suitable nesting areas. My data indicate that the activity rhythms of these amphibious lizards are correlated to tidal movements, with most feeding taking place during low tides. They will, however, leave the exposed reefs behind and seek a variety of algae up to one quarter of a mile from shore and at depths up to thirty feet. It is indeed exciting to skin dive and watch these iguanas feeding fifteen feet below the surface, seemingly with little bouancy difficulty, while schools of multi-colored fish and small sharks pass by.

I marked many individuals so I could follow their movements. At Pt. Espinosa I learned that, generally, they confine their movements to a particular reef area and will return after movements away of two hundred to three hundred yards. Here, the females were marked just as the territoriality of the males was disappearing. These females began to aggregate in large groups of thirty to fifty on the lava just a few feet from the large beach at Pt. Espinosa. Then, about two hours after sunrise, they began to move, three or four at a time, out on to the beach, where they began to dig nest burrows. I have seen as many as thirty females digging at one time. The nesting females are very aggressive, displaying with the same species-specific head-nod as the male, and also head-butting similar to the territorial males. This is the only communal nesting iguanid that has been described.

Territory holding males at Pt. Suarez might leave their territories to feed at the reef, but would return to the same ten square feet of territory. In certain areas, territories were very crowded - one male on territory on top of a large boulder, another defending an area just below the boulder. These territorial males were brightly colored and could be seen at long distances. I had a lot of fun experimenting with territories by restraining a male in the territory of another. The response was such that my presence meant little to the defender. A male driven from a territory (reluctantly) quickly returns. Where as the lava lizards show different displays on different islands, the marine iguana displays, even at such widely separated areas as Hood and Narborough Islands, are practically indistinguishable. Perhaps another thousand years will give rise to greater distinction. The marine iguana appears to have few, if any, major predators, or at least I thought so in 1962. In 1964 at Pt. Espinosa, I did see Galapagos Hawks carry off and devour iguanas, especially small individuals. The hawk also feeds on the dead iguanas as do the red crabs. I have also observed, as have others, some of geospizid finches, as well as mocking birds and red crabs picking ticks from these iguanas.

The marine iguana and the land iguana (which exhibits species-specific display-action-patterns on different islands) offer many exciting research problems for the future. The marine iguana is abundant, easily observed, and I highly recommend it to the ethologist, ecologist, physiologist and naturalist-at-large.

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