Mosquito Island
British Virgin Islands

A TERRESTRIAL RESOURCE CHARACTERIZATION

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Cover Photo: Northeast end of Mosquito Island (Blow Hole), looking at Necker Island

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SUMMARY

Island Resources Foundation (IRF) was retained by Econcerns Ltd., to undertake a terrestrial survey of the Mosquito Island for the Mosquito Island Project Environmental Impact Assessment (MIP EIA). This private island, immediately north of the island of Virgin Gorda, British Virgin Island (BIV), is owned by the Virgin Group of companies. This survey forms part of requirements for submission of a Category "A" Environmental Impact Assessment (EIA) to the Town and Country Planning Department of the British Virgin Island Government.

In June and September 2007, IRF's Kevel Lindsay and Jean-Pierre Bacle, as part of the EIA team headed by Clive Petrovic, undertook field surveys throughout the island. The effort included:

- Reviewing available project site documents
- Undertaking field observations
- Providing species lists, and characterizing the site with respect to habitat, biodiversity interests and existing threats
- Predicting impacts likely to occur from the proposed development and provide recommendations and mitigation measures to reduce these likely adverse impacts
- Report on the findings and recommendations in six (6) main sections, namely:
  - Describe existing conditions
  - Survey methodology
  - Observations
  - Impacts & mitigation

  - Recommend mitigation
  - Long-term monitoring of impacts and mitigation measures

Observations focus primarily on:

- The flora and vegetation communities;
- The fauna (amphibians and reptiles, birds, mammals and invertebrates);
- Ecology and landscape issues; and
- Development impacts and mitigation.

LOCATION

Mosquito Island lies in the entrance of Virgin Gorda's North Sound (Figures 1 and 2). It is located about 0.15 km north of Anguilla Point, Virgin Gorda (VG). The closest community is Leverick Bay on Virgin Gorda, situated a little over 1.6 km to the southeast.

The island consists of a hilly landscape covered mostly with dry semi-deciduous forest. It has an approximate area of 132 acres, with the highest point reaching 83 m. The island has no permanent streams or ponds. For the most part, the soil is volcanic in origin, well-drained and thinly covers the underlying bedrock.

PROJECT DESCRIPTION

The Mosquito Island Development proposes to develop a private residence on the northeast portion of the island along with associated amenities and support facilities. In addition, there will be up to 20 luxury villas constructed primarily on the upland parts of the island. The core development will cover a minor portion of the 132 acre island, and much of it will be in the Drakes Anchorage area.

The development will include the provision of necessary roads, utilities, support services and recreational amenities both for the use of island guests and residents and for the general public. Public amenities will be provided on the most popular and frequently visited Long Beach area at Manchioneel Bay.

The proposed development will emphasize as much as possible on adopting "green and carbon neutral" design. Electricity will be generated from renewable sources. Wastes will be recycled and reused wherever possible. Impacts on the environment will be minimal and carefully managed to preserve the ecological integrity of the island.

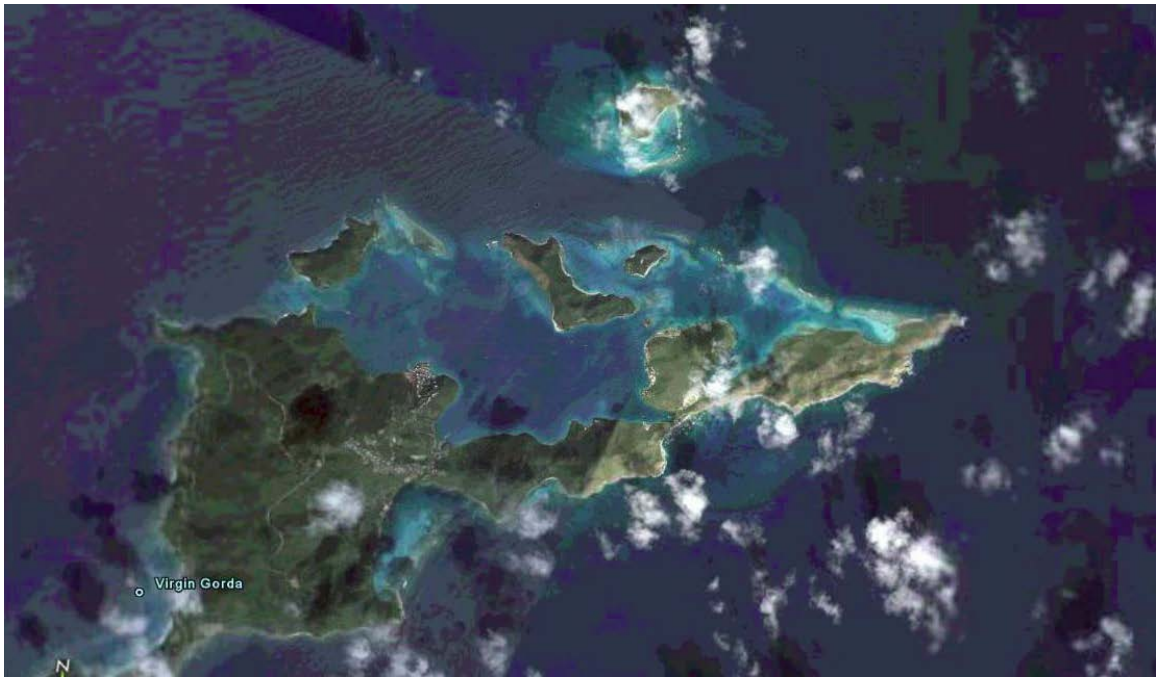

Figure 1. Virgin Gorda and islands in the North Sound.

Figure 2. Mosquito Island.

EXISTING CONDITIONS

Although currently uninhabited, the former Drake's Anchorage Resort, located along the northeast coastline adjacent to the treacherous Colquhoun Reef, was a popular "hang out" for scuba divers as well as the sailing crowd. Built by Mr. Bert Kilbride in the 1960s, the resort closed in 1997 with a brief reopening in 2000/2001 before officially closing.

There are 13 vegetation communities found at Mosquito Island. Most of the island is vegetated, with semi-deciduous forest and mixed dry shrubland communities. Grasslands cover extensive areas on the eastern-facing slopes, much of these areas transformed into pasture due most likely to human agents and land-use practices during the 19th and 20th centuries. A total of 287 species of plants representing 71 families were recorded during field surveys.

Although it was long after the northern-bound spring migration headed north, a total of 47 species were observed on island and in the surrounding marine waters.

Three species of mammals are known or believed to occur on Mosquito Island. During field investigations, two species were observed.

Of the 25 species of reptiles and amphibians recorded for the BVI, 8 species of reptiles have been recorded for Mosquito Island. No amphibians were observed during the field surveys or have been recorded in the past.

CLIMATE AND WEATHER

As with most islands in the British Virgin Islands, Mosquito Island's is strongly affected by the Northeast Trade winds, which means winds approach with great constancy from directions between east-northeast and southeast. The average wind direction varies throughout the year according to the following pattern:

- December to February: winds blow from east-northeast (known locally as "Christmas Winds"),
- March to May: winds blow from easterly directions,
- June to August: winds blow from east to east-southeast directions,
- September to November: winds blow mainly from the east to southeast.

Normally, except for the occasional hurricane, highest wind speeds are experienced from December to February and again in June and July. Average wind speeds for the months of June – July are around 9m/sec (20mph), while for October average wind speeds drop to 6m/sec (13.5mph).

During the winter months, October to April, the Territory is occasionally influenced by frontal systems moving in an eastward direction across the southern part of the United States. The trailing edge of these fronts sometimes affects the BVI and results in winds blowing from between northwest and northeast for short periods of time – usually no more than on to two days.

The area also lies within the hurricane belt. These intense storms occur between June and November, with September being the month when most tropical storms or hurricanes occur. Within recent years, several hurricanes passed sufficiently close to the BVI to cause significant damages (Table 1).

Hurricanes generate high winds and waves, storm surge and heavy rainfall/flooding. Hurricane Hugo, which passed 97km (61 miles) south of the BVI in September,1989, resulted in damage to the Territory of US$ 200 million (BVI National Report to UNCED, 1992). Hurricanes, and indeed hurricane waves, may approach from any direction, as was seen in November 1999 when Hurricane Lenny moved from west to east across the Caribbean Sea. Scientific analysis of past climate and oceanographic records has resulted in prediction for increase hurricane activity in the North Atlantic basin, including the Caribbean, over the next two decades (Vermeiren and Watson, 1994).

Temperature varies little throughout the year, with daytime temperatures that fall within the range 25-29 C and usually drop 6 C at night. Temperatures average an annual 81° F (21.6° C), with the winter lows averaging 76° F (24° C), and the summer high reaching the mid to upper 80s. The temperature and climate are moderated by near constant on-shore breezes. Due to year-round high temperatures and nearly constant winds, the evapo-transpiration rate is generally high.

Heavy rainfall sometimes occurs during the passage of the easterly tropical waves, which are spurned off the West African coast from June to November of each year. Occasionally, these waves intensify into tropical depressions, tropical storms, or hurricanes.

The amount of rain varies monthly and annually, with the general trend of dry-to-wet from east-to-west and south-to-north. Average rainfall data, compiled from several years of records at nearby Necker Island, can be misleading in that it probably gives a false perception of the actual precipitation at a particular area in any given year.

The late Rowan Roy, a long time resident from Hodges Creek (Tortola), has recorded rainfall data from 1974 to 1999. According to his records, the annual mean rainfall over a 25 year period is 38.505" (Roy, 1999). This corresponds with records from the Development Planning Unit, Government of the British Virgin Islands, which indicates that from 1996 to 2005, the average rainfall was 37.01". (http://dpu.gov.vg/Indicators/rainfall1.htm).

Table 1. Recent Tropical Storms and Hurricanes in the BVI.

Date	Storm	High Gusts (BVI)	Rainfall (BVI)
1955, Sept	H. Conny	80 MPH	-
1960, Aug	H. Donna	90 MPH	-
1979, 29 Aug	H. David	75 MPH	3.00"
1979, 4 Sept	H. Frederick	83 MPH	9.32"
1988, 10 Sept	T.S. Gilbert	40 MPH	2.45"
1989, 17 Sept	H. Hugo	145 MPH	9.71"
1995, 19 Aug	H. Iris	-	-
1995, 4 Sept	H. Louis	125 MPH	2.74"
1995, 15 Sept	H. Marilyn	145 MPH	5.00"
1996, 6 July	H. Bertha	120 MPH	3.25"
1996, 9 Sept	T.S. Hortense	50 MPH	3.20"
1998, 21 Sept	H. Georges	130 MPH	2.51"
1999, 21 Oct	H. Jose		
1999, 17 Nov	H. Lenny	65-80MPH	3.00"

GEOLOGY

The island lies on the Puerto Rican Bank which was created by volcanism during the Cretaceous and became emergent largely through orogenic movement in the lower Eocene age (35 – 40 M years ago). Subsequent sea-flooding occurred in the Oligocene followed by uplift, erosion and faulting during the middle Miocene orogenesis. The continuity of the original mountain axis of the Puerto Rican bank is interrupted on the eastern end of Puerto Rico and reaches lower elevations through the islands of Culebra, Vieques, St Thomas, St John, and Tortola to Virgin Gorda. According to Mitchell (1954), during the Pliocene (2-3 M years ago), this Creataceous mountain axis underwent tilting to the northeast allowing the Atlantic and Caribbean to flood part of the landform, thereby isolating the Virgin Islands from Puerto Rico.

Mosquito Island like most surrounding islands dominantly reflects a volcanic landscape. According to Helsley (1960), these volcanic sediments were deposited on the surface during the Eocene age as part of the Necker Formation. Bedrock type is mostly of fined-grained tuffs inter-bedded with breccias. These rocks are well exposed throughout the island but especially along the north facing cliffs. Typically, the breccias consist of cemented rock fragments that are generally more than 4 mm in diameter. The fragments vary in size and have angular

facies. On the other hand, the tuff deposits are fine grained pyroclastic sediments composed of fragments less than 4mm in diameter.

The Necker formation is intruded by numerous porphyritic basalt dikes and sills several of which are present along the north facing cliffs. These intrusions are composed of minerals that are denser and more resistant to erosion thereby creating a pattern that is discernable from tuffs and breccias bedrock.

Structurally, strike of bedding follows a northwest – southeast axis. This is particularly evident along northwest cliffs, where differential bedrock erosion has accentuated this pattern. For example, most pocket beaches along this coastline follow this axis.

Mass wasting and weathering of bedrock are normal geomorphic processes occurring throughout the island's landscape. Mass wasting such as rock falls or rock slides is frequent on very steep and exposed rock surfaces along the northern sea cliffs. On a minor scale, it is common to see localized weathering of bedrock that produces bedrock fissures or bedrock cavities due to erosion of softer rock minerals. On occasion, such cavities are used by wildlife for nesting, foraging, and staging (Photo 1).

About 10 % of the island is formed of recent quaternary deposit. These deposits occur mainly along the northeast side of the island where the old Drake's Resort lies. Here, sands and finer sediments of undetermined depth cover most of the area. Being adjacent to the Colquhoun reef, it is likely that these sediments overly a reef substrate. The other main recent quaternary deposit includes the long beach area at Manchioneel Bay and the salt pond to the west.

DRAINAGE AND WATERSHEDS

Because of its size, elevation, and low precipitation, there are no freshwater ponds and no perennial stream on the island. Intermittent stream locally known as ghuts are poorly developed and only flow during intense rainfall.

The island can be delineated into 12 small watersheds, although only five of them barely have distinguishable ghuts (Figure 2). The only two salt ponds are dry for most of the year. Only after heavy rains do they tend fill up rarely more

than a few inches. Hurricanes and tropical storms may also introduce saltwater from the seaside.

Potential groundwater reserves on the island are unknown at this time. An old freshwater well, located just inland from the abandoned buildings, at the toe of the sloping hillside is the only known one (GPS: 18 30' 47.5"N, 64 23' 29.3"W). Production capacity and the quality of this water source have yet to be determined. Preliminary observations indicate that the well has shallow brackish water. Water level was measured at 3 m below ground surface.

Figure 3. Watersheds.

COASTAL CHARACTERISTICS

The island has a diverse coastline ranging from steep elevated cliffs to wide sandy beach, and fringing mangroves. Eight coastal types were mapped and are depicted in Figure 3. The dominant and important ones are summarized below.

High rock cliffs dominate over 50% of the coastline. These cliffs span around the north, west and southwest of the island. Typically their heights range between 20 to 30 m. Erosion features such as bedrock fractures and debris talus are common. Interspersed along this coastline are narrow pocket beaches that formed along axis of softer bedrock types. Beach material is mostly comprised of rock boulders and some coral rubble brought in by heavy seas.

