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**ACCIDENT OF THE OIL TANKER "JESSICA"
OFF THE GALAPAGOS ISLANDS (ECUADOR)
January 16, 2001**

**FINAL REPORT
to European Commission
DG Environment ENV.C.3. – Civil Protection**

EU Task Force in Galapagos from January 27 to February 3, 2001 :

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INTRODUCTION

This report describes the mission and recommendations of the European Commission Task Force in Galápagos in relation with the spill resulting from the grounding of the tanker "Jessica" at the entrance to Puerto Baquerizo Moreno, in Wreck bay, on San Cristóbal island (see figure 1) on January 16th, 2001.

The report contains three parts :

- Part 1 presents the summary of the incident, the environment and the meteo oceanic conditions prevailing in this area
- Part 2 is the account of the experts visits on site
- Part 3 presents their recommendations and issues arising from observations of the response on the shore (techniques used for cleaning and command structure) and from discussions held with the Directorate of the Galápagos National Park (GNP) and the Directorate of the Charles Darwin Research Station (CDRS).

The European Commission Directorate-General, Environment C.3 – Civil Protection under the command of Mr Alessandro Barisich and Mr Gilles Vincent, formed a Task Force in order to determine ways in which the European Community could help the Ecuadorian authorities to minimise the damage of the spill, assist in the recovery of damage caused by the spill and support future work associated with the spill.

To this end, C. Tiercelin, W.G. Sanderson and J. Villanueva were sent on site to provide advice on aspects of shoreline clean-up, oil spill management, monitoring and biodiversity conservation, shipping and contingency planning.

PART 1 : SUMMARY OF THE INCIDENT AND ENVIRONMENTAL DATA

1.1. Summary of the incident :

In the evening of the 16th January 2001 the tanker "Jessica", owned by Acotramar, ran aground at the entrance to Puerto Baquerizo Moreno, in Wreck bay, on San Cristóbal island, Galápagos (see figure 1). The ship was carrying about 600 tons (160 000 gal) of diesel oil and 300 tons (80 000 gal) of intermediate fuel oil (IFO 120). The diesel was destined to be delivered to the fuel dispatch station on Baltra Island and the IFO was destined for the tourist vessel "Galapagos Explorer".

The spill of IFO began on Saturday 20th January and immediately personnel of the GNP, the Navy, fishermen and local volunteers started to contain (double barrier) and recover the oil on the surface of Wreck bay. All the dispersant available at the time was used around the "Jessica", and oiled animals (sea lions, pelicans, boobies) were attended to.

An emergency plan was developed. Twice daily flights over the area enabled mapping of the slicks and therefore informed emergency plans and decisions were made (Figure 2).

Because of lack of essential equipment and especially because of the conditions at sea and the degree of listing of the boat, the personnel failed to control the contamination. Slicks began to drift with the wind and prevailing ocean currents towards Cerro Tijeretas and Isla Lobos (San Cristobal island) and the island of Santa Fé, 20 miles West-North West of San Cristobal

(Figure 2). In both places, the contamination could be partially controlled manually, using dispersant, barriers and absorbent materials.

On San Cristobal, seven sea lions and 17 birds (pelicans and blue footed boobies) were affected by the fuel oil. On Santa Fe, several sea lions, in particular 15 juveniles, were affected.

On the afternoon of Sunday 20th, the USA Coastguards arrived in San Cristobal with specialised equipment. The barge "Cirius" also arrived from Guayaquil bringing dispersant and absorbent materials. On Monday 22nd, the USA Coastguards started operations to remove the remaining fuel oil from the boat, in co-ordination with the 2nd Naval Zone. The operation was successful on the port side tanks. Before removing the fuel remaining in the starboard side tanks, the "Jessica" had to be righted but this operation failed. At the end of US Coastguard recovery operations (31/01/01), the team leader, Ed Stanton, estimated that there was less than 1000 gal of fuel oil left on board in the service tanks. It was also estimated that the cargo tanks were empty with the exception of a film of fuel oil on top of water in number 3 hold. This film could not be recovered because there was too little for their pumps to work on. It was possible that the remainder could be removed by application of sorbant into number 3 hold.

