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# MARINE AND TERRESTRIAL FLORA AND FAUNA NOTES ON SOMBRERO ISLAND IN THE CARIBBEAN

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## Introduction

Sombrero Island (Lat. 18° 36' N, Long. 63° 25' W; Fig. 1) is an elevated block of limestone 6-12 m above sea level with no beaches and a precarious anchorage subject to damaging ground swells. It is 1.2 km long and approaches the shape of an obtuse triangle extending northeast and southwest. Isolated from the Anguillan bank by the 32-mile Sombrero Passage, it forms the northernmost limit of the Lesser Antilles and is separated from the Puerto Rican/Virgin Islands bank (part of the Greater Antilles) by the 40-mile wide Anegada Passage. Sombrero is 366 m wide at its widest and represents a remnant of an island believed to have been as large as its present 5.6 x 8 km wide underwater platform which varies from 16-30 m deep. It is believed to consist of a volcanic base capped by Pleistocene limestone (Julien, 1866). According to Julien this limestone represents the floor of a pre-historic lagoon once protected by a barrier reef and possibly enclosed by an atoll. His evidence for this is the abundance of fossils, in particular, Bulla (bubble shell). The fossil shells and corals are extensively described by Julien.

Presently Sombrero is exposed to the open Atlantic Ocean. The occasional severe ground swells and regular heavy seas limit coral growth. They also affect the land-dwelling populations. Fortunately, the seas were calm for our stay, but even then the salt spray was evident. The eroded cliffs are precipitous (Fig. 2) and undercut, but occasionally slope toward the water and are then undercut below the water surface. The island was uninhabited until 1856 when operations began for mining of the phosphate rich, rock-guano deposits. Presently it is inhabited by four lighthouse keepers.

The following observations were made on June 10-11, 1979 using the yacht Tüchtig.

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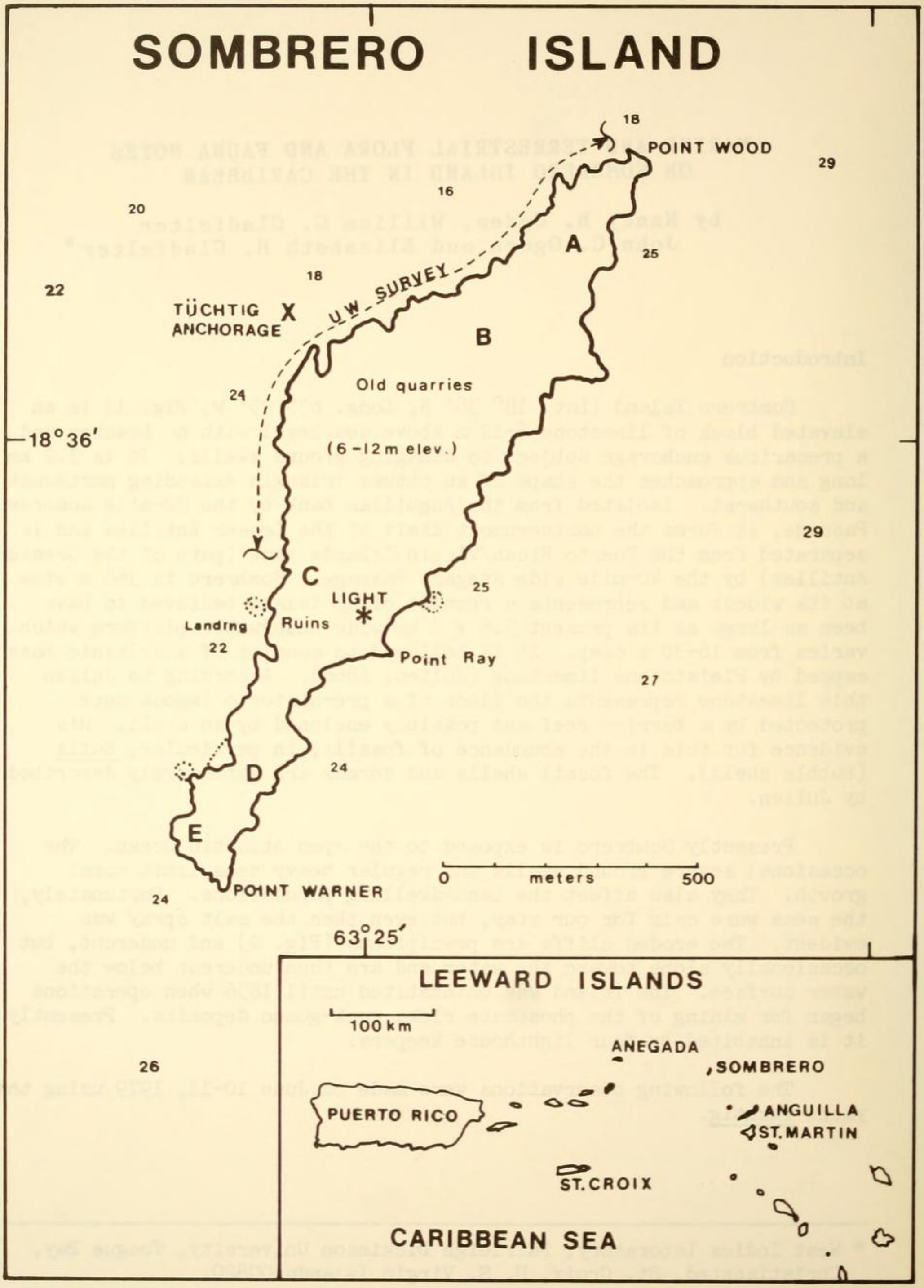