Low rock cliffs (5 m or less) are the second most dominant shoreline type. They stretch westward from the old dock to Manchioneel Bay. A man made stone pathway follows the base of the cliff for the entire distance. The shoreline side of the pathway is colonized with shrubby coastal vegetation including some mangroves.

The third most common shoreline type extends eastward from the old dock to just before the Blow Hole headland. A narrow sandy beach outlines this low lying area formed of quaternary deposits. Most of the shoreline is exposed to a low wave energy environment due to the buffering effect of the Colquhoun reef system. However, this shoreline type is vulnerable to erosion during heavy storms because it is very low lying and lacks the typical beach profile and foreshore profile that helps dampened wave activity. Erosion is most pronounced where red mangroves are absent (Photo 2).

Long beach at Manchioneel Bay is the most prominent sandy beach on the island. It was measured140m long and 40 m wide. This beach is a relatively stable beach and is somewhat sheltered from high wave energy from the northeast by an extensive offshore reef. Most the sand is well sorted coralline sand originating from the offshore reef. Evidence of sea turtle activity was recorded during field investigation. Beach vegetation should be maintained to ensure beach stability and wildlife activity. This beach, by far offers the greatest recreational potential for the island.

Minor fringing mangroves, mainly red mangrove strands occur along the northeast lowlands. This shoreline area is experiencing some erosion.

Promoting the expansion of red mangroves would help reverse the process as well as enhancing wildlife habitat.

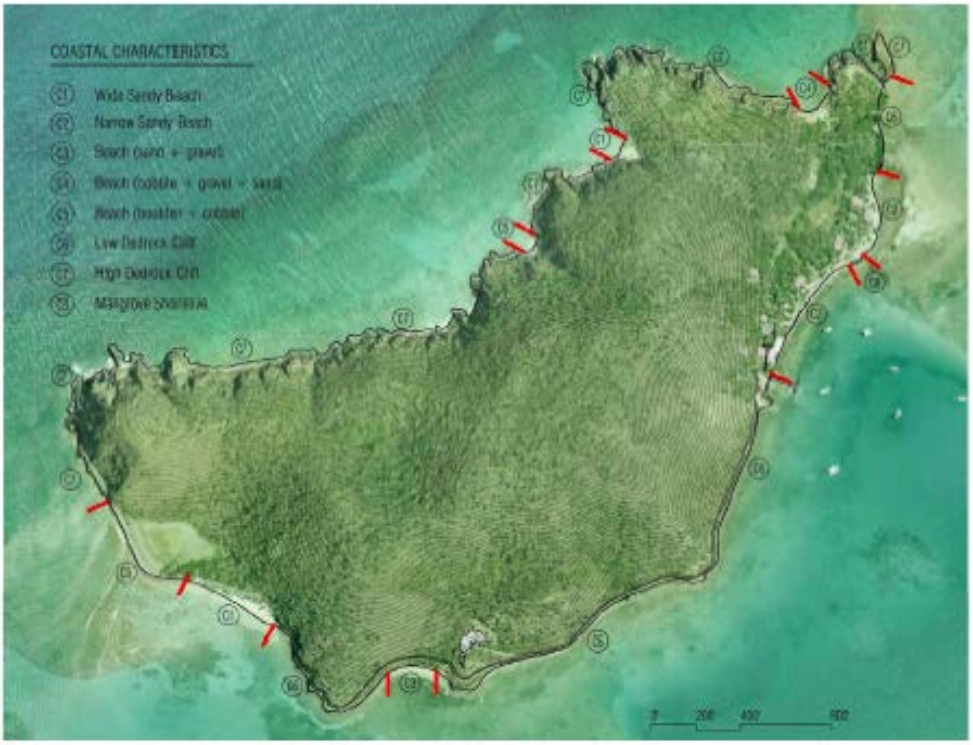

Figure 4. Coastal Characteristics.

Photo 1. Bedrock cavities created through the process erosion of softer rock minerals may provide opportunities for wildlife. At this site, bird pellets (possibly the V.I Screech Owl) were collected.

Photo 2. Shore erosion along the northeast coastline.

METHODOLOGY

Most of the flora and fauna on Mosquito are widely distributed throughout parts of the island. Some species, such as birds are transient, some staying as long as food and shelter are available and others may only pass through on their way to more productive grounds. Some are seasonal migrants while others are year long resident.

To provide the most representative and comprehensive picture of life at Mosquito Island, surveys required going beyond the boundaries of the proposed development area. The challenge was to assess the communities of plants and animals and not exclude or miss those features and assets that may lie just beyond the immediate boundaries, or those that may only occupy the property during periods convenient to them, but not during our presence there.

Prior to and during the period of surveys of the site, extensive reviews of existing literature, aerial imagery and baseline information relevant to the island and surrounding area were conducted.

The specific methods used to survey and assess the flora, fauna and environment of Mosquito Island are discussed below:

Survey of the Vegetation and Plants

Mosquito Island's 132 acres is small enough to allow for targeted surveys of specific areas of the island's landscapes and features.

The flora was were assessed by traversing the island's main and secondary trails, as well as by hiking along ghuts and drains, by targeting outstanding areas and features such as grasslands, rock outcrops and caves, the beaches, and the wetland areas. The survey team also targeted specific plant communities and focused on the unique features and characteristics and species makeup. Specimens were identified on site and where and when necessary, photos and specimens were taken for further study and identification.

The team also used aerial photos to determine past and current land-use, vegetation types and distribution, outstanding and special features, and the location of possible historical/archaeological sites.

Survey of Terrestrial Vertebrates

The terrestrial vertebrate fauna of Mosquito Island is limited to native bats, the introduced Black Rat (*Rattus rattus)*, birds and reptiles. Marine turtles are included in this terrestrial characterization given their need to use sandy beaches to lay their eggs.

Reptiles were surveyed and assessed using a combination of incidental observations and encounters, targeted searches of habitats and specific sites/features and from previous reports and records.

Amphibians were similarly assessed. No amphibians were observed or previously reported for Mosquito Island.

Bats were surveyed by making nightly observations of activities, by roost searches, mist netting and for incidental signs of bat activities. The survey team carried out three nights of mist netting at two sites. Only one of those nights produced specimens.

For birds, the survey team undertook roost surveys, the targeting of specific sites such as feeding areas and nest roosts, by incidental observations and from previous reports and records.

Survey of Terrestrial Invertebrates

Terrestrial invertebrate surveys were carried out using pit traps around the "camp site," by searching dead/decaying logs and plant materials, by direct capture using insect nets and other methods, from incidental captures and observations, and from previous records.

Survey of Threatened, Rare and Endangered Species and Habitats

Special and particular care was taken to locate and identify any critical species of plants, animals and habitats and determine the particular threats and issues relating to their conservation status.

GENERAL OBSERVATIONS

The proposed core development on Mosquito is limited to the low lying areas along the northeastern part of the island where the once Drake's Anchorage Resort was. The site lies on quaternary sediment deposits. Further inland, topography steepens upslope toward the central backbone of the island.

The vegetation along the shoreline of this area is primarily altered coastal hedge with areas of planted ornamental gardens, introduced species, and cultivars. The slopes further inland this coastal area consist of pasture mixed scrubland, open grasslands, secondary woodland and scrub. Much of this vegetation community is in successional stages of development.

On the easternmost tip of Mosquito – a rocky peninsula, the vegetation consist primarily of scrub and low windswept trees and shrubs with areas of open grassy patches and low forbs. Much of the rest of Mosquito is heavily wooded, especially on the northern and northwestern sides of the island.

Interspersing the forested areas and woodlands, especially on rocky outcrops and areas of shallow and stony soils are grassy swales and patches, some of which are likely native. These native grasslands are quite rare, and given that they are usually quite small in size, they are vulnerable to human activity.

There are two small salt-ponds on Mosquito Island. For most of the year they remain dry. The two salt-ponds are found behind barrier beaches – likely created after long-shore drift, and also as a result of buildup of sediments by tropical storms and hurricanes. The prospect that tropical storms and hurricanes have played a significant role in the formation and configuration of the shoreline of Mosquito may be an indication of the potential severity of some storms, and the impact they may have on habitats and ecosystems, and on the man-made structures.

Fringing mangroves, consisting primarily of red mangroves (*Rhizophora mangle)*, are found only along the eastern shoreline.

The flora and fauna of Mosquito is representative of the dispersed nature of the islands of the Puerto Rico Bank, and of the relict vestiges of the once diverse and rich biodiversity of these islands.

During the spring and summer months, a number of seabird species congregate by the thousands on the waters offshore while the very rare White-tailed Tropicbird (*Phaeton lepturus*) nest on the northern cliffs.

Landbirds numbers and species fluctuate depending on the season, the amount of rains, the availability of food, and on available nesting habitat. However, the explosion of Pearly-eyed Thrasher numbers across the island may help to keep total bird numbers down. The species' generalist nature, its ability to adapt to just about any condition, and its willingness to predate on other birds, on insects and on fruits makes it the most successful and influential vertebrate predator on the island.

Of potential great interest is the possible presence of the Virgin Islands Screech Owl. A large number of what looked like owl pellets were discovered in small cavities in rock outcrops situated on the slopes just above the old resort. Though the species' presence on the island has not been confirmed, the possible presence of the owl is not only significant, but is also of critical concern because the species is quite rare and on the verge of extinction. In fact, the species is reported to have gone extinct on much of the US and British Virgin Island and possibly on Vieques and Culebra. Its continued presence on the islands of the Virgins has been the subject of intense speculation and discussions for about the last 15-20 years with little actual evidence that it remains extant on any of the islands.

Other species of vertebrates such as snakes and lizards are relatively quite common throughout the island. There are six species of lizards and at least one snake known from Mosquito. The absence of any large predator, including the non-native Indian Mongoose (*Herpestes javanicus*) has allowed reptiles to flourish.

Perhaps the most obvious animals on Mosquito Island are the invertebrates. During the wetter periods of the year, when the island is flush with green foliage and moisture is abundant, the island is teeming with Lepidoptera, beetles, forest and woodland roaches, bees, scorpions and many other types of inverts.

This abundance provides the island's birds and reptiles with a diverse and rich food source, but they may prove a challenge for future human residents and guests on the islands, especially the scorpions whose numbers on Mosquito seem quite high.

Though no formal estimates of populations and population densities were undertaken, reptiles are relatively quite abundant on Mosquito. The Virgin Islands Ground Lizard (*Ameiva exsul exsul*) and the Crested Anole (*Anolis cristatellus wileyae*) are the most visible species, occurring throughout all habitats and elevations of the island. However, the most abundant reptile on the island is the Dwarf Gecko (*Sphaerodactylus macrolepis*). A terrestrial species of nocturnal habits, this species has been known to achieve densities of up to 52,800 -ha in some habitats on Guana Island off Tortola. It would not be surprising if the population on Mosquito may also achieve such densities given the abundant leaf litter in the forest and woodlands of the island.

One of the world's smallest lizards, the Sphaero also named "dwarf gecko" (*Sphaerodactylus parthenopion*) was observed on Mosquito Island. This rare gecko was observed on the northeastern end of the island near Guana Hole. Little is known about this species regarding its behavior, population, range, and ecological requirements. More research is required to insure its survival on the island.

OBSERVATIONS: THE FLORA

Flora

Mosquito Island has a diverse Flora for its size. Plant species compositions were assessed during both fieldwork sessions (June and September). A total of 287 species of plants belonging to 71 different families were recorded. Appendix 1 provides a listing of all species recorded.

Out of the total number of species recorded, 239 (83%) species are considered native. The remaining 48 (17%) of species are introduced (or exotics). Table 2 below summarizes the break down of the number of species tallied.

Table 2. Physionomic Plant Categories.

Category	Numbers	Percentage
Herbs	111	39%
Shrubs	63	22%
Vines	45	16%
Trees	68	24%
Total	**287**	**100%**

Vegetation Communities

There are 13 vegetation community types found on the Mosquito Island. Very few non-native species are present in the forests and woodlands, which is a good indication of the relatively natural and undisturbed nature of the island's vegetation communities. A summary of the vegetation community types are described below and their distribution illustrated in Figure 5.

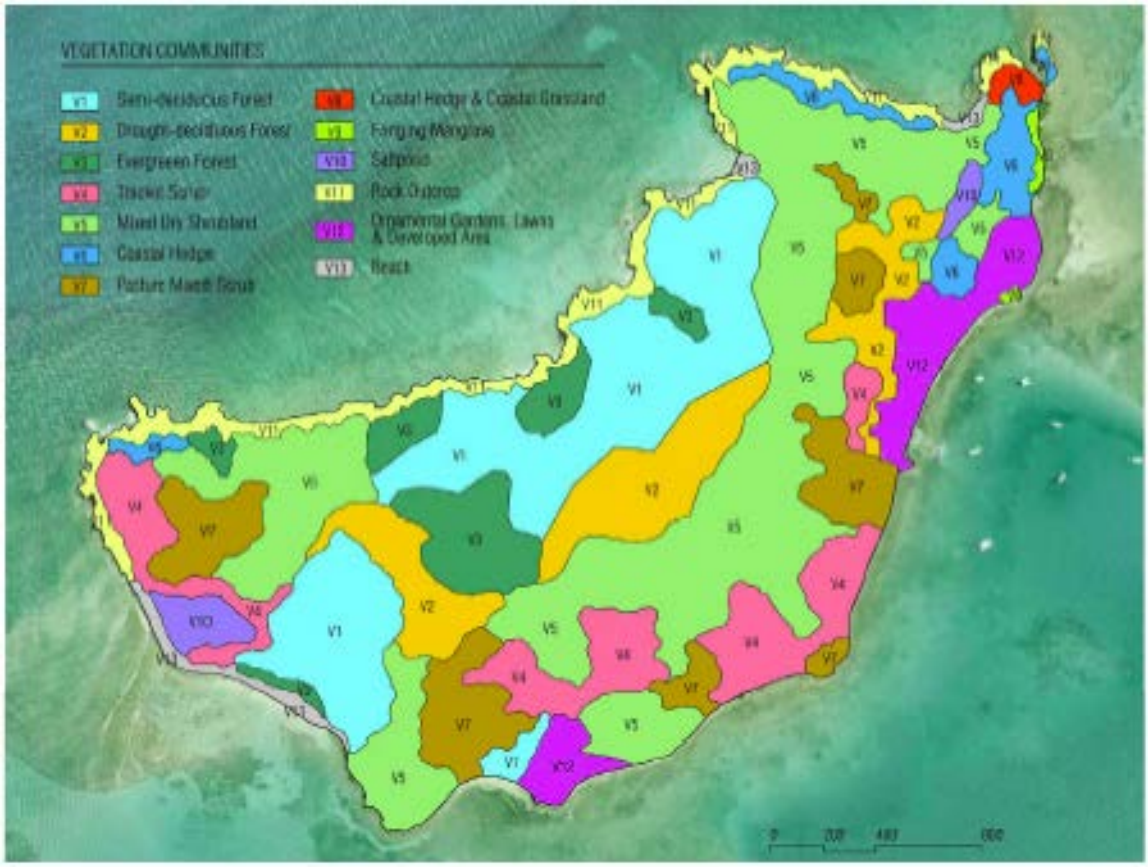

Figure 5. Vegetation Communities.

