.

Information Sheet on Ramsar Wetlands

1. Date this sheet was completed/updated: 20 May 2002

2. Country: Ecuador

3. Name of wetland: Sur de Isabela Wetlands

4. Geographical coordinates:

00º 56´ 20" – 00° 56´ 30" South latitude
90º 57´ 10" – 90° 59´ 50" West longitude

5. Altitude: Between minus six metres to two metres above sea level

6. Area: 872 hectares (359 hectares of coastal wetland and 513 hectares of marine wetland)

7. Overview:

The Sur de Isabela wetlands, proposed for inclusion on the list of Ramsar wetlands of international importance, are made up of Poza de Los Diablos, Los Tunos, Puerta del Jelí y Baltazar and the beaches, mangroves and shallow seawater of Puerto Villamil Bay. All the wetlands are within the Galapagos National Park and the Galapagos Marine Reserve.

Coastal wetlands: These are mangroves and lagoons of brackish water formed by infiltration of seawater and underground freshwater tributaries from the higher parts of the island. At certain sites, there are direct connections between the sea and the lagoons during spring tides (*aguajes*) and discharge of fresh water from the lagoons to the sea during occurrences of El Niño phenomena. The concentration of salts and size of water surfaces depend on the amount of rainfall. Lagoons with poor connections to the sea and few sources of underground freshwater have high concentrations of salt in the dry seasons.

Marine wetlands: Puerto Villamil Bay is protected from wave action by lava flows and small islands that form a natural breakwater, creating an area of quiet water with a sandy bottom of organic origin and some parts with rocky substrata. The water is shallow; rarely deeper than six metres at low tide. Mangroves and a large beach area of white sand have become established in this bay. The water usually remains clear because of its shallow depth and the absence of mouths of rivers or other sources that carry suspended materials. The mangrove is expanding into areas of very recent lava flows of pahoehoe and aa lava, in which deposits of organic material have accumulated.

8. Wetland type: A, D, E, G, H, I and J

Types of wetlands by decreasing order of importance: A, I, J, E, D, G and H

9. Ramsar criteria: 1–4, 6–8

Criteria that best characterize the site:

10. Map of site included? Please tick yes -or- no

11. Name and address of the compiler of this form:

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12. Justification of the criteria selected under point 9, on previous page:

Criterion 1: These wetlands have unique characteristic landscapes because of the presence of mangroves formed by red mangrove (*Rhizophora mangle*), black mangrove (*Avicennia germinans*), white mangrove (*Laguncularia racemosa*) and button mangrove (*Conocarpus erectus*), together with endemic species of cacti such as candelabra trees (*Jasminocereus thouarsii*) and tuna (*Opuntia echios*) interacting in the same ecosystem and growing on soils of recent lava (less than 500,000 years). Because of its geographic isolation and the convergence of cold and warm ocean currents, there is an incredible combination of environments specific to tropical and temperate areas (for example the mangroves with penguins and seals).

Criterion 2: These wetlands are on oceanic islands of recent volcanic formation with numerous endemic species, many of which are considered vulnerable according to the IUCN Red List (see annex II). The *gaviota de lava* (*Larus fuliginosus*) is an endangered species, of which about 400 pairs survive in all the Galapagos. The Sur de Isabela wetlands are one of its main feeding sites. The marine wetland is an important feeding area for the *pingüino de Galápagos* (*Spheniscus mendiculus*), an endemic species to the archipelago that is vulnerable. The conditions of the marine wetland make it one of the main feeding and breeding sites for the endemic subspecies of *lobo marino de un pelo* (*Zalophus californianus wollebacki*), listed as vulnerable on the IUCN Red List. Because of the existence of submerged marine beds with a large production of seaweed, these wetlands are a relevant place for

feeding of endemic marine reptiles such as the *iguana marina* (*Amblyrhynchus cristatus*), included on the IUCN Red List as a vulnerable species. The presence of shallow sea water over a rocky bottom permits establishment of many benthic species of echinoderms, several of which are endemic such as the *erizo verde de Galápagos* (*Lytecinus semituberculatus*), and other commercial species such as the *pepino de mar* (*Stichopus fuscus*). There are many endemic plants of very limited distribution that are endangered and almost disappearing from this area. This is the case of *Nolana galapagensis*, for which few specimens have been reported in the area of influence where natural regeneration is very low. The endemic subspecies of tuna (*Opuntia echios inermis*) has a distribution restricted to this wetland and the surrounding area and is highly endangered by the presence of wild donkeys.

Criterion 3: The Sur de Isabela wetlands are essential for maintenance of the biological diversity of the Galapagos Islands because they are the habitat of several species that depend exclusively on this wetland for their life cycle: flamingo (*Phoenicopterus ruber*), *patillo* (*Anas bahamensis*), *tero real* (*Himamtopus himantopus*), *ostrero* (*Haematopus palliatus*), *gallinula* (*Gallinula chloropus*), *cangrejo fantasma* (*Ocypode* spp.) and fiddler crab (*Uca galapaguensis*). Because of the existence of underground freshwater tributaries, the low concentration of salt in several ponds in the wetland permits establishment of freshwater invertebrates that do not exist in other coastal wetlands of the archipelago. This wetland contains one of the largest areas of mangrove in the archipelago, contributing significantly to conservation of the biodiversity of the islands. This wetland forms the most representative and largest marine-coastal wetland in the Galapagos archipelago.

Criterion 4: This wetland is an important place for feeding and reproduction of the following species: *pingüino de Galápagos* (*Spheniscus mendiculus*), *iguana marina* (*Amblyrhynchus cristatus*), *lobo marino de un pelo* (*Zalophus californianus wollebacki*), *garza de lava* (*Butorides sumdevalli*), *gaviota de lava* (*Larus fuliginosus*), *garza morena* (*Ardea herodias*), *patillo* (*Anas bahamensis*), *gallinula* (*Gallinula chloropus*) and flamingo (*Phonicopterus ruber*). They are also an important feeding site for the following migratory birds: *chorlito semipalmado* (*Charadrius semipalmatus*), *zarapito* (*Numenius phaeopus*), *vuelvepiedras* (*Arenaria interpres*), *playero enano* (*Calidris minutilla*), *playero común* (*Calidris alba*) and *chorlo chico* (*Tringa flavipes*). It is one of the main nesting sites for the green turtle (*Chelonia mydas*) in the Galapagos Islands, a species that is endangered and is on the IUCN Red List. The wetland sustains 53.5 percent of the nesting colonies of the endemic subspecies of Galapagos flamingo (*Phoenicopterus ruber glyphorhynchus*) (Bird survey carried out by PNG on 22 January 2002). The marine wetlands form a breeding site for fish and crustaceans because of their shallow water, bays with mangroves and underwater lava tunnels.

Criterion 6. This wetland provides habitat for more than 22.5 percent of the population of the endemic subspecies of *flamenco de Galápagos* (*Phoenicopterus ruber glyphorhynchus*) (Bird survey carried out by PNG on 22 January 2002).

Criterion 7: This wetland sustains a significant proportion of several populations of autochthonous fish, such as the *diablo* (*Chanus chanus*) that is seriously endangered, *pargo* (*Lutjanus* spp.), *lisa* (*Mugil galapaguensis*) and cod (*Mycteroperca olfax*).