The oil collected directly from the sea around the vessel, by fishermen, park wardens, experts from Petroecuador (the Ecuadorian state-owned oil company) and the Merchant marine was estimated around 70 containers of 60 gallons (4200 gal) on the 22nd January. The quantity of fuel oil spilled was estimated to a quarter of a million gallons (approx. 250 tons) of diesel and IFO.

Very soon after the beginning of the leak, on the afternoon of Sunday 20th, the flights over the area showed that slicks were scattered over a large surface (approximately 1000 km²). Patches were also observed drifting during the following days, between the islands, under the influence of the wind and prevailing currents.

On the 26th, a small slick was reported between Floreana, Santa Fé and Española and a patch of fuel oil was sighted along the east coast of Floreana. A small beach south of Santa Cruz and Tortuga bay were affected.

On the 27th, a small slick was reported near Puerto Villamil in southern Isabela but both on Isabela and Floreana, the impact to wildlife was reported to be minimal.

The total known shoreline affected during the Task Force mission was estimated to be between 5 and 15 km but a systematic survey programme was just beginning.

1.2. Environment and endemic fauna

The Galápagos archipelago consists of about a dozen islands and many small islets and rocky outcrops spanning about 450 km (Figure 1). In addition to this, the Galápagos are considered one of the most volcanically active areas in the world giving rise to a landscape dominated by black volcanic rocks.

The Galápagos is a World Heritage Site, a National Park and the surrounding waters are a Marine Nature Reserve (under the Special Law of the Galápagos). The islands are characterised by high levels of endemism. Species such as marine iguana (*Amblyrhynchus cristatus*) (Plate 1), Galápagos penguins (*Spheniscus mendiculus*) and lava gulls (*Larus fuliginosus*) are found nowhere else on the planet, whilst others such as Galápagos sealions (*Zalophus californianus wollebacki*) are distinct subspecies. As well as the more familiar

vertebrates, many marine invertebrates and 17 % of fish species are known to be endemic (Hickman 1996; 1997, Human 1993).

Marine species within the Galápagos archipelago also have restricted distribution patterns. Reck (1986) provided a classification of the islands into different marine zones and surveys of marine species such as territorial fish for example (Jennings *et al.* 1994) and those reported in Sanderson *et al.* 1996) show that certain species are restricted to the western zone of the archipelago which is characterised by cold surface water influenced by upwelling (Harris, 1969; Wellington, 1984). Similarly, there are several species of territorial fish almost exclusively recorded in the warmer waters of the northern and north central isles.

Overall, it appears that, although the “Jessica” spill may have been relatively small compared to other high profile European spills such as the “Erica” and the “Sea Empress”, the potential for substantial impact existed given the restricted distribution and endemism of many of the Galápagos marine fauna and flora.

1.3. Meteo-oceanic conditions

Swells are predominantly from the South but between December and June unpredictable northerly swells can develop. Trade winds also slacken at the beginning of this period and warmer waters can move in from the North. ‘El Niño’ events have disturbed the ecology of the islands with changes in oceanic currents causing substantial changes to the distribution and survival of marine life.

PART 2 : TASK FORCE VISITS ON SITE

2.1. Visits on site

After a briefing in Quito on January 26th with Mr Carrasco, Coordinator of the operations in Galápagos, the Task Force proceeded to the Galápagos archipelago on the 27th.

Three islands were visited from January 27th to February 3rd, 2001 : San Cristobal, Isabela, Santa Cruz (see figure 1). The experts were driven by personnel from the Galapagos National Park who took part in the cleaning operations to the shores which had been contaminated early after the spill.

January 26, 27, 28, 2001 : San Cristobal

The experts arrived on the 27th in San Cristobal at the beginning of the afternoon and proceeded first to the Galápagos National Park (GNP) office where they met officials coordinating the response to the oil. They were briefed on detailed history and recent actions in response to the spill by staff of GNP and the US National Oceanic and Atmospheric Administration (NOAA). It was estimated that less than 6,000 gal of diesel remained at the time, mostly in the engine fuel tanks of the vessel. The experts were then invited to take a boat to inspect the site of the wreck of the Jessica (see Plate 1).