Semi-deciduous Forest

This community is found primarily on north-facing sheltered upland slopes of parts of Mosquito Island. It is largely dominated by Turpentine (*Bursera simaruba*), Thatch Palm (*Coccothrinax alata*) and Loblolly (*Pisonia subcorda*), (*Swietenia mahogani*).

This community may grade into the following types below.

Drought-deciduous Forest

This community is dominated by greater than 75% deciduous species, but it is otherwise very similar to "*Semi-deciduous Forest*" community, though it may occur is less sheltered locations. The main canopy trees include Loblolly (*P. subcordata*), Turpentine (*B. simaruba*), *Citharexylum fruticosum*, Princewood

(*Exostema carribaeum*), Ebony Wood (*Krugiodendrum ferreum*) and Pigeon Berry (*Bourreria succulenta*).

Evergreen Forest & Woodland

The community is well represented by an extensive Thatch Palm (*C. alata*) forest that occupies some north-facing slopes and narrow valleys on the north side of the island. Palms may form 50% or more of the stems in the forest (Photo 3). Elsewhere, significant evergreen woodland is found behind Manchioneel beach.

Photo 3. Thatch Palm woodland on the north side of the island.

Thicket Scrub

This community is dominated by thorny species and is found on more exposed rocky slopes where the soils are thin or drain quickly, and where plants are exposed to desiccating winds, intense sunlight, and/or have been disturbed by human activities/feral livestock.

The vegetation may achieve heights of up to 4 meters in height and is dominated by Sage (*Lantana camara*, *L. involucrata*, *Randia aculeate)*, the composite (*Lepidaploa glabra*, and *Crossepetalum rhacoma)* and Nothing Nut (*Cassine xylocarpa*).

This community is found on the slopes above the abandoned resort heading southwest toward the old Manager's residence and on low slopes on the northeastern peninsula.

The Thicket Scrub community often grades into the more dominant Mixed Dry Shrubland, and borders the Pasture Mixed Scrub and Grasslands communities described below. Thicket Scrub may in fact be a community in successional flux, moving from open scrub and grasslands to deciduous woodland and forest.

Mixed Dry Shrubland

This community is somewhat similar to the above but it tends to be shorter in stature and dominated by thorny species, including *Opuntia*, the Columnar Cacti (*Pilosocereus royeni*), the native *Agave missionum* and by shrubs such as *L. camara* and *L. involucrata*, *Croton flavens* and *Lepidaploa glabra* (Photo 4). Mixed Dry Shrubland is one of the most dominant community types on the island and favors the south and southeast facing slopes.

Coastal Hedge

This community is influenced by wind, sun exposure and salt-spray. It is found mainly on the north and northeast coasts of the island. It may be shrubby in nature or form a relatively narrow strip of woodland. The community is represented by Manchioneel (*Hippomane mancinella*), White Cedar (*Tabebuia heterophylla*), Buttonwood (*Conocarpus erectus*), Torchwoods (*Jacquinnea arborea, J. beterii*, and *Eritalis fruticosa),* Seaside Mahoe (*Thespesia populnea*), and Seagrape (*Coccoloba uvifera*).

Pasture Mixed Scrub

This community probably resulted from the removal of native woodlands and the disturbance of small areas of native grassland. There are areas of exposed rocky outcrops and/or patches of bare soil, which may have once been natural

grassland glades (Photo 5). The grassland may be dominated by up to 20% of a mixture of thorny species, including *L. camara* and *L. involucrata*, *Opuntia* spp., and *R. aculeata*.

Photo 4. Mixed Dry Shrubland on the south-facing slopes.

Photo 5. Pasture Mixed Scrub Community on south-facing slopes.

Coastal Grasslands

This community occurs on more exposed rocky coastal areas with thin dry soils, which have low moisture retention capacity and are exposed to salt spray. The community may have 10% and greater of the soil or rock based exposed (Photo 6).

The vegetation is dominated by a variety of grasses, low shrubs of *Chamaesyce articulata, Chamaecrista nitida, Opuntia spp., Turnera diffusa, Crossopetalum rhacoma, Croton flavens, Wedelia calycina*, Turk's Cap cactus (*Melocactus intortus*) and *Agave missionum*.

Forbes species include: *Commelina sp., Rynchosia minima*, and various other vines.

Photo 6. Coastal Grassland community on eastern end of Mosquito Island.

Fringing Mangroves

The primary mangrove habitat on Mosquito Island is fringing. This occurs in two types:

Fringing Red Mangrove (*R. mangle*) occurs along the eastern coastline forming dense stands between the coastline and the sea. The fringe is dominated primarily by Red Mangrove, but scattered throughout is Black Mangrove (*Avicennia germinans*), White Mangrove (*Laguncularia racemosa*), Buttonwood (*Conocarpus erectus*), Manchioneel (*Hippomane mancinella*) and Torchwoods (*Jacquinnia* spp.) (Photo 7).

Photo 7. Fringing Red Mangroves on northeast coast, south of Blow Hole.

Further along the coast, going southwestward, the mixed fringing mangroves occurs as a narrow strip (sometimes just one tree thick) in broken stretches along the seaward side of the coastal man-made stony pathway.

The community is not dominated by one species but is a mixture of all three mangroves and Buttonwood, and may include Seaside Maho (*T. populnea*), and even some more salt-tolerant terrestrial species such as the Wild Frangipani (*Plumeria alba*).

Salt Ponds

There are two small salt ponds on Mosquito Island, both situated at opposite ends of the island. The first is located to the northeast of the former Drake's Anchorage resort and is divided into somewhat discreet ponds, with the most easterly third, the deepest area of the pond, retaining a shallow pool of water, sometimes for weeks. The perimeter of the pond is dominated by *L. racemosa* and *C. erectus* trees, while the shallow exposed areas is dominated by the marsh forb *Batis maritima*, which forms rather extensive cover.

The other pond is to west of Manchioneel Bay and is primarily a *Batis maritima* marsh. No mangroves are found. The pond is dry for most of the year and becomes flooded after torrential rains and hillside runoff (Photo 8).

Photo 8. *Batis maritima* salt pond just north of Manchioneel Bay. Note the rock rubble storm berm in the foreground.

Rock Outcrops – Sparsely Vegetated Rock

Most of the natural rocky outcrops are on the steep northern and northeastern coast. Only about 10% or less of the exposed rocky surface is vegetated and is dominated by cacti and low forb vegetation, including grasses (Photo 9).

Photo 9. Rocky coastal cliff, sparsely vegetated.

Ornamental Gardens and Lawns

Ornamental gardens on Mosquito are artificial constructs that have now been abandoned, but remain intact. Most of the species have been planted in carefully designed and constructed "contained" areas around the old buildings, but may include many native trees and shrubs.

Much of the natural low beach grasslands around the abandoned resort have been modified by human activities, human and mechanical traffic and some level of pruning.

Beach

This community type occurs on shoreline beach of sand, cobbler or gravel and exhibits less than 10% vegetation coverage. Constant changing beach and shoreline provide unstable growing condition, although some plants are well adapted like the Beach Pea (*Canavalia maritimea*), Morning Glory (*Ipomoea pescaprae*) and Sea Purslane (*Sesuvium portulacastrum*).

OBSERVATIONS: THE FAUNA

Birds

Bird surveys were done along coastline, trails, ghuts, salt ponds and bird flyways. The focal points for bird activity were along trails, pathways, forest edges, open patches of forest, and wherever fruiting trees and large invertebrate populations occurred.

At least 47 species of terrestrial, wetlands and seabirds were observed over the period of the survey (see Appendix 2). It is important to note that the number of species reflects a short time frame in the day and within the season, and offers only a sample of the numbers of species that may occur there throughout the year. The list will undoubtedly expand considerably if surveys were done more frequently covering all seasons.

Of notable absence were the North American migrants. This survey was conducted well after the northward spring migration of birds, and most, if not all of the species have long departed the BVIs for their American nesting habitats. An exception to this was the Osprey (*Pandion haliatus*), which was seen flying above the island on a number of occasions. Ospreys normally depart for North America during early spring, and return to the Caribbean from late September onwards.

At least 15 of the species recorded are believed to be nesting, including one species of seabird. The very rare White-tailed Tropicbird (*Phaethon lepturus*) nests on the northern cliffs. Two specimens were observed during the survey period and anecdotal reports obtained during this effort seem to suggest that the species, though never common, have been declining on Mosquito and the rest of the BVI over the years, and only now nest in low numbers.

Land-bird numbers and species fluctuate greatly, depending on the season, the amount of rain, the availability of food, and nesting habitat. However, the explosion of Pearly-eyed Thrasher numbers across the island may have contributed to keep total bird numbers down, given the species' generalist nature, its ability to adapt to just about any condition, and its willingness to predate on other birds, on insects and on fruits.

Most other species of seabirds are transient in surrounding waters, and are present only during the spring and summer months. These species nest on islands and cays through the Virgin Islands, and feeds in the extensive marine waters, including the areas surrounding Mosquito.

One species of particular concern is the potential presence of the Virgin Islands Screech Owl (*Otus nudipes newtoni*), a subspecies of the more common Puerto Rican Screech Owl (*O. n. nudipes*), which is endemic to Puerto Rico. A large number of what seemed like owl pellets belonging to a small owl were discovered in small cavities in rock outcrops situated on the slopes just above the abandoned resort (see Photo 1).

Though the species' presence on the island has not been confirmed, its possible presence on the island is of critical concern because the species is quite rare and on the verge of extinction. In fact, the species is reported to have gone extinct on much of the US and British Virgin Island, and possibly on Vieques Island If its presence on Mosquito Island is confirmed then all efforts must be made to protect and conserve it.

Mammals

Bats are the only native mammals extant in the today. Little is known about them. There are at least six species of bats recorded for the US Virgin Islands, and only four these have been confirmed for the BVI. Of these four, the Velvety free-tailed bat (*Molossus molossus*) is now confirmed for Mosquito Island (Photo 9) with the tentative sighting and evidence for a fruit bat species, most likely the Jamaican Fruit Bat (*Artibeus jamaicensis*), a very common and widespread species throughout the Antilles.

The survey team carried out visual, roost, and mist netting surveys during the field work period. Of the two insectivorous roost sites located, only one was mist netted. Nine specimens of the Velvety free-tailed bat were captured. The team took wing measurements, the gender, breeding status, and general health conditions of the specimens. Four specimens—two males and two females—were retained as vouchers, which will be sent to mammologist Dr. Gary Kwiecinski of Scranton University, Pennsylvania, for further study and analysis.

Photo 10. Velvety free-tailed bat (*Molossus molossus*), the first bat species recorded on Mosquito Island.

The only other mammal known from Mosquito Island is the Black Rat (*Rattus rattus*). This non-native species is a very common pest, and in most places throughout the Virgin Islands, it can be frequently seen climbing trees or scurrying about at nights, and sometimes even during the day.

Before we began our June 2007 surveys, a local pest control firm (BVI Pest Control) had just completed a rat eradication effort across the island. During our last field survey in September 2007, we observed half-a-dozen rats at two different locations and captured one with a Sherman trap. The specimen was preserved for future analysis.

A complete eradication effort for a sizeable island such as Mosquito is expensive and not always successful. To ensure that rats do not return to the island or that the numbers will be kept low and under control, a sustainable rat monitoring program should be implemented on an on-going basis.

Reptiles and Amphibians

The BVIs contain 34 amphibians and reptiles (G. Perry and G.P. Gerber, 2006). Of that total, we recorded 8 species of reptiles and no amphibians on Mosquito Island. These include:

1. *Ameiva exsul exsul* – Virgin Islands Ground Lizard
2. *Anolis cristatellus wileyae* – Virgin Island Crested Anole
3. *stratulus* – Spotted Anole
4. *Mabuya sloanei* – Slipperyback Skink
5. *Sphaerodactylus macrolepsis macrolepsis* – Cotton Ginner/Dwarf Gecko
6. *Sphaerodactylus parthenopion* - Dwarf Gecko or Sphaero
7. *Hemidactylus mabouia* – House Gecko/Woodslave
8. *Alsophis portoricensis* – Puerto Rican Racer

Of these species, only the *M. sloanei, S. parthenopion, and A. portoricensis* are considered vulnerable.

The Skink (Photo 11) is uncommon throughout Mosquito Island; throughout its entire range in the West Indies, the species is rare on some islands and extinct on others. Slipperyback (*M. Sloanei)* was observed during the day in the lowland areas to about 90 ft (30 meters) in elevation, under decaying tree and Agave stumps, and in the leaf litter.

The Shaero (Photo 12), also named "dwarf gecko" (*Sphaerodactylus parthenopion*), is one of the most important species of animal on the island. This rare gecko was first reported on Mosquito by Heatwole, *et al*. (1981). Details about the location of his first observations are not available. Our survey team found a small population on the northeastern end of the island near Guana Hole. This species was found to co-exist with the slightly larger *S. macrolepsis*, in the leaf litter of the coastal woodland area

Very little is known about the ecological requirements of *S. parthenopion* or if it is found elsewhere on the island, but given the overall rarity of this species and its current distribution, every precaution should be taken to protect it and its habitat. It is imperative that more research is pursued to insure its survival on the island.

Photo 11. The Skink (*Mabuya sloanei*) is uncommon throughout the island.

Photo 12. The Shaero (*S. parthenopion*), also named dwarf gecko.

The Puerto Rican Racer is relatively common throughout parts of the island, particularly in low-lying sandy areas such as that around the abandoned resort and in the forests and woodlands on the western third of the island, especially in habitats with open mid-story and heavy leaf-litter, perhaps because of the abundance of its preferred food item, the Ground Lizard.

During the survey, the team captured 10 specimens consisting of six males and four females. The largest was a female measuring 3.5 feet (1.1 meters) in total length (snout-vent plus tail length). The largest male measured 2.5 feet (0.7 meters). The smallest, a juvenile male measured 1.7 feet (0.5 meters). Though our results are only preliminary, the captures suggest that there is some sexual dimorphism in this species. There were color variation between the sexes as well with males being somewhat darker and females a light grey. Two of the eight specimens caught were released without taking measurements. However, photos were taken.

Six or 60% of the specimens caught had damaged or shortened tails, a condition likely caused by the Black Rat, which has been known to attack snakes (see Photo 13). A similar situation was recorded for the Antiguan Racer snake (*Alsophis antiguae*) on Great Bird Island, Antigua back in the 1990s before the rats were eradicated (Kevel Lindsay, *pers. comm*., 2007).