Criterion 8. This wetland is one of the main breeding, feeding and growth sites for autochthonous fish in the Galapagos archipelago.

13. General location:

The Sur de Isabela wetlands are located in the canton of the same name, province of Galápagos, Ecuador. The closest town is Puerto Villamil with an area of 122 hectares, which is the only urban area on the island. It is next to this system of wetlands and even has several lagoons and mangroves within its jurisdiction. Twelve kilometres away is an agriculture area (*zona de uso agropecuario*) of approximately 3,500 hectares. Only one percent of the island is used for human settlement, and there are clearly defined limits between the colonized areas and the Galapagos National Park. The total population of the island is approximately 1600 inhabitants.

14. Physical features:

Geology and hydrology: Laguna de Los Diablos and the nearby ponds are of volcanic origin, formed by the collapse of lava in coastal areas that has permitted the entry of sea water and the accumulation of sand banks (beaches) of organic origin. The beaches serve as a barrier between the ocean and the lagoon and have been covered in large part with mangroves and herbaceous species that stabilize on the substratum. In addition, these lagoons receive large amounts of underground fresh water. From the point of view of geology, Isabela is a very young island that was formed less than a million years ago. It has very permeable volcanic soil that allows rainwater and runoff from the upper parts towards the coastal areas to penetrate.

Because of the soil characteristics specific to recent lava flows, the lagoons are interconnected by tunnels or underground cracks in the lava. Several parts of the wetland, such as the ponds Puerta del Jelí y Baltazar, have no direct contact with seawater or large sources of underground freshwater, resulting in greater salinity. Water level often depends on precipitation.

The Los Diablos wetland, like the others in the Sur de Isabela, has continuous supplies of underground freshwater from runoff from the higher parts of the volcanoes and also infiltration of seawater. It has water throughout the year. During the rainy season and even more so during the occurrence of El Niño phenomena, several areas of the wetland are flooded, especially the mangroves.

The marine wetlands are affected by notable fluctuations in the temperature of the sea depending on the influence and predominance of the warm currents from the northeast (January–May) or cold currents that flow from the Antarctica (June–December).

Soil: Among the permanently covered bottoms, about 99.9 percent of the sea bottoms are formed by sand in the form of lenses or open and irregular platforms. Less than 0.1 percent are associated with rocky structures, forming lowlands, overturned rocks in the form of emerging crags, abrasion platforms, scattered rocks (less than 1 metre) and bottoms made up of submerged fragments of broken rocks (1 metre in diameter) associated with exposed points and capes. Both types of

substrata are found in shallow areas up to 25 metres in depth. In addition, there are 10.5 hectares of rocky substratum formed by small islands (Ecociencia, 2002).

Water quality: *Los Diablos wetland*: The water of this wetland has a WQI index of 0.68, which indicates water of medium quality. Oxygen is the chief parameter that reduces the index and over saturates the water (165 percent). This can be attributed to growth in populations of photosynthetic organisms that supply oxygen to the water; for example phytoplankton. When this happens, these high levels usually decrease during the night, producing larger amounts of carbon dioxide. However, it is natural that the wetlands, with high exposition to sunlight, have a high production of photosynthetic organisms, unless there are insufficient nutrients. The pH is high (9), indicating rather basic water. From the point of view of ecology, this value is normal for natural water. Biological oxygen demand is high (11.2 mg/l 5d), which indicates the presence of a high population of aerobic bacteria. Visibility is low (15 centimetres), owing to the presence of microorganisms mentioned earlier (phytoplankton and bacteria) and other substances. Concentration of suspended solids is low (16 mg/litre). This wetland has the lowest variation in temperature (3.5° C) and the lowest concentration of dissolved solids (365 mg/litre). A low level of dissolved solids makes this wetland the least saline (0.3 ppt).

Los Tunos wetland: The water in this wetland has a WQI index of 0.63, which indicates water of medium quality. There is evidence of a high percentage of saturated oxygen in the water (182 percent), which is due to a high growth of photosynthetic organisms such as phytoplankton. This is confirmed by the green colour of the water, which is another indicator of a large population of photosynthetic micro algae. Nonetheless, it is natural that in wetlands with a high exposure to sunshine the production of this type of organism is high. Ammonia is a nutrient of nitrogen present in high amounts (2.58 mg/litre). When this appears in easily detectable amounts (more than 0.1 mg/l), it indicates the presence of processes of putrefaction in the water or that it was introduced. This is the only wetland of the Sur de Isabela with high levels of ammonia. Also, biological oxygen demand here is the highest among the wetlands of the island (18.03 mg/l 5d). This indicates a high population of aerobic bacteria. The pH (4.5) is the lowest registered in the wetlands in the islands. The water has low visibility (1 centimetre). This characteristic can harm the aquatic organisms that live there. Visibility is usually reduced by the presence of suspended solid particles and high levels of certain substances and microorganisms, such as bacteria and phytoplankton that are abundant in this area. These are probably responsible for the turbidity, because concentration of suspended solid particles is not a major problem (91 mg/litre). Salinity recorded for this wetland was 1.6 ppt.

Baltazar wetland: The water in this wetland has a WQI index of 0.56, which indicates water of medium quality. Among the parameters that reduce water quality is the presence of faecal coliformes (approximately 433 coliforms/100 millilitres), which indicates entry of faeces of human origin or from warm-blooded animals to the wetland. They are found in a concentration above the Ecuadorian and NSF standards for water used for recreation (bathing, swimming, boating, etc.), which is 200 coliforms/100 millilitres. In addition, the percentage of saturated oxygen is high (152 percent), indicating an overpopulation of photosynthetic organisms such as phytoplankton and algae. Biological oxygen demand is high (11.24 mg/l 5d) because

of large populations of aerobic bacteria that decompose organic material. Visibility is reduced (5 centimetres), because of the presence of organisms such as bacteria and micro algae in addition to other substances and solid particles in suspension that cause turbidity. Recorded salinity is not high (1.09 ppt). Chlorine is also present (0.2 of free chlorine and 0.5 of total chlorine). The origin of this element is anthropogenic, because it is found in products used for disinfection and cleaning, especially to eliminate bacteria that can produce diseases in human beings. The Ecuadorian criteria for water quality for the preservation of aquatic fauna and flora allow total permissible residual chlorine of 0.1 (96H CL-50) mg/litre.

Puerta del Jelí wetland: Water in this saline wetland (2.08 ppt) has a WQI index of 0.54; which indicates medium water quality. The main parameter that reduces water quality in this wetland is the abundance of faecal coliformes (1100 coliforms/100ml). This is the highest value recorded in the Sur de Isabela wetlands. This indicates a supply of faeces of human origin or from warm-blooded animals. These bacteria can enter aquatic environments by either direct or indirect discharge (washing of the soil) of waste of those groups. According to the Ecuadorian standard, the maximum permissible level for water used for recreation is 200 coliforms/100ml. The percentage of saturated oxygen in the water is high (165 percent), which is probably due to a high growth of photosynthetic organisms such as phytoplankton, algae and aquatic vegetation. The biological oxygen demand is high (12.65 mg/l 5d). This usually occurs when there is a large number of aerobic organisms that require oxygen for their activities, such as decomposing organic material. Variation in temperature is high (9° C). Low visibility (16 centimetres) also reduces water quality. Turbidity is produced by the presence of suspended solids, but also because of certain substances and microorganisms, such as bacteria and micro algae, which are abundant in this wetland. These are clearly the main sources of reduced visibility, because the amount of suspended solids is not excessively high (71 mg/litre).