On the 27th, Mr Villanueva offered his collaboration and that of the Directorate of the Spanish Merchant Marine to develop a contingency plan for Galápagos. Mrs Tiercelin confirmed the possible assistance of the European Commission in this field.

On the 28th, the experts went with personnel of the GNP to inspect rocky and sandy shores on the north-western coast of San Cristóbal (see Plate 1) that were believed to have been affected by oil. There was no apparent oil residues remaining on sandy or rocky shores visited (some shores were not safe to access due to surf and there is no ready access from the land). There was also no evidence of mortality of intertidal invertebrates and algae. A few small patches of green algae measuring only a few metres could be seen but these may be entirely natural.

January 29, 2001 : From San Cristobal to Isabela

J. Villanueva stayed in San Cristobal to work on contingency planning with GNP and proposed to develop the cooperation between Spain and Ecuador. For that purpose, he had meetings with D. Juan Diego Ruiz Cumplido, Co-Director of the Spanish cooperation in Galapagos through the medio-ambiental project "Araucaria" funded by Spain and with D. Ricardo Ruiz Molero, Director of the project (in Quito). He met also D. Mario Hurtado (in Guayaquil) who participated in the tentative classification of Galapagos as a Marpol Special zone.

J. Villanueva proposed that, due to the fact that the project "Araucaria" is under the patronage of the Spanish Agency of cooperation of the Ministry of Foreign Affairs (the Director of which works with the Director of the GNP), a study concerning the acquisition of counter pollution equipment could be included in the project. Furthermore, funds could be looked for in the European Union and IMO programs for this work.

These proposals were presented also to the Director of the Merchant Marine in Guayaquil (on the 31st) as well as offers of expertise in control of maritime traffic and definition of vessel traffic separation systems, and also training in the Spanish centre "Jovellanos".

The two other Task Force members, C. Tiercelin and W.G. Sanderson continued their reconnaissance and travelled with the Galápagos National Park (GNP) reconnaissance aircraft arriving in the morning at Isabela where oil slicks arrivals had been reported on the 28th. A small slick emanating from the wreck site at San Cristobal as well as some more near-shore slicks between Punta Loberia and Punta Veintmilla (Isabela) were observed during the flight.

Local officials of the GNP in Puerto Villamil took C. Tiercelin and W.G. Sanderson to shores (see Plate 1) that were potentially affected but no signs of contamination were observed. C. Tiercelin and W.G. Sanderson met with Jaime Cevallos (Charles Darwin Research Station) in Villamil. Local staff of CDRS were conducting coastal monitoring work along the south of Isabela.

There were no reports of substantial shoreline contamination but one or two beaches were known to have had very small tar balls on them in the last day or two according to Edwin Levine (NOAA) who C. Tiercelin and W.G. Sanderson met with at Isabela. Observations showed that these tar balls seemed to have moved off Bahia Villamil.

Activity in Puerto Villamil focused that day on the collection of oil from near-shore slicks. There was a two mile strip of oil patches extending offshore between Pto Villamil and the western extent of the south coast. Local fishermen and GNP staff were working together using sorbants and make-shift booms and skimming devices constructed from mosquito net, sorbant pads and coke-bottle floats. Recovery of oil seemed to be quite effective - about 20 x 60 gal drums of a mixture of fuel oil and powdered sorbent were collected (see Plate 1).

January 30, 2001 : San Cristobal to Santa Cruz

The Task Force members, C. Tiercelin and W.G. Sanderson, came back from Isabela to San Cristobal on the 30th in the morning with the Galápagos National Park (GNP) and saw no evidence of slicks drifting at sea en route from Isabela to San Cristobal.