Photo 13. Puerto Rican Racer with damaged tail.

The species will also climb low trees and shrubs in search of prey or to escape danger. Two specimens were caught off the ground, one on the small trunk of a White Cedar at around 3 feet (1 meter) and the other in low shrubbery sunning itself in the late afternoon at around 2 feet (6 meters).

The two species of Anoles or tree lizards are relatively common on the island. At Mosquito Island, the Crested Anole is the most visible and abundant, commonly observed on tree trunks and rocks, along trails, paths and the main access through the property and in the forest, from the highest elevations down to the coast. The Spotted Anole is the smaller of the two species, and is far less commonly seen, but has been observed throughout the island, including around the buildings of the abandoned resort, and in forests and woodlands.

The Virgin Island Ground Lizard is relatively common and widespread throughout Mosquito, and is seen at all hours of the day, but more so at around mid-mornings and mid-afternoons.

Males can grow quite large, and are very distinct with their bright blue and white spots and blotches on the sides and flanks.

The House Gecko or Wood Slave is believed to be a West African immigrant, arriving in the West Indies via slave ships from Africa within the last 400 years.

No sea turtles were seen along the shoreline; however, evidence of sea turtle activity was recorded at two sites. At Long Beach (Manchioneel Bay), team members observed a few turtle pits under Sea Grape shrubs. These excavations were 1 m to 1.5 m in diameter and assessed to be non-active. On September 12, 2007, the team observed a fresh turtle "crawl and pit" located a few meters off one of the cottages along the northeast shoreline. No further investigation was done to determine if it was an active nest site.

The Hawksbill Turtle (*Eretmochelys imbricata*) and the Green Turtle (*Chelonia mydas*) are permanent residents in the BVI and occur regularly in the waters off Mosquito Island. Surveys by Conservation and fisheries Department dating to the 80s confirm nesting activity on Long Beach (Manchioneel Bay) by the Hawksbill and the Green (Eckert, *et al*. 1992).

Despite deliberate and extensive searches of the island and micro-habitats for amphibians both at day and at night, there is no evidence that they are currently

present on the island. However, further surveys over different seasons would need to be done to confirm these findings.

Terrestrial Invertebrates

Previous to this effort, little was known about the terrestrial invertebrates of Mosquito Island. Nevertheless, invertebrates of Mosquito are the most diverse and abundant group of animals on the island, and only plants outnumber them in their diversity and numbers.

Various survey methods were used to assess the terrestrial invertebrates. Species were collected along the trails, from under and within logs and other dead and decaying plant materials, under bark, from the foliage and inflorescence of plants, from old trash and waste piles, under rocks and stones, and from around and in the abandoned structures and facilities.

Species were collected using hand nets, pit traps and through incidental capture. A portable ultraviolet lamp was used to help us locate certain species. A number of specimens were preserved in alcohol for further study and identification and will eventually be cataloged and preserved as museum specimens.

The survey team collected and identified species belonging to at least 20 orders and five sub-orders, representing 43 families and 61 species. This diverse group includes at least two species of scorpions and one centipede, crustaceans, including the Hermit Crab (*Coenobita clypeata*), fiddler and other crabs species, forest and wood roaches, beetles, flies, a cicada, termites, butterflies and moths, at least one praying mantis species, antlions, grasshoppers, katydids and crickets and at least one species of walking stick. Appendix provides a list of the species of terrestrial invertebrates that are known to occur on Mosquito Island to date.

At the time of the survey, none of the species of invertebrates were known to be of critical conservation concern. This, however, may only be as a direct result of the fact that very little is known about the terrestrial invertebrates of the islands of the BVI and so, the team can make very limited judgment on which species are in need of special conservation intervention and management. Further study and assessment would need to be undertaken to determine the conservation status of the island's invertebrate species.

ENVIRONMENTAL ISSUES

The proposed development raises several issues regarding species of flora, fauna and habitats. Species of special concern are listed in Table 3 for **Fauna** and Table 4 for **Flora**. Figure 6 highlights the main areas on the island that deserve management attention. A more detail description of species and habitat issues is presented below.

The issues and concerns include:

1. The potential loss of the *Batis maritima* saltpond west of Long Beach;
2. The impact of the Mosquito Island development on the loss and/or degradation of native grasslands/glades;
3. The loss of mangroves;
4. The need to protect, and the potential for enhancement of, the mud/tidal flats of Mosquito Island;
5. The possible presence of the Virgin Islands Screech Owl (*Otus nudipes newtoni*);
6. The potential impact of the development on White-tailed Tropicbird (*Phaeton lepturus*) nesting;
7. The potential for the development to have adverse impacts on rare and endangered species of plants and habitats;
8. The spread and control of non-native invasive species of plants and animals;
9. The decline and loss of the native *Agave missionum*;
10. Preservation of the Sabal Palm (*Sabal casuarium*);
11. Control of Manchioneel trees (*Hippomane mancinella*);
12. Control of Scorpions;
13. The past indiscriminate disposal of solid wastes and the continued presence of numerous waste disposal sites throughout the old resort site.

Table 3. Species of Special Concern — FAUNA.

Species	Habitat &Distribution	Local Status/Listing	International Listing	Comments
BIRDS				
White-tailed Tropicbird *(Phaethon lepturus)*	High coastal cliffs on northeast coast of Mosquito.	An estimated 50 pairs nest in the BVI with as few as a pair nesting on Mosquito Island.	Least Concern, IUCN	Only one pair has been observed at the coastal cliffs on the island. However, as many as four to six pairs have been reported nesting on the island in the past.
V.I. Screech Owl *Megascops nudipes newtoni*	Thick forest and woodlands. Requires tree cavities and rock crevices for nesting and roosting.	A Virgin Islands sub-species endemic. Its status in the BVI is unknown. Regarded as extinct in the USVI by some authorities.	Least Concern, IUCN	Bird pellets, possibly left by this species were found on Mosquito Island in June 2007. The species has not been confirmed for the island.
Puerto Rican Flycatcher *Myiarchus antillarum*	Dry coastal woodlands, including mangroves.	A Puerto Rican and Virgin Islands endemic. Very rare and threatened. This species has declined on most of the US and British Virgin Islands in the last 100 years. In the BVI the species is now severely restricted to a few scattered localities throughout the Territory.	Least Concern, IUCN	The species may be vagrant to Mosquito from nearby islands. Rarely observed, virtually nothing is known about the reasons why this species continues to decline.
REPTILES				
Marine Turtles				
Green Turtle *Chelonia mydas*	Coastal waters throughout the Virgin Islands.	?	Endangered, IUCN	This species is very vulnerable to hunting pressures, egg collecting,

Species	Habitat &Distribution	Local Status/Listing	International Listing	Comments
				nesting habitat decline and coastal pollution.
Hawksbill Turtle *Eretmochelys imbricate*	Coastal waters throughout the Virgin Islands.	?	Critically Endangered, IUCN	Very vulnerable to hunting pressures, egg collecting, nesting habitat decline and coastal pollution.
Snakes				
Puerto Rican Racer *Alsophis portoricensis anegadae*	In forests, woodlands, and grassy areas throughout the upland and lowland areas throughout Mosquito Island.	?	None.	Very vulnerable to predation by the introduced Black Rat (*Rattus rattus*).
Lizards				
Dwarf Gecko, or Sphaero, *Spherodactylus parthenopion*	Located at only on small patch on the northeast coast near to Guana Hole.	Very rare.	None.	This species is listed as the world's second smallest lizard.
Slipperyback,Skink *Mabuya sloanei*	In grassy areas or northeast, south coast and central ridge of summit of Mosquito.	Locally common in preferred habitat.	None.	Vulnerable to human disturbance, development, land clearing and rats.
INVERTEBRATES				
Most species of invertebrates on Mosquito are data deficient		Data deficient.	None.	Data deficient.

Table 4. Species of Special Concern — FLORA.

Species	Habitat	Local Status/Listing	Comments
Pectis linifolia	Grassy flatlands along trails to Honeymoon Beach and the Summit.	Uncommon to rare in the BVI overall.	Though not threatened with extinction, the species has a very restricted distribution on Mosquito and should be monitored.
Night Blooming Cereus *Hylocereus trigonus*	Sheltered Woodland on northeast coast.	Vulnerable on Mosquito.	The extensive stands of this species have been severely cut back due to some preliminary hand clearing in early September 2007. The population was reduced by an estimated 75+%.
Turk's Cap *Melocactus intortus*	Rocky coastline, cliffs and grasslands.	Locally common on Mosquito and Necker but vulnerable in the BVI and the wider-Caribbean.	
Woolly Cactus *Mammilaria nivosa*	Rocky and sparsely-vegetated coastline and cliffs.	Locally common on Mosquito and Necker Island though vulnerable in the Virgin Islands and the rest of the Caribbean.	
Bulldog/Stinging Cheery *Malpighia woodburyana*	Areas along south coast, the slopes above the old Manager's residence and along trail to summit of Mosquito.	Locally common on Mosquito and Necker Island.	A protected species in the USVI. It is vulnerable to coastal development and land clearing.
Ziziphus rigonii	Coastal woodland at Long Beach, Mosquito Island.	Rare on Mosquito and generally uncommon to rare throughout its range in the Virgin Islands.	Thought not in danger of extinction, the species on Mosquito Island is nevertheless vulnerable to development pressures such as land clearing.
Sabal Palm *Sabal causarium*	Coastal cliffs on north coast of Mosquito.	Very rare. Only two specimens are known from the Mosquito.	Endangered throughout the Virgin Islands, especially in the USVI where it is proposed to for listing on the state endangered species list. Uncommon to rare in the BVI.

Species	Habitat	Local Status/Listing	Comments
Psychilis macconnelliae	On the trunks and stems of trees and cacti, as well as rocks throughout the island.	Locally common but vulnerable.	Vulnerable to land clearing, habitat alterations and collecting for the horticultural trade. Locally protected in the USVI.
Yellow Dancing Lady *Tolumnia prionochila*	On the trunks and stems of trees and cacti, as well as rocks throughout the island.	Locally common but vulnerable.	Vulnerable to land clearing, habitat alterations and collecting for the horticultural trade.
Digitaria bicornis	On headlands and rocky uplands with thin soils, exposed to direct sun and drying winds. Thin soils dry out quickly.	Thought the species is not uncommon, due to the disappearance of its habitat throughout the Virgin Islands and the Lesser Antilles, the species remains vulnerable.	Threatened. This species is vulnerable to land clearing for building construction, roads and to non-native invasive plant species.
D. insularis	Similar to above.	Similar to above.	Similar to above.
Digitaria sp.	Similar to above.	Similar to above.	Similar to above.
Heteropogon contortus	Similar to above.	Similar to above.	Similar to above.
Setaria setosa	On headlands and rocky uplands with "cryptogamic soils." Soils are thin and dry out quickly when exposed to direct sun and drying winds.	Similar to above.	Similar to above.
Spartina patens	Similar to above.	Similar to above.	Similar to above.
Sporobolus virginicus	Similar to above.	Similar to above.	Similar to above.
Uniola virgata	Similar to above.	Similar to above.	Similar to above.

Species	Habitat	Local Status/Listing	Comments
Urochloa fasciculatum	Similar to above.	Similar to above.	Similar to above.
Urochloa sp.	Similar to above.	Similar to above.	Similar to above.
Stenotarphrum secumdum	Similar to above.	Similar to above.	Similar to above.

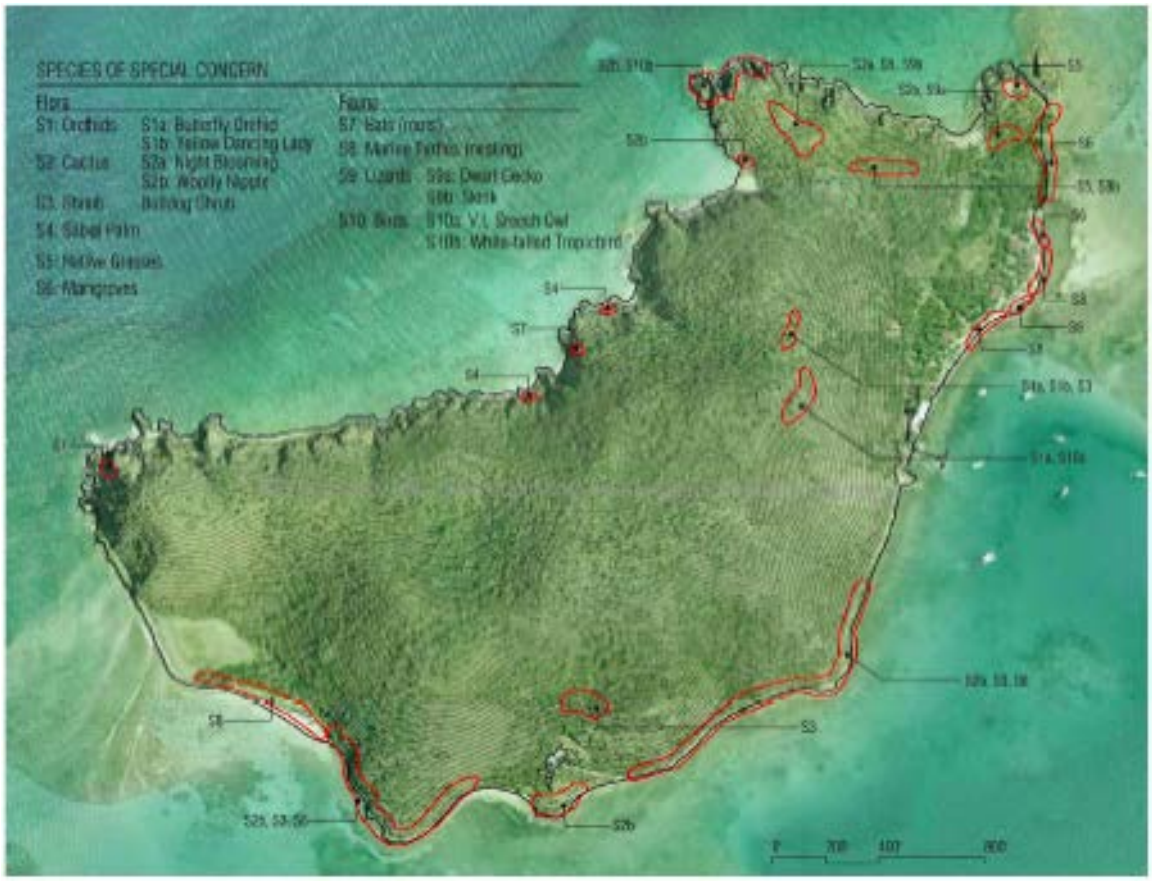

Figure 6. Species of Special Concern.