Depth, fluctuation in level and permanence of water: Los Diablos marine-coastal wetland has shallow water with a maximum depth of two metres. During the dry season, areas of mudflats often form, making it impossible to travel in rowboats throughout the wetland, but only through certain channels. Water level can fluctuate considerably depending on the amount of rainfall. This is the case during the occurrence of El Niño phenomena that flood many areas and form canals for evacuation of water towards the sea. In general, the increase in water level in the rainy season is between 30 and 60 centimetres. Water can be found in the lagoons of Los Diablos wetland year round, even during periods of extreme dryness, because there are underground freshwater tributaries that come from the higher parts of the island with runoff from volcanic soils of recent formation.

Climate: The Galapagos Islands have two clearly defined seasons. Winter, the hot season, occurs between January and May, when the sea is calm and the temperature of the water is lukewarm (an average of 25° C). Sporadic torrential rain can occur, followed by clear skies. Air temperature and humidity are high. The low and dry areas of the islands turn green. During occurrences of El Niño phenomena, continuous rain showers are produced. The other season is known as the *garúa* (cool season), which usually extends from June to December. The sky remains cloudy most of the time. Persistent light rain falls in the southern parts of the high areas of the islands between 300 and 600 metres of altitude. However, the lower

parts remain dry. Seawater temperature likewise decreases (an average of 22° C), and the sea is usually rough. The temperature of the sea can vary between 16° C during the season of *garúa* up to 28° C during the hot season.

15. Hydrological values:

Because of its large capacity for capturing runoff water and rain and its direct access to the sea, the Sur de Isabela wetlands represent an important site for controlling flooding, especially when El Niño phenomena occur. Likewise, the area occupied by the mangroves contributes significantly to coastal stabilization and retention of nutrients, protecting the land against tides, wind action, waves and the currents. Because of the geological characteristics already commented on in previous chapters, this wetland contributes to recharging the surrounding aquifers from which water is extracted to supply the inhabitants of Puerto Villamil.

16. Ecological features:

Coastal area: Dominated by four species of mangrove: red (*Rhizophora mangle*), white (*Laguncularia racemosa*), black (*Avicennia germinans*) and button mangrove (*Conocarpus erectus*), which are present throughout the system of the Sur de Isabela wetlands and the surrounding area. Each species occupies a different site of the wetland depending on its particular adaptation. However, the four species sometimes interact at a single site. There are areas of fertile soil with underground freshwater and saltwater tributaries that have promoted growth of very large black mangroves, the largest in all the Galapagos. Several species of trees are associated with the mangrove, for example *manzanillo* (*Hippomane mancinella*) and *majagua* (*Hibiscus tiliaceus*) or shrubs such as the *monte salado* (*Cryptocarpus pyriformis*). Many mangroves at the edge of the sea grow in blocks of lava with very little accumulation of organic material, which gives them a shrub appearance despite their being mature specimens.

Dry area: The plants present are composed of a variety of native and endemic arboreal, herbaceous and shrub plants, depending on the soil characteristics. For example, in old and fertile deposits of organic marine debris that remained inland because of continuous eruptions, large forests of *algarrobo* (*Prosopis juliflora*) and *manzanillo* (*Hippomane mancinella*) have formed as dominant species. However, in soils of volcanic rubble with little accumulation of organic material or in pahoehoe lava fields with some accumulation of soil, the dominant vegetation is shrubs or low trees (three to four metres). In other cases, there are only endemic grasses of great resistance to a lack of water, which grow among cracks in the lava (for example *Chamaesyce* spp. or *Tiquilia galapagoa*).

Lava areas: The island of Isabela is one of the youngest areas in the world in which there are large lava fields, many of which extend to the edges of the lagoons, creating ecosystems of complete singularity. In the recently formed lava fields, colonization by species is very incipient and in many cases there are only lichens that survive because of marine winds loaded with humidity.

Beaches: The white beaches of Villamil Bay are of organic origin, formed by the accumulation of tiny fragments of exoskeletons from marine species. In some parts

of the beaches, there are flows of pahoehoe lava. In other places, the sand is formed from seashells, snails and mainly the remains of sea urchins, which are found mixed with minuscule lava pieces from erosion of stones by the waves. Most of the beaches at Villamil are under the jurisdiction of the Galapagos National Park, free of introduced plants and without the threat of being affected by urban development.

Shallow sea water: Villamil Bay is protected by lava flows and small islands that form natural barriers that block the waves, forming shallow and calm water at many sites where there is good visibility because of the small amount of suspended material. In some areas, the rocky bottoms allow establishment of many benthic species and algae, however, a substratum of sandy bottom is the most frequent.

17. Noteworthy flora:

The coastal marine wetlands on Isabela Island provide a drastic change in the availability of water for plants, breaking the monotony of the landscape and increasing plant biodiversity in the low areas of the Galapagos Islands. For this reason, interaction among species specific to arid areas has been created with mangroves and other plants typical of the sand dunes. Practically all the native and endemic vegetation is in perfect conservation status except for *Nolana galapagensis* and *Ipomoea stonolifera*. However, there is an introduced grass of African origin, kikuyu grass (*Pennisetum clandestinum*), which is present in several lagoons and invading mainly the shores. In annex I, are listed the main species of plants found in the Isabela wetlands.

18. Outstanding fauna

The Isabela Island wetlands have both indigenous (native and endemic) and introduced species. The only centre of population that exists on Isabela, Puerto Villamil, is located in the area of wetlands. Since colonization of the island in 1897, countless species of animals have been introduced. With the passage of time, feral populations of these species have become established, and this is currently one of the main problems for conservation of the archipelago. In annex II, are listed all the species of animals found in the Isabela wetlands.

Fauna of the marine wetlands: A total of 99 species of benthic macro invertebrates have been recorded. As for the abundance of species, molluscs are the group that is most represented, followed by crustaceans and echinoderms (Ecociencia, 2000). In addition, 55 species of fish, including rays and sharks, have been recorded in the marine wetlands. In annexes II and III, there are lists of the main species, their distribution and abundance.

19. Social and cultural values:

The island of Isabela was colonized in 1897 by Antonio Gil. Since then most of the inhabitants farm in the higher and wetter parts of the island, mainly growing coffee. During World War II, the government of the United States established a military base near Los Diablos wetland, which even had an airfield. In 1948, the government of Ecuador created a penal colony on Isabela Island, which occupied installations left by the Americans after they abandoned that military base. In the 1970s, significant

human migration from the province of Loja occurred, which also took up farming. Subsistence fishing has taken place since the beginning of colonization. However, with the passage of time commercial fishing has been expanding, leading little by little to abandonment of the rural areas and concentration of the human population in Puerto Villamil.

Tourism is just beginning despite the existence of excellent natural attractions, because there have been no adequate facilities for promoting this activity.

