IMPERIAL COLLEGE

OF SCIENCE & TECHNOLOGY

ST. KITTS

1960

THE EXPLORATION BOARD

IMPERIAL COLLEGE EXPLORATION BOARD

IMPERIAL COLLEGE ST. KITTS EXPEDITION 1960

Final Report

Imperial College of Science and Technology
February 1961.

SECTION A - GENERAL

by

Shelagh Hocking

ADMINISTRATION

This was the first women-only expedition to be sent out from Imperial College. The aims of the expedition were to visit the island of St. Kitts in the Leeward Islands to make a rough survey of the fauna for the British Museum (Natural History), South Kensington, and to make specialised collections of different zoological groups for the Natural History Museum, and for private collectors.

Members:-

Miss Shelagh Hocking (Zoology II)
Miss Anne Phillips (Zoology II)

PREPARATION

Preparation for the expedition was found difficult because the members were working for very heavy exams, and with only two people each member had to carry a great deal of responsibility. Original plans for the expedition were started in February 1959, when there were three members of the expedition, two geologists and Miss Phillips. Miss Hocking was included in October 1959, together with one other zoologist. Finally, on the recommendation of the Imperial College Exploration Board, it was decided to cut the expedition to two members only. For personal reasons it was more convenient for the two women members to carry on alone, and this was decided in January 1960.

PUBLICITY

The expedition gained much publicity and earned a little of their finances in this way. Publicity was organised through an agent

recommended by the Exploration Board, Mr. George Greenfield of Farquharson Ltd., 15 Red Lion Square. Mr. Greenfield has been very helpful and taken a great deal of trouble.

The publicity gained was as follows:-

Two television appearances before departure, one with B.B.C. and one with Independent Television Ltd.,

Three radio interviews, one of which was broadcast in Grenada for listeners in St. Kitts, and the expedition was widely known about in St. Kitts when the members arrived.

Newspaper articles appeared in:- "Times, Evening Standard, Star, Kent Messenger, East African Standard", and local West Indian papers. Some of these were found to be highly inaccurate, especially one in the local St. Kitts paper which described the expedition as "two people from Tanganyika who have come to look for flowers".

SCIENTIFIC EQUIPMENT

This was obtained from the following sources:-

1. British Museum (Natural History)

Consisted of all the collecting gear. One padded crate with large jars containing formalin for reptile collecting. Presses etc., for botanical collecting. Sweep nets, butterfly nets, ground traps etc., for entomological collecting.

2. Grundig. Ltd.,

One "Cub" tape recorder was lent to the expedition. Spare tapes and batteries were bought on expedition funds. Unfortunately the recorder was found quite inadequate for the conditions and work

required and broke down early in the trip, and was unable to be repaired.

3. Smiths Clocks and Watches Ltd.,

Two ladies wrist watches were given to the expedition. One of these was stolen from a haversac in Antigua; the other was found to stand up to the very wet conditions very well, but was inclined to lose time.

4. Royal Geographical Society.

1 Altimetre.

1 Compass.

5. Purchased through the College:-

Silica gel.

Glass insect tubes.

Paradichlorobenzene.

6. Imperial College Exploration Board.

2 Kelvin barometers.

all the necessary camping equipment.

7. Purchased elsewhere:-

Ethyl acetate.

Note books etc.,

FREIGHT ON OUTWARD JOURNEY

All the freight was packed in 9 tea chests and shipped direct to St. Kitts, free of charge, by the Harrison Line. The freight had to leave two months before the members of the expedition. Carting in London

was carried out by Thomas Meadows Ltd., who were found to be very unreliable. At the last minute there was also some difficulty over the contents of the freight as certain items, namely ethyl acetate, 'Flypel' etc., were listed as 'dangerous chemicals'. The Harrison Line, however, kindly solved this problem by taking the freight as deck cargo, not in the hold. It sailed in S.S. 'Novelist' on 11. 6. 60. Mr. Emile Delisle of Delisle Walwyn and Co. Ltd., Basseterre, St. Kitts, agreed to deal with it when it arrived the other end. The expedition members had met Mr. Delisle in London while he was on leave.

The freight consisted of the following:-

Food

Ostermilk	Rice
Jam	Dates
Tinned plums	Dextrosol tablets
Shreddies	Margarine
Sugar Puffs	Lifeboat biscuits
Powder soup	Rich cake
Dried vegetables	Salt
Curry powder	Coffee
Marmite	Tea
Condensed milk	Luncheon meat
Egg powder	Bully beef.

Items such as sugar and fresh fruit were purchased in St. Kitts.

Other Equipment

Steel wool	Polythene water jug and basin
Enamel plates and cutlery	Primus
Polythene sheets	Nesting billies
Aerosol insect spray	2 Kelvin barometers
Gammaxane	2 Tilley lamps
Toilet rolls	Tent
Polythene bags	Knives assorted sizes
Botany collecting gear	Biscuit tins for specimens
Glass tubes Field haversacs	Silica gel
Small collecting boxes	Ethyl acetate
All-purpose tape	Note books
Canvas bucket	Kite nets
Rope	P.D.B.
Cetavlex antiseptic cream	2 Sweep nets
Avachlor tablets	2 Pack frames
Penavlon	1 Camp bed
Antisnakebite serum	Ground trap
First aid kit	Chest of reptile collecting gear.
Kleenex	

All pharmaceutical requirements were provided by I.C.I. free of charge.

£12 B.W.I. (British West Indian) were charged as duty on the freight entering St. Kitts. This was a considerable reduction on the true duty payable, as St. Kitts makes its revenue on exorbitant duty on entering goods. £ 6 B.W.I. was charged as porterage and lighterage.

On the return journey only £ 7 B.W.I. was charged as porterage and lighterage, the freight being shipped through H.F. Wildy and Co. Ltd.,

There was much delay in the return of the freight due to the doubt of the Harrison Line agent in St. Kitts that it was returning free of charge, and also the disrupting of the shipping at that time due to Hurricane 'Donna'

The freight list on the return journey was as follows:-

2 Tilley lamps	Canvas water bucket
1 Field haversac	Cutlery
1 Altimetre	Plastic sheets
1 Compass	Steel wool
1 Butterfly net	Collecting bowes
4 Pairs dunlop boots	Nesting billies
2 Kelvin barometers	4 Biscuit tins dried specimens
2 Enamel cups and plates	Tent
Botany pressing gear	Entomology collecting gear
Polythene jug and basin	Reptile collecting gear with 8 jars specimens.
Primus	

PEOPLE SEEN FOR ADVICE AND ASSISTANCE BEFORE LEAVING

Dr. Gwynne Vevers of the London Zoo gave us advice on collecting specimens, and also mentioned the animals that the Zoo would be interested in. None of these were found.

David Attenborough of the B.B.C. interviewed the expedition and gave much helpful advice on equipment, keeping animals under expedition conditions and firms to approach for equipment.

Mr. E.G. Donohoe and Mr. Ken Law of the West Indian Dept., Colonial Office spent a great deal of time contacting the Administrator and other officials in St. Kitts, to tell them of the expeditions arrival.

Through them we made a number of very useful contacts in St. Kitts itself.

Mr. Emile Delisle was met in London while on leave from St. Kitts, offered to take care of the freight when it arrived, and gave advice on the conditions and clothing necessary.

Dr. W.E. China, Dr. D.J. Lewis, Dr.Stearn and Miss Grandison of the Natural History Museum all gave us much advice and loan of equipment.

Prof. G. Macdonald of the London School of Tropical Medicine and Hygiene advised us on the medical requirements of an expedition to the tropics.

CORRESPONDANCE IN ST. KITTS

Lt. Col. H.A.C. Howard, Administrator, gave official permission for the expedition to visit the island, and the names of a number of people who were useful contacts. Unfortunately Col. Howard was on leave while the expedition was on the island, but a great deal of assistance was given by Mr. Sam Graham, Acting Administrator. Mr. Graham arranged for accommodation when the expedition first arrived, and took a great deal of interest in the activities of the party.

A courtesy letter was written to Mr. Southwell, Chief Minister in St. Kitts. This was written on the advice of the Colonial Office, who said that protocol was very important in such a small island.

On the recommendation of Col. Howard, the following people were written to in St. Kitts.

Mr. Goefrey Boon[illegible]or of [illegible]field Estate, with one of the few running rivers on the island. The expedition subsequently spent a week

working on the Wingfield River.

Mr. Bertil Owen manager of Molyneux Estate which runs up to Phillips Level, the pass between the Middle Range of mountains and the South East Range. Mr. Owen kindly lent transport when the expedition made a trip over the old, now disused military road across the level. Most of the journey has to be done on foot.

Mr. Harmon Abbott is the Superintendent of Agriculture in St. Kitts and introduced us to the problem of mealy bug in pineapplies on Mansion Estate, and also took us round Bayfords, the Government Stock farm.

Mr. Campbell Evelyn of Buckleys Estate is the islands best mountaineer, and became our guide and adviser for all trips around the island to places off the beaten track.

FINANCES

Up to the last minute the expedition was very short of money, and there was much doubt that the party would be going at all. The Exploration Board of Imperial College had made us a grant of £100, but when finances were so desperate, went to a great deal of trouble to find us a further £50. Apart from this we only had £40 from each of the two expedition members.

Mr. George Greenfield, of Farquharson Ltd., the expedition's publicity agent, contacted the publishers who might be interested in giving us an option on a book. Eventually Mullers Publishers Ltd., gave £100. This was on the understanding that the book would be written after the members had taken their final exams in March 1961.

During the last week before the expedition was due to sail the Royal Geographical Society donated the expedition £50.

Therefore the money available was as follows:-

	£
Imperial College Exploration Board	150
Contribution of expedition members	80
Mullers Publishers Ltd.,	100
Royal Geographical Society	50
TOTAL	£380

Expenditure was as follows:-

£50 was deposited on the fares early in March and then a further £210 paid nearer the time of sailing.

£35 was spent on food and equipment bought through the college.

£5 was spent on sundry expenses.

£10 was taken in Sterling for use while travelling.

£10 was converted to West Indian Dollars for use while in transit to St. Kitts.

£60 was transferred through the college to the Bank of Canada in Basseterre, St. Kitts.

TOTAL = £380.

The money transferred to St. Kitts was spent on sundry expenses, extra equipment, small fares etc.,

The Exploration Board undertook the insurance of all expensive equipment i.e. cameras (1 Voetlander Veto B, 1 Zeiss Contina, 1 1A Kodak) camping equipment, watches etc., They also insured personal baggage, but this was paid for by the expedition members. Freight was insured through the shipping company. Out of this, one watch was claimed as this was stolen from a haversac in Antigua.

The Board also insured the lives of the expedition members, and £100 medical attention. This was not claimed owing to the kindness of the various people who gave medical attention.

TRAVEL ARRANGEMENTS THROUGHOUT THE TRIP

By far the most expensive item of the trip was the cost of fares. The expedition spent a great deal of time assisted by the Hampstead Travel Agency, trying to discover the cheapest method of travelling. Shipping lines which ran cargo boats only, refused to take women, so more orthodox methods had to be used. Also the French Line refused to allow European girls to travel dormitory class on their boats. The reason for this was understood when the expedition travelled one class up from this - tourist with cabin accomodation. This method is not be be recommended for women, and the journey would have been exceedingly unpleasant except for the kindness of the French Line in allowing the expedition to use First Class facilities. On the return journey the boat was carrying 200 coloured soldiers in the tourist class, and gave us first class cabin accomodation for the same price. The round trip by boat, travelling tourist, cost £98 each as 10% reduction was given by booking for a return journey. This compares with £135 single for First Class fares.

The dates and means of travel were as follows:-

On the 10. 7. 60 the expedition sailed from Southampton on the French Line vessel "Colombie". The boat arrived in Point-a-Pitre, Guadaloupe on the 20. 7. 60. The expedition found accomodation in Point-a-pitre, and owing to a misunderstanding had a delay of two days before flying by Pan American to Antigua.

Owing to the previous misunderstanding, the plane failed to connect with the plane bound for St. Kitts, and a further delay of 1 day, was spent in Antigua.

The expedition finally arrived in Basseterre St. Kitts at 7 a.m. on the 23rd July. The expedition was met by the Acting Administrator, Mr. Sam Graham. The airline operating in this area was the Leeward Island Air Transport (L.I.A.T.)

The expedition returned to Antigua on the 26th July; this was to do some collecting in this island with much drier conditions, and also to see the annual Antigua Carnival and take photographs for use in the book. The intention was to camp near the beach, but the Administrator of the island, Mr. Ian Turbott, would not allow this and lent the expedition a government house for the duration of their stay.

The party returned to St. Kitts on the 4th August, again by L.I.A.T.

Mr. Kit Wigley, of West Farm Estate, St. Kitts, took the expedition to Nevis by air for one day on the 25th August. It was planned to return to Nevis to visit the recent agricultural schemes, but this had to be abandoned owing to hurricane 'Donna'.

The returning freight was due to be handed in to Wildy and Co., for shipping on the 16th September, and the return bookings for the party members were not until the 23rd September. Miss Phillips went to Nevis to stay with friends, and Miss Hocking to Antigua. The plane was due to leave on 21st from Antigua, but it was found more convenient as it avoided spending time in hotels in Guadaloupe, to charter a plane on the morning of the 23rd. Allowing for the money that would have been spent

on hotel bills, and including the refund from Pan American, this worked out at the same price as the scheduled fare.

On the 23rd September the expedition sailed on the "Colombie" from Point-a-Pitre, arriving Southampton on the 4th October.

ADMINISTRATION DURING TRIP

The arrival and departure of freight is dealt with under the heading 'Freight'.

A laboratory was made available for the use of the expedition throughout their visit to St. Kitts. This was arranged through Mr. Sam Graham, and by permission of Mr. George Warren, manager of St. Kitts Sugar Factory. The laboratory belonged to the research dept., of the St. Kitts Sugar Association, and was free for use owing to the fact that the association were very short staffed at the time.

Throughout the stay of the members in the West Indies, transport was lent, Miss Hocking having an Antigua and St. Kitts driving licences. Cars were loaned by Mr. James Irby of the Pan American Missile Base, who had a Humber Hawk, and Mr. Wigley of West Farm Estate, St. Kitts lent a Morris 1000 shooting brake for the whole duration of stay of the expedition. The Sugar Association lent a Landrover for heavy work such as collecting freight, and private estate owners lent jeeps etc., for trips into the wetter, steeper parts of the mountains. As transport to the base of the crater of Mount Misery, before beginning the climb, Belmont Estate provided a tractor and trailer!

A visit was made to Brimstone Hill in St. Kitts as a site of local historic interest. Brimstone Hill is described under the section "History of St. Kitts".

In Antigua visits were made to English Harbour which was used by Nelson, and to historic sites in Nevis, such as the Church where Nelson was married.

In St. Kitts, a day's excursion was made over Old road, across Phillips level (see map) where the old military road connecting the British parts of the island used to run, the French sections being on each side. This is now in complete disuse, and cannot be entirely traversed even on horse back, but there are plans to renovate it as it is one of the most picturesque walks on the island.

Various attempts were made to climb the mountains described under the section on scientific trips, but these proved fairly inaccessible due to the constant bad weather at this time of year.

On first arriving at St. Kitts, Mr. Sam Graham made arrangements for us to stay with Mr. and Mrs. Z. Jagr of Bata Ltd., in Basseterre itself. A week was spent in getting to know the island and various estate managers. Police permission was not given for the expedition to camp, and this was regarded with horror by most people. We felt that this was due to the fact that the type of life is such for the average white person, that camping is never necessary, or viewed as a pleasure. Alternative accomodation was always provided, as hospitality abounded everywhere, and the subsequent weather proved so atrocious that camping could have proved disastrous.

Another factor was that every available piece of land of suitable gradient was planted with sugar cane, leaving very little choice for camp sites.

After staying in Basseterre, a week was spent on Wingfield Estate with Mr. Stewart Davis, working on the Wingfield river.

The rest of the time in St. Kitts was spent at West Farm Estate with Mr. Kit Wigley. During the stay at West Farm, Hurricane 'Donna' passed through the East Indies. This was given good radio warning in advance, and a great deal of work had to be done on the estate, dealing with livestock battening down the house etc., The house remained shuttered from the evening of Saturday, 2nd September until the Monday morning, the hurricane passing through on Sunday night. The front of the hurricane was 200 miles wide and St. Kitts was 50 miles from the centre, so was not affected as badly as the neighbouring island of Anguilla which was devastated. Telegraph poles, trees etc., were uprooted but there was no loss of life. The hurricane succeeded, however, in disrupting many of the plans of the expedition, such as that of a trip round the narrow gauge sugar cane railway, and the obtaining of a 'mountain chicken' from Montserrat.

HISTORY OF ST. KITTS - from "Historical Geography of St. Kitts and Nevis" by Gordon C. Merrill.