Fig. 1. Sombrero Is. (DMA, 1976) with an inset of its location in the Eastern Caribbean island chain; depths in meters; dotted line shows extent of the underwater survey. A-E represents bird areas listed in Table 2.

**Land Plants**

One's first impression is that there are only two species of land plants, but walking the length of the island and back revealed 8 species (Table 1). Pluchea symphytifolium (grows to 3 m tall) must be a recent introduction as previous literature refers to the cactus Opuntia antillana (grows to 0.6 m tall) as the tallest plant on the island. The most abundant plant, sea purslane (Sesuvium portulacastrum), appeared to be the preferred nesting site for boobies (Fig. 4 ) while blast holes, rock rubble, crevices and natural depressions provided numerous niches for the other six species of nesting sea birds.

**Birds**

Seabirds arrive from the south in March and depart in late May, June, July and even August (Lawrence, 1864). "The lighthouse crew" (during phosphate mining years) "reports that nests and eggs can be found on the island during at least 8 months of the year" (Lawrence, 1864). According to Lawrence, the nesting seabirds suffered considerably from poaching by the phosphate miners. Quarrying of the guano deposits went on from 1856 (Lawrence, 1864) to 1890. Julien arrived in 1860 and four years later made the statement that ".. laborers have been so indefatigable that I do not believe a single young bird has been hatched since our occupation of the Key. Consequently, last season (spring of 1863) only about two dozen eggs in all were found, instead of the thousands of previous years." Julien also mentioned wild cats as predators (Lawrence, 1864). We suspect the nesting bird populations have recovered considerably since then, but according to the present head lighthouse keeper, men still come from Anguilla to get eggs and birds. Migrating birds sometimes appear on the island and occasionally birds from larger neighboring islands (Lawrence, 1864). We observed nests of noddy, sooty and bridled terns and brown boobies. Julien never saw booby nests despite their presence from June to November - suggesting the thorough poaching of their eggs. Lazell (1964) did see them nesting. Noddy terns were most abundant of all, as was the case during Julien's stay (Table 2).

**Reptiles**

Other than the seven species of nesting birds, the black lizard Amieva corvina (Teiidae) is the next most obvious inhabitant. This endemic, slatey black or black and tan (occasionally with light speckled flanks) lizard was the only recorded living reptile until 1964. We observed it throughout the island. Its main food is reported to be bird's eggs (Lazell, 1964). One was observed during our stay eating the small, yellow Portulaca flowers. Lazell (1964) reported the lizard Anolis gingivinus (Iguanidae) and the gecko Sphaerodactylus sputator (Gekkonidae) - both are common to the Anguillan and St. Kitts banks. Only one Anolis was seen in the north central portion of the island during our visit. According to Lazell (1964) the Anolis varies from olive drab to distinctly light greenish with a bold, light flank stripe and varying spots. The gecko is "at or near the longitudinally-striped, extreme color pattern" (Lazell, 1964). It was not seen by us.

Julien (1866) mentions the discovery of fossil remains of land turtles which he was led to believe belonged to three new extinct and gigantic species similar to those of the Galapagos Islands. Auffenberg (1967) finds that none of Julien's original fragments can be found, but he and a colleague obtained more in the Pleistocene fissures at the northern end of Sombrero in 1964. Auffenberg (1967) states that Julien's tortoise fragments were originally described as the new species Emys sombrerensis Leidy. It is now known as Geochelone sombrerensis (Leidy) Auffenberg, 1967. The sternum length was hypothesized to have been 12 inches. Some of Julien's material reportedly represented specimens with a plastral length of at least 32 inches (Auff. 1967). Geochelone carbonaria (Spix) Morocoy is a species presently found on many Caribbean Islands. It is commonly around 12 inches in length, but larger ones have been reported (pers. com.). G. denticulata (Linneaus) which has reached a shell length of 26.5 inches is reportedly found in Trinidad (Underwood, 1962).

**Marine Algae**

The marine algae on the exposed limestone cliffs were quite different from other Caribbean islands. Wrangelia penicillata, commonly found 2 m deep and deeper, was the most common macroalga in the splash zone for 2 m above the surface. Also there was a surprising lack of Sargassum and Turbinaria at the surface. Protected areas were more typical of combinations found elsewhere. In general brown algae - Dictyopteris delicatula; Dictyota dichotoma, D. dentata and Lobophora variegata represented the most biomass 2 m deep and below. Four species of colorful, fleshy, encrusting algae were very striking in the top two meters. Snorkelling and scuba diving were limited to the northern half of the leeward side (Fig. 1), while collections were made from land on the windward side of the northeast end (Table 3).