(1) The Potential Loss of the Batis maritima *Salt Pond*

The *Batis maritima* salt pond is a unique wetland system. Located just northwest of Long Beach on the west coast of Mosquito, the pond is populated only by the herbaceous marsh plant, the Saltwort (*Batis maritima)*. Although the Virgin Island has other types of marine-influenced wetland systems that are without any mangrove species, this wetland is unique in that it is entirely populated Saltwort.

There is talk that the developer may want to replicate the success of the Flamingo Pond on nearby Necker Island, and the Saltwort pond is one of only two options that may be suitable for this effort. The other is the pond on the eastern end of the island. Choosing this pond has some potential disadvantages. It is relatively more exposed to the influences of the ocean and to the wind, and is more accessible to visitors from long beach.

The pond was created over hundreds of years by the build up of rock and coral rubble deposited by heavy surf and storms. Undoubtedly, the pond has experienced breaching during severe storms and hurricanes. This could pose potential risks for any future re-engineering of the site.

The representativeness of the *Batis maritima* salt pond as a unique ecosystem is also very important to be realized. Given the fact that the pond is very shallow and mostly dry, it has limited value to shorebirds and waterfowl during most periods of the year. Any attempt to re-engineer the pond to increase its attractiveness to birds and other wildlife, should consider the preservation of the pond's uniqueness. Further study of the ecological characteristics of the salt pond would provide better understand of the dynamics that would need to be in place to best manage the site.

(2) The Loss and/or Degradation of Native Grassland and Glades

Native grasslands throughout all of the Virgin Islands are under extreme threat. For many years, it was the norm for the general public to consider any grassland or pastures to be non-indigenous and unimportant. In fact, few published works on Virgin Islands and Lesser Antillean flora gave credence to the existence of native grassland habitats. However, over the last 10 years, through the work of Dr. Gary Ray, a botanist, and Eleanor Gibney, a plant expert, both of St. John, U.S.

Virgin Islands, there is now recognition of the uniqueness of native grasslands, and the severe threats that these declining ecosystems face.

On Mosquito Island, native grasslands and glades have been severely impacted by land clearing and the introduction and spread of non-native grasses. Extensive old pasture and scrubland now dominate areas on the southern, south, northeastern, and eastern slopes. At some point in the past, these areas were once cleared, and over time, these non-native species have obliterated much of the characteristics of the native grassland habitats.

(3) The Potential Loss of Mangroves

Mangrove habitats on Mosquito Island are relatively small and its distribution limited primarily to the eastern coastal area of the island. The northeast salt pond consists of a mixture of White Mangrove (*A. germinans*) and Buttonwood trees (*C. erectus*) while nearby along the coast, fringing Red Mangroves (*R. mangle*) dominate.

Plans to transform and enhance the pond as a Flamingo habitat would change the current ecosystem. Since this pond sits on unconsolidated marine sediments, deposited by long-shore drift and through the actions of storms and hurricanes, the potential exist for these very same forces to alter a re-engineered salt pond and adversely affect its surroundings.

If designed correctly, reopening the current salt pond may prove beneficial to wildlife, especially invertebrates and birds. To mitigate any potential adverse impacts that wetland reclamation may cause, and to increase the benefits to biodiversity then a site assessment study of the ecology of the pond should first be undertaken, along with the engineering and site management plan for the new pond.

It is also suggested that the developer go a step further and artificially enhance and speed up the development of the fringing mangroves by selectively planting red mangroves along parts of the mudflat. This should attract increased numbers of shorebirds and waterfowl, and enhance the area as a fish and invertebrate nursery. The planting of mangroves along the flat should be preceded by careful planning.

(4) Protecting and Enhancing the Mud/Tidal Flats of Mosquito Island

As stated above, the loss of mangrove habitats is of major concern. Any development on Mosquito will have some effect on coastal ecosystems, especially on the fringing red mangroves and the mud/tidal flats.

To reduce likely adverse impacts, any final development plans should avoid the construction of buildings and structures too close to mangrove habitats. The developer should encourage the further growth and development of mangroves by planting seedlings out onto the mud/tidal flats as described above.

Red mangrove seedlings should best be grown in nursery conditions since this gives them at least a 50% or greater survival rate, and helps to reduce the cost of replacement plantings.

A red mangrove nursery can be set up on-site, and would involve the collection of seed stock from the trees on Mosquito, an open area for the setting out of the polythene plant bags, access to fresh and seawater, and fertilizer. Excluding the nursery preparation process, the time-frame from seeds to planting should be about 14 months.

(5) The Possible Presence of the V.I. Screech Owl (Otus nudipes newtoni)

The Virgin Islands Screech Owl is a subspecies of the more common Puerto Rican Screech Owl, which is endemic to Puerto Rico. Potential evidence of owl activity, in the form of owl pellets, was collected from small rock cavities above the abandoned resort this past June. A large number of pellets were discovered in rock outcrops situated on the slopes just above the resort. Preliminary indications are that these are from a small owl, which feeds primarily on small invertebrates, birds and reptiles.

The Virgin Islands Screech Owl is a rather small nocturnal species, measuring some 9-10 inches (23-25 cm). It is most active during the early evenings and mornings.
The presence of this species on Mosquito Island would make this a great conservation discovery. The species is rather rare to extinct through most of its

range in the U.S. and British Virgin Islands, Culebra and Vieques, and has not been confirmed as present on any of these islands for more than 20 years. There have been reports of this species from Guana Island (BVI). However, there has been no confirmation of the presence of this species on Guana Island or any of the other islands of the BVI.

A report by Dr. Jorge E. Moreno of the University of Colorado in 1995 declared the species to be extinct on the U.S. Virgin Islands and on Vieques and Culebra. Moreno based his conclusions on the result from a three-week survey effort in the U.S. Virgin Islands to find this species. The effort turned up no evidence.

Though considered extinct by some experts, others continue to believe that the species may survive on some of the Virgin Islands. The species is listed as "critically endangered" by the Division of Fish and Wildlife in the U.S. Virgin Islands.

The reasons for the decline of the Screech Owl are numerous, but the two most important factors may be habitat loss and predation/competition from the Pearly-eyed Thrasher. Thrashers are known to predate on a number of species of small birds and on reptiles and insects. It directly competes with the Owl for food, and also for nest sites. The owl nests in small cavities in trees, cacti and in rock outcrops. In Puerto Rico, where the other subspecies persist, Thrashers are known to destroy owl eggs and kill the chicks in order to obtain the nest cavity. Over time, along with habitat destruction, this may have a deleterious effect on owl numbers.

Nevertheless, the Screech Owl may thrive with human habitation if it is low impacting and if plans are put in place to improve owl habitat. The first thing that should be done is to send off the pellets to an owl expert for confirmation and analysis. If confirmed, there should be a comprehensive survey of its presence, habitat and population.

After these studies are completed, then plans should be developed to protect the owl habitats and to find ways to increase owl numbers. A number of things can be done to increase the population, for example, by setting out owl boxes for nesting and roosting. Owl boxes can be designed to exclude competition/predation by Thrashers and other potential predators.

At the same time, it may become necessary at some early stage to control the Pearly-eyed Thrasher population on the island. This may prove to be a very sensitive issue, given that the culling of animals can often turn out to be public relations issue. But done carefully, with the approval of the BVI Department of Conservation and Fisheries, and by using the most appropriate scientific methods, this option can be very successful.

(6) The Potential Impact on White-tailed Tropicbird (Phaeton lepturus)

White-tailed Tropicbird numbers in the BVI seem to be on the decline. The species, a white seabird with long-streamer-tail feathers, nests in small cavities on rocky cliffs on the island's northern coast.

On Mosquito, this species nest in very low numbers, estimated to be less than five pairs. The overall numbers in the BVI is also rather low, estimated in 2000 to be less than 50 pairs.

Though there are no current plans to develop the northern and northeastern coastline of the island, any future development of this area will have a negative impact on the birds. This species is very reclusive and needs the seclusion that such areas provide to breed successfully.

One of the limiting factors that this species faces is the absence of adequate nest cavities. There is the potential to enhance nesting on the island by providing artificial nest facilities. These can be placed on the cliffs on the west, northern and northeastern coasts. This effort would have to be carefully monitored and managed for breeding success. Specific details on artificial nest cavities for tropicbirds are available from the Bermuda Aquarium.

Another factor is rat predation. Though there has been an initial attempt to reduce the Black Rat population of Mosquito Island, this species may persist in low numbers, allowing it to continue to decimate native species and habitats. Because this and other non-native rodents thrive in human environment, then every effort should be made to completely rid the island of these pests.

(7) The Adverse Impacts on Rare and Endangered Species of Plants and Habitats

There are a number of rare, endangered and threatened species on the Island. If not carefully planned and developed, the project could have adverse effects on these species. The flora, fauna and habitats of critical concern on Mosquito are listed in Tables 3 and 4 above. To reduce adverse impacts plans should be carefully reviewed to ensure that there is no construction of buildings and facilities where these species occur, and/or that specimens of plants are transplanted to other suitable sites on the island when and where conservation conflicts are unavoidable. For critical habitats, all attempts should be made to save and manage these areas.

(8) The spread and control of non-native invasive species of plants and animals

Non-native invasive species can be the most destructive force for native flora and fauna and habitats. The only non-native vertebrate known from Mosquito is the Black Rat. For invertebrates, nothing is known.

The only non-native invasive plant that is of conservation concern is *Callisia repens.* This species had been introduced to the island to enhance the ornamental gardens at the old resort and at the manager's residence. The species has since spread throughout the woodlands surrounding the structures and along the coastal road. If not kept in check, this species may find its way to the forest and woodlands on the north and northeaster coast, which could be disastrous for native biodiversity.

For this very reason, all future development plans should consider using native species of plants for ornamental gardens, and avoid the importation of exotic species of animals, especially cats, rodents and passerine birds.

It is also recommended that *C. repens* be controlled and/or removed from areas to which it has escaped.

(9) The Decline and Loss of the Native Agave missionum

The native Agave, *A. missionum*, is seriously threatened. The species has been on a steep decline over the last five years or so since the introduction of an exotic pest from Mexico, the Sisal Weevil (*Scyphophorus acupunctatus*). This weevil burrows into the unopened young leaf shoots of the plant and feeds on the soft tissue, thereby killing it.

Throughout the island there are the dead and dying remains of numerous specimens of this Agave, with little sign that the crisis is at an end. This situation strongly illustrates what may happen when non-native invasives are introduced and the impact they may have on native biodiversity. Photo 14 below shows an Agave under attack by beetles.

Photo 14. An Agave dying from the ravages of the Sisal Weeval.

The Agave has been described as a keystone species in the Virgin Islands – one that has great importance in maintaining ecosystem function (Thomas and Devine, 2005). It provides shelter and food for a number of birds, reptiles and invertebrates, especially when it blooms in the spring. The decline of this species

on Mosquito, and throughout the Virgin Islands, may be having adverse impacts on the small passerines and some insects, as well as on other plant species.

As part of a recovery effort, native *A. missionum* seedlings could be transplanted in parts of the island to help stabilize populations.

(10) Preserving the Sabal Palm (Sabal casuarium)

Two stands of the native Sabal Palm (*Sabal casuarium)*, also named Hat Palm was identified at two different locations on the northshore ciffs (Photo 15). This species is locally endangered and is an important component of the plant diversity of the island. Although no development is planned in or near their locations, efforts to preserve or encourage promulgation of this specie should be included in the environmental management of the island. The GPS locations of the two specimens are: #A; 18 30.698N, 64 23.742W; Specimen B: 18 30.692N; 64 23.782W.

Photo 15. Sabal Palm (*Sabal casuarium*).

(11) Control of Manchioneel Trees (Hippomane mancinella)

The very poisonous Manchioneel tree (*Hippomane mancinella)* could prove a serious health risk to guests, visitors and residents of Mosquito Island. However, every effort should be made to keep the relatively few specimens present on the island, and only when absolutely necessary should any tree be removed.

Manchioneel is an excellent coastal stabilizer, perhaps second best only to mangroves and the Seagrape (*C. uvifera*). In areas where it may prove a risk to people, low branches should be carefully and safely removed, fallen fruits raked and discarded, and dead branches and leaves should never be used for composting or any other uses.

When handling this species, every precaution should be taken to protect the skin, hair, eyes and nostrils from the caustic effects of the sap, wood particles and dust.

(12) Control of Scorpions

Given the abundance of scorpions on the island, it is inevitable that conflicts with people may arise (Photo 15.). Though scorpions pose no serious health risks, their stings are rather painful, and there is always the potential that someone may develop an allergic reaction to the venom.

To avoid these conflicts in the future, areas around structures and facilities should be cleared of all dead and decaying materials, compost heaps and disposal sites situated as far away from structures as possible.

Scorpions like warm humid environments, and often seek out such places, including indoors. To reduce the likely incidence of this, in residences, all windows should be screened and doors fitted with swipes. All holes and cracks should be plugged to prevent the animals from gaining access.

Photo 16. Scorpion, *Centruroides sp.*, widespread throughout the island.

(13) The Past Indiscriminate Disposal of Solid Wastes and the Continued Presence of Numerous Waste Disposal Sites throughout the Old Resort Site

The previous resort chose to dispose of its waste materials by dumping them in pits situated around the perimeter of the salt pond on the northeast coast. Though attempts were made to burn some of this waste, much of it still remains. The soil and materials around these sites are likely to be very toxic, given that just about anything was disposed of in this manner.

Aside from the unsightly nature of these garbage heaps, these disposal sites also continue to have adverse environmental effects even today. Glass bottles and other containers trap and kill countless reptiles and invertebrates. The sites are also excellent nest and roost sites for rats and other vermin.

Before the new development takes place, every attempt should be made to remove these waste disposal sites. In the future, non-compostable garbage should be removed from the island and sent to Tortola to be incinerated, or if this is too costly, then the waste should be incinerated on Mosquito in a mechanical

incinerator. However, this option is not an environmentally safe one since the ashes from these "kilns" are also very toxic. The challenge, therefore, is to find an environmentally suitable and sustainable method to dispose of waster generated on the island.

Conservation and Mitigation Plan

It is recommended that as part of the development plans for Mosquito Island a five-year "*Conservation and Mitigation Plan*" be drawn up and submitted to the Department of Town and Country Planning.

The Plan should include contingencies for natural disasters such as hurricanes, floods and high storm surges.

