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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SOMMAIRE

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- N é c r o l o g i e -

LE DOCTEUR E. YALE DAWSON

Notre Fondation est en deuil de son regretté Secrétaire pour les Amériques, le Docteur E. Yale Dawson. Homme de terrain et algologue réputé, celui-ci s'est noyé le 22 juin 1966 près de la ville d'Hurghada, en Egypte, au cours d'une expédition dans la Mer Rouge. Il venait de commencer un tour du monde scientifique pour visiter les stations marines et renouer des contacts avec les chercheurs de sa spécialité. Cette vaste tournée devait se terminer à Tokyo, où il projetait de prendre part au XIe Congrès des Sciences du Pacifique. La mort vint le surprendre en pleine activité, à un âge où une longue et brillante carrière s'ouvrait encore devant lui.

Ce n'est pas ici la place de retracer l'oeuvre entière de notre collègue. Après avoir passé de longues années dans divers laboratoires et institutions de l'ouest des Etats-Unis, le Dr. Dawson venait de se voir nommé Curateur au Département de Botanique de la Smithsonian Institution à Washington et était un des nouveaux éléments dynamiques de cette institution en plein essort. Spécialisé dans l'étude des algues, il avait à son actif de nombreuses publications relatives à la systématique et à l'écologie des espèces marines dont il avait lui-même collecté de longues séries. Mais les plantes terrestres, et plus particulièrement les Cactées, avaient également retenu son attention. Ses connaissances écologiques étaient vastes et remarquablement éclectiques.

Les algues autant que les cactus l'attirèrent aux Galapagos. Il fut un des plus actifs participants du Galapagos International Scientific Project 1964 de l'Université de Californie, Berkeley, à l'issue duquel il publia plusieurs rapports et mémoires du plus haut intérêt.

Dès 1964, il acceptait un siège au Conseil exécutif de la Fondation en même temps que la charge de Secrétaire pour les Amériques. Quelques mois plus tard, il avait réorganisé le Secrétariat américain, établi des liens étroits avec la Smithsonian Institution, et entrepris la rédaction d'une brochure de vulgarisation à l'intention du public équatorien et plus particulièrement des colons des Galapagos. Il déchargeait le Secrétariat général en Belgique et le Directeur de la Station Darwin d'une partie importante de leur travail et jouait pleinement le rôle d'ambassadeur de la Fondation aux Etats-Unis.

Il avait entrepris cette tâche avec enthousiasme et beaucoup de dévouement, car il avait fort à faire dans son nouveau service à Washington. Notre Fondation lui doit une partie notable de sa structure actuelle. La mort est venue interrompre une collaboration de chaque jour.

Je me souviens de la visite qu'il me fit à Paris en août 1964, après le Congrès International de Botanique d'Edinbourg. Dès l'abord, il me fit part de l'impression que les Galapagos et leurs communautés végétales et animales avaient eue sur lui; il me confia aussi sa joie réelle à participer à notre oeuvre de sauvegarde.

Nous garderons en notre mémoire l'image d'un homme de science intègre, passionné et compétent, et d'un ami fidèle, d'une affabilité jamais démentie. L'Ecuador aussi perd en lui un de ceux qui avaient trouvé dans sa nature sauvage quelques unes des véritables raisons de vivre.

Jean DORST.

CURSO DE HISTORIA NATURAL PARA PROFESORES PRIMARIOS DEL ARCHIPIELAGO, SE EFECTUO EN LA ESTACION CHARLES DARWIN, ISLA SANTA CRUZ

por

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Del 26 de Julio al 3 de Agosto 1.966, bajo los auspicios de la Estación Charles Darwin, tuvo lugar un Curso de Ciencias Naturales de Galápagos, al que asistieron 23 profesores delegados por cada una de las escuelas, además de la presencia de los Supervisores de Educación Primaria de la Ia y IIa Zona del Archipiélago.

A la inauguración del acto estuvieron invitados el Sr.Max Arias Hidalgo, Gobernador del Archipiélago y el ALNV-UN Mario Jácome H., Capitán del Puerto, en representación del Sr. Comandante de la IIa Zona Naval. Esta lugar en el Laboratorio principal de la Estación, mediante una sencilla ceremonia.

El Curso en mención consistió de manera especial de demonstraciones de carácter práctico y exhibiciones de plantas y animales existentes en las Islas, dando mayor importancia a aquellos que por su carácter de endémicos merecen mayor atención. Los profesores asistentes. consiguieron informaciones básicas sobre estos animales y plantas y sobre todo obtuvieron una idea de como pueden tratarse en forma práctica las Ciencias Naturales en cada una de las escuelas. Además se proyectaron numerosas vistas fijas y cortas películas que complementaron la información dada a los maestros.

Es así como la Estación Charles Darwin ha iniciado un programa de difusión de ciertos conocimientos básicos que ayudarán a comprender el problema de la conservación de animales y plantas endémicas por parte de los habitantes del Archipiélago; y es así también como la educación actualmente en pleno desarrollo, se halla aprestándose a iniciar una campaña por intermedio de las escuelas para educar a la actual generación en la comprensión de este problema y sobre todo preparar a la nueva generación para el aprovechamiento racional de esta fuente de riqueza que puede ser aprovechada dentro de campo científico y turístico, en beneficio de la economía actual de las comunidades del Archipiélago.

Para la realización de tan importantes actos se contó con la decidida colaboración y magnífica organización de todos y cada uno de los actuales funcionarios de la Estación Charles Darwin, quienes en forma total trabajaron hasta la realización de este interesante Curso.

En vista del interés que entre los maestros despertó esta inquietud y en agradecimiento al esfuerzo realizado, el cuerpo de profesores asistentes, entregó un pergamino a la Estación en el nombre de su digno Director y solicitó, que de ser posible, se organicen en forma anual cursos ya sean de carácter similar o u otros a los cuales estarían listos a asistir. Además se solicitó además una orientación permanente por parte de la Estación para el tratamiento de las Ciencias Naturales, formaciones de Rincones de Ciencias, Pequeños Museos y sobre todo orientación en los problemas de conservación peculiares a los lugares.

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CURSOS DE HISTORIA NATURAL ORGANIZADOS POR LA ESTACION CHARLES DARWIN

Leyenda de las fotografías

Foto 1.- Los Profesores participantes frente al Laboratorio de la Estación Charles Darwin.

Foto 2.- El Profesor Lucio G. Saltos G. dictando su curso.

SOME THOUGHTS ABOUT FUTURE VISITS TO THE CHARLES DARWIN RESEARCH STATION

by

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The recollections of my maiden visit to the Darwin Station during the fall of 1965 are still vivid. In this article I will try to narrate some of my adventures and add a few personal suggestions, which I hope will spark off new approaches in achieving the goals of the Charles Darwin Foundation.

Evolutionary biochemistry is developing fast. It was this branch of science which drew my attention to the classical works of Darwin and thus to the Galapagos Islands. It occurred to me that there might be a possibility to use biochemical methods in studying evolution in this extraordinary archipelago. For those readers who are unaware of these newer developments it may be pointed out that comparative homology studies between related species can be made with the tools of the molecular biologist. Relatively small specimens of plants or of animal origin suffice for these studies. Somewhat larger samples are needed for similar studies on comparative protein-structure. With a view to future explorations in this direction, I obtained permission to visit the Darwin Research Station.

Despite frantic efforts to learn on which date the "Cristobal Carrier" would sail from Guayaquil, I arrived six days late from the East coast of the United States. It took nine days and a lot of luck to catch a Galapagos-bound plane of the Fuerza Aerea Ecuatoriana which had received an emergency call from Baltra to pick up a man who had broken his arm (caused by a game of judo !). We passengers (3) had been told that it might be a rough landing on Baltra as the runway was temporarily out of order. However, a pleasant surprise awaited us when we landed. A modern four-engine jet could have landed comfortably at such a beautiful asphalt covered airport and our Dakota certainly had no trouble.

My next effort was directed to reaching the Academy Bay from Baltra. The Commander of the garrison was kind enough to help me getting into a local fishing boat. If I had known, that six weeks before, this "little ship" had been lost and found again near Cocos Island without its crew (whom were never heard of any more) I might not have felt so comfortable. My sailing trip through Baltra Bay and the channel between Santa Cruz and Baltra was gorgeous. Sea turtles and "manta

raja's" flapped their fins in ecstasy. But on the Ocean our engine failed and it took some effort to pull the boat back along the channel to reach the military barracks again.

I had better luck when director Roger Perry and manager Edgard Pots came to pick me up in their speed boat. Once again it was no luxury trip. It was dark and we were soaked while reaching Islas Plaza where we were to sleep in the middle of the sea-lion colony. With a bottle of rum as our only source of warmth, that night will always be remembered ! Next day Pots steered us ingeniously over big waves but we ran out of petrol near Puerto Nuñez, Santa Cruz. I agreed to accompany Perry in order to notify the Darwin Station about the location of Pots and the speedboat. On my tennis shoes I followed Perry for five hours over incredible Galapagos terrain and Roger certainly has learned how the Dutch swear. He guided me patiently to our destination and proved to be an excellent host.

