

NEWS FROM ACADEMY BAY

CONSERVATION PROBLEMS AND PROGRAMMES

Lack of funds at the Charles Darwin Research Station (CDRS) has compelled a reduction in the number of the staff scientists, whose primary function is conservation. Consequently there has been some redistribution of responsibilities. Marcia Williams, who arrived with her husband in 1985, has taken over the direction of ornithology and entomology as well as herpetology. Mario Hurtado combines the duties of assistant station director with his familiar speciality of marine biology. Jonas Lawesson has recently taken charge of botany, including forestry and the eradication of introduced plants. Luis Calvopiña continues to lead the team devoted to the study and control of the introduced mammals which do so much damage to the native wildlife. This delineation of duties does not interfere with the close co-operation between the various disciplines: for instance, the herpetologists, when repatriating captive-bred Land Iguanas to their natural homes, require the help of the predator controllers on account of the marauding cats, and of the botanists on account of the supply of plant food. Similarly almost all conservation projects are planned, researched and carried out in the closest collaboration with the Galapagos National Park Service (GNPS).

THE GIANT TORTOISES

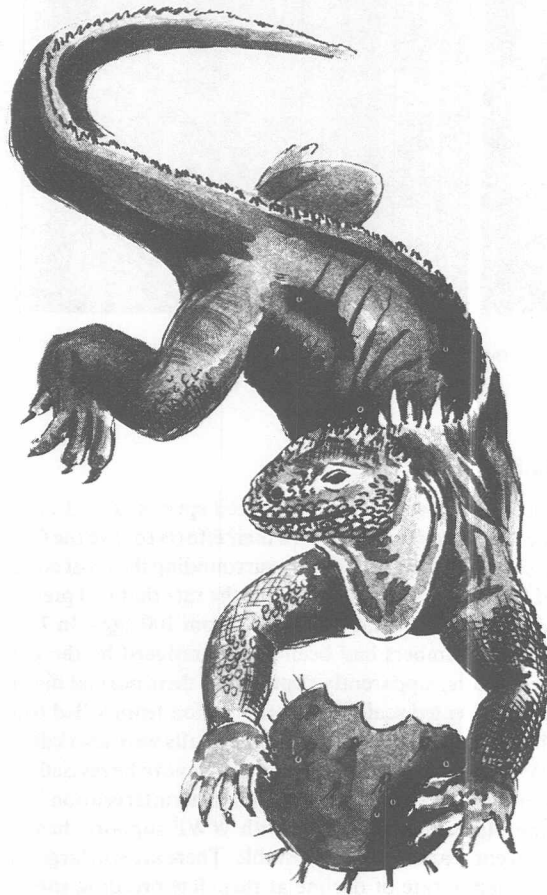
The captive-breeding of tortoises at the CDRS was begun twenty years ago and batches of the young animals have been regularly restored to their respective ancestral islands for the last fifteen years. As these long-lived reptiles mature slowly, none seems so far to have reached reproductive state. (Nobody yet knows when Galapagos tortoises begin to breed nor how long they live). When Marcia Williams recently visited Española (Hood) Island, where the entire population consists of captive-bred juveniles as the few surviving adults were taken to the CDRS in 1965 for breeding purposes, she found that the tortoises were not in very good shape. This was probably due to the effect of the prolonged drought on their food supply, which was temporarily deficient in spite of the fact that the introduced goats, formerly so destructive to the vegetation, had been eliminated some years ago. Two tortoises, aged 6 and 13 years, were dead; these were the first captive-bred losses to be recorded on the island. Another disappointment was the discovery of 4 carapaces of adult tortoises by her assistant, Cruz Márquez, while he was making a census of the tortoise populations on Cerro Azul and Sierra Negra (Isabela). There can be little doubt that they had been killed by poachers, a practice that had largely ceased since the establishment of the CDRS. More encouraging tortoise news is given by Susan Metzger & Ron Marlow elsewhere in this issue, and in spite of the occasional setbacks the tortoise programme remains an outstanding success.

Because of the advantages of operating with the natural climate and food (or by sheer good luck?) the CDRS has always been more successful than the great zoos in hatching and raising giant tortoises. But there have been ups and downs; deaths of hatchlings in their first year have occurred from a number of causes and methods have been tried to counteract them. The latest experiment has been to hatch half the 1985 eggs of the Cerro Azul, Santiago and Española races in open-air incubators while hatching the other half as usual inside the tortoise house. The results are awaited with interest. With Swedish support, a comprehensive survey involving both laboratory and field studies will be launched in 1986-87 to investigate the present status of the tortoise and land iguana populations in the wild and the captive breeding and restocking programmes of the CDRS & GNPS.