**Coral**

There were no reef-like accumulations of coral, but the species common on other eastern Caribbean islands were generally well represented particularly on the shelf on the northern side of the island. Colonies were generally of moderate size and flattened, especially on the vertical slopes of the island. Coral growth must be affected by the occasional severe ground swells that toss boulders and cobbles about on the bottom and have cut a notch at the base of the island at a depth of about 10 m.

**Fishes**

The fish community generally was rich and diverse (Table 4). A few species unusually well represented were Kyphosus sectatrix (Bermuda chub) and Cephalopholis fulva (coney) - common near the walls; and Paranthias furcifer (Creole fish) and Xanthichthys ringeas (Sargassum triggerfish) common over the leeward shelf. Conspicuous by their absence were grunts, probably due to the lack of soft bottom and seagrass beds. The proportional representation of major trophic categories (Table 5) was similar

to shelf edge fish communities censused elsewhere in the northeastern Caribbean by the authors (unpublished).

**Miscellaneous Observations**

A colorful variation of the crab Grapsus can be seen skirting the edges of the island. The periphery of the island is dotted with salt-water, brackish and fresh water pools. Seven meters above the sea level there were pools with occasional ocean surgeonfish, sergeant majors and Diadema (the long-spined black sea urchin). Echinometra, a short-spined urchin, inhabited the wave-washed areas. Some pools were choked with filamentous, green algae. Others had waterbugs, backswimmers, and other small swimming organisms.

Insects, in general, were not noted, but houseflies, a flattened, tan spider, the cabbage butterfly, red mites and small elongate ants were observed. Tectarius shells seemed poor fare for the purple-clawed hermit crab Coenobita clypeatus which grows much larger on other islands where larger shells are available. In general, other than sea birds, terrestrial life is very limited - probably due to the lack of soil and the presence of abundant salt spray.

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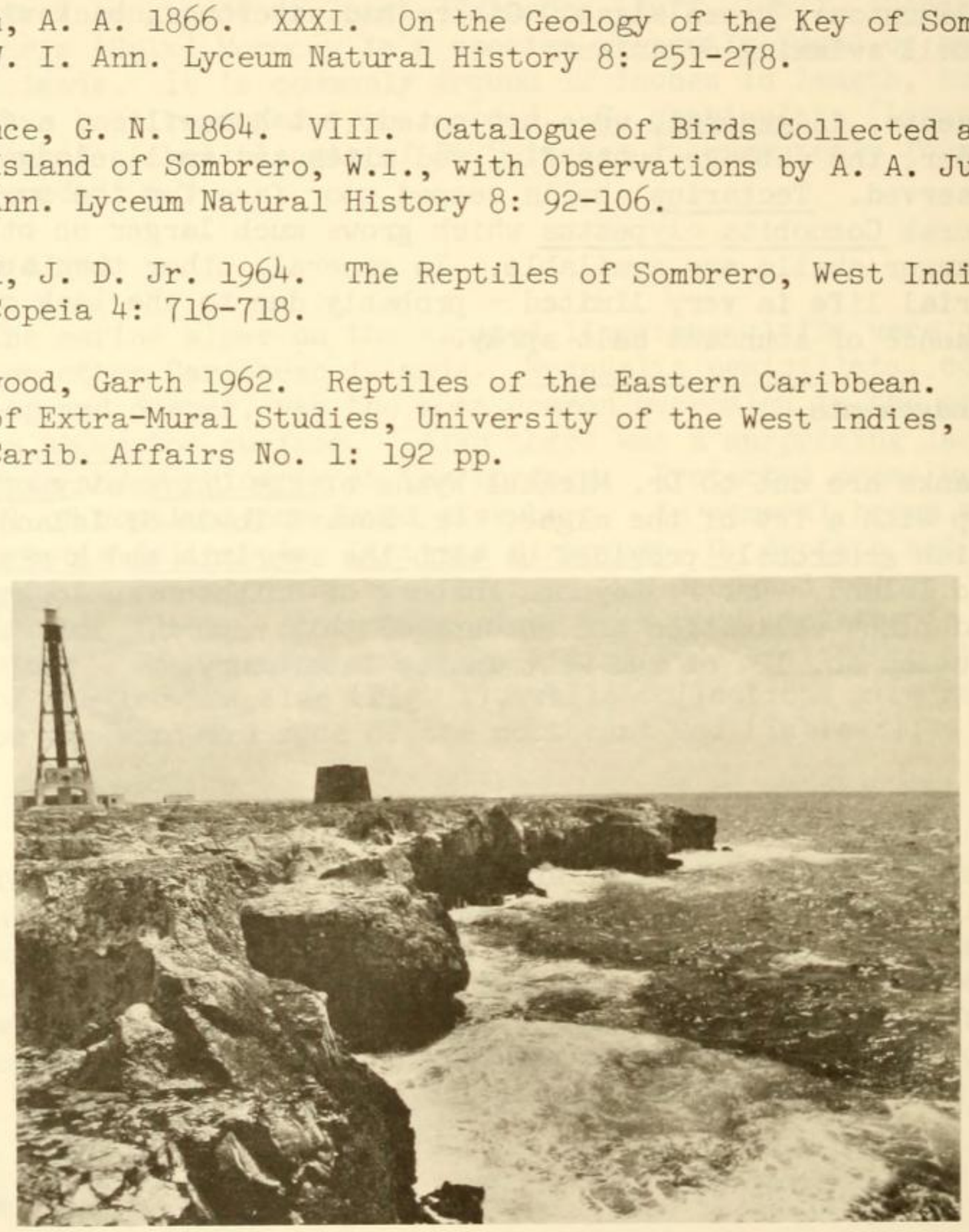