When recovered I made a most interesting trip to the tortoise reserve on Santa Cruz via the hospitable Horneman farm house. Chapi took me on a most rewarding eleven hour walk to show me the huge reptiles from which the archipelago has derived its name.

After my return from the inland I was informed that the "Beagle" would sail to Isabela and Fernandina to put two tortoise-search teams ashore. A marvellous evening was spent on Santiago beach where we saw the flamingo colony in the lagoon. Next day, not far from Tagus Cove, the Miguel Castro-party left us while Roger Perry started one day later on his (fruitless) tortoise survey of the Fernandina crater.With Van Mol, my colleague from Brussels, I had an exceptionally good time surveying the mangrove-beach of Fernandina with its sea-lions, penguins and wingless cormorants. A pair of cormorants were breeding, but a month later Van Mol on a second visit found the nest destroyed, apparently by man.

On my return trip I was lucky again : the "Cristobal Carrier" made its voyage to the continent via Baltra to pick up men, trucks and equipment of the airfield-contractor. A plane was due and I guess that it brought me in a more comfortable manner to Guayaquil than the overcrowded "Carrier" ever could have done.

I have often asked myself what is to be learnt from my experiences which could be of value to any individual who wants to see the creatures of the Galapagos. Some of the ideas that crossed my mind are listed below.

(1) For optimal functioning of the Charles Darwin Station much more money is needed than what is available now. Apart from the important contribution from UNESCO, only five countries are contributing,namely the United States, the United Kingdom, West-Germany, Belgium and Ecuador. It should be the duty of at least all developed countries to participate directly in the conservation and research program of the Station. Rangers should be stationed on all of the interesting islands

and they should have the means of protecting their area against invadors. Programs of raising new colonies in reserves could be developed. The Laboratory could be equipped with homogenizers, freeze-drying apparatus and a deep-freeze.

(2) There is a much wider market of people interested in the Galapagos than is explored now. All biology teachers of the world should have the opportunity to marvel at the wonders of the Galapagos. The airport of Baltra could easily receive the planes which would bring these groups of "tourists". Since these visitors are genuinely interested in the biology of the Galapagos and since they would be accompanied by rangers of the Darwin Station on their trips to the various islands, the risk of damage to flora and fauna would be negligible. Back home these people would disseminate the spirit and motivation for which the Darwin Foundation stands.

(3) Communications should be improved. It would be a simple measure to appoint a "consul" of the Darwin Station at Guayaquil, who could be in radio-contact with the Director of the Station. Thus there would be no delay in correspondance between Academy Bay and the outer world. A connection by ship between Baltra and Academy Bay should be established (to be followed later by introduction of regular transportation to other islands).

I realize that many additional suggestions as well as critical remarks could be made. However, I am convinced that, with the right type of organisation, the goals of the Charles Darwin Foundation could be served optimally by enabling greater numbers of selected visitors to come to the Galapagos. With the help of the Ecuadorian authorities it should not be difficult to make adequate safeguards against unwanted visitors.

ECOLOGICAL APPROACHES TO THE VEGETATION OF THE GALAPAGOS----FUTURE NEEDS

by

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Botanical approaches to date in the Galapagos Islands have been made mainly from the standpoint of taxonomy and phytogeography by collecting plants, describing species and studying their distribution in the Archipelago and in the adjacent continent. On the other hand, the vegetation itself and its relation to natural environment were little concerned except for some biologists. In his recent monograph on Darwin's finches, R.I. BOWMAN describes the vegetation zonation in the region of Academy Bay and extending inland to the highlands of Santa Cruz (R.I. BOWMAN 1961, 1963(1961)). Then I confirmed his descriptions and further clarified that the various vegetation types there are well associated with two main environmental factors : the percentage of the ground surface covered by lava blocks and the altitudes (S. ITOW 1965).

Summarizing my report, Opuntia echios and Bursera graveolens show to be predominating in arid habitat, where lava blocks cover 75 to 100 per cent of the ground surface (lava scarcely weathered) at elevations ranging from 5m to 40m above sea level ("Arid coastal zone" in BOWMAN's description); Pisonia floribunda and Psidium galapageium for 10 to 80 per cent of lava coverage, at elevations from 40m to 180m ("Transition zone"); Scalesia pedunculata for 0 to 10 per cent of lava coverage (lava almost completely weathered), at elevations from 180m to 280m ("Scalesia forest"); Psidium galapageium at elevations between 280m and 420m, in a zone free from lava (so called "Brown Zone"); Miconia robinsoniana between 420m and 580m ("Miconia belt"); the grassland between 580m and 870m ("Upland Zone").

According to my observations during the Galapagos International Scientific Project in 1964, the vegetation zonation on the other islands is not the same as on Santa Cruz. For example, there is no change in vegetation on the west slope of Española up to the altitude of 150m above sea level. There predominates only Prosopis dulcis, a thorny shrub of Leguminosae. This species is scarcely found in the Academy Bay region. In the Black Beach region of Floreana, though fairly disturbed, areas covered by lava flow support only the growth of Bursera graveolens, while trees of giant cacti could rarely be recognized there. Scalesia forest in this region is found at altitudes

between 320m and 400m, while on the south side of Santa Cruz, as stated before, this zone occurs between 180m and 280m above sea level. So far as I know, mangrove forests are developed in the same manner throughout islands I visited. Rhizophora mangle-dominated mangrove is found on lava shore, Laguncularia racemosa mangrove on muddy shore and Avicennia nitida mangrove is restricted to rather drier muddy swamps contiguous to Laguncularia mangrove. All are found only in calm inlets and lagoons.

Excepting the mangrove vegetation, why do the vegetation types differ with islands even at similar habitat ? What types are ecologically equivalent between islands ? And why does the same type differ in the altitudinal range on different islands ? These questions will be answered when the vegetation-habitat relationships are studied for each island and compared among the islands.

The ecological point of view focuses further on the species composition and structure of plant communities. Studies on the species composition deal with all component species of the plant community. This approach aims at detailed analysis of the vegetation-habit relationship and, as a result, contributes to the demarcation of ecological distribution for individual plant species in relation to the vegetation types or the plant communities. So far as I observed on Santa Cruz, Tournefortia pubescens is distributed exclusively in the Opuntia/Bursera forest and in the lower part of the Pisonia/Psidium forest in the arid coastal area, while T.rufo-sericea is restricted to the upper part of the Pisonia/Psidium forest and to the Scalesia forest, that is in moist habitats. Thus the distribution of these two endemics overlap only in a small area.

Studies on the community structure allow researches in the stratification of plant community, the spacing of plant individuals and the age distribution of tree populations in a community. Here I shall refer only to the stratification, which depends upon habitat conditions. The Opuntia/Bursera forest in the arid habitat at Academy Bay belongs to a three-layer plant community : a tree layer, a shrub layer and an herb layer, all of which, especially the herb layer, are very sparse. The Scalesia forest at moist habitat is five-layered : a 1st- and 2nd-tree layer, a shrub layer, an herb layer and a moss layer, with rich growth of epiphytes and lianas. The Opuntia/Bursera forest on Santa Fé is composed only of a tree layer, the shrub and herb layers being very poorly represented or lacking. This is probably because of heavy browsing and grazing by introduced goats. The same is true of the Prosopis dulcis-dominated thicket on the west slope of Española.

A further step in ecological approaches is the vegetation mapping. It is a time-consuming work. Theoretically and practically, the existing plant communities can be classified into two categories, the "natural" and the "man-altered or deteriorated". Both are subdivided according to their characteristics in species composition and structure. The communities thus classified might be mapped. The vegetation

map is a summarized result of ecological studies on the vegetation itself and the vegetation-habitat relationships. When compiled, it will not only show the distribution of each natural and man-altered plant community, but also provide an aid for studying the ecological distribution of animal populations, in relation to their habitat, and further give some ideas for taking measures of conservation of nature and natural resources in the Galapagos.

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CENSUSING DARWIN'S FINCHES

by

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"When will the day come that we know these things of any one species ?" So asked Charles Darwin Janssens in a letter dated more than a hundred years ago. With 'these things' he meant population statistics. Darwin's implicit pessimism was waranted, for now still our data of population statistics of almost any one species are shamefully poor. In fact, we have reliable statistics only of such species which are already on the verge of extinction - Californian condor, whooping crane, for example - and which thence are of little interest from the viewpoint of evolutionary research.

The Galapagos finches, or Darwin's finches (subfamily Geospizinae) are mentioned in textbooks as an excellent illustration of evolution in action. However, it is astonishing that the conclusions have been largely derived from examination of skin collections only. The only notable exceptions are the classic of LACK twenty years ago, the recent investigations of BOWMAN of the diet of various species and races, and of their song, as well as the ecological and ethological studies of CURIO, EIBL-EIBESFELDT, and KRAMER.

With the exception of the rather hasty attempts of LACK almost thirty years ago, no one has tried to estimate the densities of the breeding populations. BOWMAN goes so far that he considers such attempts futile "by any orthodox method". This view is wholly incomprehensible to me, since, in most Galapagos habitats, the census is relatively easy, owing to their openness. Difficulties arise mainly in the "transition zone" and "Scalesia forest" of the larger islands, owing to dense underbrush.