Much of the interest of St. Kitts lies in the knowledge of some of its varied historical background, and a very much condensed account is given here taken from Gordon Merrill's extremely interesting book.

The island of St. Kitts was discovered by Christopher Columbus in 1493 on his second voyage to the New World, who named it St. Christopher; this was shortened to St. Kitts at the end of the seventeenth century. For a hundred and twenty five years, St. Kitts was unsettled by Europeans, left as the forested home of the Caribs. Spain was the dominant country in the Carribbean at the end of the sixteenth century, and was uninterested in St. Kitts for several reasons:

1. She was more interested in Hispaniola, Cuba and the mainland.
2. The island was occupied by the war-like Caribs.
3. The island lacked mineral wealth.

After 1550, the English, French and Dutch came on the scene ready for booty, trading in contraband, cutting logwood and making salt. Sir Francis Drake visited the island in 1585 with 25 ships and 2,300 men.

Both the island of St. Kitts and Nevis were a source of logwood Haematoxylum campectlianum which is still present, and Lignum vitae which has since disappeared.

Colonisation of St. Kitts by the English and French began in the early 1620's Thomas Warner was founder of the original English settlement, and his grave is still to be found near to Old Road in the island. He chose St. Kitts because:

1. By this time it lacked a strong Carib population.
2. It was a relatively isolated island.
3. The island held greater promise of fertility.

Thomas Warner landed in 1624 in the 28th January with thirteen others, and founded the first successful colony in the West Indies.

Later the French and the English divided the island and lived in forced and intermittent enmity for more than four decades. St. Kitts served as a mother colony for the British as it was from here that later parties set out bound for other islands.

Originally the colonies were friendly with the natives, but a combined English and French massacre took place within a few years and the Indian occupation ended in 1627.

Archaeology is rich in St. Kitts, there being pictographs, stone carvings, pottery, shell implements, kitchen middens to witness to a considerable population since prehistoric times. The Carib name for St. Kitts was Liamuiga which means the Fertile Isle. St. Kitts from the beginning was agricultural; tobacco, cotton and indigo were grown prior to the establishment of sugar.

The introduction of sugar is credited to the Portuguese Jews from Brazil, and by 1658 there were 3 mills under the rule of Governor de Poincy. The full history of sugar cane is dealt with under the section on sugar.

One of the most interesting places in St. Kitts is Brimstone Hill, otherwise known as the "Gibralter of the West Indies". This is a very steep rising subsiduary cone of Mount Misery on the North Eastern part of the island. It is a natural fort, with a view of the St. Kitts/Nevis channel and the first guns were placed there in 1690 when the island was in French possession. Many battles were fought in the area and after some

brilliant manouvres, Brimstone Hill came under British rule. A full scale fort was built in various stages, but in 1851 it was abandoned as a post of defence, and acts of vandalism have gradually desecrated the buildings. They are, however, still in remarkably good state of repair.

TOPOGRAPHY AND GEOLOGY

St. Kitts and Nevis are in the northernmost section of the arc of the Lesser Antilles which sweeps from Grenada in the south to Saba in the north. It is 40 miles South East of Saba centred on 17° 15 N., 62° 40 W. The main part of the island is a volcanic mass, but a narrow low lying peninsular extends five miles to the South East. St. Kitts is separated from Nevis by a channel two miles wide.

PENINSULAR:-

This begins with a broken region of low lying hills, the Conaree and Morne Hills, and terminates in a wide triangular knob with peaks up to 1,100 feet. Within the peninsular hills are restricted areas of flatter land, and a large salt lake is enclosed. The relief is in the form of hills which are the remnants of ancient volcanoes, greatly reduced by denudation.

MOUNTAIN AREA:-

The mountainous area appears as one mass, but a broken ridge of uplands can be traced from South East to North West. There are three distinct ranges of volcanoes:

1. The South East or Olivees Range.
2. Middle Range
3. North Range which consists of Mount Misery 3972 feet.

There are also numerous adventitious cones e.g.

1. Brimstone Hill on Mount Misery, 779 feet.
2. Monkey Hill far down slope of Olivees, 1,174 feet,
3. Ottley's Level on Middle Range, 1,709 feet.

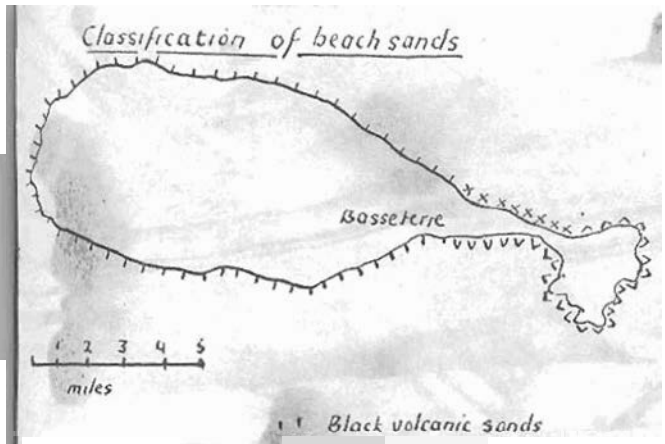
The topography of the island suggests youth and recent growth, the old worn volcanoes of the peninsular stand in contrast to the young volcanoes of the Middle and North Ranges.

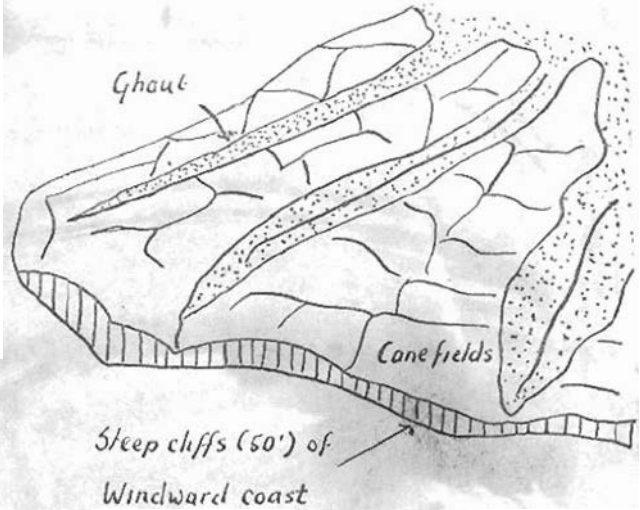
A radial drainage pattern has produced deep ghauts and series of ridges reaching from sea level to the summits. These ghauts are generally dry except for a few hours after rain, and then water rushing down can cause phenomenal damage. The expedition observed this on the 21st August 1960 when the maximum rain was 8" in three hours and all roads etc., were impassable. The Wingfield river on the Leeward side of the island is one of the few permanently running streams. The upper slopes of the volcanoes are unstable as is evident from numerous land slides observed on Mount Misery. Work planned by the expedition on the crater lake in Mount Misery had to be abandoned as a landslide had obliterated the lake.

Mt. Misery is stated to have erupted in 1693; this is not believed by G.C. Merrill of Carleton University, but fumarole activity still continues.

COASTAL AREAS

The rise of the sea level during post glacial times (100ft) has produced sea cliffs which are seldom higher than 50 ft., and are more pronounced on the windward than leeward side.





Shoreline Features of St. Kitts

There is great scarcity of beaches, and where found they are of black sand. The only white sand beaches are found in the salt pond area. A small reef is found on the Atlantic side of the island, but is entirely absent on the Carribbean side.

Lava flows are uncommon on the island. Mount Misery has a single flow of basalt, overlain by younger deposits except for exposure on the North East coast where it is known as 'Black Rocks'. Recent volcanic activity is evident in Brimstone Hill; the hill itself is a plug of andesite which was extruded and carried up on its flanks and shoulders the upturned beds of limestone which occur on all sides of it except the North East.

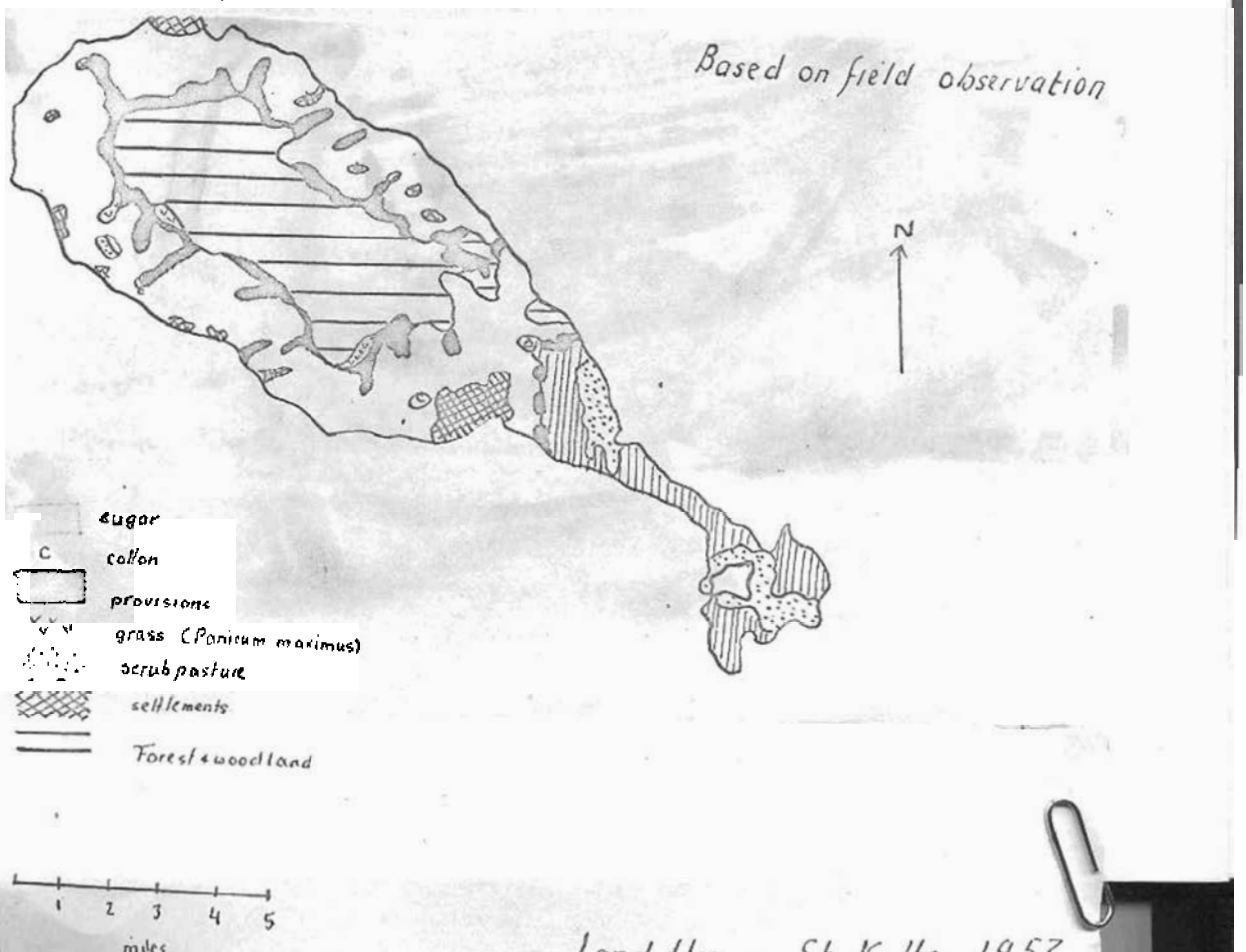
GEOGRAPHY

Estate Agriculture in the Twentieth Century

Ninety nine per cent of the estates grow sugar cane and this is discussed under the section on Sugar.

Guinea grass, Panicum maximum, is planted on a few acres of high land on the leeward side. This is cut and fed to horses and cattle which are kept in pens in the estate yards.

The Department of Agriculture operates one Estate, Bayfords, as a dairy farm. Here Hereford and Jersey pedigree cattle are kept for sale, and for servicing of estate cattle. This estate provides the only fresh milk supply on the island, apart from a little produced by Frigate Bay estate. Two estates in the peninsular support livestock, and a very little salt is produced from Great Salt Pond.



PEASANT AGRICULTURE

Little land is available in St. Kitts for other than sugar cane, so there are few people with sufficient knowledge to make full use of the land that is available. The greater yam, Dioscorea alata, was introduced by Europeans as a slave food and is still widely grown. Bread-fruit, Artocarpis communis, is very common in the ravines and is widely used as a shade tree. Apart from this the only land available is steep mountain plots. Tree crops are common on the whole, e.g. mango, coconuts, soursop, custard apple, paw paw, limes, bananas, plantains, avocado pears etc., which are grown mainly within the limits of the villages. Also found are bitter and sweet cassava, pigeon peas, beans, yams, sweet potatoes and tannias. The surplus produce is taken to market, but few villages meet all their own needs.

THE PRINCIPAL ITEMS EXPORTED FROM ST. KITTS, NEVIS AND ANGUILLA

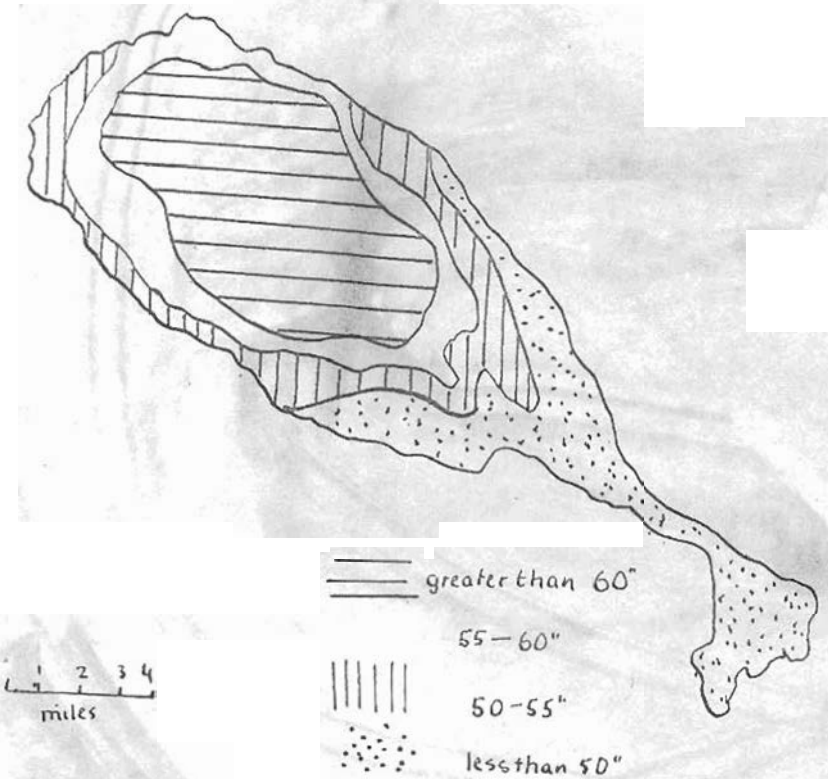
Sugar	47,001 tons
Molasses	1,228,003 galls
Cotton	425,293 lbs.
Salt	9,326,400 lbs.
Copra	309,871 lbs.

CLIMATE

St. Kitts has a tropical climate ranging from that of the seasonally dry lowlands, with xerophytic vegetation to the constantly wet highlands clothed in rain forest. On the whole it is a very comfortable climate as the island is situated in the North East trades.