Fig. 2. Looking north at the lighthouse near Pt. Ray; windward side on a calm day showing precipitous nature of the island's shoreline.

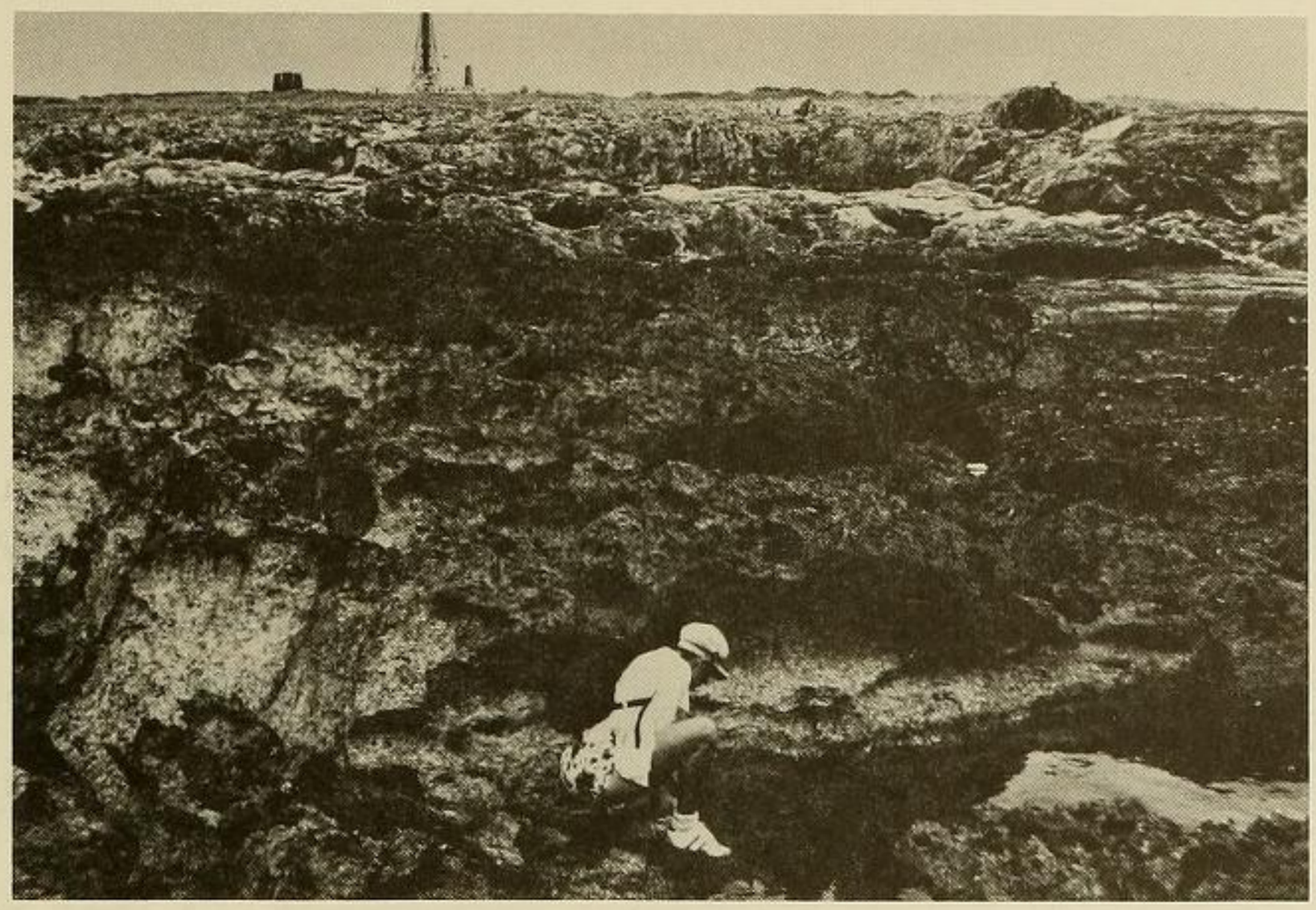

Fig. 3. Quarry area near our anchorage looking south toward the lighthouse.