THE LAND IGUANAS

Ten years ago the wild dogs came close to extinguishing the important Land Iguana populations on Santa Cruz and at Cartago Bay on Isabela. There are of course other populations on other islands but variation is one of the outstanding characteristics of the Galapagos and it was decided that every effort should be made to save all of them. The few survivors were taken to the CDRS where, after trial and error, methods of breeding these peculiar animals were successfully developed in the Station's pens. However the level of hatchlings and first year survivals fell off in 1984 and new solutions were sought. With the help of Howard and Heidi Snell, old friends of the CDRS who have been involved with the rescue operation from early days, a new "air-conditioned" incubation system was devised under which 74 hatchlings were produced from 79 Cartago Bay eggs: a remarkable achievement. This system will be applied experimentally to some of the tortoise eggs in the next breeding season.

The problems of re-introducing the captive-bred iguanas to their former territories are even greater than those of raising them. There is no point in breeding little iguanas at great expense to feed cats, yet there was clear evidence that at least some of the earlier repatriates had been eaten by cats and efforts to counteract this threat had been only partially successful. One theory was that, being raised in captivity, the young iguanas were too tame to defend themselves. As an experiment and for purposes of comparison, 32 of the latest batch of hatchlings were released at Cartago Bay very shortly after birth; the others will be kept at the CDRS and not repatriated until they are bigger.



Land Iguana (*Conolopus subcristatus*)
Drawing by Hilary Bradt

In addition to establishing a breeding centre at the Station, the CDRS and GNPS teams settled a few survivors of the Santa Cruz population on a tiny off-shore islet called Venezia. They laboriously deposited tons of soil there to provide breeding burrows. It was a semi-captive system and it was hoped that it would be safe from the dogs. So it was — but the black rats reached it across the water. Every effort has been made to eliminate these rats but new recruits can be expected. Meanwhile the iguanas have bred and Howard Snell and Cruz Márquez have transferred a dozen of the hatchlings to their natural home near Conway Bay, where attempts will be made to protect them from the marauding cats in the hope of re-establishing the former colony.

Yet another Land Iguana project is being expanded. During the wartime occupation of Baltra (South Seymour) by U.S. forces, the island's entire Land Iguana population disappeared. However, some years before the war, a number of Baltra iguanas had been transferred by a visitor to neighbouring North Seymour, where some of them survive to this day, though they do not breed successfully. CDRS are now doing research to determine the causes of this reproductive failure. Meanwhile a few taken to the Station's pens are breeding successfully and larger corrals are being built to permit breeding on a larger scale.



One week-old petrel in front of nesting burrow

Photo: Felipe Cruz

THE HAWAIIAN PETRELS

The complexity of the problems of protecting endangered species is well illustrated by the fluctuating fortunes of Felipe & Justine Cruz and their helpers in their efforts to save the Galapagos race of the petrel, *Pterodromo phaeophygia*, from extinction. In 1984, by surrounding the most concentrated breeding colony on Floreana with poisoned baits, they virtually excluded the rats that had previously preyed on the chicks and achieved the remarkable result of fledging 72 chicks from 100 eggs. In 1985, the control of rats was made much easier because their numbers had been greatly reduced by the prolonged drought but this blessing turned into disaster as cats, apparently deprived of their normal diet of rats and mice, invaded the petrel colony on an unprecedented scale. The conservation team killed 64 cats (compared with 5 in 1984) but the number of chicks fledged fell to 23, and some adults were also killed in their nesting burrows. (Rats do not kill adults or fledged chicks.) Clearly tactics will have to be revised; but in spite of setbacks due to unpredictable climatic events and to the fact that all human intervention is bound to produce changes in the balance of nature, the Floreana experiment, with WWF support, has already demonstrated that the extinction of this magnificent seabird is not inevitable. There are still large numbers of these petrels on the high seas, if only the desperate rate of decline at their few breeding sites can be halted.