Further, it is not so necessary to know very accurately the absolute numbers of breeding pairs, because the populations are - perhaps with the exception of the smallest isolated islands Culpepper and Wenman, and such rare species as Cactospiza heliobates - so large that random drift hardly has any marked effect. It is more relevant to ascertain the relative densities of different species in a given locality, and the densities of the same species in different localities. The observability of different species in the same locality and of one species in different localities is of course different. But I am convinced that previous experience in census work and familiarity with the Galapagos environment will help to overcome this difficulty.

In the most difficult habitats, I have limited the breadth of the transect to ten meters, and walked very slowly, one mile in three hours or so.

It is also important to know the fluctuations of the breeding population within one breeding season and between different years. Such estimates are, of course, susceptible to sampling variation only.

DENSITY OF BREEDING POPULATIONS IN THREE ISLANDS

I started my censuses on 15th January 1966, at the very beginning of the breeding season, and the last census was made on 10th April, when nesting was ceasing, owing to severe drought. The rainy season began in the beginning of December 1965, and the last rain fell on 11th February. Total precipitation for this period amounted to 128 mm (50 inches).

Census work was made in three islands : Indefatigable (Santa Cruz), Barrington (Santa Fé), and Tower (Genovesa). Because these are very different ecologically, I shall deal with their finch faunas separately in the following.

(1) Santa Cruz (Indefatigable)

This is the only one of the censused islands where all vegetation zones are present. The exact length of the transects is not known, owing to the lack of maps, but amounts to about 15 miles. They include the old and the new trail as well as minor transects in the Scalesia forest. A third of these transects were censused thrice : in January-February, in March, and in the beginning of April.

Regarding the finch populations, the application of the vegetation zones is not adequate, it may to some extent even be misleading, because marked changes take place within the zones, and zone borders do not always mark changes in the finch populations. In this connection, however, I think it sufficient to apply the customary division.

The following tabulation gives the numbers of males in breeding plumage (black bill) for the March 1966 census. Camarhynchus pauper and Geospiza conirostris have never been found nesting in Santa Cruz, and Geospiza difficilis is extinct since at least thirty years. The numbers are percentages of the total finch population for the three altitudinally lower zones of Santa Cruz. The total number of pairs is mentioned aside.

PERCENTAGES OF MALES IN BREEDING PLUMAGE
ON THE TOTAL FINCH POPULATION
(ISLA SANTA CRUZ, MARCH 1966)

	Geospiza magnirostris	Geospiza fortis	Geospiza fuliginosa	Geospiza scandens	Platyspiza crassirostris	Camarhynchus psittacula	Camarhynchus parvulus	Cactospiza pallida	Certhidea olivacea	TOTAL NUMBER OF PAIRS
Scalesia forest	-	+	10	-	+	2	9	7	71	300
Transition zone	1	17	26	8	4	2	15	1	25	250
Coastal zone	-	17	51	27	1	-	2	1	1	100

The picture is clear enough, and agrees with earlier knowledge : the coastal zone is the domain of the genus Geospiza, Certhidea predominates in the Scalesia forest, and the transition zone has the richest finch fauna, with all the species of the island represented.

The bills of Geospiza fuliginosa and Camarhynchus parvulus are not so specialized as the bills of the other species; these species also are rather common in all zones, whereas the extremely specialized Geospiza scandens does not breed beyond the middle of the transition zone, where the prickly pear cactus (Opuntia) vanishes from the landscape. (By the way, this species has another specialization, not shared by any other finch : it has a song flight). Also BOWMAN has reported that Cactospiza is conspicuously confined to the Scalesia forest and Platyspiza to the transition zone.

However, seasonal fluctuations somewhat confuse this picture. Platyspiza bred early, and was four times so abundant in January - February as in March; moreover, it bred commonly also in the coastal zone early in the season. Also the proportion, though not absolute numbers, of Certhidea increased markedly towards the end of the season : in April, its percentage was close to 40, even at the coast, and represented the commonest species there. This is the more remarkable as LACK ascribed its absence, in some years, from the coast to drought with consequent rarity of insects, and it was already very dry in April 1966.

The total number of breeding pairs fell from 328 pairs in January-February and 278 pairs for March to only 40 in April and the number of species from 9 and 6 to 4, respectively. The percentages of Camarhynchus parvulus and Geospiza fuliginosa were remarkably constant through the season, which again shows the ecological versatility of these species. The fourth species still breeding in April was Geospiza fortis. Unfortunately, I made the census only once in the Scalesia forest.

(2) Santa Fé (Barrington)

During the visit of MELVIELE, more than a hundred years ago, Barrington was one of the most luxuriant of the islands, but goats have done their job, and now it ranks among the most barren ones. This is well reflected also in the geospizine fauna. Although there are seven breeding species, the vast majority consists of the genus Geospiza : 97 per cent of the 209 pairs encountered. Even within this genus, the hierarchy is more prominent than on the coast of Santa Cruz; and again the ubiquitous Geospiza fuliginosa gains upper hand with its 63 per cent, against 24 per cent of G. scandens, 16 per cent of G. fortis, 3 per cent of G. difficilis and 1 per cent of G. magnirostris. Camarhynchus parvulus suffers from the lack of vigorous trees; these are damaged by goats which eat their leaves almost as soon as they appear. Its proportion was 2 per cent, and the remaining 1 per cent were Certhidea.

(3) Genovesa (Tower)

This island is also very barren, since rain is very rare and elevation only 200 feet. Indeed, the recorded number of vascular plant species is as low as 21, and lower vegetation is almost non existent. Most of the island is homogeneously covered by only one vegetation layer, which comprises 5 to 15 feet high bushes. Moreover, as the island is almost saturated with hundreds of thousands boobies and frigate birds, it is not surprising that the overall density of finches is much less than in the equally barren Barrington. Another feature, quite opposite to the situation in Barrington, is that no species is dominant to others. Of the 131 pairs met with, 34 per cent were Certhidea, 31 per cent Geospiza conirostris, 24 per cent G. difficilis, and 11 per cent G. magnirostris. Species diversity is thus close to maximum, which is reached when all species are equally represented. This suggests that the niches of different species do not overlap much, quite in contrast to the other two islands, where diversity is far from maximum.

The proportion of other species than the Geospizinae of the total number of breeding land birds was about one third in all zones of Santa Cruz and in Barrington, but two thirds in Tower. The latter is obviously due to the large area of bare rocks in Tower, where the Galapagos dove (Nesopelia) finds suitable nesting sites.

MAJOR AND SECONDARY ADAPTATION

Since the annual variations in the Galapagos climate are very great, it would be too hasty to derive any general conclusions from the census results of one year only. Moreover, quantitative data from other islands would essentially replenish - and most probably alter - the picture. However, I am tempted to make one point. It seems commonly - though more or less tacitly - held that the major adaptational types, that is, the different genera, have evolved in different islands, and that they have met secondarily by dispersion. In my opinion, it is equally probable, in view of the marked confinement of the genera Geospiza, Platyspiza, Cactospiza and Certhidea to different zones of Santa Cruz, that these types could have evolved within a single island by 'topographical isolation' i.e. by geographical isolation on microscale. On the other hand, since all species of the genus Geospiza are so clearly concentrated to the coastal zone, it seems inconceivable that adaptive radiation would have been possible within a single island. The situation is very likely the same with regard to Camarhynchus, and seems virtually proved by LACK with respect to C. pauper. But in the genus Cactospiza, with a long distance between the two species' populations - pallida at high elevations, heliobates in coastal mangrove - divergence seems possible within a single island.

THE BEHAVIOR OF THE ROCK CRAB, GRAPSUS GRAPSUS L. ON GALAPAGOS

by

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The main object of the German Galapagos-Expedition 1962/63 under the direction of Dr. E. CURIO was the investigation of the behavior of Darwin's finches (Geospizidae), especially their ability to cope with their enemies. A brief and preliminary report on the results achieved was published in this journal (1).

Particularly the unique cannibalism of the rock crab Grapsus grapsus L. made it seem rewarding to investigate as thoroughly as possible the social behavior and the ecology of this colorful animal. So I kept studying G. grapsus extensively on Tower, Abingdon, Indefatigable, and Wenman Islands throughout our one-year stay on Galapagos. I also observed it for a period of five days on the Ecuadorian mainland near Palmar, in the vicinity of Guayaquil.

G. grapsus inhabits rocky shorelines in the tropics and subtropics. The Galapagos crabs differ from their mainland counterparts in size and in brightness of color. They probably should be treated as a separate subspecies (2). But there are also cases of inter-island differences. On Wenman Island I never observed individuals without any ochre spots on the red and yellowish upper surface of the carapace; on the other hand are such individuals often found on Abingdon, Tower and Indefatigable.

In the Galapagos, G. grapsus is preyed upon, on land, chiefly by the two small herons, Butorides sundevalli and Nyctanassa violacea. In the water there are many potential predators, such as fish (e.g., Cirrhitus rivulatus, moray eels) and octopi. On the Ecuadorian mainland there are additional terrestrial enemies such as coatis (Nasua) and/or racoons (Procyon).

A brief survey of the results of my ethological observations, which are published in detail elsewhere (3), follows.