20. Land tenure/ownership of:

At the site: All the wetland is under the jurisdiction of the Galapagos National Park except for three private properties with an area of approximately seven hectares. However, up until now there has been no human activities at those sites and, therefore, they represent no threat for the time being to conservation of these wetlands.

Surrounding area: Within the area surrounding the system of wetlands, on the south, west and north, is also protected area under the jurisdiction of the Galapagos National Park. On the eastern side, the pools of Puerta del Jelí y Baltazar border on the urban area of Puerto Villamil, which has an area of 122 hectares.

21. Current land use:

At the site: Within the system of wetlands, which is a protected area, tourism is allowed. Observation trails with wooden walkways over some of the areas subject to flooding and trails of lava through the dry forests have been constructed. Non-commercial fishing for self-consumption by the local inhabitants has been carried out at Los Diablos, Los Tunos and La Escondida pools since before creation of the national park. The local inhabitants hunt introduced mammals, such as cows, pigs and goats, for food or donkeys for domestication and use as beasts of burden.

In the surrounding area: The urban area of Puerto Villamil has a human population of approximately 1600 inhabitants, which mainly fishes in the Galapagos Marine Reserve. Likewise, several groups are working in ecotourism and others in farming activities in the rural part of the island.

22. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land use and development projects:

At the site: During the El Niño phenomenon that occurred in 1983, Los Diablos wetland naturally drained water towards the sea through a canal. After that, that canal was blocked by construction of a road between the ocean and the wetland, placing large stones and thick volcanic rubble, which prevent seawater from reaching the wetland through this site and prevent migration of species.

Presence of introduced frogs: The *rana costeña* (*Scinax quinquefasciata*) represents one of the main problems for conservation of the wetlands in the southern part of the island. Currently, this frog is found only in the lagoons near the populated area, but

because of its great reproductive capacity its expansion towards the rest of the wetlands on the island is very possible.

Introduced mammals such as the common rat (*Rattus rattus*), cat (*Felis catus*), pig (*Sus scofra*), donkey (*Equus asinus*), cow (*Bos taurus*) and goat (*Capra hircus*) cause alterations to the wetland ecosystems, either through competition for food or by predation on native and endemic species, in addition to the changes in the soil caused by overgrazing and trampling.

The introduced bird known as the *garrapatero* (*Crotophaga ani*) has colonized remote areas of the Galapagos Islands, and every day its population increases in the wetlands, competing for space and, above all, for food. Furthermore, there have been reports of cases of attacks of *garrapateros* on finch chicks (an endemic species of great scientific importance).

Kikuyu grass (*Pennisetum clandestinum*) is a grass of African origin that was introduced to the wetlands near Puerto Villamil as a source of food for domestic animals. Over time, this weed has invaded a large part of the coastal wetlands and has even completely covered the water of several very shallow areas. It tolerates concentrations of salt greater than that of the mangrove and can even advance with its stolons on the water forming small islands on the mud banks. Furthermore, it has been proven that kikuyu grass represents an ideal site for reproduction of the introduced frog. There is pollution of the water in the wetlands near the populated area from faecal coliformes and chlorine. Several pathogenic bacteria are affecting the chemical composition and biodiversity of the micro invertebrates that serve as food for many species of aquatic birds. Over-fishing in the lagoons of Los Diablos, Escondida and Pozas Verdes has been the main cause of the decrease in the population of *pez diablo* (*Chanus chanus*). In annex IV, there is a list of animals and plants introduced into the wetland.

In the surrounding area: Several activities carried out by man within the urban area of Puerto Villamil near the system of wetlands are causing changes in the natural conditions of the wetlands, such as pollution of water tables through discharge of sewage, problems for the nesting of sea turtles caused by lighting in the town and the presence of domestic animals wandering through the wetlands.

23. Conservation measures taken:

Regulation of ecotourism on trails constructed in the wetlands by park guards;

Periodic cleaning up of inorganic trash brought by the sea to the coasts, as well as trash that accumulates on the trails;

Continuous control of frogs (*Scinax quinquefasciata*) in the wetlands where the presence of this introduced species has been reported;

Monitoring of the distribution and abundance of frogs in the wetlands;

Monitoring of sea turtles (*Chelonia mydas*) during the nesting season (Monthly survey of coastal birds present in the wetland);

Campaigns for manual removal of kikuyu grass (*Pennisetum clandestinum*) during the dry season.

24. Conservation measures proposed but not yet implemented:

Preparation and implementation of a management plan for the system of wetlands with participation of the local community, guaranteeing that activities carried out in the lagoons are regulated and serve to promote rational use of resources;

Continuation of several experiments to control introduced frogs, which in the future should lead to eradication of this species;

Recovery of new areas where natural entrances of water to the coastal wetlands have been blocked in order to re-establish the flow of tidal water that existed before human intervention;

A permanent campaign to control cats and rats in the wetlands and their area of influence;

A campaign for controlling two species of introduced birds: the *garrapatero* (*Crotophaga ani*) and the domesticated pigeon (*Columba livia*);

Maintenance of periodic work for manually controlling the invasive African pasture, kikuyu grass (*Pennisetum clandestinum*);

Support for efforts by the municipal government of Isabela to treat sewage water from the urban area in order to decrease or rid pollution from the water in the wetlands near the town.

25. Current scientific research and facilities:

The Galapagos National Park together with the Charles Darwin Scientific Station is carrying out research on the control of introduced frogs in the Isabela wetlands with support from the government of the United States through provision of a specialist in that field. Also, there is the help of the United States Agency for International Development (USAID) and the ARAUCARIA Programme of the Agencia Española de Cooperation Internacional (AECI) for carrying out several conservation activities in the wetlands, such as a study of the environmental impact of tourist infrastructure, drafting of a plan for ecotourism and implementation of a management plan for the wetlands. In addition, international scientists have carried out research on the wetlands in this area.

As regards the existing infrastructure, repairs have been made, using two wooden bridges, to the natural canals that allow seawater to enter into the wetlands during high tides and water to exit in periods of continual torrential rains. Likewise, wooden walkways have been constructed along the edges of some of the lagoons, as well as trails through the lava in the non-flooded areas.

26. Current conservation education:

The Charles Darwin Scientific Station, in direct coordination with the Galapagos National Park, is working with local secondary students in controlling introduced frogs in the wetlands in the form of credits required for graduation. The wetlands have been used for carrying out environmental education activities for schoolchildren, who have held camps on conservation awareness about these ecosystems.

27. Current recreation and tourism:

Isabela Island does not have an airport for commercial flights from the continent, and there are no tour operators for boat cruises. As a result, tourism is limited to weekly or twice-a-month visits of a boat with capacity for 100 passengers, who visit the wetlands for the day and have lunch in one of the five restaurants in the town. Since 2001, several visitors' trails have been built through the wetlands near Puerto Villamil. There are wooden walkways along the edges of some of the lagoons and flooded areas as well as trails through the lava. Tourists have the opportunity to observe various terrestrial and aquatic species of both marine and migratory birds and to snorkel in shallow water for observation of marine species such as seals, iguanas and even penguins at certain times of the year. As for the flora, there are very interesting contrasts of plant formations produced by the presence of the wetlands, lava fields and dry forests. Because of these conditions and, above all because of the singularity of these ecosystems, ecotourism has been increasing day by day. Work is taking place in organizing and training the local community as an option to produce foreign exchange through an activity compatible with conservation.