THE PENGUINS, CORMORANTS AND GULLS

The future of the Galapagos Penguin and the Flightless Cormorant has caused great anxiety in recent years, first because of the invasion of wild dogs along the coast of Isabela and more recently because of the drastic reduction of both populations by starvation during the 1982-83 El Niño, when the rise in temperature of the sea severely affected the food supply of all seabirds. The dog invasion was successfully halted by the CDRS-GNPS eradication campaign and, as Carlos Valle explains in a separate article, the cormorants are almost back to their pre-Niño numbers while the penguins' recovery is now proceeding satisfactorily after a slow start. But these two birds will always remain a cause of special concern for three main reasons: they cannot fly; their habitat is very restricted; there are so few of them. By their recovery from the El Niño devastation, they have demonstrated their capacity to survive the most severe natural disaster but they must be given constant protection against changes induced by man and particularly against the feral animals man has introduced.

The Lava Gull is even rarer than the penguin and the cormorant — it is probably the rarest gull in the world — but it seems perfectly capable of looking after itself. The other endemic Galapagos gull, the beautiful Swallow-tail, virtually disappeared from the islands during the El Niño period, but it is an opportunistic breeder and not dependent on any annual cycle, so its numbers should be quickly restored.

THE FIRE ANTS

Not often noticed by visitors, unless they have the misfortune to be bitten by one, the Fire Ants have a highly disturbing effect on the ecology of all the islands where they have been introduced. Not only do they exterminate the native ants but they affect a range of other insects and gastropods — and who knows what else eventually? In spite of strict regulations on the disinfection of food, clothes and equipment of scientists and wardens, Fire Ants have been discovered a second time on Santa Fe, an island otherwise free from introduced species. The most drastic action will have to be taken to eliminate them before they can spread. The problem of the unintentional introduction of alien organisms into the archipelago and their dispersal from one island to another will remain for all time. There is no easy solution — but constant, expert vigilance can reduce the danger.

THE CONTROL OF INTRODUCED MAMMALS

As with the native species, the distribution of introduced species varies from island to island, so each has its own set of problems. (A few fortunate islands are completely free from alien animals). The Black Rats are probably the most widespread and the most intractable invaders. On tiny islets such as Mosquera, Venezia or Pitt, eradication has been possible but there is no guarantee against renewed infestation. Rats can be held in check in a limited area during a breeding season, as has been done on Floreana, but no permanent solution can be expected until science produces an effective method of control. Consequently, as explained on other pages, the Research Station can incubate and rear Pinzón tortoises until they are big enough to resist the rats, but when they are repatriated to their native island they cannot breed successfully there because the rats will continue to kill every hatchling as they have done throughout living memory. And so the struggle must go on.

Goats have been eliminated on small and medium-sized islands — Plaza, Rábida, Sante Fe, Marchena, Española — and the last few of the 40,000 on Pinta should be removed by 1986. In all these cases erosion has been checked and the vegetation is recovering. Ole Hamann, CDF Vice-President, reports that on Pinta the recovery is spectacular. Santiago, with its 100,000 goats and 20,000 pigs, is a much more serious problem. The mere logistics of eradicating such numbers of animals on a large, rugged and waterless island are alarming, even if a constant flow of funds could be guaranteed. Nevertheless, after much study, a vigorous start was made in 1985, concentrating first on the pigs. This was a good moment as the severe drought, which did so much damage to some native species, had also affected the pigs and goats. One immediate result of the campaign has been to reduce the pressure on the marine turtles whose nests on the beaches were constantly dug up by the pigs. This campaign will last for years.