Some secondary sexual characters are presumed to be of behavioral significance. Especially striking are size differences, and the

presence of brushes consisting of bristles up to one cm. in length; these are situated on the propodus of the first two ambulatory legs of big males only.

Hairy ridges are found on the dorsal surface of the ambulatory legs. These are probably parts of sense organs serving in perception of the touching, by the dactylopodits, of conspecific crabs.

In slow locomotion rock crabs walk directly forward or slightly obliquely. In fast locomotion, however, they move sideways. They leap as far as 30 cm. from one rock to another. And they also can swim short distances on the surface of the water by means of rapid synchronous beating of the flattened ambulatory legs.

Much of their food is obtained by tearing off portions of algae with the pincer-like tips of their chelipeds. However, they evidently prefer to eat meat. They chase and try to seize all small moving objects in their vicinity. The big males, in particular, attack smaller members of their own species, eating them or their autotomized legs; indeed their is evidence, that they subsist almost entirely on smaller conspecifics.

Small and middle-sized crabs stay together in groups of individuals of equal size for the most part. They frequently face in the same direction. These patterns of social behavior may reduce the above mentioned cannibalism.

In a variety of situations, the crabs touch each other with their ambulatory legs. Apparently they transmit mechanical and perhaps even chemical stimuli as they do so. It seems that small crabs may prevent the impending attack of a larger conspecific by approaching it sideways and touching it gently with the second and third ambulatory legs of one side.

The fights of males are almost always conducted in a ritualized manner. This involves the use of three clearly discernible displays. The one most often exhibited involves rotating the brilliant red chelipeds, which are held toward the opponent like a shield.

I observed two other responses that appear to be examples of defensive behavior. Animals sitting in the foam of the surf, or in the beam of a flashlight, hold the second and third legs of one side elevated and outstretched. Also, sideways retreating crabs turn the front side of the claw so as to orient it backward toward the pursuer.

In the first phase of courtship the displaying male follows the female. In the second phase the still displaying male slowly retreats. He is then followed by the female who touches him with her ambulatory legs. Copulation may ensue. Occasionally small males may attempt co-

pulation with females of equal or greater size without any preceding courtship dance.

In certain situations the crabs emit jets of water from small movable nozzles situated near the basis of the second antennae. They may direct these jets at other crabs.

During slow locomotion the crabs frequently bring an empty cheliped from the ground to the mouth parts. The male also exhibits these sham feeding movements during copulation.

Animals that are quietly sitting can be seen rubbing their legs against one another. Sometimes they cover their front, sternum, and pereopods with foam produced from the frontal openings of the gill cavities. Both these patterns probably serve a cleaning function.

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L'ASSOCIATION DES SCIENCES DU PACIFIQUE
ET
LE XIième CONGRES DES SCIENCES DU PACIFIQUE
(Tokyo, 22 août - 8 septembre 1966)

par

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Prenant la suite de dix Congrès des Sciences du Pacifique, le XIième Congrès à brillamment réussi la réalisation des objectifs principaux de la Pacific Science Association (Association des Sciences du Pacifique). D'après l'article 2 des déclarations de principe de l'Association (1st Pan-Pacific Science Conference, Honolulu, Hawaii, 1920), ces objectifs sont :

(1) "To initiate and promote cooperation in the study of scientific problems relating to the Pacific Region, more particularly those affecting the prosperity and well-being of Pacific peoples.

(2) To strengthen the bonds of peace among Pacific peoples by promoting a feeling of brotherhood among the scientists of all the Pacific countries."

1. L'ASSOCIATION DES SCIENCES DU PACIFIQUE

Il est opportun de rappeler ici que le siège de la Pacific Science Association se trouve au Bernice P. Bishop Museum à Honolulu, Hawaii 96819. Le Secrétariat du corps administrant, le Pacific Science Council, est assumé par Brenda Bishop, tandis que les membres du Conseil susnommé - anciennement au nombre de quinze - sont issus des institutions représentatives des pays concernés. Parmi les membres de ce Conseil pour la période 1961-1966 il faut citer les noms de MM. Koji Hidaka (Japon), Roland W. Force (Hawaii, Etats-Unis d'Amérique), C.F.A. Pantin (Royaume-Uni), Roger Heim (France), Ian McTaggart Cowan (Canada), R.S. Allan[1] (Nouvelle-Zélande), Sydney Sunderland (Au-

1 Le Professeur R.S. Allan est décédé en juillet 1966.

stralie), Juan Salcedo, Jr. (Philippines), Charng Ratanarat (Thailande), Iso Reksohadiprodjo (Indonésie), et Knowles A. Ryerson (Etats-Unis).

Les Standing Committees (Comités permanents) assurent les activités de la Pacific Science Association durant les périodes séparant les Congrès successifs. Leurs présidents respectifs sont nommés par le Président du Congrès dernier-en-date. Ainsi le Président du Xième Congrès des Sciences du Pacifique (Honolulu, Hawaii, 1961), le Docteur Laurence H. Snyder, avait e.a. nommé les personnalités suivantes :

- F.R. Fosberg (Natural History Museum, Smithsonian Institution, Washington, D.C.20560, Etats-Unis d'Amérique) pour la Biologie végétale;
- Harold J. Coolidge (National Academy of Sciences, National Research Council, Pacific Science Board, Washington, D.C.20418, Etats-Unis d'Amérique) pour la Conservation;
- Keizo Yasumatsu (Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka, Japon) pour l'Entomologie;
- Florencio Tamesis (Philippine Wallboard Corporation, Manila, Philippines) pour la Sylviculture;
- K.B. Cumberland (Department of Geography, University of Auckland, Nouvelle-Zélande) pour la Géographie;
- Hisashi Kuno (Geological Institute, University of Tokyo, Bunkyo-ku, Hongo, Tokyo, Japon) pour les Sciences géologiques et la Géophysique;
- Milner B. Schaefer (Institute of Marine Resources, University of California, San Diego, California, Etats-Unis d'Amérique) pour les Sciences de la Mer;
- W.J. Gibbs (Commonwealth Bureau of Meteorology, Melbourne, Australie) pour la Météorologie;
- Roger Duff (Canterbury Museum, Christchurch, Nouvelle-Zélande) pour le rôle des Musées dans la Recherche au Pacifique;
- J. Ralph Audy (The George Williams Hooper Foundation, San Francisco Medical Center, University of California, San Francisco, Californîia, Etats-Unis d'Amérique) pour la Santé publique et les Sciences médicales;
- H.T. Chang (Department of Agriculture and Forestry, Taiwan Provincial Government, Taipei, Taiwan) pour la Science du Sol;
- Ian McTaggart Cowan (Department of Zoology, University of British Columbia, Vancouver, Canada) pour la Systématique et la Distribution des Faunes insulaires.

Tous les Comités avaient réalisé un remarquable travail préparatoire, aidant ainsi de façon substantielle à canaliser le caractère extrêmement polyvalent des travaux du Congrès de Tokyo.

2. LE COMITE ORGANISATEUR DU CONGRES

Afin de mieux obvier à cette polyvalence et tout en ne perdant jamais de vue les deux objectifs de la Pacific Science Association, le Comité Organisateur avait prévu deux catégories de réunions, notamment les "symposia" et les "réunions de sections".

Le Comité Organisateur était constitué d'un Bureau directeur (Central Office) et de douze Sections (selon les disciplines traitées au Congrès). Président du XIième Congrès des Sciences du Pacifique était le Professeur Sin-itiro Tomonaga (Tokyo University of Education, Tokyo), Prix Nobel, Président du Science Council of Japan, Ueno Park, à Tokyo. Secrétaire général du Congrès était le Professeur Yoshio Hiyama (Fisheries Institute, Faculty of Agriculture, University of Tokyo, Bunkyo-ku, Hongo, Tokyo), membre du Science Council of Japan.

L'on ne fera jamais assez l'éloge du travail réalisé par l'équipe du Comité Organisateur, compte tenu e.a. de facteurs aussi divers que le nombre de participants au Congrès, l'utilisation rationnelle des locaux de l'Université de Tokyo au campus de Hongo, l'organisation des symposia et des nombreuses excursions hors Tokyo.

3. DELEGATIONS OFFICIELLES ET REPRESENTATION D'ORGANISATIONS SCIENTIFIQUES INTERNATIONALES

Les délégations officielles totalisaient 192 délégués, ceux-ci représentant les institutions scientifiques ou politiques de 46 pays dont 40 riverains du Pacifique, les non-riverains se rapportant à l'Argentine, la France, le Honduras, le Laos, le Portugal et le Royaume-Uni. A ce propos, il est intéressant de remarquer que les 7 nations-membres d'honneur de la Pacific Science Association sont toutes des pays non riverains du Pacifique, notamment : l'Inde, la Birmanie, Ceylon, les Pays-Bas, le Danemark, la Norvège et la Suède.