Average temperature per annum	= 79 F.
January average	= 76.4 F
July average	= 80.9 F
Average Annual extremes	= 65.5 and 89.9 F.
Average relative humidity	= 75%

RAINFALL



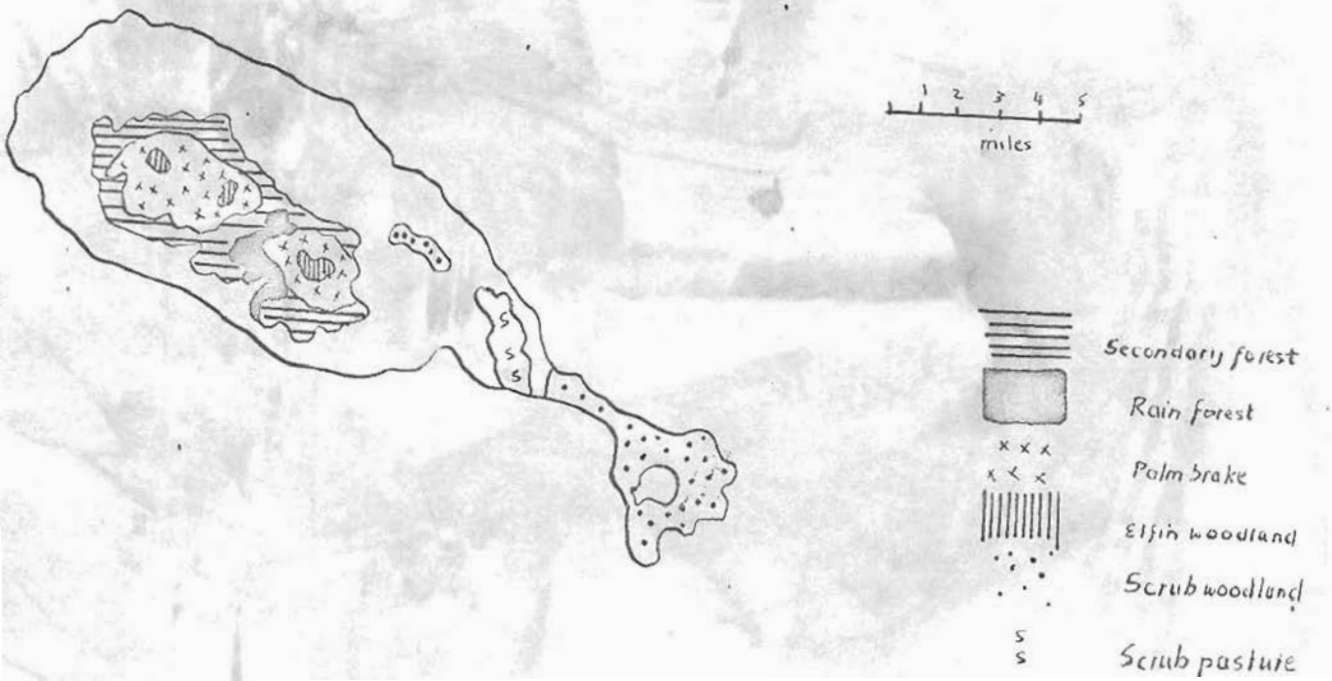
Map of Average annual Rainfall in St Kitts.

The rainfall is one of the major concerns of the island as it varies greatly from area to area and from one year to the next. Basseterre gets about 50" a year. Most of the precipitation is in intense showers of short duration. e.g. during the stay of the expedition on 20/8/60 8" was recorded in 4 hours on West Farm Estate. Most of the estates receive far more than 50", Wingfield being notably one of the wettest on the island. The ease and monotony of the tropical climate, common to the Leeward Islands is broken on occasion by tropical hurricanes which form over the Atlantic Ocean to the South East. Hurricane 'Donna' passed over St. Kitts on the 4/9/60 causing little damage to St. Kitts, but a great deal to Anguilla.

The hurricane was heralded by a lull in the trade winds and fall in the barometric pressure, together with a very overcast sky. This particular hurricane was recorded as having winds up to 150 m.p.h. and was moving forward at a speed of 17 m.p.h. which is greater than the average 15 m.p.h. The effects of the hurricane were felt for 3 days.

VEGETATION

The plants and animals found reflect the environment conditions. More than three centuries of European settlement have witnessed many changes in the fauna and flora, for which man is responsible.



Vegetation Map. St Kitts.

Table of distribution of tree flora in the Lesser Antilles

	Dry Zone	Swamp	Rainforest	Mountain Zone
Trees of wide distribution in the Greater Antilles and Tropical America.	40%	100%		8%
Migrants from Puerto Rico	28%		17½%	27%
" " S. America	12½%		16%	12%
Endemic to Lesser Antilles	"		42%	53%
Erratic or disjunct dist.	7%		7%	
Native trees. (total No.)	103	8	102	23

Climatological Data for Basseterre, St. Kitts.

	Jan.	Feb.	March	April	May.	June
Mean monthly temp °C	24.70	24.70	24.70	25.50	26.30	26.80
Mean monthly temp °F	76.40	76.40	76.40	77.80	79.30	80.20
Average rain in inches over 40 years.	3.48	1.95	2.11	3.18	3.90	4.02
Mean relative humidity	76.00	74.00	70.00	74.00	76.00	77.00
% cloudiness	48.00	44.00	44.00	48.00	56.00	61.00
days with precipitation	17.80	14.70	13.20	12.70	13.60	17.40
days with thunderstorms	-	-	-	0.20	2.80	2.80
mean wind velocity metre/sec.	4.47	4.34	4.60	4.34	4.02	4.65
mean wind velocity mile/hour	10.00	9.70	10.30	9.70	9.40	10.40

	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Mean monthly temp. °C	27.20	27.40	27.40	27.10	26.50	25.30	26.10
Mean monthly temp °F	80.90	81.30	81.30	80.70	79.60	75.80	78.90
Average rain in inches over 40 years	4.34	5.37	5.38	6.11	5.22	3.67	49.73
Mean relative humidity	76.00	77.00	78.00	78.00	78.00	75.00	76.00
% cloudiness	53.00	50.00	52.00	50.00	48.00	43.00	50.00
days with precipitation	17.30	18.00	17.70	18.30	15.30	17.80	193.70
days with thunderstorms	2.50	1.50	4.10	3.40	2.20	1.00	20.50
mean wind velocity metre/sec.	4.96	4.70	4.16	5.08	3.71	3.89	4.25
mean wind velocity mile/hour	11.10	10.70	9.30	6.90	8.30	8.70	9.50

The tree flora of the lowland zone is relatively rich in species of wide distribution in Central and Tropical America and Greater Antilles as dispersal of seed by birds and ocean currents is effective in lowland zones. There is greater selection in the rainforest and montane zone, where birds alone are effective. The lowland is subject to far more human disturbance, with a number of species introduced and since naturalised, e.g. wild coffee, found in the forest. The long history of intensive land use in the lowland zones has removed all vestiges of natural vegetation; everywhere except in the dry peninsular agficultural crops prevail.

The mountains are clothed in dense tropical forest strongly modified at lower elevations by man. There is strong definition of vertical zonation.

1. Undisturbed Rain Forest

This is rare. Even in better stands there is secondary growth after human damage or storm damage. Where found it is of simple floristic composition with few species. The upper story - 90 to 100 ft. above the ground consists mainly of gumlin trees, Dacryodes excelsa, this composing 40% of the rain forest. The cabbage palm, Euterpe globosa, comprises another 30%. The Guana sweet wood, Aniba bracteata, and a number of species of Sloanea make up another 7%. Sloanea is the burr wood. There is an irregular understory composed of upper story species, grown to a height of 10 to 40 ft. climbing, and also cabbage palms and lianes. The ground species are relatively sparse.

2. Forest affected by seasonal drought.

This is found below the rain forest and consists of the same species in a less luxuriant form.

3. Montane.

This is found above the rain forest, where growth is limited by the winds.

4. Secondary Forest.

This is far more widespread than any of the preceding types, and also consists of more species. The trees grow to a height of 40 to 60 ft. and are found immediately above the crop land. The forest contains cleared pockets used by the coloured population for raising provisions. The tree fern, Cyathea arborea, is common as a fast invader of abandoned cleared areas, as is also the trumpet tree, Cecropia peltata. It is this part of the forest which is used by the coloured population for illicit stills or 'moonshining' producing what is known as "Hammonds Report" after the report of a government inspector who visited the island some years back to report on illicit stills.

VEGETATION ON MOUNT MISERY

On the windward side exposure to winds gives rise to palm brakes at 1,200', but on the leeward side of sheltered islands, forest survives to 3,000'. Palm brake is dominated by the mountain cabbage, Euterpe Globosa and tree fern, Cyathea arborea. The mouhtain cabbage is the first coloniser of land cleared by land slides. The palm brake vegetation is on the ground level much denser than that of the forest, and consists of a

sodden, moss covered layer. The last few feet of Mt. Misery consists of knee high shrubs and the final goal of the peak is reached on hands and knees.

ELFIN WOODLAND

This is found on the summits of ridges above 2,000 ft. and a machete is needed for its penetration. The vegetation is low, gnarled and entangled with lianes, sodden growth of hanging mosses and epiphytes.

PENINSULAR

This supports scrub woodland and provides a poor pasture for cattle, some of which run wild. Various species of Acacia and Cassia are common. Also found are the seaside grape, Cocoolobis uvifera; on dry rocky slopes there is Agave americana and several cacti, including Opuntia tuna, Cercus insularis, and Melocactus communis.

DISTURBANCE OF FAUNA AND FLORA BY MAN

This has had a profound effect in St. Kitts, and the extinction of many species is due to the influx of population during the seventeenth century. The habit of burning vegetation destroyed the habitat for small rodents and birds, and also the introduction of the ship rat, Rattus rattus, resulted in the extinction of many rodents. The introduction of the mongoose, Herpestes a. auropunctatus, in the late nineteenth century to control rats and snakes has brought about the extinction of many species of mammals and birds and reptiles throughout the Antilles. The Green Monkey, Cercopithecus sabaeus, was introduced to St. Kitts as house pet by the French and is now very numerous. This monkey was responsiblf for the extinction of the large St. Kitts bullfinch, Loxigilla portoricensis gravidis. The "Mountain chicken" Leptodactylus fallax became extinct in St. Kitts through over exploitation as food. Attempts have been made to reintroudce it to Dosdan pond. The expedition started a trip to visit the

pond, but this had to be abandoned due to very bad weather. There has also been over exploitation of the iguana, Iguana iguana rhinolapha, which is also now extinct in St. Kitts.

The effect on the vegetation is very difficult to determine. The forest used to stretch down to the sea, but the lower slopes have long been cleared by burning, for the sugar cane.

VISITS MADE BY THE EXPEDITION OTHER THAN WORK

1. Nevis A short visit was made by both members, and a two-day visit by one member after the freight had been packed for the return to U.K. A visit was planned to the agricultural Department in Nevis, as extensive work is being carried out there, but this had to be abandoned due to Hurricane 'Donna'. It had also been hoped to work on the Hemiptera pests in the island.

2. A visit was made to Antigua from the 26th July to the 4th August. It was planned to camp there, but the Administrator, Mr. Ian Turbott, did not advise this during the Carnival time and loaned a furnished government house to the expedition. The purpose of this visit was partly to visit the annual Carnival to gain photographs and local colour for the book to be written by the expedition members, and to visit the historic sites such as Nelson's Dockyard, and also to make a comparative survey of the lizards of St. Kitts and Nevis.

3. A trip round the narrow gauge sugar cane railway was planned in St. Kitts but this had to be abandoned because of damage to the railway by the hurricane. Similarly visits such as those to the mountains, and the climb to the peak of Mt. Misery had to be abandoned.

4. A visit was made to Brimstone Hill in St. Kitts for geological and historic interest.

5. One visit was made to the crater of Mt. Misery, but bad weather prevented a descent into the crater.

6. A day's journey was made, partly on horseback, partly on foot, over Old Road, the old military road connecting the old English and French sections of the island.

COLLECTION OF HEMIPTERA IN THE FIELD

This was a group concentrated on by Miss Hocking, for collection, and were found to be more abundant than the other insect groups collected. There are no major Hemipteran pests of sugar cane, other than the mealy bug, dealt with in another section, and it had been hoped to work on some of the pests of cotton and cassave in Nevis, but as stated before, the hurricane disrupted all plans for visiting Nevis. The Cassava lacewing bug, Leptopharsa illudens, is a common pest in Nevis. The majority of the specimens are awaiting identification by the Natural History Museum, but by far the commonest bug found was Nezara viridula, the green stink bug.

Nezara is one of the Pentatomidae and is a pest of cassave but is found on many other host plants including cotton, tomato, eggplants, tobacco, peppers, okra and squash. It is not however of sufficient importance to warrant control measures.

Dysdercus is commonly found in St. Kitts, but as there is very little cotton, it is found on wild guava, particularly in the Ottley's level area. The aggregation of the nymphs on the underside of leaves was noted with interest but no work was done on this line. Several times it was noted that there were adults as well in the aggregations of the nymphs.

A species with the posterior tibiae expanded was also found on the guave, and this was thought to be a specimen of Leptoglossus.

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SECTION B - SCIENTIFIC

by

Anne Phillips

THE SUGAR CANE INDUSTRY ON THE ISLAND WITH SPECIAL REFERENCE TO THE BIOLOGICAL CONTROL OF SUGAR CANE PESTS

St. Kitts is a mountainous island with a lofty axial range rising to 3,700 ft. From 1,100 ft. to sea level there is a gently sloping glacis of detrital volcanic material traversed in the lower levels by deep gullies. Below 1,100 ft. the land is intensively cultivated, Sugar cane (Saccharum officinarum) being the main crop, while above this level the mountains are covered by virgin forest.

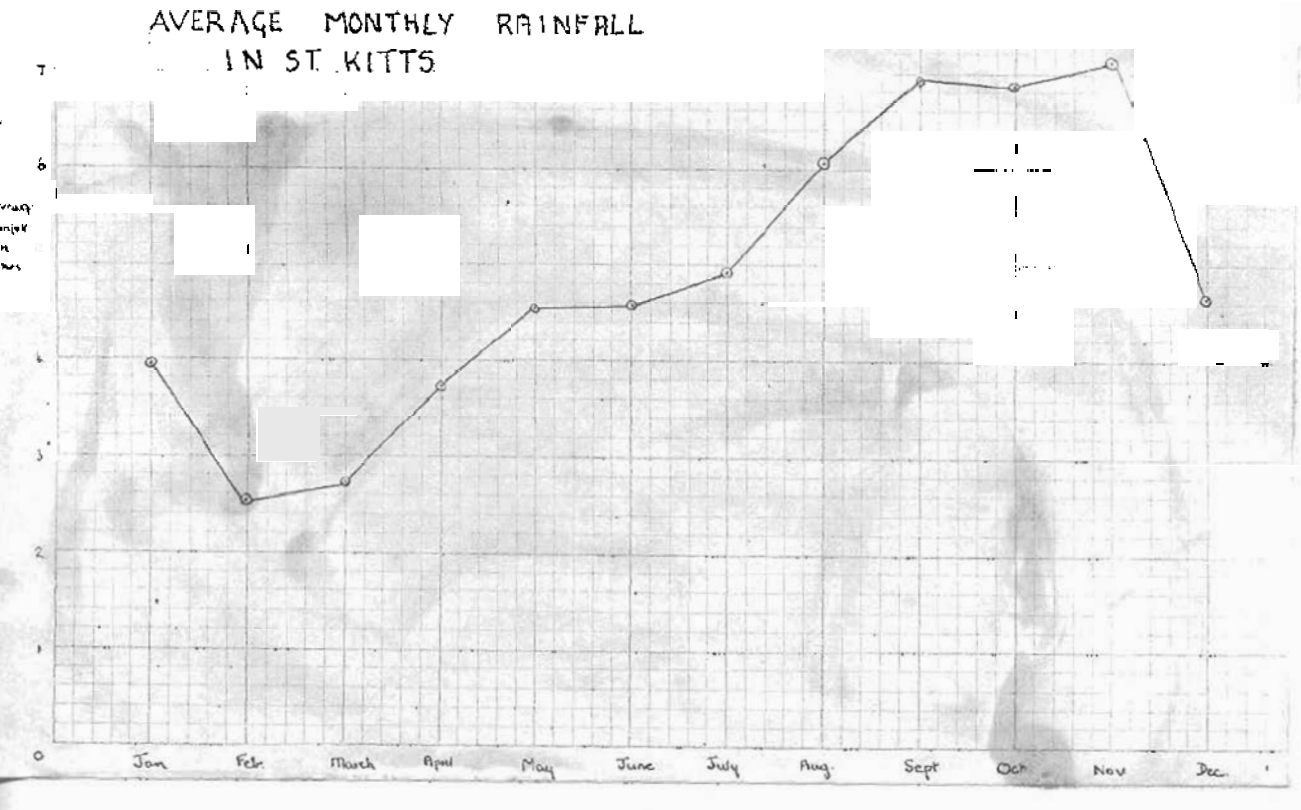
The soils of St. Kitts are light, sandy loams with an infiltration of silt deposits in the north-west corner of the island. They contain little organic material, are light and drain easily. Their fertility varies with their ecological position, those near the coast being fertile and deep while those bordering on virgin forest are variable in depth, having suffered severely from erosion, and less fertile.

The rainfall in St. Kitts is seasonal, the dry season lasting from January to June, although substantial rainfall may occur in May and June. The graph on Page 36 shows the average monthly rainfalls from 1914-1956. Rainfall normally increases in July, is greatest in September, October and November and declines in December.

These factors make St. Kitts admirably suited to the growth of Sugar Cane which requires a high rainfall and well drained soil. Sugar cane is also one of the few crops which can stand up to the high winds and storms which frequently sweep the island, whose location is in the

Western Hurricane Belt stretching from the Tropic of Cancer to the Tropic of Capricorn.

13,000 acres of cane are harvested each year, this being approximately 30% of the island's total area and 85% of the arable land on which the cane could be grown commercially. Provision crops are grown on the remaining 3,000 acres which lie between the uppermost cane fields and virgin forest.