28. Jurisdiction:

Territorial: The Sur de Isabela wetlands are under the jurisdiction of the Cantón Isabela, Province of Galápagos, Ecuador.

Administrative: The Sur de Isabela wetlands are under the administrative jurisdiction of the Galapagos National Park. The Ecuadorian navy also has authority over the beaches and bays.

29. Management authority:

The Galapagos National Park is the authority responsible for management of these wetlands because it is the institution responsible for the management of the terrestrial areas of the national park and the Galapagos Marine Reserve. The main offices and the administration of the Galapagos National Park are located in the town of Puerto Ayora, Isla de Santa Cruz.

30. References:

Annex I

Flora in the Sur de Isabela Wetlands

Native Plants

	Scientific name	Common name	Family	Distribution and abundance
1	*Acacia macracantha*	Faique	Mimosaceae	Rare tree found in dry areas
2	*Alternanthera filifolia*	Alternantera	Amaranthaceae	Small shrub common near the sea or in dry areas
3	*Avicennia germinans*	Mangle negro	Avicenniaceae	Rare in all wetlands but occasional well-developed specimens
4	*Bastardia viscosa*	Bastardia	Malvaceae	Common throughout the area surrounding mangroves
5	*Batis maritima*	Batis	Bataceae	Rare low shrub in areas subject to flooding and certain wetlands in hyper saline areas
6	*Bursera graveolens*	Palo santo	Burseraceae	Common small tree in the dry areas or lava fields
7	*Caesalpinia bonduc*	Chililica	Caesalpiniaceae	Found in cleared areas and in the shade of mangroves often climbing into the crowns
8	*Capraria peruviana*	Capraria	Scrophulariaceae	Very common shrub in the wetlands and dry areas
9	*Cardiospermum halicacabum*	Semilla corazón	Sapindaceae	Creeper very resistant to drought, common in the lava and wetlands
10	*Clerodendrum molle*	Rodilla de caballo	Verbenaceae	Common shrub in dry areas and wetlands
11	*Chiococca alba*	Espuela de gallo	Rubiaceae	Common in several parts of the wetlands, even under the shade of *Prosopis* trees
12	*Commicarpus tuberosus*	Comicarpus	Nyctaginaceae	Very common herbaceous plant resistant to drought in areas influenced by wetlands
13	*Conocarpus erectus*	Mangle jelí	Combretaceae	Very common in dune areas next to the beaches, marshes and even in areas far from water
14	*Cordia lutea*	Muyuyo	Boraginaceae	Small tree common in dry areas
15	*Cryptocarpus pyriformis*	Monte salado	Nyctaginaceae	Shrub, sometimes climber, very common in rocky coastal areas and mangroves
16	*Cyperus ligularis*	Cipero de agua	Cyperaceae	Herbaceous plant with extensive root system, very common in brackish lagoons
17	*Dodonea viscosa*	Jelicillo	Sapindaceae	Rare shrub with little natural regeneration
18	*Heliotropium curassavicum*	Cola de escorpión	Boraginaceae	Low grass common in open areas
19	*Hippomane mancinella*	Manzanillo	Euphorbiaceae	Poisonous tree, very common on the coast, sometimes coexisting with mangrove
20	*Ipomoea alba*	Soguilla blanca	Convolvulaceae	Common climbing plant found from wetlands to transition area at 200 metres in altitude
21	*Ipomoea pes-caprae*	Soguilla	Convolvulaceae	Creeper common in some wetlands and dry areas
22	*Ipomoea stonolifera*	Flor al suelo	Convolvulaceae	Rare, found in sand dunes
23	*Ipomoea triloba*	Mañanera	Convolvulaceae	Common annual climbing plant found in sunny areas
24	*Laguncularia racemosa*	Mangle blanco	Combretaceae	Common tree found in all wetlands
25	*Lippia strigulosa*	Lippia	Verbenaceae	Creeping grass common in wetlands under shade trees and even in dry areas
26	*Maytenus octogona*	Arrayancillo	Celastraceae	Rare low tree found in dry areas
27	*Mentzelia aspera*	Pegajosa	Loasaceae	Common in dry areas, near lagoons
28	*Merremia aegyptica*	Merremia	Convolvulaceae	Rare climbing plant found mainly in cleared areas in soils of volcanic rubble
29	*Parkinsonia aculeata*	Palo verde	Caesalpiniaceae	Tree found in very dry areas but also in flooded areas of wetlands
30	*Passiflora foetida*	Bedoca	Passifloraceae	Creeper common in dry areas, mainly in the rainy season
31	*Plumbago scandens*	Pegadilla	Plumbaginaceae	Common in shade under trees and in cleared dry areas
32	*Portulaca oleracea*	Verdolaga	Portulacaceae	Herbaceous plant
33	*Prosopis juliflora*	Algarrobo	Mimosaceae	Very common at dry sites and flooded areas of several wetlands
34	*Rhizophora mangle*	Mangle rojo	Rhizophoraceae	Common tree in all wetlands mainly in areas facing the sea subject to waves
35	*Scaevola plumieri*	Uva de playa	Goodeniaceae	Very common shrub along the beaches, very resistant to salinity
36	*Scutia spicata var. pauciflora*	Espino	Rhamnaceae	Common shrub in dry areas

37	*Senna pistaciifolia*	Vaina aplastada	Caesalpiniaceae	Common shrub in wetlands up to 200 metres
38	*Sesuvium portulacastrum*	Sesuvium	Aizoaceae	Common herbaceous plant found along beaches and sand dunes, very resistant to salinity
39	*Solanum erianthum*	Sombra de noche	Solanaceae	Rare shrub found in arid areas
40	*Sporobolus virginicus*	Hierba de orilla	Poaceae	Abundant among dunes facing the sea
41	*Tribulus terrestris*	Cacho de chivo	Zygophyllaceae	Crawling plant common in dry and sunny coastal areas
42	*Triumfetta semitriloba*	Triunfeta	Tiliaceae	Common shrub in dry areas of volcanic rubble near wetlands up to 300 metres
43	*Vallesia glabra*	Peralillo	Apocynaceae	Common small tree in the dry area, even under larger trees
44	*Waltheria ovata*	Walteria	Sterculiaceae	Very common shrub in lava near the edge of the sea
45	*Zanthoxylum fagara*	Uña de gato	Rutaceae	Sparse small tree in dry areas