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Appendix A: Mosquito Island — PLANT LIST

Family	Subfamily	Scientific name	Common name	Growth form	Origin	Habitat
POLYPODIACEAE		*Nephrolepsis multiflora*		H	I	Oa
		Cheilanthes microphylla		H	N	Oa
ACANTHACEAE		*Justica mirabiloides ???*		H	N	Wo/Oa
		Oplonia spinosa		S	N	Fa/Wo
		Ruellia tuberosa var. ???	Mini-root	H	N	Oa/We
		Siphonoglossa sessilis	Rock balsam	H	N	Wo/Oa/We
		Graptophyllum pictatum	Caricature plant	S	I	Ga
AIZOACEAE		*Sesuvium portulacastrum*	Sea purslane	H	N	Be
		Trianthema sp.	Hog weed, Horse purslane	H	N	Be
AMARANTHACEAE		*Amaranthus dubius*		H	N	We
		A. spinosus		H	N	We
		Amaranthus sp.		H	N	We
		A. viridis	Whitey Mary	H	N	We
		Blutaporon vermiculare	Bay flower	H	N	Be
		Celosia nitida		H	N	Fo/Wo/Oa
		Iresine angustifolia		H/V	N	Fo/Wo/Oa
ANACARDIACEAE		*Comocladia dodonaea*	Christmas bush, Christmas tree	T	N	Wo/Oa/Cl

Family	Subfamily	Scientific name	Common name	Growth form	Origin	Habitat
APOCYNACEAE		*Catharanthus roseus*	Periwinkle	H	I/C	Ga
		Nerium oleander	Oleander	S	I/C	Ga
		Pentalinon luteum	Wild allamanda	V	N	Wo
		Plumeria alba	Wild frangipani	T	N	Fo/Wo/Cl
		P. rubra	Frangipani	T	I/C	Ga
		Rauvolfia viridis	Bitterbush	S	N	Wo/Oa
		Thevetia peruviana	Luckynut	T	N	Fo
		Annona muricata	Soursap	T	I(?)	Oa/Ga
		A. squamosa	Sugar apple	T	N(?)	Oa/Ga
ASCLEPIADACEAE		*Calotropis procera*	Giant milkweed	S	I/n	Be
		Cryptostegia grandiflora	Purple allamanda	V/S	I	Ga
		Matelea maritima	Beach milk vine	V	N	Be
		Matestelma grisbachianum		V	N	Wo
ASTERACEAE		*Emilia fosbergii*		H	N	We
		Cyanthillium cinereum		H	N	?
		Launaea intybacea	Wild lettuce	H	N	Oa
		Lepidaploa cineria	Inflammation bush	H	N	Wo/Oa
		Lepidaploa glabra		S	N	Wo/Oa
		Pectis linifolia		H	N	Wo/Oa
		Synedrella nodiflora	Fatten barrow, node weed	H	N	Oa
		Borrichia arborescens	Sea marigold	S	N	Oa/Be
		Wedelia calycina		H	N	Wo/Oa

Family	Subfamily	Scientific name	Common name	Growth form	Origin	Habitat
		W. fruticosa	Shub wedelia	S	N	Wo
BATACEAE		*Batis maritima*	Salt plant, saltwort	S	N	Be
BIGNONIACEAE		*Macfadyena unguis-cati*	Cat's-claw	V	N	Fo/Wo
		T. heterophylla	White cedar	T	N	Fo/Wo
BORAGINACEAE		*Argusia gnaphalodes*	Bay lavender, crab bush	S	N	Be
		Bourreria succulenta	Pigeonberry, chink	T	N	Fo/Wo/Oa
		Cordia rickseckeri	Dog almond	T	N	Fo/Wo/Be/Oa/Ga
		Heliotropium angiospermum	Eyebright	H	N	We
		H. curassavicum	Seaside heliotrope	H	N	Be
		H. ternatum		H/S	N	Oa
		Tournefortia microphylla		V/S	N	Wo/Oa/Be
BRASSICAEAE		*Cakile lanceolata*	Sea rocket	H	N	Be
BURSERACEAE		*Bursera simaruba*	Turpentine	T	N	Fo/Wo
CACTACEAE		*Hylocereus trigonus*	Night-blooming cereus	V	N	Wo
		Melocactus intortus	Turk's-cap	S	N	Cl/Fo/Wo/Be
		Opuntia cochenillifera	French prickly pear	S	N	Fo/Wo/Be/Cl/Oa
		O. dillenii	Prickly pear	S	N	Fo/Wo/Be/Cl
		O. repens	Suckers	S	N	Fo/Wo/Be/Cl/Oa
		Pilosocereus royenii	Pipe organ	T	N	Fo/Wo/Be/Cl/Oa

Family	Subfamily	Scientific name	Common name	Growth form	Origin	Habitat
CANELLACEAE		*Canella winterana*	Wild cinnamon	T	N	Fo/Wo
CAPPARACEAE		*Capparis baducca*	Rat Bean	S/T	N	Fo/Wo
		C. cynophallophora	Black caper	T	N	Fo/Wo
		C. flexuosa	Limber caper	V	N	Fo/Wo
		C. hastata ???	Caper	S	N	Fo/Wo
		C. indica	White caper	T	N	Fo/Wo
		Cleome viscosa	Sticky cleome	H	N	We
CASUARINACEAE		*Casuarina equisetifolia*	Casuarina, Weeping willow	T	I	Ga
CELASTRACEAE		*Cassine xylocarpa*	Marble Tree	T	N	Fo/Wo/Be/Oa
		Crossopetalum rhacoma	Maidenberry	S	N	Fo/Wo/Be/Oa
		Maytenus laevigata	Maytenus	T	N	Fo/Wo
		Schaefferia frutescens	Yellow box	S	N	Fo/Wo/Oa
CLUSIACEAE		*Clusia rosea*	Pitch apple	T	N	Wo/Oa
COMBRETACEAE		*Conocarpus erectus*	Buttonwood	T	N	Be/Wet
		Laguncularia racemosa	White Mangrove			
		Terminalia catappa ?????	Tropical almond	T	I/C/n	Be/Ga
CONVOLVULACEAE		*Convolvulus nodiflorus*	Clashi mulat	V	N	Wo/Oa
		Evolvulus convolvuloides ???		V	N	Wo/Oa

Family	Subfamily	Scientific name	Common name	Growth form	Origin	Habitat
		E. filipes		V	N	Wo/Oa/We
		Ipomoea batatas	Sweet potato	V	I/C	Ga
		I. eggersii	Jumbie potato	V	N	Be
		I. pes-caprae	Beach morning glory, bay vine	V	N	Fo/Wo
		Jacquemontia pentanthos ???	Clashie-malashie	V	N	Wo
		Ipomoea sp.				
		Merremia quinquefolia		V	N	Oa/We
		M. dissecta	Noyan vine	V	N	We
CRASSULACEAE		*Bryophyllum* (*Kalanchoe*) *delagoensis*		H	I	Ga/Oa
ERYTHROXYLACEAE		*Erythroxylum brevipes*	Brisselet	T	N	Fo/Wo
CUSCUTACEAE		*Cuscuta americana*	Love bush, love vine	V	N	Wo/Oa
EUPHORBIACEAE		*Acalypha* sp.		H	N(?)	Fo/Wo
		Adelia sp. ???		T	N	Fo/Wo
		Chamaesyce articulata		H	N	Wo/Oa
		C. hirta	Milk weed	H	N	We
		C. hyssopifolia		H	N	We
		Croton astroites	Maran	S	N	Fo/Wo/Oa
		C. mesembrianthemifolia	Beach euphorbe/beach spurge	H	N	Be
		C. betulinus	Pistarckle bush	S	N	Wo/Oa

Family	Subfamily	Scientific name	Common name	Growth form	Origin	Habitat
		C. flavens var. *ridgidus*	Yellow maran	S	N	Wo/Oa
		C. lobatus	Croton	H	N(?)	We
		Dalechampia scandens	Bull nettle	V	N	Fo/Wo
		Euphorbia heterophylla	Red milkweed	H	N	We
		Euphorbia petiolaris	Hill manchineel	S	N	Wo
		Codiaeum variegatum	Variegated laurel, garden croton	S	I/C	Ga
		Gymnanthes lucida	Crabwood	T	N	Fo/Wo
		Hippomane mancinella	Manchineel			
		Jatropha gossypifolia	Wild physicnut	S	N	Fo/Wo
		Margaritaria nobilis	Gounglehout	T	N	Fo/Wo
		Tragia volubilis	Stinging nettle	V	N	Fo/Wo/Oa
FABACEAE						
	Caesalpinoideae	*Caesalpinia bonduc*	Gray nicker	S	N	Wo/Oa/Be
		C. ciliata	Brown nicker	S	N	Wo/Oa/Be
		C. (*Poinciana*) *pulcherrima*	Pride of Barbados	S	I	Ga
		Chamaecrista nictitans		S	N	Wo/Oa
		Delonix regia	Flamboyant	T	I/C/n	Oa/Ga
		Parkinsonia aculeata	Horse bean, Jerusalem thorn	T	I/C	Wo
		Tamarindus indica	Tamarind	T	I/C/n	Fo/Oa
	Faboideae	*Abrus precatorius*	Jumbie bead	V	N	Wo/Oa
		Canavalia rosea	Bay bean	V	N	Be
		Centrosema pubescens	Butterfly pea, wist vine	V	N	Wo/Oa

Family	Subfamily	Scientific name	Common name	Growth form	Origin	Habitat
		C. virginianum	Butterfly pea, wist vine	V	N	Wo/Oa
		Canavalia rosea	Bay bean	V	N	Be
		Crotalaria lotifolia	Shak-shak	H	N	Wo
		Desmodium sp.	Begger's ticks	H	N	We
		Galactia striata		V	N	Wo
		Galactia dubia		V	N	Oa
		Galactia egersii		V	N	Wo
		Macroptilium lathyroides	Wild bush-bean	V	N	Wo
		Phaseolus var.	Bean	H	I/C	We
		Pictetia aculeata	Fustic	S	N	Wo
		Piscidia carthagenensis	Dogwood, fishpoison	T	N	Fo/Wo
		Calopoganum mucunoides ???		V	N	Wo/Oa
		Rhynchosia minima		V	N	Wo
		R. phaseoloides		V	N	Wo/Oa
		R. reticulata		V	N	Wo
		Sesbania sericea	Sesbania			
		Stylosanthes hamata	Donkey weed	H	I(?)	We
		Tephrosia cinerea		V	N	Wo
		T. senna		S	N	Wo/Oa
		Vigna luteola	Goat wiss, wild pea	V	N	Wo
		V. ungulculata	Black-eyed pea	H	I/C	Ga
		Pisum var.	Common pea	H	I/C	Ga
		Arachis hypogaea var.	Peanut	H	I/C	Ga
	Mimosoideae	*Acacia macracantha*	Casha, stink casha	T	I	Wo

Family	Subfamily	Scientific name	Common name	Growth form	Origin	Habitat
		A. muricata	Amarat	T	N	Wo
		A. retusa	Catch-and-keep	V	I	Wo
		A. tortuosa	Casha	T	I	
		Desmanthus virgatus		S	N	Wo
		Leucaena leucocephala	Tan-tan	T	I/n	Wo
		Pithecellobium unguis-cati	Bread-and-cheese	S	N	Fo/Wo
		Propsopis sp.	Prosopis	T	I(?)	Wo
FLACOURTACEAE		*Samyda dodecandra*	Samyda	S	N	Fo/Wo
GOODENIACEAE		*Scaevola plumieri*	Inkberry	S	N	Be
LORANTHACEAE		*Dendropemon caribaeus*	Bassinboom	S	N	Fo/Wo
LYTHRACEAE		*Ammania coccinea*		H	N	Oa
MALPIGHIACEAE		*Heteropteris purpurea*		V	N	Wo
		Malpighia woodburyana	Bulldog	S	N	Wo
		Stigmaphyllon emarginatum	Yellow wiss	V	N	Wo
		Abutilon umbellatum		H	N	We
MALVACEAE		*Abutilon umbellatum*		H	N	Oa
		Abutilon sp.		H	N	Oa
		Bastardia vicosa		H	N	Oa
		H. rosa-sinensis	Hibiscus	S	I/C	Ga

Family	Subfamily	Scientific name	Common name	Growth form	Origin	Habitat
		Malvastrum americanum		H	N	We
		Pavonia spinifex	Spiny pavonia	S	N	Fo/Wo
		Sida acuta	Wire weed	H	N	We
		S. cordifolia		H	N	We/Oa
		Sida glomerata	Wire weed	H	N	We
		S. glutinosa (?)		H	N	We
		S. repens		H	N	We
		Sidastrum multiflorum		H	N	Oa
		Sidastrum sp.		H	N	We
		Sidastrum sp. ???		H	N	Oa
		Thespesia populnea	Haiti-haiti, Seaside Mahoe	T	N	Be
		Hibiscus sp.		S	I	Ga
MELIACEAE		*Swietenia mahagoni*	Westindian mahogany	T	I/C/n	Oa
		Azadirachta indica	Neem	T	I/C	Wo/Oa
		Trichilla hirta		T	N	Wo
MENISPERMACEAE		*Cissampelos pareira*	Pataka, velvet leaf	V	N	Fo/Wo
MORACEAE		*Ficus citrifolia*	Short-leaf fig	T	N	Fo/Wo
		F. retusa	India laurel fig	T	I	Ga
MYRTACEAE		*Eugenia axillaris*		T	N	Fo/Wo
		E. biflora		T	N	Fo/Wo
		E. cordata		T	N	Fo/Wo

Family	Subfamily	Scientific name	Common name	Growth form	Origin	Habitat
		E. monticola	Rodwood	T	N	Fo/Wo
		E. pseudopsidium	False guava	S	N	Fo/Wo
		E. sessiliflora		S	N	Fo/Wo
NYCTAGINACEAE		*Bougainvillea spectabilis*	Bougainvillea			Ga
		Bougainvillea x spectro-glabra	Bougainvillea	V	I/C	
		Boerhavia diffusa	Batta batta, kallaloo bush	H	N(?)	We
		B. erecta		H	N(?)	We
		Guapira fragrans	Black mampoo	T	N	Fo/Wo
		Pisonia subcordata	Water mampoo	T	N	Fo/Wo
OLEACEAE		*Forestiera eggersiana*		T	N	Fo/Wo
ONAGRACEAE		*Ludwigia* octovalis	Wild clove, many seed	H	N	We/Oa
OXALIDACEAE		*Oxalis corniculata*	Wood sorrel	H	N	We
PAPAVERACEAE		*Argemone mexicana*	Mexican poppy, yellow thistle	H	N	We
PASSIFLORACEAE		*Passiflora edulis*	Passion fruit	V	N	Ga
		P. foetida	Pap bush	V	N	Wo/Oa
		P. multiflora				
		P. rubra		V	N	Wo/Oa
		P. suberosa	Indigo berry	V	N	Wo