Oil slicks were reported near the shore of Floreana but contrary to the IFO 120 of the “Jessica” cargo, these showed evidence of emulsification (chocolate mousse instead of black oil) and so were likely to result from illegal discharge of another ship. Shoreline oiling was reported from Santa Cruz, Santa Fé, San Cristobal, Floreana and Isabela.

Task Force members, W.G. Sanderson and C. Tiercelin, arrived on January 30th in Santa Cruz late in the evening, by boat (of the Galapagos National Park) and proceeded immediately to the Charles Darwin Research Station where a meeting was held with Dr Robert Bensted-Smith, Director of the Station. A rendez-vous was fixed for February 1st for C. Tiercelin.

February 1st, 2001

W.G. Sanderson had to leave Santa Cruz on 1st February to Quito on his return journey. Whilst in Quito he met with Mr Carrasco, Coordinator of operations in Galápagos, and provided a briefing of the Task Force work. Mr Carrasco expressed thanks for the EC Task Force work and was thanked for the excellent cooperation received in the Galápagos.

After a short presentation of the CDR Station, C. Tiercelin went to the Marine Laboratory and was invited to take part in a field trip initiating the monitoring work. Samples of sediments and infauna were taken in Tortuga Bay, south of Santa Cruz, an area lightly contaminated on the 23rd. No contamination was observed during this field trip (see Plate 1).

The monitoring team were visited on site by the Grand Duke of Luxemburg who was invited by the CDR Station as member of the Presidency of the Darwin Foundation.

Many contacts were made with scientists involved in various projects. Projects such as GIS and sensitivity mapping have to be conducted for all the islands of the archipelago as well as monitoring over several years. Amongst the scientists was Dr Paul Kingston, Heriot-Watt University of Edinburgh who offered, if needed, to give lectures on oil spill impact on marine fauna.

February 2th, 2001

On February 2nd, C. Tiercelin went to do more investigation on the shoreline especially on rocky lava shores of Santa Cruz which were believed to be contaminated. She found no trace of oil.

C. Tiercelin had a very busy program of meetings with the authorities before departure and the end of the day was dedicated to thanking the authorities and members of the CDRS and the GNP for their help during our mission (many thanks were returned by the Minister and the Director of the GNP for the involvement of the EC in oil spill assessment).

February 3th, 2001

C. Tiercelin left Galápagos on February 3rd early in the morning and arrived in Quito in the afternoon. She travelled in the same plane as the Minister and the Grand Duke of Luxemburg accompanied by the Resident Coordinator of the UN in Ecuador and their respective staff. All expressed a genuine satisfaction from the EC participation.

2.2. Task Force observations : impact and coastal clean-up

Numbers of bird casualties had been low in the time the Task Force was in the Galápagos archipelago. Twenty one pelicans had been found with more than 50 % oil and subsequently cleaned at the rescue centre in San Cristóbal (see Plate 1). There were reports of marine iguana and sea-lions also having been affected and numbers of these animals with similar levels of oiling were thought to be of an equivalent magnitude. We were aware of unconfirmed reports of small numbers of boobies showing oil contamination at seabird colonies in Floreana. Blood samples were intended to be taken from affected sealion colonies in order to better assess the extent of contamination. Overall, it was unclear how many vertebrate animals had suffered low levels of contamination.

Reports of invertebrate casualties were limited to the occurrence of tens of green urchins (*Lytechinus semituberculatus*) washed-up near Puerto Baquerizo Moreno in the first few days of the spill. Such mortalities of urchins are, apparently, within the realms of naturally occurring events anyway. Dead fish, particularly puffer fish and red and green algae were also recorded by CDRS staff at San Cristóbal. There were no investigation or reports of benthic effects from the immediate vicinity of the wreck where dispersants had been deployed in water of 6 m depth.