Sugar cane was introduced to the island by the Caribs before the arrival of the French and English. In 1639 the first reference to the planting of cane is found, and by 1659 the industry seems to have been well established. When the island became wholly English in 1713, the cane industry started to expand. Only 132 tons of sugar were exported in 1714 but by 1728 the exportation had increased to 4,000 tons. From 1910 onwards, cane growing became the most important industry on the island, nearly all the working population being employed in growing the cane or in its processing. The completion of the Basseterre Sugar Factory in 1912 marked a great step forward in the industry. Previously the cane had been processed on the estates in old muscovado mills but now this part of the industry is entirely centered in an efficient modern factory. This enabled the estate owners to concentrate on the improvement of agricultural methods and cane yield. More suitable varieties were planted as they were developed and better cultural and manurial methods were employed. This resulted in a great increase in yield, the tonnage reaped in 1888 being estimated at 275,000 tons, while that reaped in 1958 was 385,365 tons.

The factory, in 1912, had a grinding rate of 28 tons of cane per hour, and produced 3891 tons of sugar from about a third of the estates on the island. By 1958 it had increased to 120 tons per hour.

This improvement can be seen by comparing the amount of sugar produced in 1889 (19,600 tons) to that in 1958 (47,388 tons). The estates

were gradually linked by the Company's 2 ft. 6 in. gauge railway until by 1926 the whole island was linked up by rail. At the same time, more and more of the arable land acreage came under cane production.

There are 47 sugar estates in St. Kitts with a total area of 28,426 acres of which only 15,000 are suitable for cane cultivation. The estates are small, with an average of 305 acres under cane, the maximum being 668 acres (Pond and Needsmust Estate) and the minimum 32 acres.

St. Kitts, like many of the West Indian Islands is primarily dependent on the sugar industry for its wealth. For the past ten or so years, sugar and molasses have provided 95% of the value of exports, cotton and salt forming the bulk of the remainder.

The growing of sugar cane requires most work in preparing the ground- and harvesting the crop, which is done at intervals of a year or eighteen months. During the period between harvests the crop is left almost untended. Before harvesting, the cane is not burnt off, as is the method used in many other islands, and the trash is left after the crop is removed. 'Ranging' is the first operation, in which a gang of men range the trash over the old cane stools in contoured rows 5 ft. apart, leaving a clean path between the rows for the plough to operate. When pen manure or bagasse is applied as a fertiliser, it is placed over the rows of trash. Tractor drawn single mouldboard ploughs are used for furrowing, the trash and manure being buried under the banks. Cross holes may be made in the furrows for drainage purposes if there is danger of prolonged or heavy rainfall.

Planting of the crop is done during the wet months of September, October and November starting in the upper lands, continuing in the lower lands and finally in the middle lands. Some crop planting, termed 'forcing back' is practised in the drier months of February, March and April. Material for planting is obtained from selected nine months old plant canes. The commonest setts used are about nine inches long and carrying two or three buds. Long plants are used by several estates in the wetter lands. Material used in the crop period for planting 'forced back' fields is top plants from good yielding areas. The plants are soaked from 16 to 40 hours in saturated lime water and planted immediately to prevent drying out.

Previously the only form of maintaining the fertility of the soil was by the addition of pen manure or bagasse. Field experiments have shown that the application of artificial manures and fertilisers results in a considerable increase in yield. Experiments in the addition of lime and time for optimum application, are now being undertaken. Mulching is not a routine operation and although it results in an increase of about 4 tons per plant cane, the cost of application of the bagasse is prohibitive. Once planted the fields are kept clean by hand or mechanically until the cane closes in. Chemical selective weed-killers are coming more and more into use, amine salt and butoxyethyl ester of 2:4-D being the commonest types used.

To obtain the highest cane yield from fields varying in altitude, depth of soil and water content, several different varieties of cane are

other than the 'noble' canes (Saccharum officinale), the process being termed 'nobilisation'. Many of the best commercial varieties i.e. B34104 are the result of a first cross between a Barbados 'noble' variety and an introduced interspecific variety. The introduction of these varieties caused a step up in the tempo of breeding work as it removed an obstacle that hampered earlier experimenters. In 'noble' canes male sterility is rare, while reliable female parents are exceptional. In the 'nobilised' varieties a considerable range of useful female parents was available, interbreeding of the mixed strains being prevented by the male sterility of the majority of the crosses. As a result of crossing 'noble' and 'nobilised' types, variability in the seedling population was very much increased. The breeding of pure 'noble' strains has now been abandoned owing to the obvious superiority of 'nobilised' crosses in yield, vigour and hardiness. Although noble canes have a better juice quality, their capacity for ratooning (regrowing from setts left in the ground after harvesting) was very poor and they were susceptible to mosaic and gumming disease. By selective breeding the juice quality has been maintained and the undesirable characters eliminated. Work is now under way to provide the estates with cane giving the optimum yield under every kind of soil, altitude and rainfall conditions found in the West Indies and progress in this work has been astounding.

The main breeding station of the Sugar Cane Industry is in Barbados and has been centred there since 1888. Early workers found that

fertilisation of the female arrows was a problem, and a special lantern was devised to deal with this. It had to be sturdy and resistant enough to enable a man to climb up and introduce the required pollen daily, its main object being to exclude foreign pollen from the female arrow. The cost of production and inconvenience in transport, erection and storage of the lantern were great disadvantages and the scientists were trying to improve on this laborious and expensive method.

In 1954 a new method of using cut arrows in a preservative solution was introduced to Barbados after its success in Hawaii. A new, lighter lantern was produced and the cut arrows placed in dilute solutions of sulphurous-phosphatic acid and Aretan. In all cases the arrows died in a few days and had to be replaced. After a further examination of the Hawaiian methods, improvements were made in the chemical properties of the solution. Male arrows placed in this solution completed pollen shedding and several of the female arrows matured successfully, several hundred seedlings being raised from the results of these experiments. It is hoped to perfect this solution technique which involves much saving in labour and expense. As a result of the work done on the station, the varieties produced in Barbados now occupy all but an insignificant part of the Cane area of the British West Indies and British Guiana, which between them produce well over a million tons of sugar per annum.

By virtue of the improved varieties produced in Barbados, the cane yield on St. Kitts has been substantially raised from 21.66 tons/acre in 1930 to 29.01 tons/acre in 1943 and in 1952 the record total of 34.13 tons

was achieved. The earlier increase was primarily due to the scientific use of artificial manures and lime, aided by pest control, while from 1939 onwards, the introduction of new varieties played the most important part. When pen manure was almost the only fertiliser used, a plant crop or only a single ratoon could be produced, after which the land was allowed to lie fallow for at least a year to restore its productivity. With the application of artificial fertilisers, good yielding cane up to the ninth ratoon is now obtained. The substantial increase in the length of ratooning can be seen from the accompanying table:-

	1946	1947	1948	1949	1950	1951	1952
Plants	51.80	44.22	38.14	34.89	38.77	35.47	31.87
1st R	36.44	44.42	43.99	38.35	32.07	36.18	32.74
2nd R	9.55	9.68	15.41	20.62	19.05	17.04	22.53
3rd R	2.21	1.68	2.46	5.92	9.66	9.66	9.50
4th R	-	-	-	0.22	0.45	1.65	3.36
5th R	-	-	-	-	-	-	-
6th R	-	-	-	-	-	-	-
7th R	-	-	-	-	-	-	-
8th R	-	-	-	-	-	-	-
9th R	-	-	-	-	-	-	-

	1953	1954	1955	1956
Plants	26.87	21.51	18.31	21.11
1st R	28.33	24.39	22.62	19.17
2nd R	23.41	25.80	22.05	21.02
3rd R	15.14	17.68	20.71	16.61
4th R	4.81	7.64	10.03	14.76
5th R	0.97	2.32	4.03	3.36
6th R	0.47	0.59	1.34	3.20
7th R	-	0.07	0.01	0.63
8th R	-	-	-	0.06
9th R	-	-	-	0.08

Longer ratooning has enabled a much larger proportion of the area under cultivation to be harvested each year with a subsequent reduction in cost and labour involved.

Owing to the steepness of the land, mechanical harvesting of the cane is impossible. All the crop is still harvested by hand, gangs of labourers cutting the cane using machetes. The cane is cut off about 6" above ground level with a clean stroke (this prevents entry of pests and diseases into the sett) and the top and dried lower leaves (trash) removed by the cutters. The trash is allowed to remain in the field while the cane tops are collected, as they form practically the only livestock feed of the island. The cane shoots are then collected by 'handlers' who

pack them into tractor hauled carts and take them to the railway siding. Here they are dumped and packed in a special way onto railway trucks by the 'packers', each truck containing on an average five tons of cane. The trucks are collected periodically from the sidings by the Sugar Factory's trains and taken to the factory. It is not unusual to see a train hauling forty or more of these trucks at once. Once in the factory, the cane is dumped on a system of conveyor belts which carry it to the presses, where about 85% of the juice is extracted through a series of rollers. The resulting fibre is packed into bales and termed 'Bagasse'. It is then sent back to the estates for use as bedding for the animals and mulching.

The sugar cane juice is strained to remove foreign matter and concentrated. A series of purification and crystallisation processes remove the majority of the molasses and the product remaining is termed 'brown sugar'. This may be washed and the liquor centrifuged off. This is termed 'final molasses' and the sugar remaining 'wash sugar'. In this form it is exported. Much of the molasses is also exported but the consumption of the product in the island is very high, as it is added to the livestocks drinking water and is also used by the natives as the basic product in their illicit rum stilling 'industry' which is extremely prevalent in the island despite several attempts to control it.

The 'wash sugar' is poured into special metal enclosed trucks by which it is conveyed to the Company's pier outside Basseterre. Here it is sacked up and stored until ready for shipment. Owing to the shallowness of Basseterre harbour, all loading must be done by lighters and special iron

barges are employed in carrying the export to the ship. The final refining is done in the United Kingdom at the present, but there is some hope now of a profitable market in the U.S.A.

One of the biggest problems faced today by the estate owners of St. Kitts is that of labour. After the war, labour was cheap and plentiful, but since emigration to Britain has become facilitated, the working population of the island has become more and more depleted. Hundreds of people leave every year and the gangs remaining demade higher wages. During our stay on the island an experiment in the importation of labour from Barbados was attempted, but proved a dismal failure. Within three weeks of landing, the imported labour returned to their own island after a series of riots and stonings by the local inhabitants, who resented the intrusion bitterly. This problem appears to have no solution as yet and is of great concern to the employers as it may seriously affect the whole sugar industry, which is at present practically the sole source of revenue of the island.

SUGAR CANE PESTS

Sugar cane is attacked by a number of insect pests, some of which devour the roots and leaves and others which bore into the stem of the plant.

A list of the commoner ones is given below:-

The Small Moth Borer	(Diatraea saccharalis)
The Yellow Aphid	(Sipha flava)
The Sugar Cane Mealybug	(Saccharicoccus sacchari)

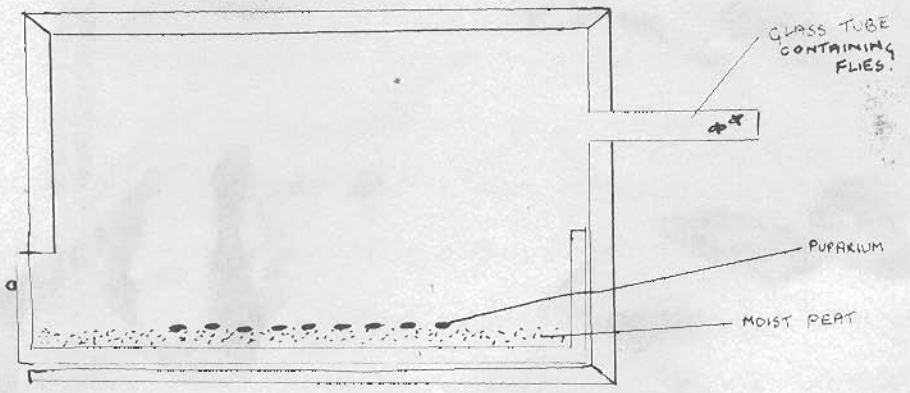
These were the commonest pests met with on St. Kitts, although other islands have a wider range of similar species.

Prior to 1932, the Small Moth Borer infested 20% of the sugar crop. The damage inflicted consists of a tunnel, up to one foot long, bored in the cane stalk and filled with frass. As a result of this the cane shoot is useless for sugar extraction and in heavy infestations, there may be a complete loss of the crop. St. Kitts is fortunate in that it has the right climatic and ecological conditions necessary for the survival of the Cuban Fly parasite, Lixophaga diatraea. This fly was introduced into the island in 1932. A Lixophaga breeding station was set up and large numbers of flies bred there were released all over the island. The fly was able to establish itself in the wild and no subsequent releases have been found necessary. The joint infestation of the borer has dropped from 20.9% in 1932 to 7.7% in 1935. The infestation since this date has averaged 5%.

In Antigua, the story is different; During our stay there we were fortunate enough to be shown the control measures employed on the island. Owing to the unsatisfactory climatic and soil conditions on the island, the parasite is unable to breed and establish itself naturally in the Antiguan cane fields as it has in St. Kitts. A special breeding station has been set up from which continual supplies of this fly are provided for releases all over the island.

Breeding stock flies are kept in gauze cages about two cubic feet capacity and are fed on a sugar solution added to the soil on which the

cages rest. This also keeps the air in the cages up to the natural standard of humidity found in the cane fields. The flies are mated in the cages and maturation of the maggots occurs in eight days, Lixophaga being viviparous. The female is then removed and dissected under microscope. Each female contains around forty maggots. These are removed with fine needles and placed on the Diatraea larvae, one near the head and one half way down the body. The breeding Diatraea are kept in closed tins and provided with about $1\frac{1}{2}$" of fresh split sugar cane for food. The small maggots (about 1mm. long) bore into the body of the grub and feed there until pupation, when they emerge from the almost dead borer and form a black puparium. These are then placed in soil-filled trays in a special incubator where the date of pupation is carefully noted.



LIXOPHAGA BREEDING CAGE

On emergence, the flies are attracted to light and enter the glass tube. From there they are separated into the sexes and a certain proportion kept back for breeding at the station. The rest are released in a special ratio (40 females to 45 males) found to be most advantageous for full fertilisation. In this way the ravages of the Small Moth Borer in the island have been very much reduced.

The Yellow Aphid (Sipha Flava)

On our arrival in St. Kitts, we were fortunate enough to find that the cane crop was in danger of being ruined by an infestation of the yellow aphid, and were asked whether we could help in any way.

Field observations were made on an unusually severe infestation at Lodge Estate. The appearance of the infected plants differed from the healthy ones in the following respects: there was a marked chlorosis of the entire leaf and a tendency to die back from the tips. The leaf vessels became red-brown in some cases, giving a streaky appearance to the leaf. Plants affected while young were stunted and in some cases the main shoot had died, causing subsequent growth to arise from the dormant lateral buds in the rootstock. These attacks cause a prevention of adequate photosynthesis and consequently a drop in the sucrose content of the cane.

In the plot observed, the infestation appeared to have begun half way down the plot, which was on the Atlantic coast of the island. The strong breeze from the sea had spread the infection inland by carrying the infective flying forms of the aphid. Seaward to the source of infection

the aphid was almost absent and the cane appeared healthy and green.

The Yellow Aphid is also a pest of Sorghum, where it attacks the flowering stems and buds. The adult is about 2.0 mm. long. The antenna is 5 segmented and bears large circular sense organs. The body is flattened and covered with long, hair-like seta or has the femora so covered. The cornicles are very short and the cauda is knobbed. The forewings have the media branched twice and in the hindwings both cubitus and media are present. The general body colour is yellow.

The life history of the insect is not fully worked out. The animals are viviparous and live on the underside of the leaf. The young feed in close proximity if the leaf is not heavily infested or may wander to another part of theplant. The winged forms are migratory. Sipha has also been found living on lemon grass and Andropogon species.

According to G.N. Wolcott, the Yellow Aphid is especially prevalent on Uba Cane, this character being linked genetically with that resisting mosaic disease. It may reach epidemic proportions on this cane, while on the standard varieties it is only a minor pest. It does not transmit any known disease but produces a characteristic progressive yellowing and reddening of the leaves before death. This may be due to the removal of sap and the injection of a toxic substance as other species feeding similarly do not produce this colour. The damage is equally striking on lemon grass.

Normally the aphis is on the underside of older leaves and only in heavy infestations does it move to the upper side and leaf sheaths.

Cane is usually 1' high when attacked and small colonies are common on the old leaves of standard varieties. Injury to high cane in normal conditions of infestation is regligible. On young plant or ratoon cane, it may stop growth for a month or so. On Uba and Java cane, mass infestations may occur at any stage of growth and stop growth or kill the plant.