Family	Subfamily	Scientific name	Common name	Growth form	Origin	Habitat
PHYTOLACCACEAE		*Rivina humilis*	Jumbie-pepper	H	N	Wo
POLYGONACEAE		*Coccoloba krugii*	Hill grape	T	N	Fo/Wo
		C. krugii X *uvifera*	Hybrid seagrape	T	N	Wo
		C. microstachya		T	N	Fo/Wo
		C. uvifera	Seagrape	T	N	Wo/Be
		C. venosa	Chiggery grape	T	N	Fo/Wo
PORTULACACEAE		*Portulaca oleracea*	Purslane, jump up an' kiss me	H	N	We
		Portulaca sp.	Rice grain	H	N	Oa
		Talinum fruticosum		H	N	Fo/Wo
HYDROCHARITACEAE		*Egeria densa*	Common waterweed	Aq	I	Wet
RHAMNACEAE		*Colubrina arborescens*		T	N	Wo
		Gouania lupuloides	Chew stick	V	N	Wo
		Krugiodendon ferreum	Ironwood, ebonyberry	T	N	Fo/Wo
		Reynosia guama		T	N	Fo/Wo
		Ziziphus rigonii		T	N	Fo/Wo
RHIZOPHORACEAE		*Rhizophora mangle*	Red Mangrove	T	N	Wo/Oa/Be
RUBIACEAE		*Chiococca alba*	Snowberry	V	N	Fo/Wo
		Erithalis fruticosa	Black torchwood	S	N	Fo/Wo
		Exostema caribaeum	Princewood	T	N	Fo/Wo

Family	Subfamily	Scientific name	Common name	Growth form	Origin	Habitat
		Ernodea littoralis	Cough bush	H	N	Wo
		Guettarda odorata	Blackberry	T	N	Fo/Wo
		G. scabra	Green heart	T	N	Fo/Wo
		Ixora sp.		S	I/C	Ga
		Psychotria domingensis		S	N	Fo/Wo
		Randia aculeata	Inkberry	S	N	Fo/Wo
		Scolosanthus versicolor		S	N	Wo
		Spermacoce assurgens		S	N	We
		S. confusa		H	N	We
RUTACEAE		*Citrus aurantifolia*	West Indian lime	T	I	Ga
SAPINDACEAE						
SAPOTACEAE		*Sideroxylon foetidissimum*	Bully, bully mastic	T	N	Fo/Wo
		S. obovatum	West Indian box, boxwood	T	N	Fo/Wo
		Serjania polyphylla	Basket wiss	V	N	Fo/Wo
SCROPHULARIACEAE		*Capraria biflora*	Goatweed	S	N	Wo
SOLANACEAE		*Physalis angulata*	Ground cherry	H	N	Oa/We
		Solanum erianthum ???		S	N	Wp/Oa
		S. polygamum		S	N	Wo/Fo
		S. racemosum	Turkey berry, wild eggplant	S	I	Wo

Family	Subfamily	Scientific name	Common name	Growth form	Origin	Habitat
		Helicteres jamaicensis	Cats balls, cow bush		N	Wo
		Melochia nodiflora		H	N	Oa/Be/Cl
		M. tomentosa		H	N	Oa/Be/Cl
		Sterculia foetida	Stinky sterculia	T	N	Wo
		Waltheria indica	Marsh-mallow	H	N	Oa/We
SURIANACEAE		*Suriana maritima*	Bay cedar	S	N	Be
THEOPHRASTACEAE		*Jacquinea arborea*		S	N	Wo/Be/Oa
		J. berterii	Barbasco	S	N	Wo/Be/Oa
TILLIACEAE		*Corchorus hirsutus (?)*	Jack switch	S	N	Oa/Be/Cl/Ro
THYMELAEACEAE		*Daphnopsis americana*		S	N	Fo/Wo
TURNERACEAE		*Turnera diffusa*	Old woman broom	S	N	Wo/Oa
		T. ulmifolia		H/S	N	Wo/Oa
VERBENACEAE		*Avicennia germinans*	Black Mangrove	T	N	Wo/Oa/Be
		Clerodendrum aculeatum	Privet, haggar bush	S	N	Wo/Oa/Be
		Citharexylum fruticosum	Fiddlewood	T	N	Wo
		Lantana camara	Red sage			
		L. involucrata	Sage	S	N	Wo/Oa
		Stachytarpetha jamaicensis	Worry-wine	H	N	We

Family	Subfamily	Scientific name	Common name	Growth form	Origin	Habitat
VITACEAE		*Cissus trifoliata*		V	N	Fo/Wo
		C. verticillata	Pudding vine	V	N	Fo/Wo
PANDANACEAE		*Pandanus odoratissimus*	Screw pine, Pandanus	T	I	Ga
AGAVACEAE		*Agave missonium*	Century plant, agave	S	N/C	Fo/Wo
		Agave sp.		S	I/C	Ga
		Agave sp.		S	I/C	Ga
		Yucca aloifolia	Yucca	T	I/C	Ga
AMARYLLIDACEAE		*Hymenocallis caribaea* var.	Spider lily	H	I	Ga
ARACEAE		*Philodendron* sp.	Philodendron	V	I	Ga
ARECACEAE		*Coccothrinax alta*	Tyre palm	T	N	Fo
		Cocos nucifera	Coconut palm	T	I/C/n	Be/Oa/Ga
		Sabal casuarium	Sabal palm	T	N	Wo/Oa
ASPHODELACEAE		*Aloe vera?????*	Medicine aloe, aloe	H	I/C/n	Wo/Ga
ASPARAGACEAE		*Protasparagus densiflorus*	Asparagus fern	H	I/C	Ga
BROMELIACEAE		*Pitcairnia angustifolia*	Pinguin,wild pineapple	H	I/C/n	Fo/Wo
		Tillandsia utriculata		H	N	Fo/Wo

Family	Subfamily	Scientific name	Common name	Growth form	Origin	Habitat
COMMELINACEAE		*Callisia repens*	Callisia	H	I/C	Ga
		Commelina erecta	French weed	H	N	Fo/Wo/Oa/We
		Commelina elegans (?)	French weed	H	N	Fo/Wo/Oa/We
CYPERACEAE		*Cyperus articulatus*		H	N	Oa/Be
		C. lingularis		H	N	Be/Oa/Wet
		C. planifolius		H	N	Wo/Be/Oa/Cl
		C. polystachyos		H	N	Be/Oa/Wet
		Fimbristylis cymosa		H	N	Be/Oa/Wet
		Fimbristylis sp.		H	N	Be/Oa/Wet
		Rhynchospora sp.		H	N	Be/Oa/Wet
		Scleria lithosperma	Forest sedge	H	N	Fo/Wo
DRACAENACEAE		*Dracaena marginata*	Dragon's tongue	T	I/C	Ga
		Sansevieria trifasciata	Snake plant	H	I/C/n	Ga
HYDROCHARITACEAE		*Thalassia testudinum*	Turtle-grass	H	N	Wet
ORCHIDACEAE		*Psychilis macconnelliae*	Butterfly orchid	H	N	Fo/Wo/Ro/Cl
		Tolumnia prionochila	Yellow dancing lady	H	N	Fo/Wo
POACEAE		*Andropogon bicornis*		H	N(?)	Wo/Oa
		Anthephora hermaphrodita		H	N	Wo/Oa
		Bothriochloa pertusa	Hurricane grass	H	N	Wo/Oa/We
		Buteloua americana		H	N	Wo/Oa/We

Family	Subfamily	Scientific name	Common name	Growth form	Origin	Habitat
		Cenchrus sp.	Sandbur, sand-spurs, bur-grass	H	N	Be
		Chloris inflata	Purple top	H	I/n	Oa/We
		Dactyloctenium aegyptium	Crowfoot grass, Fowlfoot grass	H	I/n	Oa
		Digitaria bicornis		H	N	Wo/Oa/We
		D. insularis		H	N	Wo/Oa/We
		Digitaria sp.		H	N	Wo/Oa/We
		Echinochloa colona		H	I	Wo/Oa/We
		Eleusine indica	Goose grass	H	I/n	We
		Heteropogon contortus		H	N	Oa
		Melinis repens	Natal redtop	H	I	We
		Panicum maximum	Guinea grass	H	I/C/n	Wo/Oa/We
		Paspalum sp.		H	I(?)	Oa/We
		Paspalum sp.		H	I(?)	Oa/We
		Setaria setosa		H	N	Oa
		Spartina patens	Cordgrass	H	N	Be
		Sporobolus virginicus	Salt grass	H	N	Wet/Be
		Uniola virgata		H	N	Oa
		Urochloa fasciculatun		H	N(?)	Wo/Oa/We
		Urochloa sp.		H	N	Wo/Oa/We
		Stenotarphrum secundatum		H	N	We

Table Key

Habitat: **Be** – beach; **Cl** – cliffs; **Fo** – forests; **Ga** – gardens; **Oa** – open areas; **Ro** – rocks; **We** – weed; **Wet** – wetlands; **Wo** – woodlands.

Growth Form: **Aq** – aquatic; **H** – herb; **S** – shrub; **T** – tree; **V** – vine.

Origin: C – Cultivated; I – introduced; N – native; n – naturalized; ? – origins questionable.

Appendix B: Mosquito Island – Bird List

Species	Common Name	This Survey	Previous Reports/Observations	Habitat	Conservation Status
PHAETHONTIDAE	**Tropicbirds**				
Phaethon lepturus	White-tailed Tropicbird	☐	☐	P/M	Very Rare/Nesting
SULIDAE					
Sula sula	Brown Booby	☐	☐	P/M	Transient
PELECANIDAE	**Pelicans**				
Pelicanus occidentalis	Brown Pelican	☐	☐	M	Locally Common/Transient
FREGATIDAE	**Frigate Birds**				
Fregata magnificens	Magnificent Frigate Bird	☐	☐	M	Transient
LARIDAE	**Terns & their Allies**				
Larus atricilla	Laughing Gull	☐	☐	P/M/Oa	Locally common
Sterna maxima	Royal Tern	☐	☐	P/M	Uncommon transient
Sterna antillarum	Least Tern	☐	☐	P/M	Transient
Sterna sandvicensis	Sandwich Tern	☐	☐	P/M	Transient
Sterna hirundo	Common Tern	☐	☐	P/M	Transient
Sterna dougallii	Roseate Tern	☐	☐	P/M	Transient
Sterna anaethetus	Bridled Tern	☐	☐	P/M	Transient
Anous stolidus	Brown Noddy		☐	P/M	Uncommon
Chlidonias niger	Black Tern		☐	P/M	Very Rare/Vagrant
ARDEIDAE	**Egrets & Bitterns**				

Species	Common Name	This Survey	Previous Reports/Observations	Habitat	Conservation Status
Egretta caerulea	Little Blue Heron	☐	☐	Co	Uncommon
Nyctanassa violacea	Yellow-Crowned Night-Heron	☐		Co	Uncommon
Butorides virescens	Green Heron	☐		Co	Very uncommon
ANATIDAE	**Ducks, Geese & Swans**				
Anas bahamensis	White–Cheeked Pintail	☐	☐	Co	Rare
ACCIPITRIDAE	**Hawks & Harriers**				
Buteo Jamaicensis	Red-tailed Hawk	☐		Oa	Rare
Pandion haliaetus	Osprey	☐		M	Uncommon to Rare
FALCONIDAE	**Falcons**				
Falco sparverius	American Kestrel	☐	☐	Wo/Oa	Uncommon/Nesting
CHARADRIIDAE	**Plovers**				
Charadrius semipalmatus	Semipalmated Plover	☐		Co	Uncommon to Rare
Pluvialis squatarola	Black-bellied Plover	☐		Co	Uncommon/Transient
SCOLOPACIDAE	**Turnstones, Snipes & Sandpipers**				
Actitis macularia	Spotted Sandpiper	☐	☐	Co	Uncommon to Rare
HAEMATOPODIDAE	**Oystercatchers**				
Haemantopus palliatus	American Oystercatcher	☐	☐	M	Rare/Nesting (?)
COLUMBIDAE	**Pigeons & Doves**				
Patagioenas squamosa	Scaly-Naped Pigeon	☐	☐	Fa/Wo	Locally Common/Nesting

Species	Common Name	This Survey	Previous Reports/Observations	Habitat	Conservation Status
Zenaida asiatica	White-Winged Dove	☐		Wo/Oa	Very Uncommon/Transient
Zenaida aurita	Zenaida Dove	☐	☐	Fa/Wo/Oa	Very Common/Nesting
Columbina passerina	Common Ground Dove	☐		Wo/Oa	Locally Rare
PSITTACIDAE **Parrots & Parakeets**					
Amazona sp.	Amazona parrot	☐		Oa	Accidental/Introduced
STRIGIDAE **Owls**					
Otus nudipes newtoni	Virgin Islands Screech Owl (?)	☐		Fa/Wo/Oa	Very Rare to Extinct/Nesting (?)
CAMPRIMULGIDAE **Goatsuckers**					
Antillean Nighthawk	Chordeiles gundlachii			Oa	Rare
CUCULIDAE **Cuckoos & Anis**					
Coccyzus minor	Mangrove Cuckoo	☐		Wo	Uncommon/Possibly Nesting
Crotophaga ani	Smoothed-Billed Ani	☐	☐	Wo/Oa	Uncommon but stable/Nesting
TROCHILIDAE **Hummingbirds**					
Orthorhyncus cristatus	Antillean-Crested Hummingbird			Fa/Wo/Oa	Locally Common/Nesting
Eulampis holososericeus	Green-Throated Carib	☐		Fa/Wo/Oa	Locally Common/Nesting
ALCEDINIDAE **Kingfishers**					
Ceryle alcyon	Belted Kingfisher	☐		Co	Uncommon to rare
TYRANNIDAE **Tyrant Flycatchers**					

Species	Common Name	This Survey	Previous Reports/Observations	Habitat	Conservation Status
Myiarchus antillarum	Puerto Rican Flycatcher	☐		Wo/Oa/Co	Very Rare/Transient
Tyrannus dominicensis	Gray Kingbird	☐		Wo/Oa/Co	Locally Uncommom/Nesting
Elaenia martinica	Caribbean Elaenia	☐		Fo/Wo/Oa/Co	Locally Uncommon/Nesting (?)
HIRUNDINIDAE **Swallows & Martins**					
Progne dominicensis	Caribbean Martin			Oa/Cl	Rare/Transient
Hirundo rustica	Barn Swallow	☐		Oa/Cl	Rare/Transient
Hirundo pyrrhonota	Cliff Swallow	☐		Oa/Cl	Rare/Transient
MIMIDAE **Mockingbirds & Thrashers**					
Mimus polyglottos	Northern Mockingbird	☐		Fo/Wo/Co/Co	Rare/Transient
Margarops fuscus	Pearly-Eyed Thrasher	☐	☐	Fo/Wo/Oa	Abundant/Nesting
VIREONIDAE **Vireos**					
Vireo altiloquus	Black-Whiskered Vireo	☐		Fo/Wo	Uncommon
EMBERIZIDAE **Wood Warblers, Blackbirds & their Allies**					
Dendroica striata	Blackpoll Warbler	☐			
Dendroica discolor	Prairie Warbler	☐			
Dendroica petechia	Yellow Warbler	☐	☐	Fo/Wo/Oa/Co	Locally Common/Nesting
Coereba flaveola	Bananaquit	☐	☐	Fo/Wo/Oa/Co	Common/Nesting
Tiaris bicolor	Black-faced Grass Quit	☐		Wo/Oa/Co	Uncommon to rare
Passer domesticus	House Sparrow	☐		Oa	Uncommon/Introduced