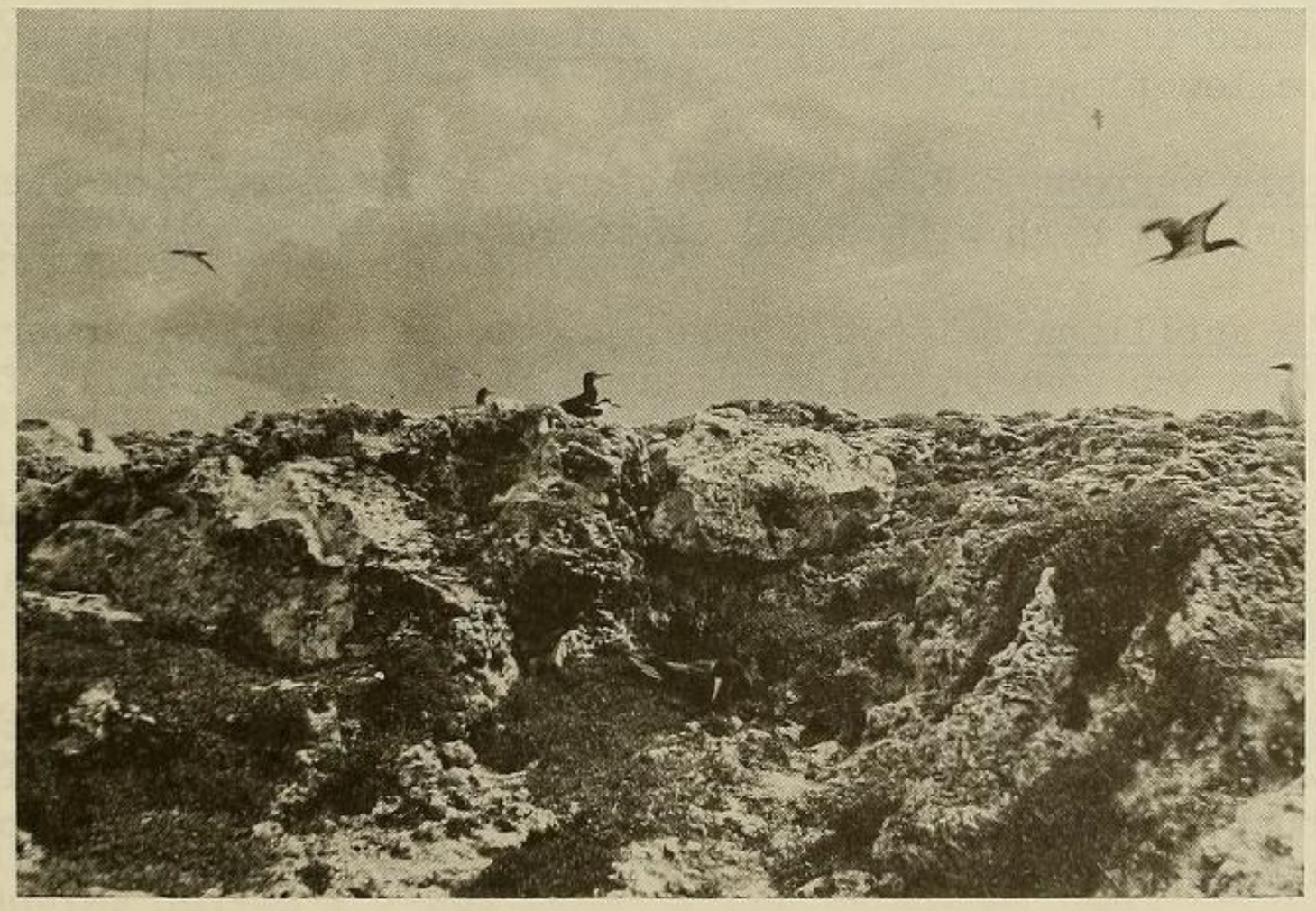

Fig. 4. Area A (Fig. 1) with nesting brown boobies on the predominant island vegetation (Sesuvium portulacastrum); bridled tern also present.

**TABLE I**

LAND PLANTS

Listed in order of apparent abundance

Sesuvium portulacastrum (L.) L., Aizoaceae - trailing succulent with light pink flowers; the most common plant on the island and possibly eaten by Amieva.

Euphorbia mesembrianthemifolia (Chamasyce buxifolia) Jacq., Euphorbiaceae - bushy, yellow-stemmed (basally woody) plant to 50 cm tall with small, ovate, vaguely succulent leaves in two ranks (the leaves strikingly angled); the second most common plant on the island.

Heliotropium curassavicum L., Boraginaceae - bushy, trailing plant with somewhat succulent, frosted looking leaves with small white flowers in a typical scorpioid spike; branches grow to 15-45 cm long; fairly common in moist, protected areas on the southern end.

Portulaca oleracea L., Portulacaceae - low, somewhat succulent herb found in an isolated patch; Amieva was observed eating the small yellow flowers.