Many predators are listed in the control of the aphis. A list is given below:-

Aphidius testacieps	A Braconid Wasp
Acrostalagmus albus	A Fungus
Chrysopa collaris	(larva only)
Hyperaspis apicalis	Coccinellid
Cycloneda sanguinea	"
Megilla innotata	"
Baccha latiusculus	Syrphid

There is also a black and yellow spider, Theridula triangulata which, like the other predators, attains abundance when the aphis infection is severe enough to be noticed by the planter. The application of insecticides is expensive and difficult owing to the position of the aphis, especially in young cane. It often proves uselsss due to the natural increase of predators, natural and spray controlled fields flourishing at the same rate. In St. Kitts, the application of insecticides is impossible owing to the presence of Lixophaga diatraea in the cane fields.

On Uba and Java canes, it is different and aphids may increase faster than predators and destroy the crop before they disappear. Heavy rains are thought to control the aphids by washing them off the leaves but this is doubtful. Severe measures may be taken in some instances

i.e. burning over young cane fields so infested. On older cane, infected leaves may be trashed and burned and spraying is more effective. Owing to the susceptibility of the Uba and Java varieties it is difficult to control the pest artificially or naturally and planting of standard varieties in infected areas is recommended. The commonest spray used is Malathione at a concentration of 1 lb. to the acre. It has also been found that outbreaks of the pest in epidemic form occur especially in fields where dusting with insecticides has occurred, especially against froghoppers.

A lighter infestation of the yellow aphid was observed at Stapleton Estate on 8/8/60. The aphis appeared to have attacked well grown cane of the variety 49119. The infestation was evident from the yellowing and reddening of the lower mature leaves, but few aphids were found. The ones causing the damage in the first place seemed well under control due to the predator Cycloneda sanguinea. This was verified by a series of laboratory experiments to determine the most efficient predator in this case.

A collection of insects found in association with the aphid colonies was made. The following species were collected:-

Hyperaspis apicalis (adult and larva)
Cycloneda sanguinea (adult and larva)
Baccha latiusculus (larva)
'The White Aphid'

Some of these insects were actually observed feeding on the insects but the relationships of the others had to be established by experiment as no

evidence of predation was seen in the field.

A series of jars was set up, each containing a piece of damp filter paper, a piece of clean cane leaf and thirty yellow aphids. The tops were covered by a piece of gauze to allow circulation of air. Two specimens of each pedator were added to each jar, and a series of three made for each predator, eighteen jars in all. The object was to count the number of aphids remaining alive after a series of subsequent twenty four hour periods, this being an indication of the effectiveness of the control.

The results obtained after a five day period are shown below:-

Hyperaspis (adult)	a	30% control
	b	33% "
	c	33% "
Hyperaspis (larva)	a	3% "
	b	27% "
	c	13% "
Baccha (larva)	a	93% "
	b	87% "
	c	100% "
Cycloneda (adult)	a	37% (one pupated after two days)
	b	97% control
	c	97% "
Cycloneda (larva)	a	93% "
	b	100% "
	c	100% "
White Aphis	a	53% "
	b	43% "
	c	60% "

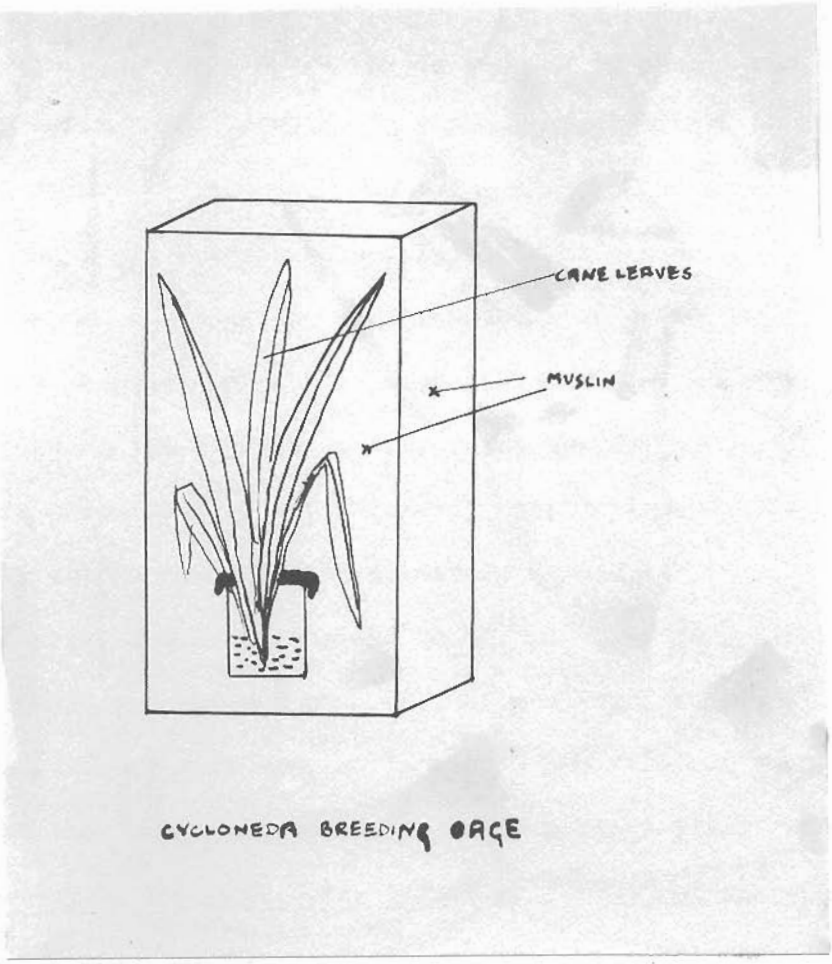
From the results obtained, Cycloneda appeared to be the most important predator. Control measures afforded by the other insects is adequate but not as complete as that of Cycloneda.

These results were verified in the Stapleton plots where almost total control had been effected by Cycloneda in the absence of the other predators. It was interesting to note that on the Stapleton ratoons the stages found were Instar V, pupa and adult. Only one third instar larva was found on a s ple of six plants examined although there were several egg clusters present, showing the onset of further predation.

It was noticed that only certain varieties were attacked, others being free or with small colonies in their usual, non epidemic position at the tops of the mature leaves where they produce the usual yellowing and dieback. In this condition they are not harmful.

Numbers of this Coccinellid were bred for release and released in fields heavily infested by the aphis. The apparatus employed is shown overleaf.

Twenty adult Cycloneda were introduced into the cage. Periodically colonies of yellow aphids were introduced as food. The first egg batches were laid three days after the start of the breeding experiment. They consisted of clusters of about twenty bright orange ovoid eggs laid on the underside of the cane leaves. These hatched into first instar larvae in ten to twelve days. These were then released in the infected plot at Lodge Estate. In all, about three hundred of these larvae were released and within a month the infestation was completely cleared.



CYCLONEDA BREEDING CAGE

The Sugar Cane Mealybug (Saccharococcus sacchari)

The most important pest of sugar cane in St. Kitts at the moment, is the Sugar Cane mealybug, which lives in colonies under the cane sheaths and damages the cane by sucking the sap and secreting a sticky honey dew on which serious pests such as moulds, thrive. Mealybugs are provided with stylets which penetrate the outer part of the cane and draw their nourishment in the form of sucrose from the vessels. They shelter under the leaf sheaths and are thus difficult to remove by dusting. They are members of the order Homoptera, family Coccidae and are soft and helpless

but have a white, mealy wax covering impervious to insecticides. Different species may be white or pinkish and they are allied to the Cochineal insect of cactus. The males are minute, fragile and two-winged and have a typical Homopteran development while the females are large and plump, wingless and show degeneration. She is non-motile and consists mainly of a mass of eggs which hatch within the mother's body in some cases, piercing the skin to escape. The spread of the pest is not due to the winged males, but to the extremely active young, which are often carried by ants or transported passively by man.

Some years ago a Coccinellid beetle was introduced to Puerto Rico from Australia and thrived on a diet of mealybugs under laboratory conditions. They were bred in thousands and released in the cane fields from which they completely disappeared in a short time. Later they were found feeding on the soft scale insect of citrus and the citrus mealybug. This was probably due to the fact that the Sugar Cane mealybug was too well protected under the cane sheath and could not be reached by the predator.

Mealybugs excrete in the form of wax or Honey-dew. Flies, bees and wasps may remove the latter, but a symbiotic existance, similar to that with Aphids, exists between the mealybugs and some species of ants. These build sheds of earth or a paper-like material over the mealybug colony as a form of protection and may carry the young to other parts of the plant. The colonies are conspicuous because of their large size and the

surrounding covering of wax and egg clusters. The egg clusters considerably reduce the size of the female during oviposition. The young nymphs, on hatching are very minute, about .38 mm. and remain under the egg mass for a few days. They then emerge and crawl actively over the plant until a good place for attachment is found, usually near the top of the stalk where the joints are tender and the young can attach themselves easily. The young females collect in masses round the nodes and remain there for the rest of their lives. The males hatch in the same mass as the females and resemble the latter closely. After five days they collect under a leaf sheath and spin a long, narrow, white coccoon. They remain there until fully matured, emerging in two weeks with a pair of delicate wings and two long anal spines. When mature, they fly in search of the females and can be seen swarming round infested cane stalks.

The young mealybugs spread infection through the cane stalks and to other parts of the stool and even adjacent stools. The pest is also spread by tops used for planting having very small nymphs under the sheaths where they cannot be removed or killed without injuring the seed itself. When planted they can be seen developing on subterranian portions of the cane and clustering round plump buds about to develop into shoots. When the shoots develop, the now mature nymphs produce another generation which infests the plant with the formation of new colonies. The original infestation may be removed before planting by immersing the

seed for thirty minutes in water heated to 50° C. This measure is often cancelled out by the infestation being already present in the field on the old stubble.

The two commonest species of mealybug in the West Indies are:- Saccharococcus sacchari Cockerell, which is pink, and Pseudococcus boninsis Kuivana, which is grey. Both species are equally well distributed and abundant, the former being the commonest in St. Kitts. They are only separable on a colour basis.

The symbiotic relationship with ants is essential to the well-being of the mealybug colony, as they remove excess honey dew. This is important as the honey dew is used as a substratum by the fungus Aspergillus flavus whose hyphae may envelop and kill the mealybug. In Louisiana and California the mealybug population showed a marked increase after the introduction of the Argentine Ant, a minor pest becoming a major one. Cheap and effective means of destroying the ant have been developed in the form of poison syrup, which kills the Argentine Ant but has no effect on the native ant population. The foremost ant symbiont in the West Indies is the Fire Ant or 'Hormiga Brava. (Solenopsis geminata) Even where colonies of the ant are wiped out, other ants promptly fill the niche. Ant control in the Cane Fields is only a partial and temporary measure as the poison syrup method cannot be duplicated with the native species.

The leaf sheath protects the bug from its enemies but often rectangular areas are found neatly chewed away in these sheaths above the

mealybug colonies. Such 'windows' are also found in Egypt and Peru. In Hawaii, the rats and mice eat the mealybug but in these cases the damage to the cane is much greater than that shown by the 'windows'. In Cuba, the Parasol Ant Atta insularis Guerin, have been observed carrying the bugs away through the holes in the leaf sheaths which they have undoubtedly gnawed. This does not account for similar occurrences in countries where this ant does not occur.

Parasites of the mealybug are few. One important one is the Cecidomyid fly Karschomia cocci Felt. The adults show an unusual habit of hanging in rows on strands of spiders web where they rock gently by beating their wings. The adult has been reared from the mealybug in Puerto Rico and possibly occurs in other islands. It also attacks other mealybugs and may be useful in their control.

H.E. Box (I.C.T.A.) lists the following predators for Saccharococcus:-

Hyperaspis trilineata Muls. (Barbados)
Scymnus bilucernarius Muls. (Trinidad)

Hyperaspis is a very small Coccinellid beetle about 2mm. long which is able to get under the leaf sheaths and thus gain access to the mealybug colony. It was introduced into St. Kitts from Trinidad by H.E. Box recently but has almost vanished from the cane fields and appears to be effecting little or no control over the pest, which is still in epidemic form in the cane fields. It is hoped that another release of the predator is to occur shortly.

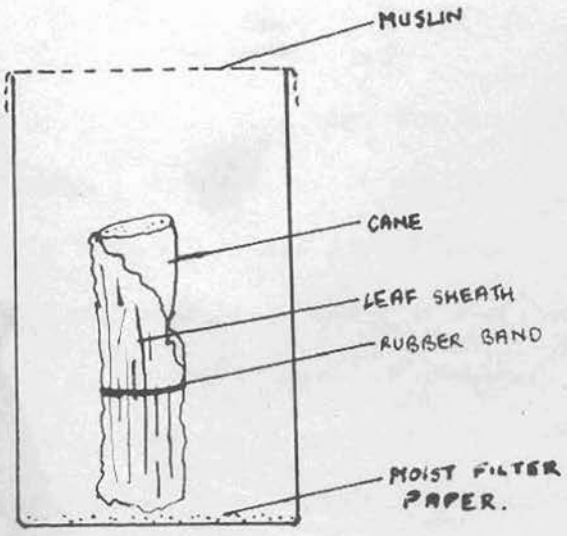
A few incidences of the occurrence of a more serious mealybug pest have been recorded in St. Kitts. This is Ripersia radicocola Morrison, a root inhabiting species feeding on the roots of small grasses as well as Sugar Cane. The colonies are thought to have been introduced on produce by accident from other islands and a close check is now put on all fresh vegetables entering the island. These mealybugs are globular and not flattened ventrally and very pink as the covering of wax is scant. In light soil areas, such as St. Kitts, it may cause serious injury to the cane and in areas where soil and drainage are unfavourable to cane growth, the crop may be completely killed off by this pest. There is yet no method of biological control for this pest and the only method of eradication is to completely eradicate all grasses from the area and grow leguminous crops. The danger is that in good cane growing areas the cane shows no outward sign of infestation although it may be heavily infested and help in the spread of the pest.

During our stay in St. Kitts we were shown a Coccinellid extremely common in the cane fields and were informed that it was Hyperaspis trilineata, introduced to control the mealybug. Reference to the records shows no drop whatsoever in the infestation percentage of the cane and we were asked to conduct some experiments to verify the effectiveness of this beetle in the control of the mealybug.

Preliminary examination of the specimens showed no evidence that the species in question was Hyperaspis trilineata for this species, as its

name implies, has three orange stripes, but only the apex of the elytra were orange. This indicated that the species was probably Hyperaspis apicalis, which has no controlling measures on the mealybug population. The following experiment was set up to verify this:-

Two sets of three jars each were set up as shown in the diagram.



MEALYBUG APPARATUS.

Six adult mealybugs were introduced beneath the leaf sheath in each case. In the first set of jars, two specimens of the Coccinellid imago were introduced and in the second set, two specimens of the larva.

The numbers of mealybugs present were counted after intervals of two days.

	1st count	2nd count	3rd count	4th count.
Ia	6	6	6	6
b	6	6	6	6
c	6	6	6	6
IIa	6	6	6	6
b	6	6	6	6
c	6	6	6	6

From these results it can be seen that the Coccinellid had no control over the mealybug. This was later verified by sending specimens of the local Hyperaspis to L.C.T.A. for identification. It was subsequently found that the species in question was H.apicalis and not H. trilineats, which is known not to have any control over the mealy' g. Arrangements are now being made for a fresh supply of H.trilineata to be sent from Barbados for release in the St. Kitts canefields.

There is now a move in St. Kitts to eradacate the mealybug pest mechanically. In Barbados there is widespread infestation of ratoon cane which causes serious losses in ratoon yield. Fields are being ploughed and replanted before normal time in an attempt to eradicate the pest, and fields continuing in ratoons are having to have expensive treatment. In St. Kitts the mealybug occurs only in plant and not in ratoon canes. Patches of young plants die out when only about 1' high and on digging

up, now their root systems infested with mealybug. The cleared patches are not supplied immediately as the roots of the supplies come in contact with the dead roots of the original plants and become infested by contact. Dead stools are therefore lifted with as much of the root system as possible, collected and burned. The furrows are then forked to scatter and break up what remains of the old roots and left for a fortnight to weather before supplying. Some fields have young plants growing normally but with their root systems still infested and the pest is probably more widespread in plant cane than is realised.

In Trinidad, infestation of the ratoons has been cleared by ploughing out the old ratoons and destroying the stools. The stools are chewed into small pieces by a rotary hoe, the soil is ploughed to 1' in depth and chiselled to a further 6". In St. Kitts it is recommended that every ten years the old stumps should be uprooted and the fields close ploughed. The stools will then be exposed to the sun, broken down and destroyed and the soil aerated. This would help in the eradication of infestations of crops and diseases accumulating in the old stools now being allowed to rot in the soil.