Appendix C: Mosquito Island — List of Invertebrates

CLASS	ORDER	SUB-ORDER	FAMILY	SPECIES	COMMON NAME	Conservation Status
ARACHNIDA – ARACHNIDS	ACARINA - MITES		IXODIDAE – Hardbacked Ticks	*Geckobia* sp. (?)	Reptile Mite	May be rare.
	SCORPIONIDA - SCORPIONS		BUTHIDAE – Buthid Scorpions	*Centruroides nitidus*		Very common
				Heteronebo sp.		Uncommon
	AMBLIPIGI – WHIP SPIDERS		PHRYNIDAE – Phrynid Tailless Whipscorpions	*Phrynus* sp.	Whip scorpion	Seemingly common, though in fact, this may represent more than a single species.
	ARANEAE - SPIDERS	MYGALOMORPHAE – TARANTULAS & THEIR KIN	THERAPHOSIDAE - Tarantulas	*Holothele* sp.		Data deficient
				Trichopelma sp.		Data deficient
		ARANEOMORPHAE – TYPICAL SPIDERS	THERIDIIDAE – Comb-clawed Spiders	Species undetermined		Data deficient
			ARANEIDAE - Orbweavers	*Gasteracantha tetracantha*		Data deficient
				Eriophora sp.		Data deficient
				Argiope sp.		Data deficient

CLASS	ORDER	SUB-ORDER	FAMILY	SPECIES	COMMON NAME	Conservation Status
		THOMISIDAE????		*Stasina* sp.		Data deficient
		SPAROSSIDAE????		*Selenops* sp.		Data deficient
		LYCOSIDAE????		Species undetermined		Data deficient
				Species undetermined		Data deficient
				Species undetermined		Data deficient
				Species undetermined		Data deficient
				Species undetermined		Data deficient
CHILOPODA – CENTIPEDES	SCOLOPENDIOMORPHA – GIANT CENTIPEDES & THEIR KIN		SCOLOPENDROMORPHAE – Scolopendrid Centipedes	*Scolopocryptops* sp.		Data deficient
			GEOPHILIDAE – Soil Centipedes	*Arenophilus* sp. (?)	Soil centipede	Data deficient
DIPLOPODA – MILLIPEDES	MILLIPEDES	?????	????	Species undetermined	Millipede	Data deficient
CRUSTACEA - CRUSTACEANS	ISOPODA - PILLBUGS		PORCELLIONIDAE – Snow Bugs	*Porcellio* sp. (?)	Wood Lice	Seemingly common.
				Species undetermined	Wood Lice	Data deficient
		DECAPODA –	GECARCINIDAE – Land Crabs	*Cardiosoma guanhumi*	Giant Land Crab	Uncommon to rare.

CLASS	ORDER	SUB-ORDER	FAMILY	SPECIES	COMMON NAME	Conservation Status
		LOSTERS, SHRIMP, CRABS & THEIR KIN				Limited to the two saltponds on island.
				Gecarcinus lateralis	Black Land Crab	Uncommon to rare.
				G.. ruricola	Mountain Crab	Uncommon to rare on island. Found mostly in forested areas of island.
			OCYPODIDAE – Fiddler Crabs	*Uca pugnax* (?)	Fiddler Crab	Uncommon. Limited in distribution to the two saltponds and along shallow mud flats near shore.
				Ocypoda quadrata (?)	Ghost Crab/Sally Light Foot	Common
			COENOBITIDAE – Land Hermit Crabs	*Coenobita clypeata*	Hermit Crab	Common, though specimens tend to be on the small size, perhaps limited by the availability of large ??? shells.
INSECTA – INSECTS	DIPLURA - DIPLURANS		CAMPODEIDAE – Diplurans	Species undetermined	Diplura	Data deficient
	BLATTODEA – ROACHES		CRYPTOCERCIDAE -	Species undetermined		Data deficient
			BLABERIDAE – Blaberid Roaches	Species undetermined		Data deficient
				Pancholora sp.		Data deficient
			BLATTELLIDAE – Wood Roaches	*Blattella* sp.		Data deficient
			BLATTIDAE – Blattid Roaches	Species undetermined	Wood	Seemingly common

CLASS	ORDER	SUB-ORDER	FAMILY	SPECIES	COMMON NAME	Conservation Status
					Roach/Forest Roach/Wingless Roach	
				Periplaneta americana	American Cockroach	Common. An introduced species considered a major pest and a nuisance.
	COLEOPTERA - BEETLES		CARABIDAE – Ground Beetles	Species undetermined		Data deficient
				Species undetermined		Data deficient
			TROGIDAE – Hide Beetles	Trogium sp. (?)	Bark Lice	Data deficient
			SCARABEIDAE – Scarab Beetles	*Cyclocephala* sp. (?)		Data deficient
			MELANDRYIDAE – False Darkling Beetle	*Penthe* sp. (?)		Data deficient
			MELOIDAE – Blister Beetles	*Epicauta* or *Eumorpha*	Blister Beetle	Seasonally common (may be a complex of two or more species).
			ELATERIDAE – Click Beetles	*Deilelater* sp.	Luminescent Click Beetle	Data deficient
				Deilelater sp.	Luminescent Click Beetle	Data deficient
				Cyclocephala sp.		Data deficient
				Species undetermined		Data deficient
			PTINIDAE – Spider Beetles	*Ptinus* sp. (?)		Believed rare. Collected from owl pellets found on island.
			TENEBRIONIDAE – Darkling Beetles	*Tenebria* sp.		Data deficient

CLASS	ORDER	SUB-ORDER	FAMILY	SPECIES	COMMON NAME	Conservation Status
				Tenebrio sp.		Data deficient
				Eleodes sp. (?)		Data deficient
			CERAMBYCIDAE – Longhorn Beetles	*Monochamus* sp. (?)		Data deficient
				Eburia quadrigeminata	Ivory-marked Beetle	Data deficient (this may in fact represent a complex of two or more species or seasonal variants). Further study warranted to determine species status.
				Species undetermined		Data deficient
				Species undetermined		Data deficient
				Species undetermined		Data deficient
			CHRYSOMELIDAE – Leaf Beetles	*Chrysochus* sp. (?)		Data deficient
			SCOLYTIDAE – Bark Beetles	Species undetermined		Data deficient
			CURCULIONIDAE – Weevils/Snout Beetles	Species undetermined		Data deficient
				Species undetermined		Data deficient
	DERMAPTERA - EARWIGS		CARCINOPHORIDAE – Red-legged Earwigs	*Eurobellia* sp. (?)	Earwig	Data deficient
	DIPTERA – FLIES, MOSQUITOES & THEIR KIN		TIPULIDAE - Craneflies	Species undetermined	Crane Fly	Data deficient
			CULICIDAE - Mosquitoes	*Aedes* sp.	?????	Common. Regarded as a pest species.
				Aedes sp.		Common. Regarded as a

CLASS	ORDER	SUB-ORDER	FAMILY	SPECIES	COMMON NAME	Conservation Status
						pest species.
				Psorophora sp. (?)		Common. Regarded as a pest species.
			CERATOPOGONIDAE – Biting Midges	*Culicoides* sp.	Sand Fly/No See Ums	Locally common along sandy shores. Considered a pest and a nuisance, especially after rains.
			TABANIDAE – Horse & deer Flies	*Tabanus* or *Hybromita* sp.	Horse Fly	Data deficient
			MUSCIDAE – House Flies	*Musca domestica*	Common House Fly	Common. Considered a pest and a nuisance.
				Fannia sp.	Small House Fly	Relatively common. Considered a pest and a nuisance.
			TACHINIDAE – Tachinid Flies (?)	Species undetermined	Tachinid Fly	Data deficient
	HEMIPTERA - BUGS		REDUVIIDAE – Ambush & Assassin Bugs	Species undetermined	Assassin bug	Data deficient
			PENTATOMIDAE – Shield & Stink Bugs	*Euschistus* sp.	Stink Bug	Data deficient
	HOMOPTERA – CICADAS, LEAFHOPPERS & THEIR KIN		CICADIDAE - Cicadas	*Tibicen* sp.	Cicada	Seasonally common
			CERCOPIDAE – Spittlebugs & Froghoppers	Species undetermined		Data deficient
				Species undetermined		Data deficient
			CIXIIDAE – Cixiid	*Cixius* sp. (?)		

CLASS	ORDER	SUB-ORDER	FAMILY	SPECIES	COMMON NAME	Conservation Status
			Planthoppers			
			FLATIDAE – Flatid Plant Hoppers	*Metcalfa* sp. (?)		Data deficient
	HYMENOPTERA – WASPS, ANTS & BEES		CYNIPIDAE – Gall Wasps	Species undetermined	Gall Wasp	Data deficient
			VESPIDAE – Vespid Wasps	*Michocyttarus* sp.	Paper Wasp/Jack Spaniard	Data deficient
				Polistes sp.	Paper Wasp/Jack Spaniard	Data deficient
			POMPILIDAE – Spider Wasps	*Pepsis* sp.	Spider Wasp	Data deficient
				Pepsis sp.	Spider Wasp	Data deficient
				Species undetermined	Spider Wasp	Data deficient
			CABROINIDAE -	*Stricta* sp. (?)		
			SPHECIDAE – cicada killers, mud daubers & Sand wasps	*Palmodes* sp.	Hunting Wasp	Data deficient
			SCOLIIDAE – Digger Wasps	*Campsomeris* sp (?)	Scoliid Wasp/Flower Wasp	Data deficient
			APIDAE – Bumble Bees & Honey Bees	*Xylocopa* sp.	Bumble Bee	Data deficient
			FORMICIDAE – Ants	Species undetermined		Data deficient
				Species undetermined		Data deficient
				Odontomachus sp.		
				Solenopsis sp.	Black Fire Ant	Locally common. Considered a pest and

CLASS	ORDER	SUB-ORDER	FAMILY	SPECIES	COMMON NAME	Conservation Status
						nuisance species.
	ISOPTERA - TERMITES		TERMITIDAE – Nasutiform Termites	*Nasutitermes costalis*	Termite/Wood Louse	Data deficient
			KALOTERMITIDAE – Dry Wood Termites	Species undetermined	Wood Termite	Common. Considered a pest by some but this and other termite species are critical to soil ecology and nutrient cycling, especially on such a dry island.
	LEPIDOPTERA – BUTTERFLIES & MOTHS		DENAIDAE – Monarch Butterflies	*Danus plexipus*	Monarch Butterfly	Rare
			NYMPHALIDAE – Brushfooted Butterflies	*Junonia* sp.	Buckeye	Data deficient
			HELICONIDAE – Heliconid Butterflies	*Agraulis vanillae*	Gulf Fritillery	Data deficient. The subspecies present is unknown, and the features of specimens on the island seem somewhat different to those described for the area.
			LYCAENIDAE – Gossamer-wing Butterflies	Species undetermined		
			PIERIDAE – Whites & Sulphurs	*Ascia monuste*	Great Southern White	Seasonally common
			HESPERIIDAE – Skippers	*Polygonus* sp.		
				Urbanus proteus	Common Long-tailed Skipper	Data deficient
				Pyrgus oileus	Tropical Checkered Skipper	Data deficient

CLASS	ORDER	SUB-ORDER	FAMILY	SPECIES	COMMON NAME	Conservation Status
				Species undetermined (Either *Wallengrenia otho* or *Choranthus vitellius*)	(Broken Dask Skipper or V-Marked Skipper)	Data deficient
				Species undetermined (perhaps *Panoquina ocola*)	(Ocola Skipper)	Data deficient
			ARCTIIDAE – Tiger Moths	*Composita credula*		Data deficient
				Species undetermined	Wasp-moth	Seasonally common
			GEOMETRIDAE – Measuringworm Moths	Species undetermined		Data deficient
				Species undetermined		Data deficient
				Species undetermined		Data deficient
				Species undetermined		Data deficient
				Species undetermined		Data deficient
				Species undetermined		Data deficient
				Nemoria sp.	Emerald Moth	Data deficient
			SPHINGIDAE – Hawk Moths	*Hyles* sp (?)		Data deficient
				Maduca sp. (?)		Data deficient
				Pseudosphiny tetrio	Frangipani Sphinx Moth	Seasonally common
			NOCTUIDAE – Owlet Moths	*Ascalapha odorata*	Owl Moth/Black Witch/Jumby Moth	Data deficient
				Allotria sp.	Owlet Moth	Data deficient
			YPONOMEUTIDAE – Ermine Moths	Species undetermined		Data deficient
			GELECHIIDAE – Gelechiid	Species undetermined		Data deficient

CLASS	ORDER	SUB-ORDER	FAMILY	SPECIES	COMMON NAME	Conservation Status
			Moths			
				Species undetermined		Data deficient
				Species undetermined		Data deficient
				Species undetermined		Data deficient
				Species undetermined		Data deficient
				Species undetermined		Data deficient
			PYRALIDAE – Pyralid Moths	Species undetermined		Data deficient
				Species undetermined		Data deficient
	MANTODEA - MANTIDS		MANTIDAE - Mantids	*Mantis* sp. (?)	Praying Mantid	Data deficient
				Stagnomantis sp. (?)	Praying Mantid	Data deficient
	NEUROPTERA – ANTLIONS & THEIR KIN		MYRMELEONTIDAE – Antlions	*Mymeleon* sp. (?)	Giant Antlion	Data deficient
				Myrmeleon sp.	Antlion	Data deficient
	ORTHOPTERA – GRASSHOPPERS. KATYDIDS, CRICKETS & THEIR KIN		ACRIDIDAE - Grasshoppers	*Schistocerca* sp.		Data deficient
			TETTIGONIIDAE - Katydids	*Microcentrum* sp. (?)		Data deficient
				Neoconocephalus sp.		Data deficient
				Neoconocephalus sp.	Conehead Katydid	Data deficient
				Scudderia sp.		Data deficient

CLASS	ORDER	SUB-ORDER	FAMILY	SPECIES	COMMON NAME	Conservation Status
				Species undetermined		Data deficient
			GRYLLIDAE – Crickets	*Amphiacusta* sp.		Data deficient
				Oecanthus sp.	Tree Cricket	Data deficient
			RHAPHIDOPHORIDAE – Camel Crickets	*Ceuthophilus* sp. (?)	Ground Cricket	Localized. Common under dead fallen tree stumps and in refuse heaps.
	PHASMATODEA – WALKING STICKS		PHASMATIDAE – Stick Insects	Species undetermined	Walking Stick/God Horse	Data deficient