Parmi les institutions scientifiques il faut tout d'abord mentionner celles qui ont qualité représentative au sein du Pacific Science Council (voir chap.11, la composition du Conseil pour la période 1966-1971). En ce qui concerne d'autres nations-membres on citera les institutions suivantes :

- Consejo de Rectores, Universidades Chilenas;
- Academia Peruana de Ciencias Exactas, Físicas y Naturales;
- Escuela Politécnica Nacional, Quito, Ecuador;
- Academia Colombiana de Ciencias;
- Universidad de Panamá;
- Universidad de Costa Rica;

- Universidad Nacional de Nicaragua;
- Universidad de El Salvador;
- Ministerio de Relaciones Exteriores de Guatemala, Dirección de Tratados y Organismos Internacionales;
- Academia de la Investigacion Científica, Mexico;
- University of the Ryukyus;
- Academia Sinica, Taiwan;
- University of Hong Kong;
- Académie des Sciences de l'Union des Républiques Socialistes Sovietiques;
- Ministre de l'Education Nationale du Cambodge;
- University of Malaya, Kuala Lumpur, Malaysia;
- University of Singapore;
- Société d'Etudes Mélanésiennes, Nouméa, Nouvelle-Calédonie;
- Société d'Etudes Océaniennes, Papete, Tahiti;
- Académie des Sciences de Lisbonne;
- Sociedad Científica Argentina.

Le Comité Organisateur du XIième Congrès des Sciences du Pacifique avait invité de très nombreuses organisations scientifiques internationales. Au delà de 25 d'entre elles ont répondu à l'invitation et étaient représentées par un ou deux délégués au Congrès de Tokyo. Parmi ces organisations il faut citer :

- Food and Agriculture Organization of the United Nations (F.A.O.);
- World Meteorological Organization;
- International Union of Geological Sciences (I.U.G.S.);
- International Union of Geodesy and Geophysics (I.U.G.G.);
- I.U.G.G.-International Association of Meteorology and Atmospheric Physics;
- I.U.G.G.-International Association of Geomagnetism and Aeronomy;
- I.U.G.G.-Upper Mantle Committee;
- International Paleontological Union;
- International Commission on Stratigraphy;
- International Association of Physical Oceanography;
- International Geographical Union;
- International Union of Biological Science;
- Inter-American Tropical Tuna Commission;
- International Council for Bird Preservation (I.C.B.P.);
- International Commission on National Parks;
- South Pacific Commission;
- Fondation Charles Darwin pour les Galápagos; etc.

4. LA SEANCE INAUGURALE DU CONGRES (22 août 1966)

La séance d'ouverture eut lieu dans le vaste hall du Nippon Budokan, en présence du Prince Akihito et de la Princesse Mitchiko, de-

vant une audience de plus de 5000 personnes. Après l'exécution d'une salutation musicale, interprêtée au koto par un groupe d'instrumentistes, le Prince Akihito, héritier du trône du Japon et haut protecteur du Congrès, s'adressa aux congressistes. Cette allocution impériale fut suivie de celle du Professeur Sin-itiro Tomonaga, Président du Congrès.

Au nom de leurs institutions respectives, plusieurs membres du Pacific Science Council, dont le Docteur Roland W. Force, le Professeur Koji Hidaka, le Professeur Sydney Sunderland et le Professeur Roger Heim, prirent la parole. Tous mirent l'accent sur les objectifs primordiaux de la Pacific Science Association et insistèrent sur la grande signification humaniste qu'allait représenter la rencontre de plus de 2000 scientifiques, venus de très nombreux pays, et de leurs collègues japonais sur le sol hospitalier qu'est la terre nipponne.

Pendant la seconde partie de la séance il fut procédé à la remise de médailles et de "Honorary Life Fellowships". Tout d'abord, c'est le Docteur Deogracias V. Villadolid, Doyen de l'Institute of Graduate Studies and Applied Research de la Araneta University (Philippines), qui se voit décerner la Médaille Shinkishi Hatai pour ses remarquables travaux dans le domaine de la Biologie marine. Cette médaille est remise pour la première fois et sera attribuée, lors de chaque Congrès des Sciences du Pacifique, au scientifique dont les travaux en Biologie marine du Pacifique se sont avérés les plus méritoires. En cette occasion, la médaille est présentée par M. Terajiro Takagi, Président du Comité de Direction de la Japan Society for the Promotion of Science.

Ensuite, le Docteur Roland W. Force, Directeur du Bernice P. Bishop Museum à Honolulu, présente la Médaille Herbert E. Gregory (instaurée en 1961 par le Conseil du musée susmentionné) au Docteur George Peter Murdock, Professeur de la Chaire Andrew Mellon d'Anthropologie sociale à l'Université de Pittsburgh, Pennsylvanie. Puis, Monsieur Harold J. Coolidge et le Président Sin-itiro Tomonaga présentent les "Honorary Life Fellowships" de la Pacific Science Association respectivement au Professeur Koji Hidaka (Japon) et au Docteur Cyril E. Pemberton (Hawaii) pour leurs activités multiples au service de l'Association.

La séance inaugurale se termine par une brève allocution du Secrétaire général du Congrès, le Professeur Yoshio Hiyama.

5. SYMPOSIA ET REUNIONS DE SECTIONS

Il est impossible de donner ici un aperçu complet des sujets traités lors des symposia (60 "Symposia" du 23 au 27 août 1966; 2

"Congress Symposia" sur des thèmes particuliers; 4 "Special Symposia" du 4 au 7 septembre 1966) et des (42) réunions de sections. Nous nous bornerons à citer, tant pour les Symposia que pour les réunions de sections, les communications comportant un intérêt certain pour l'Archipel des Galapagos.

Les titres sont repris en Annexe au présent texte.

Il est bien entendu que ces communications ne représentent qu'un aperçu éclectique. Les titres se rapportant directement aux Iles Galapagos ne sont qu'au nombre de quatre. Elles ont pour auteurs : F.R. Fosberg (Etats-Unis), E. Yale Dawson (Etats-Unis), J. Laruelle (Belgique), et R.C. Stebbins, J.M. Lowenstein & N.W. Cohen (Etats-Unis). Ce nombre peut paraître bas. On ne peut néanmoins oublier que le Xième Congrès des Sciences du Pacifique, tenu à Honolulu, Hawaii, en 1961, avait consacré un symposium entier aux Galapagos. Rappelons ici la part active qu'y prirent le regretté premier Président de la Fondation Charles Darwin, le Professeur Victor Van Straelen, et l'ancien Secrétaire pour les Amériques, le Docteur Robert I. Bowman.

Les contributions énumérées en Annexe ont un rapport direct ou indirect avec les problèmes multiples posés par le milieu galapagien. Il faut aussi rappeler la part éminente prise par certains membres du Conseil exécutif de notre Fondation soit dans l'élaboration des programmes de session, soit comme présidents de session, soit comme animateurs de certaines discussions ayant débouché sur l'énoncé des résolutions du Congrès. Nous voulons citer ici les noms de MM. Harold J. Coolidge (Etats-Unis) et Jean-Paul Harroy (Belgique).

6. PUBLICATIONS DU CONGRES

Tous les membres participant au Congrès ont reçu les Comptes rendus sous forme de 12 volumes ronéotypés, un treizième volume faisant fonction de livre-guide pour les sessions. Par décision du Pacific Science Council, ces Comptes rendus ne comportent que les Extraits des communications présentées et ne seront pas suivis de la publication des textes in extenso. Ces derniers peuvent être publiés dans des périodiques nationaux ou internationaux, laissés au choix de chaque auteur.

En vue de disposer de données centralisées, l'Association des Sciences du Pacifique insiste pour que les auteurs fassent connaître le nom du périodique choisi et envoyent un tiré-à-part de leur texte aux deux adresses suivantes :

- Liaison Committee for Pacific Science, Science Council of Japan, Ueno Park, Tokyo; et

- Pacific Science Association, Bernice P. Bishop Museum, Honolulu, Hawaii 96819.

Il faut signaler enfin que le Science Council of Japan sortira sous peu un quatorzième volume consacré aux points suivants : la séance inaugurale, la séance de clôture, les réunions du Pacific Science Council, les nouveaux règlements et statuts, les résolutions, ainsi que les rapports des Comités permanents.

7. LES RECEPTIONS PENDANT LE CONGRES

Cinq réceptions furent organisées pendant la première semaine du Congrès à l'intention des délégations officielles et des représentants d'organisations scientifiques internationales. Dans l'ordre chronologique les réceptions ont été données par :

- le Président du XIième Congrès des Sciences du Pacifique et le Professeur Takeo Watanabe (à Chinzanso, 22 août 1966);
- le Gouverneur de Tokyo (au Palace Hotel, 23 août 1966);
- l'Empereur et l'Impératrice du Japon (au Palais Impérial Kunaicho, 24 août 1966);
- le Premier Ministre du Japon (à la Résidence du Premier Ministre, 25 août 1966);
- le Président de la University of Tokyo (au Jardin Botanique de l'Université, 26 août 1966).

Pendant la deuxième semaine il y eut les réceptions organisées par les Ambassadeurs accrédités et les Consuls résidant à Tokyo.

8. NOMBRE DE PARTICIPANTS AU CONGRES

A la date du 1er septembre 1966 le nombre de membres participants totalisait 5.906, partagé entre 3.740 membres japonais et 2.166 membres étrangers. Les inscriptions les plus nombreuses avaient été notées pour les Sections VI (1.258 membres) et VIII (1.013 membres), tandis que le nombre d'inscriptions le plus bas revenait à la Section XII (96 membres)[2].