Most of the shoreline contamination seemed to have occurred before the Task Force arrived in Galápagos. On most contaminated shores, attempts had been made to clean. Cleaning was largely restricted to the use of sorbants. A boom had been used at Santa Fé to corral oil and prevent it from entering a bay of particular nature conservation importance (sea-lions). Hand spraying of dispersants on shores had apparently occurred in the first couple of days after the oil had spilt but this had been restricted to a very small area of Santa Fé and the practice had ceased after this point. For the most part, sorbant of peat fibres (HTP) was pushed into the crevices of the intertidal rock at Santa Fé and washed out by the incoming tide. Affected shores at Santa Fé were reported to be only a few hundred metres in extent. At Tortuga beach (Santa Cruz) more than 300 people comprising volunteers and GNP staff removed affected surface sand after oil came ashore.

The Task Force inspected rocky, sandy and mangroves shores on Isabela, rocky and sandy shores on San Cristóbal north western coast and rocky and sandy shores at Santa Cruz that were reported to have been oiled. There was no apparent oil residues remaining on the shores visited. Some shores were not accessible due to sea conditions and remoteness. There was no evidence of mortality of intertidal invertebrates and algae on any shore visited. Small patches of green algae measuring only a few metres could be seen but these may be entirely natural, resulting from sand scour rather than following contamination. Barnacles (cirripeda), crabs (*Grapsus grapsus*) and various gastropods were present and appeared to be normal, not being moribund or dead. In other oil spills, these taxa have been shown to be heavily affected, often becoming displaced, their shells congregating in crevices etc. Sandy shores visited seemed to have no tar balls or oily residues in them. Neither did sands or muds encountered smell of any oil/diesel, etc.

At Pto. Villamil, Isabela on the 29th January, local staff of CDRS had inspected shores on the South of Isabela as far as Punta Rose. There were no reports of substantial shoreline contamination but one or two beaches were known to have received very small tar balls on them in the preceding two days (Edwin Levine, NOAA pers. comm.). Task Force observations were that these tar balls already seemed to have gone off Bahia Villamil. Although these reports of extremely low level contamination seemed to be typical for Isabela,

by the end of our reconnaissance in the Galápagos, teams of surveyors were beginning to systematically survey less accessible coasts and discover that there was oil on some shores that were previously thought to be unaffected (Howard Snell pers. comm. 31st January 2001). Systematically surveying using NOAA methods apparently showed that oil was present for example, under boulders and high on the shore line amongst the black volcanic rocks where it was difficult to see.

Overall, it appeared that shoreline contamination had not been widespread or severe although it should be noted that the majority of shorelines are difficult to access and are distant from human conurbation.

PART 3 : RECOMMENDATIONS AND ISSUES ARISING FROM THE VISITS ON SITE AND FROM THE DISCUSSIONS WITH THE ECUADORIAN AUTHORITIES

3.1. Baseline for future management and response

During our meetings with the CDRS, work to improve preparedness for future incidents was proposed.

Oceanographic current research was considered by CDRS as important for developing better oil spill modelling. The need for modelling was also proposed by Edwin Levine from NOAA when we met on Isabela. During the oil spill, the trajectory of the oil had not been predicted well due to lack of systematic oceanographic data for the complex currents of the archipelago.

We proposed filling gaps in biological knowledge so that resource maps could be easily generated for habitats and species for nature conservation management. Such data could be presented as GIS layers and form the foundation of future sensitivity mapping. CDRS had begun to consider such a programme of work to support an overview of ecosystem function and to provide a structure for ecological monitoring. We suggest that such sensitivity mapping should not be developed just for oil spill response but to support response to all human influences on the marine environment. A systematic synoptic programme of work of this nature may cost up to US \$1 million. The CDRS seemed to be well aware of other potential risks with particular concern over the introduction of non-native marine species. Although sensitivity mapping for oil spill response is not a new concept, systems for sensitivity mapping to support general conservation management are being developed by an EU INTEREG funded pilot project (Cook & McMath 2001).

3.2. Monitoring to inform future response and management

We discussed aspects of the CDRS research programme that are relevant to the oil spill as well as their proposals for monitoring the effects. The work breaks down into the following evaluation and time-series (surveillance) studies:

1. Initial systematic survey of the extent and distribution of contamination (shores)
2. Affected seabirds
3. Fisheries effects (certain species are of high commercial and political significance)
4. Affected coastal vertebrates (of high nature conservation importance)
5. Affected coastal communities
 - a. Soft shores
 - b. Rocks

- c. Mangrove
- d. Pelagic areas.