Endemic Plants

	Scientific name	**Common name**	**Family**	**Distribution**
1	*Acacia rorudiana*	Acacia de Galápagos	Mimosaceae	Uncommon plant in dry wooded areas near mangroves
2	*Brachycereus nesioticus*	Cacto de lava	Cactaceae	Small cactus specific to lava fields
3	*Castela galapageia*	Castela	Simaroubacea e	Common, found mainly in dry areas
4	*Chamaesyce* sp.	Escoba	Euphorbiaceae	Herbaceous plant common in dry areas in the lava fields
5	*Cordia revoluta*	Laurelillo	Boraginaceae	Common shrub in the dry areas and lava fields
6	*Croton scouleri*	Chala	Euphorbiaceae	Abundant small tree in the dry areas
7	*Darwiniothamnus tenuifolius*	Romerillo	Asteraceae	Common in the dry area
8	*Encelia hispida*	Encelia	Asteraceae	Very rare small shrub
9	*Gossypium darwinii*	Algodoncillo	Malvaceae	Uncommon shrub in dry areas
10	*Jasminocereus thouarsii*	Candelabro	Cactaceae	Large cactus common on lava flows and in dry areas
11	*Lantana peduncularis*	Supi-rosa	Verbenaceae	Shrub common in dry areas
12	*Lycium minimum*	Lycium	Solanaceae	Rare shrub specific to dry areas
13	*Lycopersicon cheesmanii*	Tomatillo de Galápagos	Solanaceae	Rare in dry areas
14	*Nolana galapagensis*	Nolana	Nolanaceae	Sparse plants in wetlands and very little natural regeneration
15	*Opuntia echios var. Inermis*	Tuna	Cactaceae	Common in dry areas
16	*Pisonia floribunda*	Pega pega	Nyctaginaceae	Rare tree in dry areas
17	*Sesuvium edmonstonei*	Sesuviun de Galápagos	Aizoaceae	Uncommon found in coastal areas next to sea
18	*Scalesia affinis*	Lechoso	Asteraceae	Common in dry areas
19	*Tiquilia galapagoa*	Tiquilia	Boraginaceae	Creeping plant common in open areas or lava fields
20	*Tournefortia rufo-sericea*	Palo negro	Boraginaceae	Common in many wetlands and dry parts

Annex II

Fauna in the Sur de Isabela Wetlands

Birds

	Scientific name	Common name	Type of species	Distribution and abundance
1	*Anas bahamensis galapagensis**	Patillo	Native (endemic subspecies)	Common in Puerta del Jelí y Baltazar, rare in other areas
2	*Anous stolidus galapagensis**	Gaviotín cabeza blanca	Native (endemic subspecies)	Common on rocky coasts, shallow water and open sea
3	*Ardea alba*	Garza blanca	Native	Uncommon; present in all wetlands
4	*Ardea herodias cognata**	Garza morena	Native (endemic subspecies)	Uncommon, present in all wetlands
5	*Asio flammeus galapagoensis*	Lechuza de campo	Native (endemic subspecies)	Uncommon in wetlands
6	*Bubulcus ibis*	Garza bueyera	Native	Abundant
7	*Buteo galapagoensis*	Gavilán de galápagos	Endemic	Rare in the Los Diablos wetlands
8	*Butorides striatus*	Garza de manglar	Native	Common in all intertidal areas and mangroves
9	*Butorides sundevalli*	Garza de lava	Endemic	Common among mangroves and on rocky coasts
10	*Certhidea olivacea*	*Pinzón cantor*	Endemic	Common in wetlands and dry areas
11	*Coccyzus melacoryphus*	Cuclillo	Native	Uncommon, found mainly in dry forests
12	*Creagrus furcatus*	Gaviota de cola bifurcada	Endemic	Rare, found in coastal areas
13	*Dendroica petechia*	Canario María	Native (endemic subspecies)	Common in mangroves and dry forests
14	*Fregata magnificens magnificens**	Fragata real	Native (endemic subspecies)	Common in shallow water and lagoons, mainly in Las Pozas Verdes
15	*Gallinula chloropus*	Gallinula	Native	Common in Puerta del Jelí y Baltazar
16	*Geospiza fortis*	Pinzón terrestre mediano	Endemic	Common in wetlands and dry areas
17	*Geospiza fuliginosa*	Pinzón terrestre pequeño	Endemic	Common in wetlands and dry areas
18	*Geospiza magnirostris*	Pinzón terrestre grande	Endemic	Common in wetlands and dry areas
19	*Geospiza scandens*	Pinzón de cactus	Endemic	Common in wetlands and dry areas
20	*Haematopus palliatus galapagensis**	Ostrero	Native (endemic subspecies)	Uncommon along beaches
21	*Himantopus himantopus*	Tero real	Native	Uncommon, mainly in Puerta del Jelí y Baltazar
22	*Larus fuliginosus*	Gaviota de lava	Endemic	Common in mangroves and on rocky coasts
23	*Myiarchus magnirostris*	Atrapamoscas	Endemic	Common in wetlands and dry areas
24	*Nesomimus parvulus*	Cucuve de Galápagos	Endemic	Common in wetlands and dry areas
25	*Nyctanassa violacea pauper**	Guaque	Native (endemic subspecies)	Common in mangroves and present in wetlands
26	*Pelecanus occidentalis urinator**	Pelícano café	Native (endemic subspecies)	Common along the coast and in mangroves
27	*Phoenicopterus ruber glyphorhynchus**	Flamingo	Native (endemic subspecies)	Abundant in the Los Diablos wetlands
28	*Spheniscus mendiculus*	Pingüino de Galápagos	Endemic	Uncommon and not found year round

29	*Sula nebouxii excisa**	Piquero de patas azules	Native (endemic subspecies)	Common on the coast feeding in shallow seawater
30	*Tyto alba punctatissima*	Lechuza de campanario	Native (endemic subspecies)	Uncommon, mainly in areas of volcanic caves

*Subspecies endemic to the Galapagos

Migratory Birds

	Scientific name	**Common name**	**Distribution and abundance**
1	*Actitis macularia*	Playero manchado	Common from January to March on beaches and along the coast
2	*Arenaria interpres*	Vuelvepiedras	Common from September to March on the coasts
3	*Calidris alba*	Playero common	Common on beaches from January to March
4	*Calidris minutilla*	Playero enano	Found in small groups year round but mainly from October to May
5	*Catoptrophorus semipalmatus*	Chorlitejo	Rare on the coast in certain months
6	*Charadrius semipalmatus*	Chorlitejo	Common on beaches mainly from September to May
7	*Numenius phaeopus*	Zarapito	Common on beaches and even in the high parts of volcanoes year round
8	*Phalaropus lobatus*	Falaropo norteño	Abundant in certain years from January to March
9	*Phalaropus tricolor*	Faralopo de Wilson	Found in lagoons, usually from August to May
10	*Tringa flavipes*	Chorlo chico	Found in small groups from October to March