Euphorbia serpens H.B.K., Euphorbiaceae - fragile, pink-stemmed, trailing herb with small ovate leaves; found with Portulaca.

Opuntia antillana Britton & Rose, Cactaceae - yellow-flowering cactus with 3-6 coarse, yellow spines; grows to 0.6 m tall; found isolated and locally abundant in a large, sloping pit.

Fimbristylis cymosa Roth, Cyperaceae - a low sedge somewhat 2-ranked at the base; blades slightly cupped basally; spikelets 3 mm long; found between the lighthouse and the landing.

Pluchea symphytifolium (Mill) Gillis, Compositae - a bush to 3 m tall with large, lanceolate leaves that smell like horse liniment; two bushes seen in the sandy area N.E. of the buildings; probably a recent introduction.

**TABLE 2**

**BIRDS: Comparative observations of Julien (Lawrence 1864) appear in parentheses**

Refer to Fig. 1 for lettered areas

Noddy tern (Anous stolidus) - nesting throughout in caves and crevices; 100 birds seen on nests; one egg per nest; probably 500 nests on the island (Julien describes the nest-building process); birds are aggressive.

Sooty tern (Sterna fuscata) - some nesting, mostly not (?); concentrated in area north of the lighthouse; about 100 birds total (associate with noddies). Area B.

Bridled tern (S. anaethetus) - mostly south of the lighthouse; some nesting; more common than sooty terns; probably several hundred birds total; many dead and sick among the rocks (Julien suggests it to have been the most abundant bird next to the noddies and royal terns; lays one* egg). * We saw up to three eggs per nest. Area D.

Roseate tern (S. dougallii) - one main colony in the south - a "grassy" area; not nesting, but probably do; a few were observed roosting on tailings mid-island; about 30-40 total. Area E.

Least tern (S.albifrons) - main concentration in the center of the island in a flat, pebbly area; no sign of breeding, but probably do; 20-30 birds total. Area C.

Royal tern (Thalasseus maximus) - one pair observed arriving in the evening and departing in the morning (nested in June; departed in August; present in variable numbers; disappearing during the day or for weeks).

Tropicbird (Phaeton sp.) - one seen overhead in the evening. (Julien saw one nest and small numbers of P. aethereus, but suggests they were abundant previous to mining years. He also described seeing one other species).

Laughing gull (Larus atricilla) - common on leeward bluffs (not abundant during Julien's stay; associating with the royal terns.)

Frigatebird (Fregata magnificens) - common (breed June - July).

Brown Booby (Sula leucogaster) - nesting at northern tip of the island; eggs and large young present; about 30 nests (?); roost on leeward rocks and off south end of island; about 60 birds total. Area A. (Fig. 4).

Ruddy turnstone (Arenaria interpres) - 1 pair seen at several sites on the island (small numbers present November - May).

Cattle egret (Bubulcus ibis) - 7 in the vicinity of the lighthouse.

## TABLE 3

MARINE ALGAE

**Rhodophyta (red algae)**

Amphiroa sp. (N1144) 0.5 m deep, small inlet
Botryocladia sp. 16 m deep
Callithamnion herveyi (N1142, N1177) uncommon, 1.5 m deep in small inlet and 5 m deep on wall.
Centroceras clavulatum (N1185) splash zone
Ceramium byssoideum (on N1143, N1169 & N1185) splash zone to 1.5 m deep.
Champia parvula (on N1151) 13 m deep
Chondria sp. (erect on N1151) 13 m deep
Chondria sp. (creeping on N1151) 13 m deep
Corallina subulata (N1154) 14 m deep
Crustose coralline cobbles (unidentified) 16 m deep
Gelidium pusillum 16 m deep
Griffithsia sp. (on N1151) 13 m deep
Grallatoria reptans (N1173) abundant exposed and to 1 m deep
Halymenia pseudofloresia (N1146, N1170, N1153) 5-16 m. had a striking bright orange on brown reticulation which turned plain rose-colored upon preservation.
Herposiphonia pecten-veneris (N1176) 16 m deep
Hypnea sp. 16 m deep
Hypoglossum tenuifolium V. carolinianum (on N1151 & N1154) 13 m deep
Jania adherans (with Amphiroa N1144) 0.5 m deep
Jania capillacea (on Laurencia obtusa N1143) 1 m deep
Laurencia intricata (N1160, N1185) 1 m & less in inlet and splash zone.
Laurencia obtusa (N1143, N1169) scattered to abundant - surface to 1.5 m deep
Laurencia papillosa (N1183) exposed in splash zone
Liagora valida (N1180) 14 m deep
Lophosiphonia sp. splash zone
Martensia pavonia (on N1151) 13 m deep, also seen protected near the surface.
Polysiphonia sp. (N1176) from Colpomenia 16 m deep
Taenioma purpusillum (N1185) splash zone
Wrangelia argus seen at the surface
Wrangelia pencillata (N1171, N1185) 1-2 m above the surface dominating a 1 m wide band in the splash zone
3 unidentified fleshy crusts - bright orange (most abundant), rose-pink and chocolate purple; very dominant from the surface to 2 m deep.
Unidentified polysiphonous red - 16 m deep, creeping on Lobophora (N1173)