BOTANY

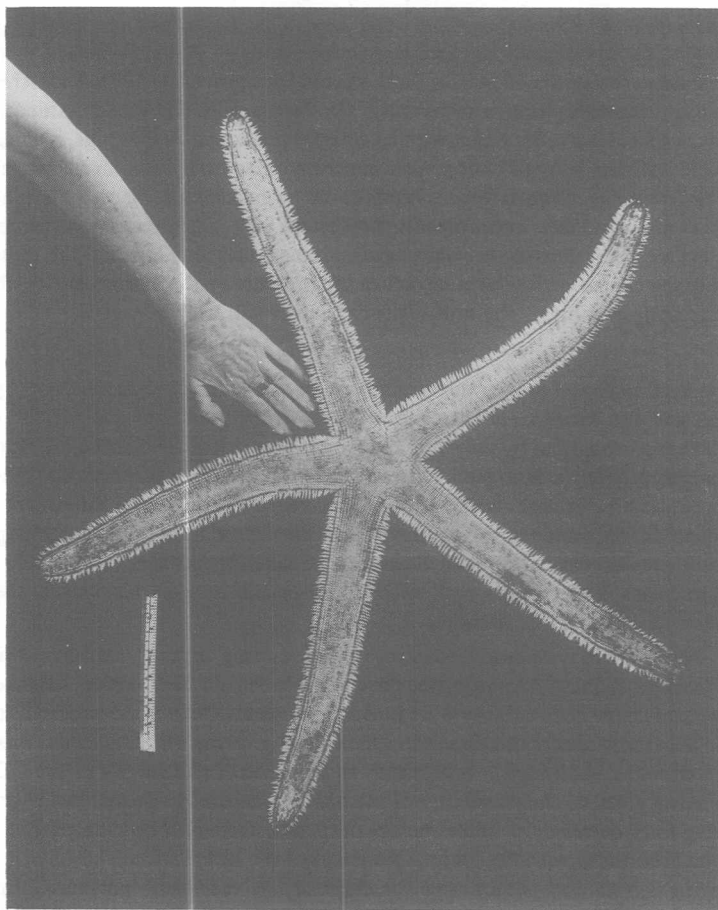
The two constant threats to the indigenous vegetation of the islands are destruction by goats and pigs (discussed above) and the invasion of introduced plants from the farms outside the National Park's boundaries, seeds being brought in by the wind and by straying cattle. On Santiago (James) Island, where the worst goat and pig problem exists, plots have been fenced off to protect particularly endangered plant species until the goats can be brought under control. The narrow peninsula at Buccaneer Bay has likewise been given a goat-proof fence and rare plants have been transferred there. The struggle against the spread of introduced trees goes on year after year. Some can be killed by poison, others have to be dug up by labour-intensive methods. Experiments with different arboricides are giving encouraging results but the campaign will have to continue for decades.

On Santa Cruz Island there is an additional problem requiring urgent solution. Owing to the rapid expansion of the village of Puerto Ayora since the establishment of the Darwin Research Station, large numbers of native trees have been cut down for building purposes. Nurseries have been started to provide native trees to fill the empty spaces but these are at best slow-growing and the project has been hampered by the prolonged drought. Although it is contrary to the general philosophy of the CDRS and GNPS, consideration is being given to the possibility of introducing carefully selected faster-growing trees as a means of satisfying local demand for timber before desperate harm is done to the native woodlands. The CDRS has been collaborating with the Plants Campaign of the International Union for Conservation of Nature in preparing a botanical programme for the next few years with particular emphasis on these forestry problems. It is also hoped to raise funds to organise a workshop on botany, plant ecology and forestry management.

It may be years before the effects of the great fire on Isabela can be fully assessed, but it is hoped that an interim report will be included in Noticias 44.

MARINE BIOLOGY

Hitherto the Darwin Foundation has devoted more of its energies to protecting the terrestrial rather than the marine species. This has been chiefly due to its limited resources and the fact that the land animals and plants were in more urgent need of protection. The marine species, apart from the fur seals and sperm whales, suffered relatively little from 19th and 20th century exploitation, and even these have now recovered wholly or partially. (Noticias 29 & 42). Nevertheless, it is increasingly desirable that *legal* authority should be provided to support the considerable unofficial marine conservation activities of the GNPS and the CDRS — because, in spite of twenty years of appeals, no sea area has yet been formally included in the Galapagos National Park (Noticias 37). Many of the land species are intimately dependent on the ocean's resources for their survival. Moreover, owing to the fact that the archipelago is situated at the conjunction of the great Eastern Pacific currents, the ecology of its waters is unique, and the biologists who have researched there speculate that the underwater resources may prove to be even more important scientifically than the terrestrial. Therefore, when President León Febres Cordero, following his visit to the islands, issued on 11 July 1985 his "Plan for Immediate Action in the Province of Galapagos", it was a source of great satisfaction that this included provision for the creation of "a marine reserve to be incorporated in the Galapagos National Park". The GNPS and CDRS are actively collaborating with the national authorities to give practical application to this proposal.



Giant Sea Star, *Luidia superba*, discovered by Gerard Wellington while diving at Tagus Cove. This is the largest five-armed sea star ever known and only the second recorded specimen of this species.