9. LA SEANCE DE CLOTURE ET LES RESOLUTIONS DU CONGRES (3 septembre 1966)

La séance de clôture s'est tenue le 3 septembre 1966 au Yasuda Hall, le vénérable auditorium situé au coeur même du campus de Hongo. Cette séance, à la fois Assemblée générale du Congrès, vit l'adoption des 55 projets de résolutions, déjà approuvés par le Conseil de l'Association des Sciences du Pacifique. Ces résolutions se rapportent à 15 sujets différents, traités soit à l'occasion des Symposia soit

2 Voir la distribution des Sections dans la liste des communications présentées aux réunions de sections (Annexe).

lors des réunions des Comités permanents.

En parcourant les 55 résolutions, issues du XIième Congrès des Sciences du Pacifique, on constate que seules 17 d'entre elles ont un rapport avec les Iles Galapagos. Les sujets en sont : la Conservation, la Géographie, Géologie et Géophysique, les Sciences de la Mer, la Météorologie, les Faunes Insulaires, et les Musées axés sur la Recherche dans le Pacifique.

La brièveté de cet aperçu illustre clairement le long et fertile chemin déjà parcouru par la Fondation Charles Darwin pour les Galapagos. Ses activités montrent jusqu'à quel point les buts énoncés en 1959, lors de sa création, ont été poursuivis et, dans une non négligeable mesure, atteints.

Parmi les nouvelles recommandations de la Pacific Science Association figure la création de trois Comités permanents, portant ainsi le total de ceux-ci à 21. Ces Comités (Standing Committees) s'occuperont respectivement des Ecosystèmes Insulaires, des Problèmes de Population, et de l'Education Scientifique. Il va sans dire que les activités du premier et du dernier de ceux-ci pourraient entraîner des décisions capitales dont dépendra, en partie au moins, l'avenir du "laboratoire vivant de l'évolution".

10. EXCURSIONS TOURISTIQUES ET SCIENTIFIQUES

En dehors des excursions touristiques et scientifiques, et du Ladies Programme, organisés durant la période des sessions du Congrès à Tokyo (22 août - 2 septembre 1966), le Comité Organisateur avait consenti un effort énorme en organisant des excursions post-Congrès du 4 au 8 septembre 1966. Selon son choix, les excursions pouvaient conduire le congressiste soit en l'île Hokkaido (excursion I), soit en différentes préfectures de Honshu (excursions II, III, IV, partim V), soit en l'île Shikoku, soit en l'île Kyushu (excursion VI). Ce choix allait même plus loin, puisque s'offrait au congressiste l'alternative d'une excursion à caractère géologique ou d'une excursion à caractère plutôt bio-géographique.

Ceux qui ont connu le privilège de pouvoir suivre une des excursions - dont l'auteur du présent article - auront pu se rendre compte e.a. de la diversité physiographique du paysage nippon et de l'incomparable hospitalité du peuple japonais. Nation de grande culture, à la recherche d'un avenir toujours en marche, le Japon nous est aussi apparu particulièrement conscient des problèmes que pose la Conservation de la Nature. C'est là presque une gageure, lorsque l'on sait combien est grande la pression démographique dans cette partie du monde. Tous ces aspects et bien d'autres nous avaient déjà été commu-

niqués, durant les deux semaines de congrès à Tokyo, sous forme de conférences publiques, d'expositions et de projections de films.

11. LE CONSEIL DE L'ASSOCIATION DES SCIENCES DU PACIFIQUE (1966-1971)

Le Conseil ayant décidé de procéder à l'élargissement du nombre de ses membres de quinze à vingt-cinq, l'on a pu enregistrer avec satisfaction l'admission nouvelle de trois institutions représentatives resp. de l'Union des Républiques Socialistes Soviétiques, de la Malaysie et de la République de Corée. Le Conseil espère pouvoir étendre le nombre actuel de ses membres par l'admission d'institutions représentatives des états d'Amérique latine.

La composition du Conseil de l'Association des Sciences du Pacifique est présentement la suivante :

- Le Professeur Sin-itiro Tomonaga, Président du XIième Congrès des Sciences du Pacifique;
- Le Professeur Sydney Sunderland, Australian Academy of Science;
- Le Docteur Juan Salcedo, Jr., National Research Council of the Philippines;
- Le Docteur Roland W. Force, Bernice P. Bishop Museum, Hawaii;
- Le Docteur W.S. Hoar, National Research Council, Canada;
- Le Professeur Roger Heim, Académie des Sciences, Institut de France;
- Le Docteur Iso Reksohadiprodjo, Madjelis Ilmy Pengetahuan Indonesia;
- Le Docteur C.M. Yonge, The Royal Society, London;
- Le Professeur Dr. A.A. Guber, Académie des Sciences de l'U.R.S.S.;
- Le Docteur Trân-Quang-Dê, Université de Saigon, Viet-Nam;
- Le Docteur Charng Ratanarat, National Research Council, Thailande;
- Le Professeur Yoshio Hiyama, Science Council of Japan;
- Monsieur Harold J. Coolidge, National Academy of Sciences, National Research Council, E.-U. d'Amérique;
- Le Professeur J.A.R. Miles, The Royal Society of New Zealand;
- Le Docteur I.C. Yuan, Academia Sinica, Taiwan;
- Le Professeur T.H. Ahn, National Academy of Sciences, Republique de Corée;
- Le Prorecteur, University of Malaya, Malaysie.

12. LE XIIième CONGRES DES SCIENCES DU PACIFIQUE

Le prochain Congrès se tiendra en Australie en 1971.

A N N E X E

SELECTION DE COMMUNICATIONS PRESENTEES AU CONGRES DE TOKYO

Les Symposia

N° 2. CHANGES IN OCEAN, ATMOSPHERE AND MARINE RESOURCES IN THE PACIFIC, WITH THEIR PREDICTIONS.----------

M. HANZAWA (Japon).- Some features of large-scale oceanic changes associated with meteorological variations.

J. BJERKNES (E.-U.).- Changes in oceanic climate, wind and pressure systems in the Eastern Pacific, particularly "El Niño".

M. OUTI (Japon).- The long-term variations of the atmospheric and oceanic conditions.

K. WYRTKI (E.-U.).- The circulation system of the Eastern Equatorial Pacific Ocean.

W. BRANDHORST (Chili).- Changes in the Peru - Chili Current system and their effects on the major currents.

M. BLACKBURN (E.-U.).- Tuna oceanography in the Eastern Pacific Ocean.

N° 3. CIRCULATION OF THE PACIFIC OCEAN : NUMERICAL METHODS IN THE THEORY OF OCEANIC CIRCULATION, WITH APPLICATION TO THE PACIFIC OCEAN.----------

A.I. FELSENBAUM & N.B. SHAPIRO (U.R.S.S.).- Numerical model of the Cromwell Current regarded as an element of the Pacific Ocean circulation.

N° 4. EVOLUTION, DISTRIBUTION AND MIGRATION OF PLANTS AND ANIMALS IN THE PACIFIC AREA.----------

P.S. HUMPHREY (E.-U.).- The sea bird marking project in the Pacific area.

H.L. CARSON (E.-U.).- The process of speciation on volcanic islands.

I.W.B. THORNTON (Hong Kong).- Isolation within archipelagos.

W.K. EMERSON (E.-U.).- Indo-Pacific elements in the Tropical Eastern Pacific, with special reference to the Mollusks.

E.A. KAY (E.-U.).- The composition and relationships of the marine Mollusks of the Hawaiian Islands.

A. SOLEM (E.-U.).- Age and origin of the Pacific land snail fauna.

F. MALKAMA (E.-U.).- Trans-palaeo-equatorial distribution of plants in the Pacific.

N° 8. LAND CLASSIFICATION.----------

F. SAHARA (E.-U.).- Land Classification program in the State of Hawaii.

K. DARMOJUWONO (Indonésie).- The use of the land utilization map for land evaluation.

M. OYAMA & H. TAKEHARA (Japon).- Soil survey of Japan.

H.S. GIBBS (Nouvelle-Zélande).- Land classification in New Zealand, 1962-'65.

N° 9. PREHISTORIC CULTURE IN OCEANIA.----------

Y. SINOTO (Japon).- Position of the Marquesas Islands in the East Polynesian prehistory.

T. HEYERDAHL (Norvège).- Prehistoric culture of Easter Island.

N°10. UPPER MANTLE PROJECT IN THE PACIFIC AREA.----------

G.S. GORSHKOV (U.R.S.S.).- Interoceanic isles, East Pacific Ridge, island arcs : volcanism and the upper mantle.

N. PAVONI (Suisse).- Investigations on the recent horizontal crustal movements in the Circum-Pacific Orogenic Belt.

G.B. UDINTSEV (U.R.S.S.).- Tectonic division of the Pacific.

R.W. GIRDLER (Royaume-Uni).- The world rift system as an indicator to possible processes in the earth's mantle.

L. EGYED (Hongrie).- Causes and mechanism of the crustal deformations along the Pacific border.

I. IWASAKI, T. KATSURA, T. OZAWA, M. YOSHIDA & B. IWASAKI(Japon).- The chlorine contents of volcanic rocks and the migration of chlorine from the mantle to the surface of the earth.