MEALYBUGS INFESTING OTHER CROPS IN ST. KITTS

Pineapple

An attempt was made during the last five years to establish a pineapple plantation on Mansion Estate in St. Kitts. Previously pineapples had been grown only as isolated clumps on native small-holdings

scattered over the island. The pineapples on the plantation developed a severe attack of Pineapple Mealybug which, with various additional fungus diseases ruined the crop and prevented subsequent pineapple cultivation on the site. The mealybug Pseudococcus brevipes Cockerell. has a symbiotic existance with Solenopsis geminata F. and causes widespread infection in the plantation as the bugs live on any fairly sheltered part of the plant. In young plants it is between the base leaves, above or below ground level and in older plants it extends upwards to the fruit with considerable colonies in the lower portions where the insects are protected by its overhang and basal leaves. Some small specimens even enter the calyx chamber. They are often protected by earth 'sheds' constructed by the ants. The damage is difficult to analyse as it may be due to a combination of factors, poor seed, drainage, fertilisation etc., They definitely cause some stunting of the growth, but areas of stunted plants may only have a few infested with mealybug. Control is effected by stimulating the plants to fresh, vigorous growth, thus offsetting the effects of the bug. The most effective insecticide is carbolic acid emulsion as the carbolic acid affects the ant symbionts and the kerosene affects the mealybug. The 'recipe' is given below:-

2 galls. Kerosene; 1 pt. crude carbolic acid; $\frac{1}{2}$ lb. soap;
1 gall water.

In St. Kitts, this mealybug was found to be infesting the calyx of the fruit where the adults, which had entered as young nymphs were now enclosed

in the fruit itself. The accummulation of honeydew, wax and dead mealybugs formed an excellent substratum for the growth of a black mould which subsequently attacked the interior of the fruit. Spraying of the concealed pest was found to be useless and at the moment, no control measures for the pest are known.

FRUITS

The Guava mealybug, Pseudococcus nipae Maskell, has now been successfully controlled in St. Kitts by the introduction of the predator Cryptolaemus montrouzieri Mulsant. This pest also attacks avocado, sour-sop, and ox-heart where it causes a loss of vitality in the tree, especially during transplanting from the nursery to the orchard. The insect colony occurs in rows along the mid-rib of the leaf and is found most commonly on the upper side of the leaf. This species also has a symbiotic relationship with the fire-ant Solenopsis geminata.

CITRUS

Pseudococcus citri is the most important pest of citrus fruit in St. Kitts. Young leaf growth is often distorted by both adult and nymphal stages during feeding. The female is 3.5 mm. long and brownish in colour, with seventeen filaments on each side of the body. It is distinguished by the antennae, which have eight segments, the apical one being twice the length of the third. The egg is .25 mm. long, ellipsoidal and creamy yellow in colour. The female starts laying eggs under her cotton covering before she is mature and the egg mass raises the body up. 300 or more eggs

are laid in each egg mass. The eggs hatch in just over a week and the 'crawlers' disperse and settle on the midrib and forks of the young shoots where they construct their cotton and wax shelters and commence feeding. Development of the males of the species is very similar to that of Saccharococcus and the adult males have a pair of wings and a pair of long filaments posteriorly. There are many alternative host plants, cacao, citrus, coffee, soybean, celery, guava and Solanum but not all of these are grown on St. Kitts.

The most important predators of this mealybug are Cecidomyia coccidarum Ckll. and Lobodiplosis coccidarum Felt.

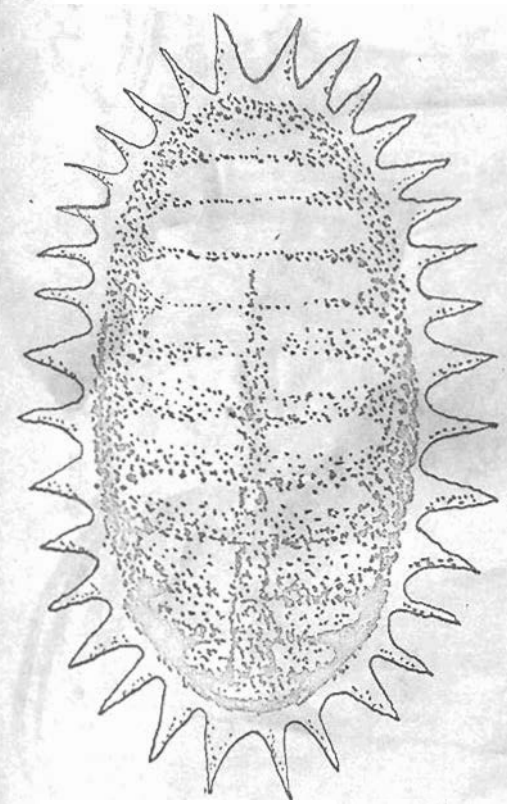
The most important parasites are listed below:-

Acerophagus nubilipennis Dozier
Leptomastix dactylopei How.
Thysanus nigrus Ashm.
T. bifasciatus Ashm.

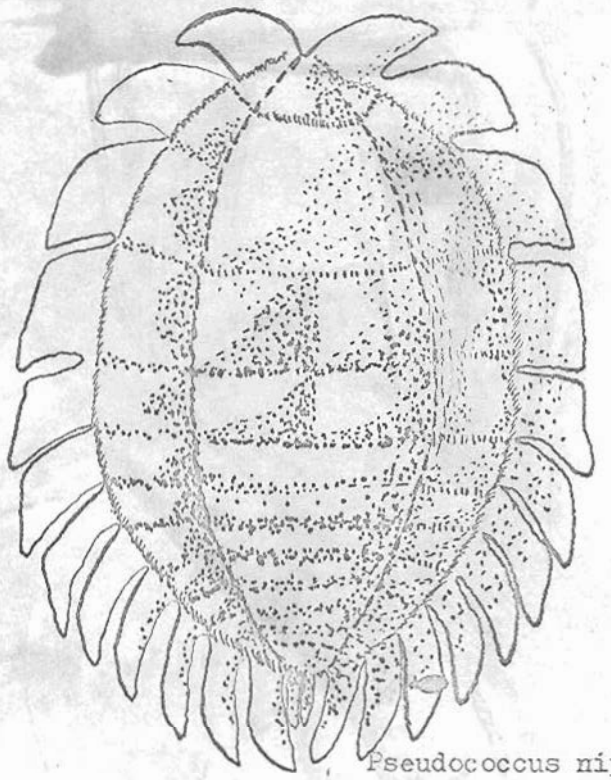
Another mealybug infesting citrus is Pseudococcus nipae Mask. The adult females and nymphs feed on the sap on the stem and leaf bases. It is also a minor pest on sweet potato. The adult female is broadly ovate and has two incomplete rows of pyramidal waxy plates on each half of the body and twelve curved and pointed plates on each side. The newly hatched nymphs are flattened and ovate and wander over the plant for some hours before settling down to feed. The waxy marginal plates develop into long, stout processes and the dorsal waxy covering becomes a group of separated, rounded tufts. The female becomes adult in two moults and the male in three.

So far, no parasites have been reared from this species but it is subject to fungal attacks from Botrytis rileyi, Cephalosporium lecanii and Empusa fresenii.

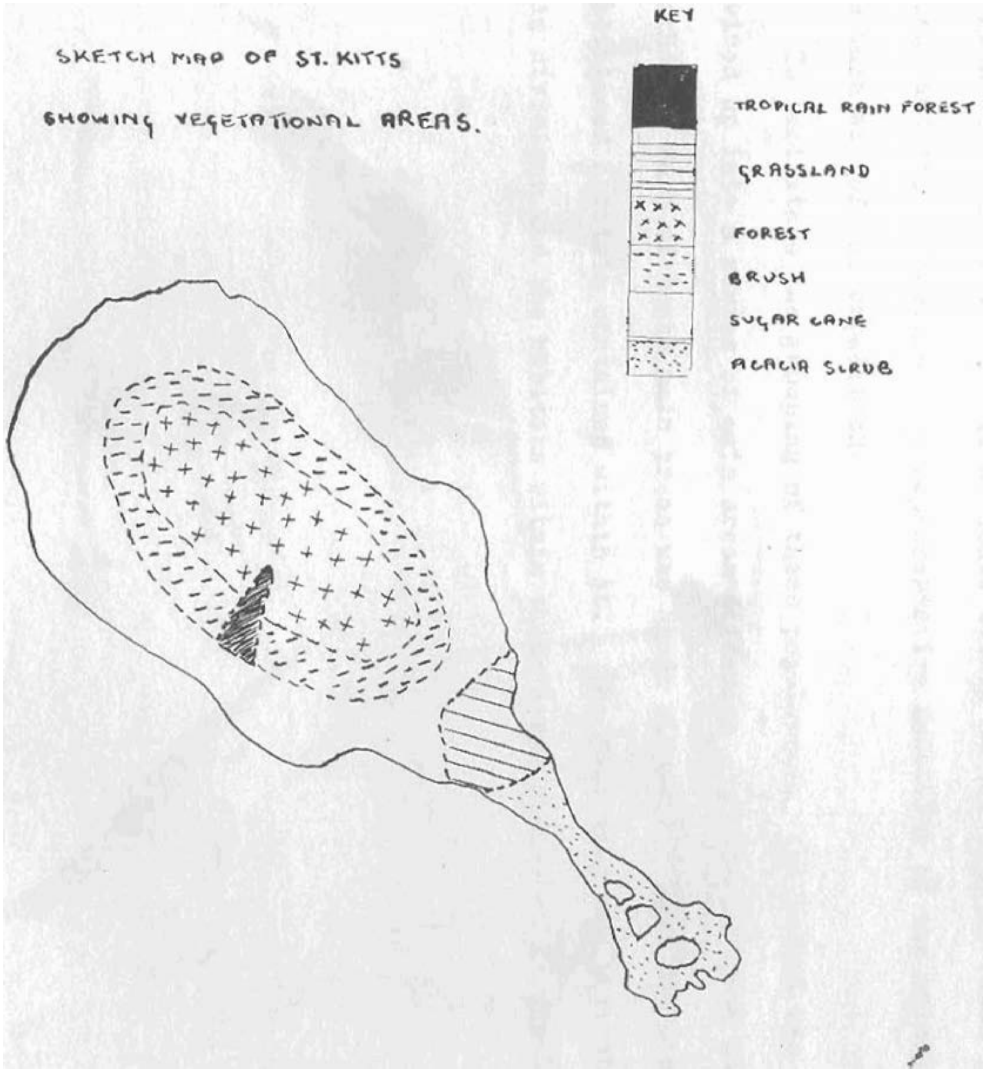
Diagrams of the above two mealybugs are given below. (Both adult females)



Pseudococcus citri



Pseudococcus nipae


SKETCH MAP OF ST. KITTS
SHOWING VEGETATIONAL AREAS.
KEY
TROPICAL RAIN FOREST
GRASSLAND
FOREST
BRUSH
SUGAR CANE
ACACIA SCRUB

THE COLLECTION OF THE FAUNA OF THE ISLAND

St. Kitts is one of the few West Indian islands that the British Museum have very few zoological records from. They were therefore very interested in any results that we could obtain of the type of fauna on the island and the collection of a representative selection of the animals was the main aim of the expedition.

To facilitate the grouping of these populations, the island was divided up into a series of main areas differing ecologically from one another. Each of these main areas was again subdivided into the more specialised habitats contained within it. The following map indicates the main divisions and the habitats within these areas described in the text.

SURVEY OF THE MAIN GROUPS OF ANIMALS, THEIR COLLECTION, DISTRIBUTION AND PRESERVATION.

Amphibia

Eight specimens of Amphibia were collected, the majority being tree frogs. These were captured in Guadeloupe as well as St. Kitts. The only toad found was Bufo regularis, plentiful in Nevis, Antigua and Guadeloupe but absent from St. Kitts. This toad grows to a length of about one foot in fully matured specimens and may weigh up to three quarters of a pound. Its normal colour is an earth brown but this may vary with the light intensity and the nature of the substratum. Pale straw coloured and completely black toads of this species have been recorded. They seemed more or less confined to the lowlands of the islands and were especially numerous in damp and swampy areas.

Three specimens of tree frog were captured in Guadeloupe. These were half to three quarters of an inch in length. The upper surface was a dark chocolate brown and the underparts white or cream. Running horizontally between the eyes was a bright orange band. From the general body shape they seemed to be allied to the genus Hylus and are now awaiting further identification. These frogs were found sheltering in the long grass on the airport fringe, either hidden in the roots or under stones etc.,

The only frogs found in any quantity on St. Kitts were the tree frogs. These were easily collected from the tree trunks at night with the use of a torch. They were about the same size as those caught in Guadeloupe but

were pale pink in colour with white underparts and a dark brown streak near the eye. At night they appeared almost transparent and the bones and blood vessels could be seen through the skin. During the day they seemed to retreat to the uppermost parts of the tree, only descending at night to feed and their whereabouts could be located by the continuous chirping croak that they emitted. They seemed to be fairly well distributed in the forest and bush areas and were found occasionally in the sugar cane belt if large trees and moist conditions were available.

The only other amphibian found on St. Kitts was a juvenile frog of unknown species. This was found in the wet leaf mould at the rim of the Crater, high in the forested area. It was about a quarter of an inch long, pale brown in colour and with darker brown markings. Owing to the fact that it is a juvenile, identification of this specimen will prove difficult.

Reptiles

The collection of reptiles was one of the major concerns of the expedition as especial interest in them had been shown by the British Museum Herpetological Department. Collections were made in both Antigua and St. Kitts for the purpose of comparing differences in the populations of the two islands. In all, seventy-two specimens were preserved from the two islands representing two examples of each species owing to lack of storage space. It was found that the populations of the two islands differed substantially in number and type of species as well as in their relative abundances although the islands are only separated

by a forty mile channel. The majority of these lizards were tree living forms of the genus Anolis although several terrestrial species were collected from each locality. A list and description of the specimens is given below:-

Antigua Ten clearly identifiable species were captured but further investigation may result in a subdivision of these groupings which were made solely on colour and size. Five of these were clearly Anolids, identifiable by the characteristic hyoid pouch in the throat. This pouch is extensible and often brightly coloured in the male and serves as a warning or display organ in mating. The commonest species was aboreal and from six to nine inches in length. Its general body colour was an irridescent leaf green, but this varied according to the substratum, from pale lime to bottle green. The underparts were typically yellowish and the head covered with a grey and white marbling. The arboreal Anolids have a characteristic position when at rest. They hang upside down from the tree trunk using the long toes of the hind foot for attachment, the tail acting as a balancing organ and the front feet as props for the body. In this position they are able to see almost two thirds of the tree's circumference and are able to escape predators easily by turning round and running up into the branches. Another interesting feature of these lizards is that only one specimen is ever found on any one tree and there seems to be some kind of territorial right to the chosen tree or post. A fight between a resident and an invading lizard was witnessed. This

entailed a display by both animals. The body was puffed out and the hyoid pouch everted. The colouring of the two animals became more intense and the slight crest at the back of the neck was raised. The combatants remained in this position for several minutes until the defending lizard rushed at the intruder with its mouth open. A short struggle then ensued during which the intruder was driven off, the defendant then returning to his resting position on the tree trunk.

The other two species of arboreal Anolid were not as common as the previous species but equally well distributed. They were similar in colour but varied in size. The larger of the two was about a foot in length and the males had a definite crest at the back of the head extending downwards to the tail. The general colour was green shading to yellow on the flanks and powder blue on the head. The other species was from six to nine inches long and green and brown mottled with a banded tail. The colour of the latter varied enormously and almost black specimens were seen as well as pale green ones similar to the former species. The identifying feature of these specimens was the banded tail, no other Anolid seen ... ... possessing this feature.

The next group of Anolids were termed 'terrestrial' but this is not strictly true, for although many of them spent long periods on the ground they always retreated to posts, trees etc., in flight. By far the commonest was a small lizard about six inches long and more slender than the other species. Its general body colour was yellow brown, the underside

being pale yellow. This colour was intensified to a bright lemon on the hyoid pouch. Both sexes had pale blue flashes at the side of the head and the males had a red tip to the nose. These lizards were found everywhere and especially around human habitations where they lived on the wooden verandahs and among the piles of the houses. We were fortunate enough to see the mating display of this species. A male specimen was sunning itself on the verandah when a female approached. The male immediately stiffened and took up a position at right angles to the female. A violent bobbing ceremony then ensued. The male began first by bobbing his head up and down violently, copied less violently by the female. This bobbing then spread to the front of the body, the front half being raised and lowered in quick succession by the extension and relaxation of the forelegs. On this, the female moved a little closer to the male who then became excited and suddenly lifted himself on all four feet, puffing his body out as he did so, and everting the hyoid pouch. The body colouration changed within a split second from the normal drab colouring to an irridescent blue green across the back and crest, the blue flashes at the side of the head becoming more intensified and the reddish tip of the nose becoming bright crimson. The pouch was vivid lemon yellow and everted to twice its normal size. In this position he remained poised for nearly two minutes before turning sharply and chasing the female. The two vanished over the side of the verandah and were lost.

The other terrestrial Anolid was a smaller but stouter animal.

Its general body colour was a dark bronze-brown with a light streak down the back along which were a series of black diamond shaped markings. It was not as common as the other species but similar in habitat and distribution.