GALAPAGOS CAVE FAUNAS

Extending the researches of the Belgians N. & J. Leleup (1965), who discovered a scientifically important blind soil and groundwater fauna (including 15 species of eyeless invertebrates and one fish), Stewart and Jaramila Peck of Carleton University, Ottawa, spent two months exploring 25 lava-tube caves and similar sites in search of cave-evolved insects and arthropods. Their most notable discoveries included 5 species of blind spiders and one species each of blind opiliones, gryllid cricket, cockroach and staphylinid troglaphiles. The Pecks suggest that there is still much to learn about insect and terrestrial arthropod communities in the Galapagos, especially the cave and soil insects of the larger and higher islands. As caves are generally considered to be ecologically sensitive habitats, they advise careful study of visitor impact, particularly on caves situated on private property outside the National Park boundaries. There may be little danger at the moment but watch should be kept on potential contamination and over-exploitation.

RARE TWIN BIRTHS OF GIANT TORTOISES

When the Charles Darwin Research Station (CDRS) was inaugurated, it looked as though the endemic giant tortoise of Hood (Española) Island, *Geochelone elephantopus hoodensis*, was doomed to extinction. Only a handful were known to survive, competing with herds of goats for the scant food supply on this arid island, and none seemed to be under 50 years of age. It appeared that they were so few and so scattered that they no longer met for mating. In 1965 the CDRS director, Roger Perry, in despair collected those he could find (one male and two females) and transferred them to a corral at the Research Station. After a period of trial and error, the first captive *G.e. hoodensis* were born in 1970. As other elderly survivors were discovered, the breeding stock was gradually raised to two males and twelve females and finally a third male was presented by the San Diego Zoo, thus increasing the genetic variety of the little herd.

By 1984, 1376 *hoodensis* eggs had been laid and the Station and the National Park Service could be congratulated on achieving a high level of annual hatchings, varying between 20 & 28%. Cruz Márquez, a CDRS staff zoologist, reports that out of all these hundreds of *hoodensis* eggs, none had produced twins until January 1985. These were hatched from the same yolk and had a common umbilical cord. One weighed 52 grams, the other 17, a total weight greater than that of a single hatchling. On the second day the smaller one died but the larger was successfully separated from it by surgical thread and continues to grow normally. Cruz Márquez considers that without this human intervention, both twins would have died. This certainly happened with twins of *G.e. vicina*, born in the wild on the Cerro Azul volcano about the same time. Their malformation was identical but they were dead when he found them while making a census of all the tortoise populations.

The Hood tortoises are being repatriated year by year to their ancestral island where conditions have meanwhile been improved by the eradication of the goats.

VISITS AND EVENTS AT THE CHARLES DARWIN RESEARCH STATION (CDRS)

1984

NOVEMBER

Segundo Coello and Fernando Huerta begin their study of the reproduction of the *bacalao*.

CDRS Director, Günther Reck, goes to Madrid to take part in the General Assembly of the International Union for Conservation of Nature (IUCN).

Armando Vasquez (National Institute of Fisheries) begins his research on zoo-plancton and fish spawn.

Andrew Laurie returns for the sixth year of his study of marine iguana populations.

Henning Adersen arrives from Denmark as acting staff botanist.

Fritz Trillmich, Gerry Kooyman, Philip Thorson and Carlos Drews conclude yet another season of research on the fur seals.

Matilde Velasco and Maria Calle, Univ. of Guayaquil, come to check material in the library, herbarium and laboratories and give a training course for local teachers.

Mireya Pozo and Maria Cornejo, Univ. of Guayaquil, come to serve as volunteers on the Hawaiian Petrel preservation project.

DECEMBER

Günther Reck and Mario Hurtado (CDRS) leave for Guayaquil to take part in the Charles Darwin Foundation's Executive Council meeting.

Visit of a NOAA group to discuss possible areas of co-operation.

Visit of representatives of the Technical University of Esmeraldas to discuss joint projects for 1985.

Aka and Ulla Norberg arrive from Sweden to study aspects of finch morphology.

Elizabeth Pillaert and Mary Jones come to work on the preservation of Galapagos anatomical specimens.

R. Curry, D. Wiggins, J. Gibbs, S. Fogle and P. de Maynadier continue the Peter Grant group's long-term study of finches and mockingbirds.

Gary Ramirez and Edison Flores, Tech. Univ. of Esmeraldas, complete their botanical projects.

1985

JANUARY

Howard and Heidi Snell return from USA to continue their land iguana investigations.

David Anderson and Sharon Fortner come to study the feeding and reproduction of boobies.