N°18. TSUNAMIS AND STORM SURGES.----------

K. IIDA (Japon).- Earthquakes and tsunamis.

D.C. COX (E.-U.).- Tsunamis and warning systems : A review.

C.L. BRETSCHNEIDER (E.-U.).- On wind tides and wind-driven longshore currents caused by winds blowing at an angle to the coast.

N°19. SEA LEVEL CHANGES AND CRUSTAL MOVEMENTS OF THE PACIFIC DURING THE PLIOCENE AND POST-PLIOCENE TIME.----------

E.D. GILL (Australie).- Description of Quaternary shorelines with special reference to the tectonic factor.

H. NAKAGAWA (Japon).- Quaternary sea-levels of the Japanese islands.

S. FUJII & N. FUJI (Japon).- Postglacial sea-levels in the Japanese islands.

N°20. CHEMICAL ELEMENTS AND ISOTOPES IN THE PACIFIC WATERS, INCLUDING ORGANIC SUBSTANCES.----------

D.W. HOOD (E.-U.).- Organic-Inorganic associations in the marine environment.

J.R. KRAMER (E.-U.).- Chemical composition of oceans in geological times.

P.K. WEYL (E.-U.).- Chemical stability of the World Ocean over geologic time.

N°21. DEEP SEA FAUNA, SEDIMENTS AND BOTTOM WATERS IN THE PACIFIC.----

P.L. BEZRUKOV (U.R.S.S.).- Distribution of rock outcrops in the Pacific and Indian Oceans.

N°24. AGE AND NATURE OF THE CIRCUM-PACIFIC OROGENESIS.----------

H. BURGL (Colombie).- The orogenesis in the Andean system in Colombia, South America.

N.P. VASILKOVSKY (U.R.S.S.).- On the geological nature of the Pacific mobile belt.

T. MATSUMOTO (Japon).- Fundamental problems in the Circum-Pacific orogenesis.

N°26. ECOSYSTEM METABOLISM AND BIOLOGICAL PRODUCTIVITY IN THE PACIFIC LAND AREA.----------

J.D. OVINGTON (Australie).- Forest ecosystem dynamics.

W.B. JACKSON (E.-U.).- A comparison of rodent population on high and low islands in Micronesia.

R. TANAKA (Japon).- A problem of unexposed population in census of outbreaking small rodents.

N°27. BIOTIC COMMUNITIES OF THE VOLCANIC AREAS OF THE PACIFIC.------

V.J. KRAJINA (Canada).- Biogeoclimatic zones of the Hawaiian Islands and their variation by volcanic activities.

D. MUELLER-DOMBOIS (E.-U.).- Topographic vegetation profiles of Hawaiian volcanoes.

° F.R. FOSBERG (E.-U.).- Observations on vegetation patterns and dynamics on Hawaiian and Galapageian volcanoes.

B.H. BRATTSTROM (E.-U.).- The biotic communities of the Revillagigedo Islands, Mexico; their origin and development.

W.A. EGGLER (E.-U.).- Plant invasion of some recent volcanic deposits in North and Central America.

A. DILMY (Indonésie).- Biological devastation wrought by the eruption of the Mountains Agung and Batur on the Island of Bali.

K. YOSHIOKA (Japon).- Development and recovery of vegetation on Mt. Konagatake since the 1929 eruption.

N°30. PACIFIC PALYNOLOGY.----------

T. KAWASAKI (Japon).- Morphological and phylogenetic studies on fern spores in Pacific areas.

N°31. THEORETICAL AND PRACTICAL PROBLEMS IN MANAGEMENT OF NATIONAL PARKS AND RESERVES IN THE PACIFIC AREA.----------

R.W. CLELAND (Nouvelle-Zélande).- The National Parks Authority of New Zealand since 1952.

J.B. ALVAREZ, Jr. (Philippines).- The National Parks of the Philippines : concept, polices and practices.

D.F. GALICIA (Mexique).- National Parks of Mexico.

Y. OSAKI (Japon).- The characteristics of the national park management in Japan.

D. BANIJBATNA (Thailande).- The problems in the management of national parks and reserves in Thailand.

Hon-Kyu KIM (Corée).- National park status in Korea.

G.C. RUHLE (E.-U.).- Conservation within national parks, proposed and existing in South-east Asia.

Yung SUN KANG (Corée).- The status of conservation and management of endemic animals to Korea.

S. KATO (Japon).- Control of visitors to the national parks and nature reserves. A technical approach for more perfect conservation.

N°36. ALGAE IN THE PACIFIC (BIOLOGY AND CULTIVATION). ----------

I.A. ABBOTT (E.-U.).- Observations on vertical distribution of marine algae at Akkeshi, Hokkaido, and Pacific Grove, California.

V.B. VOZZHINSKAYA (U.R.S.S.).- Notes on free-floating plants in the Pacific.

M.S. DOTY (E.-U.).- Distribution of the tropical Pacific benthic algae.

E.Y. DAWSON (E.-U.)[3].- Benthic algae in the northernmost Gulf of California, Mexico.

V.J. CHAPMAN (E.-U.).- Algae in the Pacific.

N°38. ARBOVIRUS DISEASES, ANIMAL VECTORS AND RESERVOIRS.----------

C. WISSEMAN (E.-U.).- Seroepidemiology of arbovirus infection in the Pacific Islands.

C. SAINMARTIN (Colombia).- Serepidemiology of arbovirus infections on the Pacific coast of South America.

W.F. SCHERER (E.-U.).- Epidemics in the Pacific area with emphasis on the past five years (Mosquito-borne viruses).

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3 La mort, accidentellement survenue en Egypte le 22 juin 1966, a empêché l'auteur de présenter cette communication.

H.E. McCLURE (E.-U.).- Current concepts of the role of migratory birds as hosts.

A. OYA (Japon).- The role of mammals as primary and supplementary hosts.

N°56. ISLAND ECOSYSTEM OF THE PACIFIC BASIN.----------

E. BALASINGAM (Malaysie).- Ecology and conservation of marine turtles.

W.B. JACKSON (E.-U.).- Terrestrial ecosystems in Micronesia, with special emphasis on rodent populations.

M. HOLGATE & E.M. NICHOLSON (Royaume-Uni).- An international conservation programme for the Pacific islands.

N°57. PHYSIOGRAPHIC DEVELOPMENT OF THE PACIFIC REGION.----------

I.P. GERASIMOV & Y.A. MESCHERIKOV (U.R.S.S.).- Geomorphological map of the Pacific Ocean.

T. SUZUKI (Japon).- On the distribution of volcanoes in relation to the configuration of their basal rocks in the Circum-Pacific orogenic zone.

H. TOYA & H. MACHIDA (Japon).- Geomorphological utilization of pyroclastic deposits.

N°59. PACIFIC CLIMATOLOGY.----------

R.L. ANSTEY (E.-U.).- Geographical climatology.

T. YAZAWA (Japon).- Cooperative investigations regarding climatic variations in the Pacific Basin.

Les Symposia extraordinaires

N° 1. MARINE PARKS.----------

D.F. McMICHAEL (Australie).- Marine national parks in Australia, present developments and future needs.

P.H. FISCHER (France).- Marine parks of the Great Barrier Reef, Australia.

D.V. VILLADOLID (Philippines).- Marine parks in the Philippines.

C. RAY (E.-U.).- Conservation and ecology in the marine inshore environment.

° E.Y. DAWSON (E.-U.)[4].- The Galapagos Islands as an international marine park.

Y. OKADA (Japon).- Marine fishes and marine parks in Japan.

N° 2. PRIMATE BIOLOGY OF THE PACIFIC AREA.----------

N° 3. TSUTSUGAMUSHI DISEASE.----------

C.B. PHILIP, D.B. LACKMAN, R.N. PHILIP, H. SCHENONE & S. COSCARON (E.-U.).- Serologic evidence of rickettsial zoonoses in South American domestic animals.

N° 4. ECOLOGICAL BASIS OF NATURE CONSERVATION OF ALPINE AND SUBALPINE ZONES.----------

T. SUZUKI (Japon).- Speciality and generality of the Japanese subalpine and alpine vegetations.

D. MUELLER-DOMBOIS (E.-U.).- Ecological relations in the alpine and subalpine vegetation on Mauna Loa.

R.E. SOERIATMADJA (Indonésie).- Phytosociological study of Mt. Tangkubanprahu.

A.B. COSTIN (Australie).- Problems and practice of nature conservation of subalpine and alpine ecosystems in Australia.

E.B. WORTHINGTON (Royaume-Uni).- The hydrological cycle in mountain conservation.

Les Réunions de Sections

SECTION I : METEOROLOGIE.----------

S.S. GAIGEROV (U.R.S.S.).- On the structure of the lower troposphere in the tropical zone of the Pacific.

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4 La mort a empêché l'auteur de présenter cette communication.

SECTION II : SCIENCES DE LA MER.----------

Y.V. ISTOSHIN (U.R.S.S.).- The Cromwell Current.

P.E. LAVIOLETTE (E.-U.).- A preview of newly constructed sea surface temperature charts of the Pacific, Altantic, and Indian Oceans.

P.K. WEYL (E.-U.).- The Pacific Ocean as a model for the Glacial Atlantic.