The initial survey is intended to map-out the affected areas in order to decide which might need clean-up and to inform the choice of areas for long-term surveillance (monitoring). The systematic evaluation of the impact will be conducted with the advice of NOAA which assisted in the clean-up of affected areas.

The CDRS acquired some data from shores and shallow subtidal areas as well as some important species before impact. Also, detailed pre-spill data exist for marine iguana on Santa Fé and a team from Princeton University, USA began monitoring work on the iguana and their food as we arrived in Galápagos. Monitoring with pre-impact data allows far more powerful experimental design for impact assessment and the lack of it is often the weakness in post oil spill studies which can be inconclusive due to this and the lack of selection or availability of control sites. Both the Galápagos National Park and the Charles Darwin Research Station are well aware of these potential limitations and intend to monitor affected sites probably including those with vulnerable species such as the lava gull, penguins, cormorants, dark-rumped petrel marine iguana and sea turtles. Although it is possible, and historically the case, that some studies aimed at oil spill impact assessment will not demonstrate the effects intended (for the benefit of informing future management), there is an opportunity for much of the monitoring work proposed to be of great value in developing the future monitoring and surveillance necessary for underpinning sensitive management. This would be in keeping with the model developed under the EU LIFE programme by Brown (2000) and subsequently under development for application in the marine environment (Sanderson *et al.* in prep.).

It may also be worth considering the scale of the impact around the wreck site. Dispersants were used around the wreck in unusually shallow water. It will be of value to ascertain the scale of benthic impacts in order to inform future dispersant use policy.

The Director of the CDRS, Dr Robert Bensted-Smith, insisted in a report dated 23 January, entitled “A preliminary overview of the impacts on the Ecosystem”, on the **need of international funding** for these tasks, as well as for the development of the capability to prevent and manage future disasters in Galápagos (disaster prevention and contingency planning). There may be some opportunities for such assistance due to similarities in work with those conducted under existing EU programmes (eg LIFE and INTEREG). Furthermore, it may be of some significance for funding opportunities that the CDRS is legally a European institution.

3.3. Training

The need for training is important. All the steps from prevention (contingency planning) to the final stage of the clean-up (waste treatment) are wished :

- recommendations to realize a contingency plan (including consideration of international conventions)
- aerial observation of the slicks at sea and their drifting at the sea surface
- recovery and treatment techniques at sea and on the shore
- development of an atlas of sensitivity (to choose priorities for the protection and cleaning options for the shoreline)
- possible use of the Net Environmental Benefit Analysis (NEBA)

- waste disposal
- toxicity of the oil and protection of the operators
- relation with the media.

The number of personnel to be trained was not evaluated. The priority, however, is to train the personnel of the GNP, together with some members of the CDRS (Park-Station partnership = management and conservation science).

3.4. Additional future needs

During the final meeting held in the Head Quarters of GNP with the Director of the GNP and the Minister of the Environment, the following issues arose :

- There was no need of additional equipment, because of the arrival of floating and sorbant booms with a team of the Environment division of Petrobras, Brazil and also from US Coast Guards (their plane came back on February 1st to recover the equipment used on the wreck and brought booms and sorbants in Santa Cruz).
- The creation of 3 centres for the storage of counter pollution equipment was planned. These centres will be located on the 3 major islands (Santa Cruz, San Cristobal and Isabela).
- A laboratory equipped for water analysis should also be installed.

Generally, it should be noted that the proposed increase in GNP/CDRS work associated with the oil spill will also require a corresponding increase in personnel, office, laboratory space and logistical support services.

During exchanges with the CDRS director it was also apparent that funding and resources directed towards the accident of the “Jessica” should not cause a neglect of the priority long-term issues, such as fisheries management, which needs research, advisory services, educational and collaboration with local community. If the effects of other oil spills are any guide, any impacts will be largely undetectable in five years time but other pressing marine environmental management issues will remain.