Fish

	Scientific name	**Common name**	**Distribution and abundance**
1	*Abudefduf troschelii*	Sargento mayor	Abundant on rocky bottoms in shallow water
2	*Acanthemblemaria castroi**	Trambollito percebes de Galápagos	Abundant in shallow water
3	*Aetobatus narinari*	Raya águila	Common on reefs and sandy bottoms
4	*Anisotremus interuptus*	Zapatilla	Abundant on rocky bottoms in shallow seawater
5	*Arothron meleagris*	Tamboril Negro	Common on rocky reefs
6	*Arcos poecilophthalmus**	Pez prendedor de Galápagos	Uncommon on rocky or sandy bottoms
7	*Ariosoma gilberti*	Anguila congrio panamica	Uncommon on sandy bottoms and in bays and coves with quiet water
8	*Aulostomus chinensis*	Pez trompeta	Common on rocky reefs
9	*Bodianus diplotaenia*	Vieja ribeteada	Abundant on rocky reefs
10	*Chanos chanos*	Diablo	Uncommon in the Los Diablos wetland
11	*Dasyatis brevis*	Raya de espina	Uncommon on sandy bottoms
12	*Diodon hystrix*	Pez erizo punteado	Uncommon on rocky reefs
13	*Eucinostomus argenteus*	Mojarra plateada	Uncommon near beaches
14	*Fistularia commersonii*	Pez corneta de arrecife	Common on rocky reefs
15	*Girella Freminvillei**	Chopa penumbre	Common on shallow reefs
16	*Gymnothoreax dovii*	Morena punto fino	Common on rocky reefs
17	*Haemulon scuderi*	Roncador ojo dorado	Abundant in areas with strong currents
18	*Haemulon sexfasciatum*	Roncador barra gris	Uncommon on shallow rocky reefs
19	*Halichoeres nicholsi*	Vieja soltera	Common on rocky reefs
20	*Holacanthus passer*	Pez bandera	Abundant on rocky reefs
21	*Hyporhamphus unifasciatus*	Picuda	Uncommon in the marine wetlands
22	*Hypsoblennius brevipinnis*	Trambollito de puntos rojos	Uncommon in shallow water
23	*Jhonrandallia nigrirostris*	Mariposa barbero	Abundant on rocky reefs
24	*Kyphosus elegans*	Chopa cortez	Uncommon in calm shallow water
25	*Lepidonectes carallicola*	Trambollito triple aleta	Abundant on rocky reefs
26	*Lutjanus argentiventris*	Pargo amarillo	Occasionally found on rocky bottoms
27	*Lutjanus novemfasciatus*	Pargo prieto	Uncommon in the marine wetlands
28	*Lutjanus* spp.	Pargo	Uncommon, present in the Los Diablos wetland

29	*Lutjanus viridis*	Rayado	Common in shallow seawater
30	*Malacoctenus zonogaster*	Trambollito de cinturón	Uncommon in tidal pools and rocky bottoms
31	*Manta hamiltoni*	Manta	Oceanic species that occasionally visits the wetland
32	*Microspathodon bairdii*	Damisela cabeza chichón	Uncommon in the marine wetlands
33	*Microspathodon dorsalis*	Damisela gigante	Common in shallow marine water
34	*Muraena clepsydra*	Morena mancha negra	Uncommon on rocky reefs
35	*Muraena lentijenosa*	Morena pinta	Common on rocky reefs
36	*Mugil galapaguensis*	Lisa	Common in the Los Diablos wetlands and shallow water
37	*Myrichthys tigrinus*	Anguila tigre	Uncommon on sandy bottoms or in rocky shallow water
38	*Ophidion* sp.*	Lengua de Galápagos	Uncommon on sandy bottoms
39	*Ophioblennius steindachneri*	Chupa piedra	Abundant under rocks and in cracks near the coast
40	*Orthopristis forbesi**	Roncador de Galápagos	Uncommon on rocky reefs with strong currents
41	*Prionurus laticlavius*	Chancho	Abundant in the marine wetlands
42	*Quassiremus evionthas**	Anguila de Galápagos	Uncommon on shallow sandy or rocky bottoms
43	*Rhinoptera steindachneri*	Raya dorada	Uncommon in bays with mangroves and marine lagoons
44	*Sacrus compressus*	Loro verde azul	Uncommon on rocky reefs and corals
45	*Scarus ghoban*	Loro barba azul	Abundant on rocky bottoms and reefs
46	*Scarus perrico*	Loro guacamayo	Uncommon on rocky bottoms
47	*Scarus rubroviolaceus*	Loro bicolor	Uncommon on rocky reefs
48	*Sphoeroides annulatus*	Tambolero	Abundant in shallow water over sandy bottoms
49	*Stegastes arcifrons*	Damisela de cola amarilla	Abundant on rocky bottoms in shallow seawater
50	*Stegastes leucorus beebei***	Damisela cola blanca	Abundant on rocky bottoms in shallow seawater
51	*Symphurus atramentatus*	Lengua arcoiris	Uncommon on sandy or muddy bottoms
52	*Taeniura meyeri*	Sartén marmoleado	Uncommon on sandy or rocky bottoms
53	*Trachinotus stilbe*	Pámpano acerado	Abundant in areas with strong currents
54	*Triaenodon obesus*	Tintorera	Common in quiet water on sandy bottoms and rocky reefs
55	*Xenocys jessiae**	Ojón	Uncommon in shallow bays

***Endemic species
**Endemic subspecies

Reptiles

	Scientific name	**Common name**	**Distribution and abundance**
1	*Alsophis dorsalis*	Culebra	Rare, mainly in dry areas
2	*Alsophis slevini*	Culebra	Rare, mainly in dry areas
3	*Amblyrhynchus cristatus*	Iguana marina	Common on the coast, mainly in rocky areas
4	*Chelonia mydas agassizi*	Tortuga verde	Common on beaches and marine wetlands
5	*Microlophus albemarlensis*	Lagartija de lava	Abundant in all wetlands
6	*Phyllodactylus galapagoensis*	Gecko	Uncommon nocturnal species, but found in all wetlands

Mammals

	Scientific name	**Common name**	**Distribution and abundance**
1	*Zalophus californianus wollebacki*	Lobo marino de un pelo	Abundant in marine wetlands

Endangered or Vulnerable Species in the Sur de Isabela Wetlands

	Scientific name	**Common name**	**Type of species**	**Status**
1	*Amblyrhynchus cristatus*	Iguana marina	Endemic	Vulnerable

2	*Buteo galapagoensis*	Gavilán de galápagos	Endemic	Endangered
3	*Chelonia mydas agassizi*	Tortuga verde	Native	Endangered
4	*Larus fuliginosus*	Gaviota de lava	Endemic	Vulnerable
5	*Phoenicopterus ruber glyphorhynchus**	Flamingo	Native (endemic subspecies)	Endangered
6	*Spheniscus mendiculus*	Pingüino de Galápagos	Endemic	Endangered
7	*Zalophus californianus wollebacki*	Seal	Endemic	Vulnerable