**Phaeophyta (brown algae)**

Colpomenia sinuosa (N1179) 16 m deep, small plants
Dictyopteris delicatula (N1165, N1148) the most dominant alga from 2-3 m deep, but also found at 14 m deep.
Dictyota bartayreesii (N1168) 14 m deep
D. ciliolata (N1182) 14 m deep

**Phaeophyta (brown algae)** continued

D. dentata (N1167) scattered to abundant several meters deep; also abundant 9 - 14 m deep.
D. dichotoma (N1147) very abundant 9-16 m deep
D. divaricata (N1182) 16 m deep
D. sp. (N1164) 16 m deep
Dilophus alternans (N1166) 16 m deep, stunted
Lobophora variegata (with N1154) (N1163) abundant 16 m deep; common as a crust in shallow water and exposed.
Padina sp. (N1178) 16 m deep, scarce
Sargassum polyceratium (N1141) scattered or locally abundant, 1 m deep to exposed.
Sargassum sp. (N1162) 9 m deep on wall
Sphacelaria sp. (N1176) 16 m deep
Stypopodium zonale (N1161) small plnt 16 m deep
Turbinaria turbinata (N1140) scattered, surface to exposed.

**Chlorophyta (green algae)**

Acetabularia sp. 16 m deep
Anadyomene stellata (N1149) abundant on parts of the wall 5-8 m deep
Avrainvillea nigricans (N1150) 13 m deep
Bryopsis plumosa abundant in one inlet at the surface
Caulerpa microphysa (N1155) 1.5 m and 14 m deep
Caulerpa vickersiae 16 m deep
Cladophora sp. in tide pool
Halimeda discoidea (N1152) 13 m deep
Halimeda tuna (N1151) 13 m deep
Neomeris annulata scattered 16 m deep
Rhipiliopsis stri (N1176) on wall 8 m deep
N1174 unidentified long skeins of very fine green filaments (17µ diam); spray zone tide pool.
N1175 unidentified, branched, tangled, filamentous green 8 cm tall; spray zone tide pool.

**Cyanophyta (bluegreen algae)**

Trichodesmium thiebautii (N1186) quite common; planktonic
N1181
N1184
Oscillatoria sp. (N1176) common on wall

**TABLE 4**

FISHES

Feeding and Abundance Categories (Sombrero Island, Northern Half of Leeward Side)

Feeding Category Key:

C = Crustaceavore
P = Planktivore
F = Piscivore
H = Herbivore
G = Invertebrate Generalist
S = Invertebrate Specialist

Abundance Category Key:

1 = 0-1/hr.
2 = 1-2 hr.
3 = 2-5
4 = 5-10
5 = 10-25
6 = 25-30
7 = 50

| | | |
|---|---|---|
| C | 3 | Holocentrus rufus (squirrelfish) - mainly in boulder strewn cove. |
| C | 5 | H. ascensionis (longjaw squirrelfish) - base of wall; more common toward the seaward end. |
| C | 3 | Adioryx vexillarius (dusky squirrelfish) - among boulders in cove. |
| C | 1 | A. coruscus (reef squirrelfish) - base of leeward wall. |
| C | 3 | Flammeo marianus (longspine squirrelfish) - base of cliffs. |
| P | 4 | Myripristis jacobus (blackbar soldierfish) - boulders in cove. |
| P | 3 | Priacanthus cruentatus (glasseye snapper) - boulders in cove. |
| F | 5 | Lutjanus apodus (schoolmaster) - in schools on reef flats and near cliff base at seaward end. |
| F | 2 | Mycteroperca venenosa (yellowfin grouper) - large, near base of wall and out on reef flats. |
| F | 2 | M. tigris (tiger grouper) - large, at cliff base. |
| F | 1 | Epinephelus adscensionis (rock hind) - boulders in cove. |
| F | 1 | E. striatus (Nassau grouper) - under ledge near second mooring. |
| F | 6 | Cephalopholis fulva (coney) - along walls, base of walls and rubble. |
| P | 6 | Paranthias furcifer (creole fish) - over reef flats and south end of wall. |
| P | 5 | Gramma loreto (fairy basslet) - under ledges |
| C | 2 | Serranus tigrinus (harlequin bass) - rubble at base of cliffs. |
| F | 2 | Caranx latus (horse-eye jack) - over sand, south end of swim; chasing mackerel scads. |
| F | 5 | C. ruber (bar jack) - in water column near moorings. |
| P | 6 | Decapterus macarellus (mackerel scad) - in a few schools above reef flats. |
| F | 2 | Seriola rivoliana (almaco jack) - same as horse-eye jack. |
| F | 4 | Sphyraena barracuda (great barracuda) - along walls and over reef flats. |