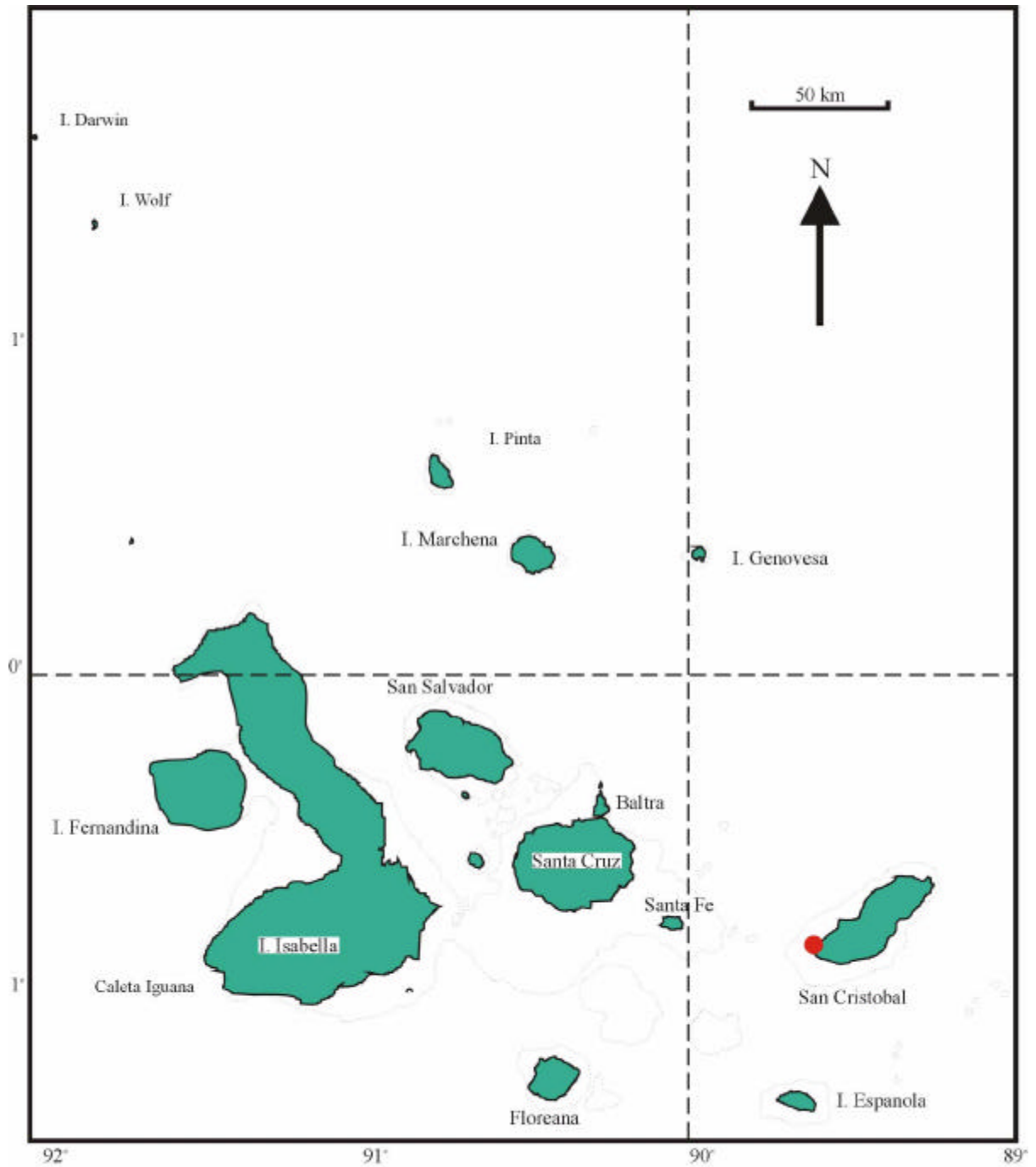


Figure 1. The Galapagos archipelago showing the wreck site of the *Jessica* in the entrance to Puerto Baquerizo Moreno, San Cristobal.