Rick Miller, Gary Lagerloef, Linda Magnum, Darrel Jack and José Rivera from NOAA come to collect data from the four underwater stations that have been measuring sea temperatures and pressures since 1979.

A group from WWF/Sweden brings funds to restore the CDRS administration building and support reptile studies.

The biologist Carlos Garcia and the geologist William Chavez of Guayaquil Univ. arrive, one to study methods of rodent control and one to search for fresh water on Santa Cruz.

Marcia Wilson arrives from USA with her husband to take up her post as terrestrial ecologist on the Charles Darwin Research Station staff.

FEBRUARY

Mitch Aide, Univ. of Texas, comes to study pollination and reproduction of plants but the intense drought makes his project impracticable.

Heinrich and Irene Schatz arrive from Austria to study terrestrial invertebrates.

The President of the Rockefeller Foundation visits CDRS.

The President of the Republic, Ing. León Febres Cordero, accompanied by the Ministers of Defense and Industry, visits CDRS.

Members of the Commission for the Revision of the Galapagos Master Plan hold meetings with the CDRS Director, Günther Reck.

Jorge Escobar and Guillermo Prado, Univ. of Esmeraldas, begin their forestry projects.

Guillermo Archibald, head of the Panama Wildlife Reserve, comes to study the management of the Galapagos National Park.

Minister of Public Works and his party visit CDRS.

MARCH

Juan Black (Sec. Gen. of CDF), Enrique Saenz and Pedro Maldonado (National Development Council) come to discuss the CDRS budget and financial situation.

Hal Whitehead, Vassili Papastavrou and Linda Weilgart (Newfoundland Inst. of Cold Water Science) begin study of sperm whales in the Galapagos Grounds.

Fire breaks out on southern Isabela.

Ambassador of Sweden visits CDRS.

Ken Margolis and members of Nature Conservancy discuss fund-raising at CDRS.

APRIL

Günther Reck lectures on Galapagos conservation at Ambato Tech. Univ.

Paul Lewis, State Univ. of Ohio, begins study of *Opuntia*.

Chris Vanbeveren, Antwerp Univ., comes to map vegetation.

Film team from American Broadcasting Corp. visits CDRS.

Günther Reck and Miguel Cifuentes (Superintendent of Galapagos National Park) leave for Quito to attend seminar on conservation problems.

The President of Congress, the Inspector General of the Nation, the Ecuadorean Group of CDF and Juan Black arrive to take part in a further stage of the seminar on Galapagos problems.

José Egred, of Quito Observatory, comes to service the seismograph.

Peter Glynn, Bob Richmond, Gary Robinson, Fernando and Priscila Rivera arrive to study the effects of the 1982-83 El Niño on the East Pacific coral reefs.

MAY

Stewart and Jarmila Peck begin their investigation of the blind arthropods in the Galapagos caves.

Reconstruction of the administration building begins.

Ana Puyol leaves for England to follow a course in environmental education.

JUNE

Training Course for auxiliary tourist guides begins.

CDRS Director invited by Swedish government to visit various European national parks and to engage in fund-raising for CDF.

Tjitte de Vries, Giovanni Onore, Robert Gara and Edmundo Maldonado of Catholic Univ. of Quito begin a survey of fire damage on Isabela.

Beagle IV sails to Guayaquil for overhaul and repairs.

JULY

Maria Calle of Guayaquil Univ. comes to study algae. Rosemary and Peter Grant return to continue their group's long-term research on finches and mockingbirds.

Tjitte de Vries continues his studies of frigate-birds on Tower (Genovesa).

Wallace Harmon and Bill Clark arrive from USA to study the extent of the spread of the avian disease *Trichomas gallinae*, introduced by domestic pigeons.

Juan Black (CDF) and Arturo Ponce (Min. of Agriculture) come to help outline plans for the future conservation of the marine area.

Jonas Lawesson, the new CDRS staff botanist, arrives from Denmark.

AUGUST

Günther Reck and Miguel Cifuentes go to Guayaquil for the meeting of the Executive Council of the CDF.

The 18th session of the Permanent Commission for the South Pacific held at CDRS.

Ole Hamann (IUCN) Vice President of CDF, visits the zone of Isabela ravaged by fire.

Carlos Garcia and Enrique Catelo of Guayaquil Univ. begin their study of introduced rats and mice.

Craig MacFarland, President of CDF, visits CDRS together with a group from WWF/US.