FISHES (continued)

| | | |
|---|---|---|
| H | 5-6 | Kyphosus sectatrix (Bermuda chub) - cliffs, base of cliffs and over reef flats. |
| P | 4-5 | Hemiramphus balao (balao) - near surface at first mooring. |
| F | 1 | Gymnothorax sp. (moray) |
| G | 4 | Malacanthus plumieri (sand tilefish) - sand and rubble areas. |
| G | 4 | Mulloidichthys martinicus (yellow goatfish) - one group in boulders of cove. |
| G | 3 | Pseudupeneus maculatus (spotted goatfish) - small junction of reef flats and sand. |
| G | 1 | Calamus sp. (porgy) - over sand flats |
| C | 3 | Amblycirrhitus pinos (redspotted hawkfish) - sides and base of wall. |
| C | 1 | Equetus punctatus (spotted drum) |
| S | 2 | Holacanthus ciliaris (queen angelfish) - cliff base and walls at seaward end. |
| S | 3 | H. tricolor (rock beauty) - cliff base and outer (seaward) reef flats. |
| S | 2 | Pomacanthus arcuatus (grey angelfish) - one pair in shallow sand-bottom cove. |
| S | 2 | P. paru (French angelfish) - reef flats and cliff base at seaward end. |
| H | 5 | Eupomacentrus dorsopunicans (dusky damselfish) - juveniles common on walls. |
| G | 5 | E. partitus (bicolor damselfish) - common on deeper reef flats near seaward end. |
| H | 2 | Microspathodon chrysurus (yellowtail damselfish) - boulders in cove. |
| G,P | 5-6 | Abudefduf saxatilis (sergeant major) - inshore. |
| G | 2 | Chaetodon striatus (banded butterflyfish) - cliff base and walls at seaward end. |
| P | 5-6 | Chromis cyanea (blue chromis) - reef flats and cliffs at seaward end. |
| P | 5-6 | C. multilineata (brown chromis) - cliffs |
| P,G | 6-7 | Thalassoma bifasciatum (bluehead) - common |
| G | 2 | Halichoeres bivittatus (slippery dick) - sand and reef flats. |
| G | 4 | H. garnoti (yellowhead wrasse) - cliff base, especially the seaward end. |
| G | 3 | H. maculipinna (clown wrasse) - cliff base. |
| G | 2 | H. radiatus (puddingwife) - cliff base |
| P | 5 | Clepticus parrai (creole wrasse) - water column above reef flats. |
| G | 5 | Bodianus rufus (Spanish hogfish) - small to large along cliffs and cliff bases. |
| H | 2 | Scarus coelestinus (midnight parrotfish) - reef flats. |
| H | 4 | S croicensis (striped parrotfish) - cliff base especially the seaward end. |
| H | 4-5 | S. vetula (queen parrotfish) - cliff sides and bases |
| H | 2 | Sparisoma aurofrenatum (redband parrotfish) - cliff sides and bases. |

FISHES (continued)

| | | |
|---|---|---|
| H | 3 | S. chrysopterum (redtail parrotfish) - cliff base. |
| H | 1 | S. rubripinne (yellowtail parrotfish) - reef base. |
| H | 4-5 | S viride (stoplight parrotfish) - cliff sides and bases. |
| H | 5 | Ophioblennius atlanticus (redlip blenny) - cliff sides |
| H | 3 | Bathygobius sp. (goby) - splash zones on the north end. |
| H | 4-5 | Acanthurus bahianus (ocean surgeon) |
| H | 4 | A. chirurgus (doctorfish) - seaward reef flats |
| H | 6-7 | A. coerulens (bluetang) - cliffs. |
| S | 3 | Balistes vetula (queen triggerfish) - over reef flats. |
| P? | 5 | Xanthichthys ringens (Sargassum triggerfish) - over reef flats and in water column. |
| H | 4-5 | Melichthys niger (black durgon) - over reef flats at moorings. |
| G | 2 | Cantherhines macrocerus (whitespottted filefish) - large, at cliff base. |
| G | 2 | C. pullus (orangespotted filefish) - cliffs. |
| G | 1 | Alutera scripta (scrawled filefish) - cliffs. |
| G | 2 | Lactophrys bicaudalis (spotted trunkfish) - cliff base. |
| G | 2 | L. triqueter (smooth trunkfish) - cliff base |
| G | 1 | Diodon hystrix (porcupinefish) - cliff base in a cave. |

**TABLE 5**

Summary of Abundances of Fish Feeding Guilds

| Feeding Category | Symbol | No. spp. per Category | % of Total No. of Species | Category Abundances | % of Total Fish Seen |
|---|---|---|---|---|---|
| Herbivores | H | 16 | 24 | 59 | 26 |
| Invertebrate generalists | G | 18 | 26 | 51 | 23 |
| Invertebrate specialists | S | 5 | 7 | 12 | 5 |
| Crustaceavores | C | 8 | 12 | 21 | 9 |
| Piscivores | F | 11 | 16 | 31 | 14 |
| Planktivores | P | 10 | 15 | 50 | 22 |
| Total | | 68 | | 224 | |