An interesting finding was the presence of a large ground living lizard at the southermost tip of the island, English Harbour. Although a search was made, this lizard was not found elsewhere on the island. It was nearly a foot in length, dark brown in colour and with a blue flash on its hind legs. Running down the back were a series of lighter bands and the tip of the nose was a reddish colour. This lizard was a very fast runner and much difficulty was found in capturing it. The animal made burrows in the earth, between cracks in stones and under logs etc., The only possible theory to account for its extremely restricted distribution is that it had been brought to this locality accidentally by ship and had established itself on the mainland. This is quite likely as English Harbour was the main harbour for shipping in the last centuries, the locality only changing to St. John, the capital when the harbour there could be dredged.

A search was made in the coastal areas for a series of small lizards which the Museum was specially interested in. These belonged to several genera, all similar in shape and size and distribution. A locality in which these lizards were common was the northern part of the island near Coolidge where they were to be found under stones and debris on the sandy soil behind the coastline. The two found most frequently were both about two inches

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long and covered in a velvety skin. One was black with a thick scattering of yellow spots and the other was dark grey banded with light grey and white. The only other one of this series captured was a single specimen which was dark brown in colour and banded with white, cream and black. All these were a form of gecko and essentially nocturnal. A very large type of gecko frequenting houses was also captured. This is known as the "wood slave" and is held in much terror by the locals. It is about six inches in length and covered with a warty pink skin, almost transparent. It is only seen at night when it comes to feed at light in the houses. Two specimens of the pink variety were captured.

Reptiles of St. Kitts

The reptilian fauna of St. Kitts was similar to that of Antigua, with certain omissions and additions. The emphasis on certain species of Anolis on the island differed appreciably from the distribution found on Antigua. Many of the species were common to both islands, notably the small green species of Anolis which was by far the commonest, the species similar to this but with black and white marbling of the head being almost absent, only two specimens being found on St. Kitts although it was found in equal proportions to the green species on Antigua. Another very common Anolid on St. Kitts was the very large green species with a crest down the back and a powder blue head. This was also found on Antigua but not in as great numbers as on St. Kitts. No specimens of the bottle-green variety with a banded tail were found on St. Kitts.

The Terrestrial Anolids were absent on St. Kitts. This may be accounted for by the presence of the mongoose in such large numbers on the island. Although the mongoose also occurred on Antigua, its numbers there were only a fraction of those found in St. Kitts. In fact, the only common ground-living lizard on St. Kitts was an extremely large species found only in certain areas of the island, notably the airport and certain areas of Basseterre, where, owing to the lack of cover in the first instance and the presence of humans in the second, made the areas unsuitable for a build-up of the mongoose population. This lizard was, when fully-grown, well over two feet long. It was similar to European Lacertid lizards in shape with

a very heavy body. The markings were small black speckles on a dusty brown background with red flashes at the side of the head and on the inside surfaces of the limbs. This lizard was a very rapid runner, and when in full flight, the short forelegs were drawn up under the front of the abdomen and the animal propelled itself by its powerful hind legs, the whole body being balanced by the long tail. It lived in burrows in the soil which it dug itself using the strong claws with which its forelegs were furnished. The only way we were able to capture these specimens was by running them down and pouncing on them as soon as they became too tired to keep up the pace.

We arrived on St. Kitts when the eggs of most of the Anolids were hatching and we were able to get a good selection of the young stages of most of the species. As these are totally unlike the adults and the species could only be determined by dissection, they have been donated to the British Museum where they are at the moment being identified.

Apart from the aforementioned species, we captured several species of gecko on the island. The commonest one was a small grey species similar to that found on Antigua. This was widely distributed over the island and was caught under debris etc., and in the houses that we visited. With this species was also another very large grey gecko, similarly marked but five times the size. Notably absent was the large pink species that we captured on Antigua. This was replaced by a black species. At first this was thought to be a specimen of the grey variety, which, as it was found in a

cellar had reacted to the light intensity of the habitat by expanding the melanphores of its skin, thus appearing black. To determine whether or not this was true, the specimen was kept in an illuminated jar for a week, but there was no change in the coloration. From this, it could be gathered that the species was, in fact, a new record for the island.

The only other geckos encountered on the island were found in rocks and rubble at Cockleshell Bay, the southernmost tip of the island. One of these was similar to that found on Antigua, being velvety black with yellow spots. The other had a banding of yellow white and black, both being similar in shape and size to those found in Antigua.

COLLECTING AND PRESERVING METHODS

All the Reptiles and Amphibians obtained were caught by hand, either by running down the specimen, in the case of ground living forms, or by catching them quickly before they could run up into the branches in the case of the arboreal species. The animals were carried to the laboratory alive in thick linen bags with a draw string at the top. Once in the laboratory, they were killed by injection of ethyl acetate into the brain via the eardrum, using a fine hypodermic syringe. This method was crude but effective in the absence of the recognised killing agent, nicotine. The bags were found to be by far the best carrying equipment as they were easily carried and lightweight. Once in them, the animals became quiet and did not struggle, an important factor especially in the case of the lizards which were very likely to shed their tails if agitated. The dead specimens were then dipped in a strong soap solution to increase their wettability on immersion in the formalin solution. The formalin solution used was roughly 2% but continual "topping up" was required to compensate for the evaporation in the heat. The equipment used was four-pint broad mouthed kilner jars which proved to be fairly airtight. The small specimens were immersed entire after the attachment of the code number tag but the larger specimens were slit up the midline ventrally beforehand to allow the penetration of the preservative and to prevent decomposition of the internal organs. Each specimen was numbered and relevent data such as locality, climatic conditions, date of capture and a brief description of the

coloration were entered in the log book. This last was very important as the preservative tended to alter the natural coloration after a few days. Before shipment, each specimen was individually wrapped in tissue paper and packed tightly with the other specimens in the jar, any spare space being filled with surplus paper to ensure that there was no movement of specimens as they were very fragile and in danger of breaking during transit. The whole was then saturated in formalin solution to keep the specimens moist and the airtight lid tightly screwed on. The jars travelled in crates lent by the British Museum, carrying six jars each in individual padded compartments to eliminate the danger of breakage.

REEF COLLECTING

The reefs on St. Kitts were very poor examples of their kind, being mostly in the degenerating phase. The reefs close to shore, and the only accessible ones, consisted mainly of dead coral with a few sponges and, especially on the Caribbean side of the island, large areas of strap-like green weed. The Atlantic reefs were too dangerous to collect on as they were just submerged even at low tide and were always covered with huge breakers which made collecting under these conditions impossible. The Caribbean reefs were therefore the only ones worked on. The equipment used was diving masks and a strong pair of plimsolls. The latter were essential as cuts from coral were found to go septic very quickly, even after treatment and took a long time to heal and left nasty scars.

CORALS

The commonest reef building coral was Millepora which formed huge flat ledges on which the rarer corals grew. In deeper water, the Stags Horn coral was equally common. Three miles off shore in Antigua, fifteen foot high specimens of this type of coral were seen. A few examples of the Brain Coral Meandrina were seen off St. Kitts in the reefs of the Salt Pond Peninsula, the largest being about six foot in diameter. A smaller example of this type of coral was preserved. Small pieces of other types of coral, not yet identified were also collected from this area. They were all preserved in formalin.

ANTIPATHERIANS AND GORGONACEANS:

Sea whips and Sea Fans were very common in the calmer waters of the Caribbean side of the island. The largest seen was nearly four foot in height and with a diameter of three foot. In the deeper waters off Antigua, a Sea Whip was found to grow to the average length of six to eight feet. The colours of these animals varies with the localities, those nearer shore being a variety of yellows and purples, while those offshore being all colours of the rainbow, brilliant reds and blues and bright lemon yellows. Owing to the difficulty in preserving and transporting these specimens, only a few were collected, these being the smaller offshore specimens.

SPONGES

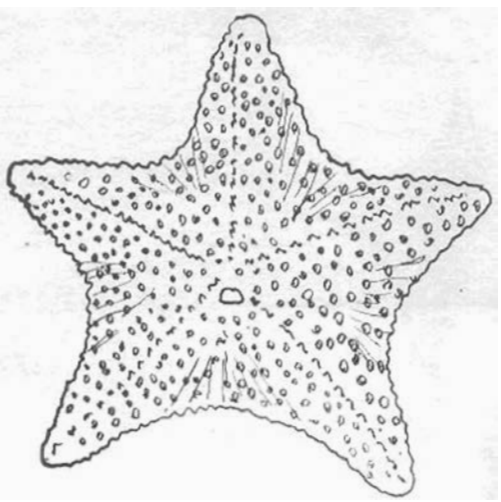
The types of sponges in the inland waters were mostly of the encrusting variety, being found in patches over the surface of the dead coral. These

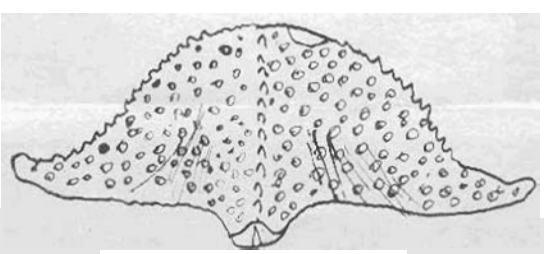
were mainly pale greens and yellows and of an unknown type. Only one specimen was preserved, that being a deep water species washed up on the shore after the tidal waves caused by the hurricanes.

This was six inches in height and bright red in colour. It consisted of branches of the zooid colony with numerous ostioles along its length. Owing to its fragile nature, this specimen was preserved in formalin.

ECHINODERMS

Asteroidea: There was very little variation in the number of species, the only common one being a large orange species found in the green weed close to the shore on sunken and degenerate reefs and on the sand. These were found in most of the Antiguan waters, but only on the sheltered and sandy bays in the Salt Pond area in St. Kitts. These varied in size from three inches across to nearly a foot in diameter. A diagram is given below to show the general shape and structure.





THE 'SUN' STARFISH

The only other starfish found was the burrowing one in which the tube feet were modified to form pointed 'legs'. Two specimens were obtained from a sandy bay on the Salt Pond area. It was found in company with the "Sand Dollar", a sea urchin described later, buried just under the surface of the sand. In the calm waters the tracks of these animals can be seen on the surface of the sand and the specimens located easily by digging at the point where these tracks ended.

ECHINOIDS

Sea Urchins were found to be very common in the rocky coves and on the coral reefs of all the West Indian Islands. By far the commonest species was known locally as the "Sea Egg". This animal was about four inches in diameter and bearing spines up to eighteen inches in length. These creatures are a deep maroon colour and are found in colonies of a dozen or so individuals all over the sea floor from the deeper water to the extreme edge of the shore where the spines may stick out of the water. These animals were a major hazard for bathers and fishermen as they instinctively turn their spines toward any object passing in their vicinity. This may be due to stimulation by vibrations or turbulence in the water. The spines are very brittle and break off easily in the flesh. They are armed with very fine, backwardly pointing bristles which allow easy penetration but prevent the piece of spine from being withdrawn from the flesh. In addition to this, the spines are open at the tip and inject an irritant

substance causing temporary paralysis. On the first collecting trip I had the misfortune to tread on one of these animals and several of the spines entered my foot. Within five minutes the whole of my leg had gone dead. The numbness passed off after about an hour and was replaced by intense irritation. The only method of removal of these spines is by allowing the wound to become septic and then squeezing out the piece of spine with the fingers. Attempts to remove them with tweezers only caused further fracturing of the spine and further irritation. As can be seen, these animals are a major danger to bathers and paddlers and necessitated the wearing of strong canvas shoes while in the water.

Another sea urchin found quite commonly in the weed banks and on the coral reefs was the common British and Atlantic genus, Echinus. This was a surprise to us as we were under the impression that it was a North Temperate genus. It is collected by the natives as an important article of diet.

One species was very common in the rocks of the headlands of the Salt Pond Area. This urchin was about two inches in diameter and the same colour as the large maroon type. The spines, however, were only about an inch in length and non-poisonous. Colonies of this species were found in most of the cracks and crevices of the rocks.

One specimen of a deep water urchin was obtained from a fish-pot used by the local fishermen. This species was four inches in diameter and had

thick spines nearly two inches in length. It was also covered with a growth of coral, a most unusual happening for an urchin as they have special organs termed pedicellaria, the main function of which is to keep off the mobile juvenile phases of sedentary animals such as corals and sponges.*

All these specimens are now awaiting complete identification.

Tests of one other Sea Urchin were found washed up on the beach after the hurricane but they were in such bad condition and so fragile that no specimens were kept. These appeared to be the biggest species found in the waters round the island and were ovoid in shape, indicating that they were highly advanced types. The average size of the shells was about nine inches by five inches and they were about six inches high. The mouth and anus were both ventral, the anus being on the posterior ventral side of the animal and the mouth a little anterior of the centre. The typical five rayed arrangement of the primary spines could clearly be seen on the upper surface. In all cases, the spines had been broken off and as no living specimens of this species were found, the length of the spines and the typical coloration is unknown.

The most advanced type of urchin found was a highly modified one, adapted for life on sandy floors. This was known locally as the "Sea Dollar" or "Sea Clock". These names are derived from the shape of the animal which is completely flat, only being a few millimeters thick at its thickest point.

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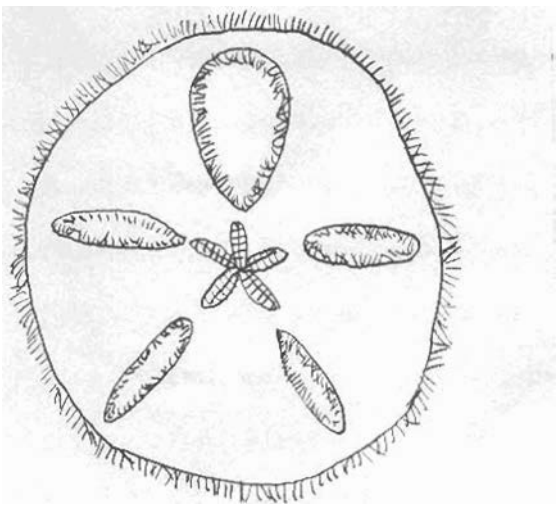
* The "coral" may well have been a coralline sea-weed held in position by the tube-feet; a form of camouflage found in numerous species, particularly in the juvenile stages. (Editor)

It is likened to a clock as radially arranged spaces occur round the central pentagonal structure of primary tube feet. The animals never reach more than about three inches in diameter and are a sandy greenish colour. They were found commonly in a sandy bay called "Friars Bay" on the Salt Pond Peninsula and not elsewhere on the island. The simplest method of locating them, as they are buried under the surface of the sand, was by grubbing for them with one's toes. In this way, a large number of specimens were collected. The general body shape is given in the accompanying diagram.



THE 'SAND DOLLAR'

Pisces

Although there was an abundance of fish in the coastal waters, owing to the difficulty in capturing them and the inadequacy of our collecting equipment, very few of the smaller species were collected, the preserving of the larger types being impossible owing to the size of the jars we had. Only one marine species was preserved on account of its beauty and rareness in these waters. This was known as the "Queen Angel Fish" and was about seven inches in length, narrow and about three inches deep. The head was developed into a characteristic point and the dorsal and ventral fins much elongated and swept back. The pectoral and pelvic fins were reduced and situated close to the gill operculum. The tail fin lobes were elongated in the same manner as the dorsal and ventral fins. The coloration of this particular specimen was exceptionally fine, consisting of dorso-ventral bands of irridescent blue and bright lemon yellow. The fins, both tail and body were brilliant orange and the gill opercula were scarlet. Unhappily, these colours soon faded in the preservative, though traces of the original markings can still be traced. This specimen was obtained from a fisherman at Cockleshell Bay, the extreme southermost tip of the island, where it was caught only a few yards off shore.

The only other species of fish preserved was a fresh water type. This was caught from the Wingfield River, the only permanently running river on the island. This fish was of particular interest as it was modified to attach itself to the rocks in the swift-running river.

It was dorso-ventrally flattened, the head and mouth being extremely large, the rest of the body tapering down to an almost whip-like tail with a small dorsal lobe. The upper surface was a dull brownish colour changing almost instantaneously to a pure white ventral surface. The interesting point about this fish was the fact that the pectoral and pelvic fins and a layer of the ventral body wall were united into a large ventral sucker by which the fish attached itself to rocks etc., The method of attachment seemed to be firstly the application of the rim of the sucker to the substrate, the ventral body wall then being depressed to expel water and then raised again, causing a lowering of pressure within the sucker. The hold of this sucker was extremely powerful and in many cases, the sucker itself had to be mutilated before the animal could be prised off the rock.