Annex III

Marine Invertebrates in the Sur de Isabela Wetlands

	Scientific name	Common name	Distribution and abundance
	Molluscs		
1	*Aplysia cedrosensis*	Libre caminadora	Slug common in intertidal area, tidal pools and shallow subtidal areas
2	*Arca truncata*	Arca truncada	Shell common in intertidal areas
3	*Arcopis solida*	Arca diminuta	Shell common in intertidal areas
4	*Babelomurex hindsii*	Babelomurex del Pacífico	Common in intertidal areas and shallow water
5	*Barbatia rostae*	Arca de costillas finas	Shell common in intertidal area
6	*Brachidontes puntarenensis*	Mejillón tallado	Shell common in intertidal areas
7	*Caducifer cinis*	Buccino ceniza	Abundant in intertidal areas on or under rocks in tidal pools
8	*Calliostoma leanum*	Calliostoma rojiza	Common shell in intertidal areas, also found in subtidal areas
9	*Cerithium adustum*	Pada common	Very abundant shell in the intertidal area, on rocks or buried in sand among rocks
10	*Chiton goodallii*	Canchalagua	Common in the intertidal area clinging to rocks
11	*Ctena galapagana*	Lucina de Galápagos	Shell on sandy bottoms, uncommon in subtidal and intertidal areas
12	*Cymatium lineatum**	Tritón rayado	Common under rocks at low tide
13	*Cypraea moneta*	Caurí moneda	Common in intertidal areas and in tidal pools
14	*Dolabrifera dolabrifera*	Gato de mar verrugoso	Slug common in tidal pools
15	*Engina maura*	Engina oscura	Common in the intertidal area and tidal pools on rocks
16	*Favartia purdyae*	Murícido de Purdy	Very common in the intertidal area under rocks
17	*Isognomon recognitus*	Ostra isognomónida	Oyster clinging to rocks, common in intertidal areas
18	*Laevicardium elenense*	Berberecho suave	Very common shell in subtidal area, also found in the intertidal area
19	*Lottia mimica*	Lapa mímica	Common limpet in intertidal area on rocks
20	*Lottia rothi*	Lapa de Roth	Limpet common in intertidal area on or under rocks in tidal pools
21	*Mitra tristis*	Mitra triste	Very common shell found in intertidal areas or under rocks
22	*Navanax aenigmaticus*	Aglaja de Panmá	Very common slug in the intertidal area and tidal pools
23	*Nerita scabricosta*	Nerita de costillas gruesas	Very common large shell found in intertidal areas or on rocks
24	*Nodilittorina galapagiensis*	Litorina conspira	Common shell in the intertidal area
25	*Nodilittorina modesta*	Litorina modesta	Very abundant shell in the intertidal area
26	*Pascula rufonotata*	Murícido rosca	Very common in the intertidal or subtidal areas
27	*Pinna rugosa*	Nacra rugosa	Uncommon, found buried in mud and mangroves
28	*Polinices ubre*	Caracol lunar del Pacífico	Abundant in intertidal and subtidal areas
	*Protothaca pertincta**	Almeja de Galápagos	Shell common on sandy bottoms found in intertidal or subtidal areas
29	*Pseudochama janus**	Joyero falso	Shell common in intertidal and subtidal areas
30	*Saccostrea palmula*	Ostra palmeada	Very common found clinging to rocks and roots of red mangrove
31	*Semele sowerbyi**	Semélida moteada	Uncommon shell found on sandy bottoms or in intertidal areas
32	*Thais melones*	Murícido manzana	Common in intertidal areas
33	*Transennella galapagana**	Transenela de Galápagos	Common shell on sandy bottoms in intertidal areas
	Starfish		
1	*Asterina sp.*	Estrella romana	Common under rocks in the intertidal area

2	*Ophiactis savignyi*	Estrella de brazos frágiles	Found among intertidal rocks and shallow water
3	*Ophiocoma aethiops*	Ofiura negra espinosa	Very common on coastal rocks and muddy intertidal areas
4	*Ophiocoma alexandri*	Ofiura de Alexander	Common in the intertidal area
5	*Ophiothrix spiculata*	Ofiura de espinas vidriosas	Very common in the middle and lower intertidal area, under rocks or clinging to algae
	Sea urchins		
1	*Diadema mexicanum*	Erizo aguja	Uncommon in intertidal area and tidal pools
2	*Encope galapaguensis**	Dólar de Galápagos	On sand banks in shallow water
3	*Eucidaris thouersii*	Erizo lapicero	Very common in shallow water on the coast
4	*Lytechinus semituberculatus*	Erizo verde	Abundant in shallow water on rocky bottoms and tidal pools
	Sea cucumbers		
1	*Holethuria arenicola*		Very common hidden under rocks in shallow water
2	*Holothuria atra*	Meón	Common in shallow water over sandy bottoms
3	*Holothuria imitans*	Pepino	Common in the intertidal area and shallow water
4	*Holturia fuscocinerea*	Pepino	
5	*Stochopus fuscus*	Pepino	Uncommon in shallow water
	Crustaceans		
1	*Alpheus bouvieri*	Camarón chasqueador	Common in intertidal area to one m in depth
2	*Calcinus explorator*	Cangrejo ermitaño punta anaranjada	Very common in the intertidal area and shallow water
3	*Coenobita compresus*	Ermitaño terrestre	Very common on beaches with mangroves
4	*Cycloxanthops vittatus*	Cangrejo camafeo	Common in the intertidal area under rocks
5	*Emerita rathbunae*	Cangrejo topo	Very common on beaches with white sand
6	*Glyptoxanthus hancocki**	Cangrejo de Hancock	Common in intertidal areas under rocks
7	*Grapsus grapsus*	Zayapa	Abundant in all the intertidal area
8	*Ocypode guadichaudii*	Cangrejo fantasma	Very common on white sandy beaches
9	*Pachygrapsus transversus*	Pachygrapsus estriado	Common in the intertidal area
10	*Palaemon gladiator*	Camarón gladiador	Common among mangroves, intertidal areas and shallow water
11	*Palaemonella ritteri*	Camarón barras de césped	Common in intertidal areas and shallow water
12	*Panulirus penicillatus*	Langosta roja	Uncommon, found in holes in shallow water
13	*Scyllarides astori*	Langosta china	Uncommon, found in holes and cracks in shallow water
14	*Uca galapagensis**	Cangrejo violinista de Galápagos	Abundant in certain intertidal areas of mangroves

*Endemic species

Annex IV

Introduced Animals and Plants

Introduced Birds

	Scientific name	Common name	Distribution and abundance
1	*Columba livia*	Domesticated pigeon	Uncommon and found only in certain wetlands near the urban area
2	*Crotophaga ani*	Garrapatero	Abundant at all sites
3	*Gallus gallus*	Chicken	Uncommon and found only in wetlands near the urban area

Introduced Mammals

	Scientific name	Common name	Distribution and abundance
1	*Bos taurus*	Cow	Sparse. Mainly in the northern part of the wetlands
2	*Capra hircus*	Goat	Sparse in Los Diablos wetlands
3	*Equus asinus*	Donkey	Common in dry areas near the wetlands
4	*Equus caballus*	Horse	Uncommon. Mainly domesticated animals
5	*Felis catus*	Cat	Abundant at all sites
6	*Mus musculus*	Mouse	Abundant at all sites
7	*Rattus rattus*	Rat	Abundant at all sites
8	*Sus scrofa*	Pig	Uncommon, mainly loose domesticated pigs

Introduced Amphibians

	Scientific name	Common name	Distribution and abundance
1	*Scinax quinquefasciata*	Rana costeña	Abundant in the Los Diablos wetland. Serious threat to other wetlands

Introduced Invasive Plants

	Scientific name	Common name	Family	Distribution
1	*Cucumis dipsaceus*	Huevo de tigre	Cucurbitaceae	Uncommon in Los Diablos wetland
2	*Furcraea hexapetala*	Cabuya	Agavaceae	Rare in Los Diablos wetland
3	*Pennisetum clandestinum*	Kikuyu grass	Gramineae	Common in Los Diablos wetland
4	*Porophylum ruderale*	Porofilun	Asteraceae	Shrub with winged seeds found in areas of volcanic rubble
5	*Syzygium jambos*	Pomarrosa	Myrtacea	Rare in Los Diablos wetland