R.D. TERRY (E.-U.).- Continental slopes of the world.

H. STEARNS & T. CHAMBERLAIN (E.-U.).- Deep cores of Oahu, Hawaii, and their bearing on the geological history of the Central Pacific Basin.

E. BONATTI (E.-U.).- Volcanogenous minerals in pelagic sediments of the Pacific.

Z.N. GORBUNOVA (U.R.S.S.).- Clay minerals in the sediments of the Pacific Ocean.

S.V. BRUEVICH, V.I. IVANENKOV, V.V. SAPOZHNIKOV, A.M. CHERNYAKOVA & A.N. GUSAROVA (U.R.S.S.).- On the basic chemical features of the Pacific Ocean.

SECTION III : GEOPHYSIQUE.----------

M.H. MANGHNANI & G.P. WOOLLARD (E.-U.).- Elastic properties of some inclusive ultramafics in Hawaiian volcanic rocks.

A.S. FURUMOTO & W.M. ADAMS (E.-U.).- Variation of the thickness of the crust under the Hawaiian Ridge as revealed by seismic refraction surveys.

A.S. FURUMOTO (E.-U.).- Seismic refraction study of the internal structure of a volcanic cinder cone.

A.S. FURUMOTO & G.L. MAYNARD (E.-U.).- Seismograph stations operated on several Pacific islands.

I. McDOUGALL (Australie).- Reversals of the geomagnetic field.

R.W. GIRDLER (Royaume-Uni).- Statistical analyses of terrestrial heat flow and seismicity of the Pacific Ocean.

E.A. LUBIMOVA (U.R.S.S.).- Temperature profiles under the continental and oceanic crust.

A. MALAHOFF & W.E. STRANGE (E.-U.).- A comparison of the geophysical characteristics of intra-pacific and circum-pacific volcanoes.

F.W. McCOY, Jr. (E.-U.).- Submarine volcanism along the east rift zone of Kilauea, Hawaii.

SECTION IV : GEOLOGIE ET SCIENCE DU SOL.----------

H.D. TJIA (Indonésie).- Volcanic lineaments in the Indonesian island arc.

T. MATSUMOTO (Japon).- Genetical considerations on the Mesozoic plutono-volcanic association in the Circum-Pacific border zone.

R.S. DIETZ (E.-U.).- Pacific border geosynclines, mountains and continent building.

G.S. MACDONALD (E.-U.).- New data on the chemical composition of Hawaiian lavas.

G. TERCINIER & P. QUANTIN (Nouvelle-Calédonie).- Effect of the weathering on the recent volcanic ashes and pumices in relation to the species, the properties and the fertility of the soils in the New Hebrides.

° J. LAMBELLE (Belgique).- Soils of the Galapagos Islands.

SECTION V : SCIENCES BIOLOGIQUES.----------

R.L. TAYLOR (Canada).- The Queen Charlotte Islands, a plant refugium of the Eastern Pacific.

E. MATUDA (Mexique).- Tree cactus and their distribution in Mexico.

P.D. ASHLOCK (E.-U.).- The origin of the Hawaiian Orsillinae (Insecta, Hemiptera, Lygaeidae).

R.N. SINHA (Canada).- Systematic value of mycophagy in some Arthropoda.

J.F. GATES CLARKE (E.-U.).- Distribution of certain insular Microlepidoptera.

D.E. HARDY (E.-U.).-Evolution and genetics of Hawaiian Drosophilidae (Diptera).

° R.C. STEBBINS, J.N. LOWENSTEIN & N.W. COHEN (E.-U.).- A field study of the lava lizard (Tropidurus albemarlensis) in the Galapagos Islands.

J.D. GIBSON (Australie).- The wandering albatross, Diomedea exulans. Results of banding and observations in New South Wales coastal waters and the Tasman Sea.

M.A. MILLER (E.-U.).- Zoological studies on Isopod Crustacea of the Pacific Islands.

K. ISHIZUKA (Japon).- Ecology of the ornithocoprophilous plant communities on the breeding places of the black tailed gull, Larus crassirostris, along the coast of Japan. I. Vegetation analysis.

R.W. BECKING (E.-U.).- Time, a measurement in vegetation research.

M. TATEWAKI (Japon).- Vegetation of the active volcanoes in Northern Japan.

R.N. JENKIN (Royaume-Uni).- The role of ecological studies in assessing the development potential of Pacific islands.

J.D. MILLIMAN (E.-U.).- Caribbean and Indo-Pacific coral reefs.

SECTION VI : AGRICULTURE, SYLVICULTURE, SCIENCES VETERINAIRES ET CONSERVATION.----------

B.H. KWACK (Corée).- Effects of calcium and other substances on pollen growth.

I. McT. COWAN (Canada).- Conservation planning on a national scale.

L.M. TALBOT (E.-U.).- Development of future conservation plants in tropical South-east Asia.

E.M. NICHOLSON (Royaume-Uni).- The role of the International Biological Programme in developing an ecological framework for a comprehensive world system of research reserves.

M. BUCHINGER (Argentine).- Conservation education at school, college, and public information levels.

H. BASJARDIN (Indonésie).- Nature conservation education in Indonesia.

S.H. HOSLETT (E.-U.).- Conservation education, international unity with national diversity.

A. MIYAWAKI & S. ITOW (Japon).- Phytosociological approach to the conservation of nature and natural resources in Japan.

R. FERREYRA (Perou).- Some efforts toward the conservation of natural areas in Peru.

F. MATTICK (Allemagne fédérale).- The necessity of nature conservation in Southern Chile. The vegetation of Southern Chile in comparison with regions of similar climate in Europe, New Zealand and Japan.

T. INUKAI (Japon).- Protection of the Japanese crane, Grus japonensis, with success in Japan.

G.H. DELISLE (E.-U.).- A method of planning for fish and wildlife resources.

H. BASJARDIN (Indonésie).- The role that ecology is playing in the planning and development of projects affecting landuse practices.

C.L.W. BRYAN (E.-U.).- Forestry in the Hawaiian Islands.

M. OHMASA (Japon).- Contribution of the soil classification to the practice of sylviculture in Japan.

K.H. TAN & R. RACHMAT (Indonésie).- On the taxonomic value of soil fabric formation in Red Tropical soils.

T. NOTOHADIPRAWIRO (Indonésie).- A contribution to the identification of Red-Yellow Podzolic soils found in the tropics.

S. AOMINE & K. WADA (Japon).- Grade of weathering and fertility of volcanic ash soils from Aso Volcano.

SECTION VII : PECHERIES, EAUX MARINES ET DOUCES.----------

T.S. RASS (U.R.S.S.).- Biogeographical fisheries complex of the Pacific.

V.G. OSIPOV (U.R.S.S.).- On the biology of some predatory pelagic fishes in the Pacific Ocean and the oceanographic conditions.

M. POLLARD FISH (E.-U.).- A reference library of biological underwater sounds.

SECTION VIII : ALIMENTATION, SANTE PUBLIQUE ET SCIENCES MEDICALES.----

H. YOSHIMURA (Japon).- Physiological adaptation to undernutrition.

S.M. KEENY (E.-U.).- Wanted, fewer, better babies.

SECTION IX : SCIENCES SOCIALES.----------

K. ITO (Japon).- Technology and Weltanschauung in Japan.

H. SAITO (Brésil).- Japanese in Peru.

E.P. WITTERMANS (E.-U.).- Some factors influencing status and prestige in a multi-ethnic society.

SECTION X : ANTHROPOLOGIE.----------

V.I. VOITOV & D.D. TUMARKIN (U.R.S.S.).- Navigational conditions of sea routes to Polynesia.

L.M. HANKS (E.-U.).- Six hypotheses on the ecology of social and cultural instability.

SECTION XI : GEOGRAPHIE.----------

S. ASAMI (Japon).- On the relationship between major soil types and geomorphic surfaces in Japan.

SECTION XII : INFORMATION SCIENTIFIQUE ET MUSEES.----------

W. PARTANINGRAT (Indonésie).- Characteristics and history of Indonesian scientific periodicals.

G.Z. ZHDANOVA (U.R.S.S.).- Translations of scientific and technical literature in the U.S.S.R. and prospects of international collaboration.

G.S. BONN (E.-U.).- Training needs for science documentation work in Pacific countries.

G. WADDINGTON (E.-U.).- Foundation of a world system of numerical scientific data.

Q. AYSON EALA (Philippines).- Scientific and technological researches and scientific information facilities in the Philippines.

R.W. FORCE (E.-U.).- Anatomy of museum.

R.T. HATT (E.-U.).- The role of science museum in island communities.

S. KADARSAN & S. SOMADIKARTA (Indonésie).- A key zoological collection in tropical South-east Asia.

A. BOSE (Inde).- On the establishment of a science museum in rapid developing countries.

FUNDACION CHARLES DARWIN PARA LAS ISLAS GALAPAGOS

CHARLES DARWIN FOUNDATION FOR THE GALAPAGOS ISLANDS

FONDATION CHARLES DARWIN POUR LES GALAPAGOS

Créée sous les auspices de l'Organisation des Nations-Unies pour l'Education, la Science et la Culture (UNESCO)

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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.