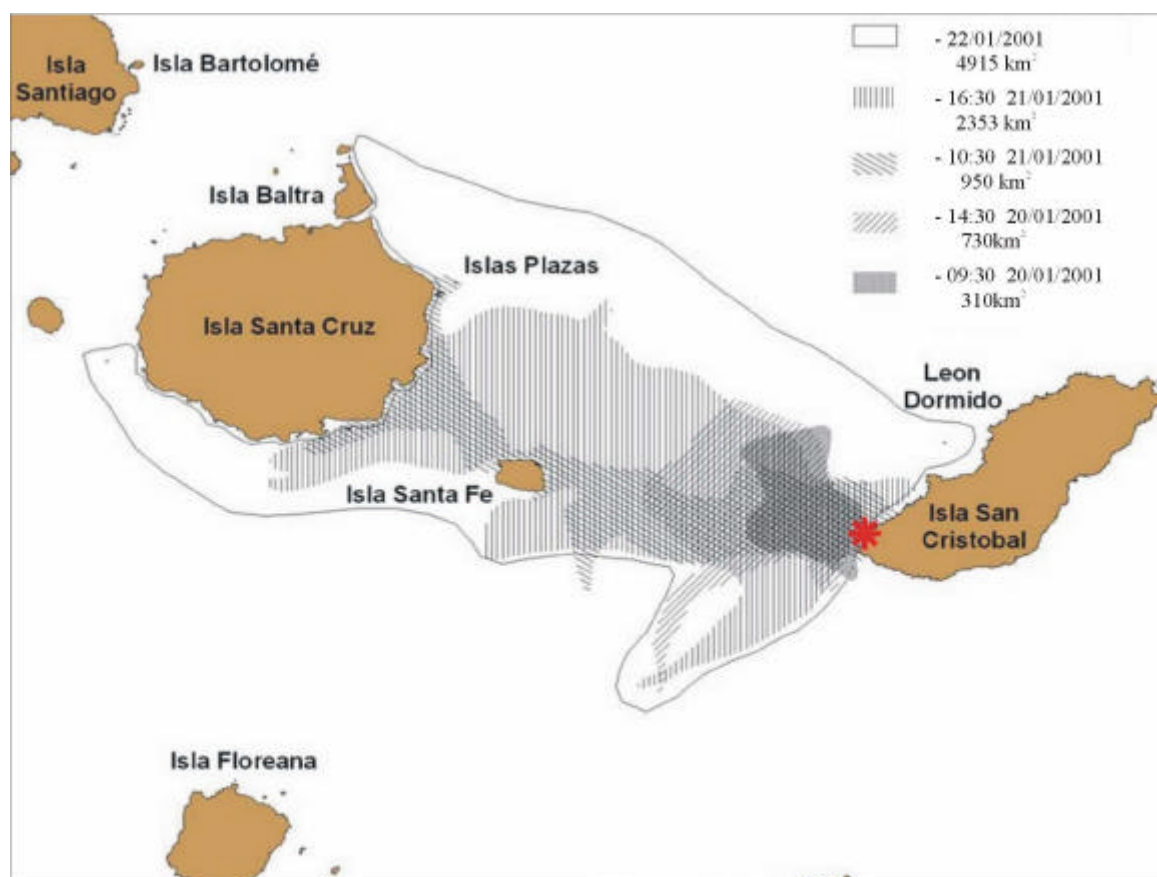


Figure 2. Spread of oil following the grounding of the “Jessica”. Increasing areas with different hatching indicate the progressive spread from 20th January to 22nd January 2001. Image courtesy of CDRS/GNP.

Plate 1



Tanker "Jessica" grounded on San Cristobal island



The exposed rocky shore, northern coast San Cristobal



Sheltered bay on San Cristobal northern coast



Isabela, algae on the beach of Villamil, southern coast



Isabela, self-made booms used to contain the slicks



Isabela, drums of IFO recovered at sea



Iguana on southern coast, Isabela



Oiled pelicans in the rescue center, San Cristobal

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