Crustacea:

During our stay on St. Kitts we were able to make a complete collection of the terrestrial crabs, of which the island has five distinct species. These animals were most commonly found at night with the use of torches as they made their way from their burrows inland to the sea, where they wet themselves and replenish the water supply around their gills. The largest of these crabs was pale cream in colour and measured from nine inches to a foot across the widest part of the carapace. The limbs were especially powerful, the right cheliped measuring almost four inches in diameter at its broadest point, the left being only half this size. These animals were found as far as three quarters of a mile inland. They never emerged except

at night and their clickings and rustlings could be heard in practically every part of the bush. When disturbed, they did not try to escape, but adopted a defence attitude with both chelipeds raised and facing the intruder. They were caught in large numbers by the local populance as an article of food and a delicous dish called "Crab in the Back" prepared from them. The only other land crab found commonly on the other islands was the 'Soldier Crab', a species of hermit crab inhabiting a variety of shells ranging from the periwinkles, about an inch in diameter, to the Queen Conchs, almost a foot in diameter. The commonest type of shell utilised by these animals was a large type of periwinkle, six inches in diameter and a large species of whelk. These animals were found in much the same type of habitat as the other land crabs, but instead of constructing burrows, they sheltered under any kind of wood or stone. When disturbed, they retreated into their shell, the opening of which was completely closed by the large left cheliped. The coloration of these crabs varied from brilliant scarlet with purple appendages to a dull brown with black tips to the appendages. The juvenile types were usually a bright orange. They were regarded with much fear by the natives and were not used as an article of food.

St. Kitts has a larger variety of land crabs than the other islands, one of the specimens found there being equal in size to the large white land crab. This specimen was of heavier build than the white type and was a blue black colour with scarlet underparts and scarlet patches on the inner surface of the appendages. They were more localised in their distribution than the white type, being found nearer the coast and only on the north west coast of the island.

An interesting habit these land crabs have, is to return to the sea as soon as bad weather is imminent. In fact, the locals knew of the approach of the hurricane before we heard news of it over the radio, simply by observing the habits of these land crabs. We went out one evening to watch the exodus. The crabs usually leave for the sea about an hour after sunset, so we went to one of their more popular runs to the sea to watch them. Within half an hour, nearly fifty crabs had passed by, the normal number being about twenty. They also tell the natives of the approach of rain, the evening before the rain actually falls, by coming out of their burrows and wandering around the countryside. They act as the scavengers of the island and are found often clustering round the dustbins and rubbish dumps of the natives on nights such as this.

The other two crabs captured could not really be termed land crabs although they both construct burrows and spend a large amount of time on dry land. One was a brackish water inhabitant, living in burrows on the mud banks of the swamps during the dry season. This was the well known 'Fiddler Crab', a small animal only about an inch in diameter. The females are a muddy grey colour dorsally with pearly pink underparts. The chelipods are small and white and normally held close against the lower part of the thorax. The males, however, are much more beautiful than the females, being an irridescent blue green dorsally with scarlet appendages and the same pearly pink underparts. The most unusual feature is the enormous right cheliped which is almost the same size as the animal itself and scarlet on its outside surface shading to pale pearly pink on the inside.

The interesting feature about this crab is that it is diurnal and a visit to its swampy habitats during the day will show hundreds of these little crabs sitting outside their burrows or submerged in the shallow water. We were lucky enough to arrive at the right time of the year (the first rains) to witness the mating ceremony of these crabs. The females were all in the water and the males ranged along the shore, each in front of its burrow. Looking along the length of the shore, it looked as if it was flashing with little lights. Each of the males was standing with its chelipeds extended and the right one was being sharply bent inwards at intervals in a beckoning movement, the flash occuring as the shiny outer surface of the appendage was struck by the sunlight. One by one, the females were seen to come out of the water and walk inland. All the males then executed a little dance running towards the female and then back to their burrows, still waving their huge appendage. The female then approached one of the males who quickly followed her down the burrow which he had constructed, only his raised chelipeds being visible out of the mouth of the burrow. The whole of this dance or ceremony takes a few days to complete, probably depending on the state of maturity of the female crab. There appears to be a surplus of males as the females were not very often found although males were very common. This may account for the elaborate courtship display, only the largest and finest males being able to find mates.

The other crab was a marine species living in burrows along all the sandy coasts. These burrows were several feet in length and the crab

remained in them all day, only emerging at night to go into the sea to feed. The crab itself was pale olive green with very large, elongated eyes which were a shining black. They gave the appearance of being very rapid runners, which they were, the legs being large and powerful. The body was ovoid and flattened dorso-ventrally. It was impossible to capture one by digging it out of its burrow as they were able to dig away faster than we could dig to them. The only way in which we were able to capture them was at night, when they sat at the mouths of their burrows. We had to find one that had moved a little distance away from its burrow, dazzle it temporarily with the flashlight and then do a rugger dive onto it with a strong piece of material in the hands to protect them from the powerful pincers. Even so, nine out of ten animals escaped as they were so much swifter than we were on the sand.

The other common crustaceans were both of the lobster family. One was the true marine crayfish, very much like the British Lobster but without the huge chelipeds. The first four pairs of walking legs are furnished with pincers at the tips, both pairs of antennae are well developed and almost equal in length. The swimmerettes on the underside of the abdomen are large and flexible and rather leaf-like, being banded with lustrous black, yellow and pink. The tail fan is particularly well developed and coloured similarily to the swimmerettes. The telson proper is the only calcified part of this organ. The carapace is furnished with a pattern of knobs and spines, the head bearing three large, forwardly pointing curved ones tipped with black. These animals are found in nearly all the coastal waters,

especially in rocky districts and are captured in large numbers by the local fishermen as an article of diet.

The other Crustacean captured was the local fresh water Crayfish, found only in the Wingfield river. We were fortunate to capture the largest specimen caught on the island for fifty years. This animal measured nearly two feet from the tip of the cheliped to the end of the tail. The normal size is approximately eight inches long. The general body colour of this animal is a very dark chestnut brown, fading to cream on the soft undersurface of the abdomen. The remarkable feature of this animal was the cheliped itself. The right one was much smaller than the left and the terminal joint of the right was nearly six inches in length, the whole organ being very long and slender, the actual pincer part only constituting the terminal half inch of the appendage. The smaller specimens were found in large numbers in the pools between the rocks in the river, the larger one being captured in the deep pool underneath the weir, built half way up the river's length.

Myriapoda

Perhaps the commonest terrestrial animals on St. Kitts were the centipedes and millepedes which were found everywhere in the sugar cane, forest and coastal areas.

The millepedes could be found under old piles of bagasse, grass etc., The commonest one was about two inches long and red orange in colour. They could be found wandering all over the roads between the cane fields and on the

paths of the houses etc., A pair of these animals were found mating near the Sugar Association Building. The male followed the female, all the time trying to keep her head still and pin the rest of her body to the ground. After much effort on his part, he managed to achieve this and then slowly turned the anterior part of her body over to expose the genital openings on the third segment. The pair of penes at the anterior and of the male were then suddenly everted and pushed into the female's genital opening, when the transference of sperm took place. They remained in this position for several minutes before the male removed the penes and released the female.

The other common millepede was larger than the red type and stouter. It was black in colour with two lateral yellow stripes. Its distribution and habitat was very much the same as that of the red type although less common than the red species.

The centipede was equally common as the red millepede and found all over the island where there was any kind of cover for it. It ranged in size from six inches to fourteen inches in length and about half an inch broad. The coloration varied very much, the basic colour being a yellow orange, the plates along the back being a mixture of green and blue green patches. The first pair of legs are modified to form a strong pair of 'pincers' and the bite of this animal had particularly painful consequences. They are a constant danger to the cane cutters as they often hide in the cane sheaths and were a major hazard in collecting any of the

animals hiding under stones etc., as one had to be careful before lifting these objects in case there was a centipede hiding underneath.

Arachnida

This class was very well represented on the island and several interesting specimens were collected.

The most interesting specimen was an Amblypegian found in one of the cellars of the estate house. This animal at first glance appeared to be a spider. It was dull black in colour and possessed two large toothed appendages similar to the front legs of a mantis, folded across the front of its body. The inner surface of these pincer-like structures were bright orange in colour and were the only coloured organs the animal possessed. The body itself was flattened dorso-ventrally and heavily chitinised as it appeared hard and rough to the touch. The first pair of appendages were modified to form a strange whip-like structure coiled in a characteristic way reminding one of the old coaching whips. These were held over the back of the animal and reflexed across the abdomen. The three pairs of walking legs appeared normal. This animal was unlike spiders in that it was not hairy but covered with minute tubercles, giving the dull appearance to the body. It is regarded by the local inhabitants as a very dangerous animal but although we picked it up, we were not bitten.

Under the bark of a dead tree stump in Wingfield estate we captured several specimens of a species of tailless scorpion. These animals were minute, the largest only measuring three millemetres in length. The body

colour was a dark grey and the pincers were either dark red or black. These were of especial interest as none of the local inhabitants had seen them before and although we looked in many other localities, we never found any other specimens apart from these.*

On our arrival in the island we were told that there were no scorpions there. During a collecting trip to Cockleshell Bay at the tip of the peninsula we found that practically every rock in this uninhabited place had a scorpion underneath. These animals measured four inches from tip to tail and were a sandy colour, otherwise like the Mediterranean scorpion. We were lucky enough to capture a female with her family on her back, so obtaining adult and juvenile phases of this animal.

We were also presented with a scorpion found in the heart of Basseterre in one of the shops there. This was totally unlike the Salt Pond species as the pincers were thin and elongated, instead of being stout and broad. The coloration was greenish with darker patches. This specimen may not be native to the island as where it was found was near the dock and it might have been brought to the island in the cargo of one of the ships visiting the island.

The spiders on the whole were uninteresting, the only spectacular species being the local Mygalid or Tarantula. This animal measured six inches from leg tip to leg tip and was found wherever the earth was dry enough for it to make its burrows. The local inhabitants informed us that they were much

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* These belong to the arachnid order Pseudoscorpiones. The description and habitat are typical. (Editor)

more numerous in the past, having declined appreciably in numbers during the last thirty years. The spider itself was covered in thick black hair and when in its typical crouched position looked rather like a furry black mouse. This animal, instead of scuttling like other members of its tribe, progressed by a series of huge six foot leaps. The bite of this animal is not fatal, as is commonly thought, but merely painful and less dangerous than that of the centipede. These spiders are normally sluggish and only emerge from their burrows to hunt or when they are flooded out by the rain.

Another large and common spider on the island was the House Spider, very similar indeed to the Italian true Tarantula, the legs being banded with black and dark grey and the body a mottled grey. The pedipalps were black with red tips and were the only patch of bright colour in the sombre background. These animals often came through the shutters of the house, especially if the weather was wet.

Another spider very much like the large tarantula was a much smaller specimen, only an inch and a half in diameter and a pinkish brown in colour, covered with a fairly thick mat of shining yellow hair. This spider constructs a burrow similar to that of the large black Tarantula but laterally under a stone or some similar object, the entrance being at the edge of the stone itself and the lower surface of the stone forming the roof. The end of the tunnel is enlarged into a chamber in which the spider lives during the day, emerging at night to hunt its prey.

The only really spectacular web-building spider found was known as the Star Spider as it had a peculiar method of resting in the middle of the web. The legs were held close together in pairs, the two anterior pairs of legs being extended beyond the head and the two posterior pairs being held backwards at the same angle giving the appearance of a cross, the spider's body being the centre. This animal measured about three inches from leg tip to leg tip and was patterned in black, lemon yellow and white, and the legs being banded with lemon and black. The web was similar in construction to that of our Orb Spider Arenews diadematata, although much larger.

Insecta

The insect fauna of St. Kitts was, on the whole, rather sparse. This may be accounted for by the fact that the island is mid-way between the North and South American continents and therefore has little indigenous insect fauna. The presence of the mongoose in such great numbers on the island may also account for the complete lack of ground-living insects and also for the scarcity of other species as it destroys their larval stages in large numbers.

By far the richest area for collecting the majority of the insect groups was the brush area of the tropical forest where the food plants could grow well owing to the amount of sunlight present. Further in the forest, insects, apart from certain lepidoptera, were rare, as the canopy of the forest trees shut out all light and prevented plants on which the larval stages could feed from becoming established on the forest floor. Hydrophilous species were found concentrated around the Frigate Bay and Canada Pond areas where there was enough free brackish water for them to breed.

Collecting Methods

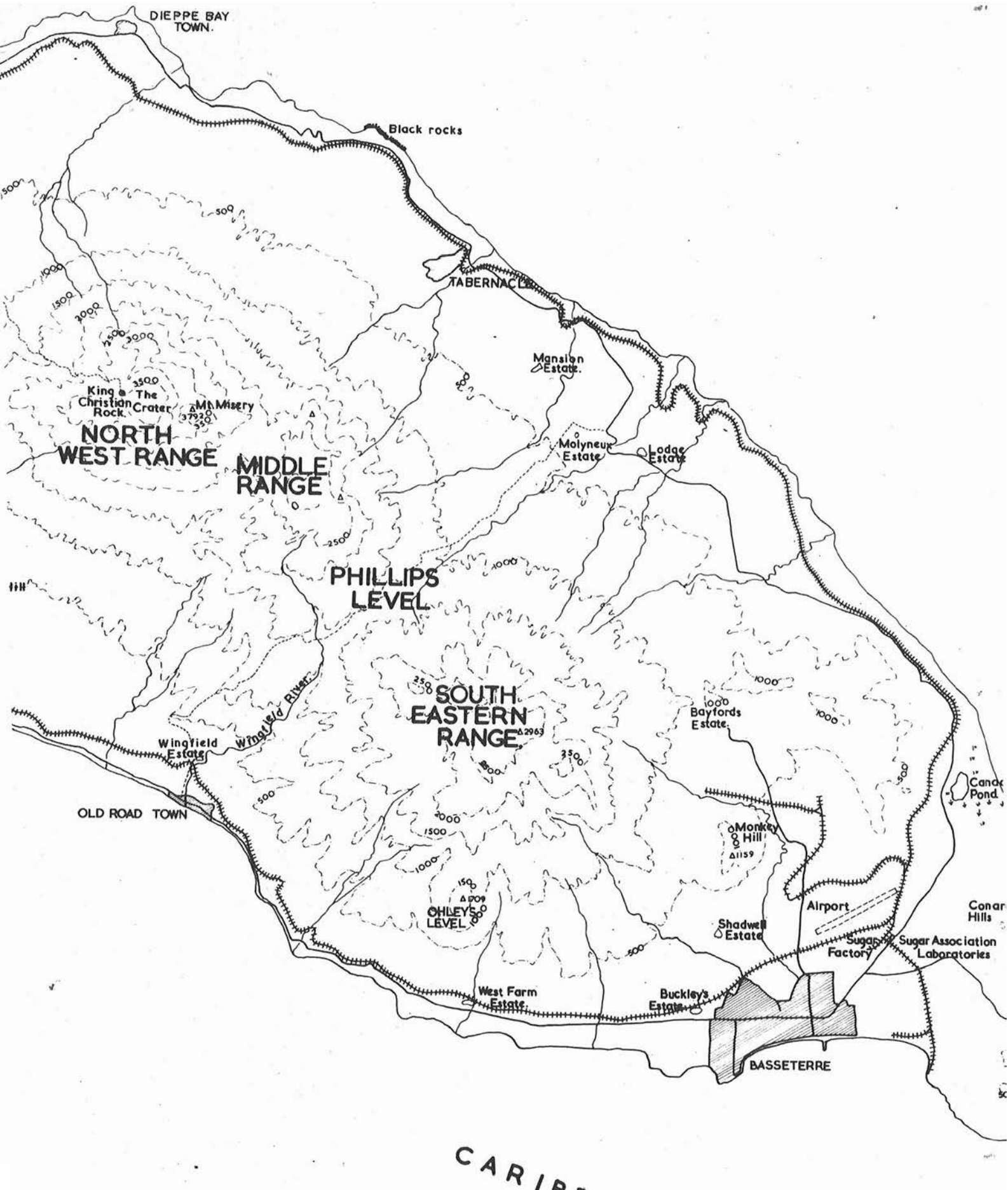
The methods of collecting the insects varied with the type of insects searched for. Ground living species were searched for under logs, rocks, debris etc., but with no luck. Xylophagous species were looked for under bark and in rotting wood in the forest and on the forest fringe. It was

found that the best way of collecting xylophagous species, especially the Longicorn beetles was by setting up light traps in the evening until midnight, when large numbers of many species of these beetles were attracted to the light. Phytophagous species, such as bugs, beetles etc., were collected by sweeping and beating the herbage of the island. This was found to be a very good method for bugs but the few beetles captured in the manner did not warrant the time spent collecting them. Flying species, such as Butterflies, Moths, Flies and Dragonflies were captured using a Kite net, which proved very suitable in open areas but almost useless in the forest due to vegetation such as lianas etc., which were likely to tear the delicate fabric.

Preserving methods

The insects, when caught, were transferred to glass tubes for transport to the laboratory. They were killed with ethyl acetate vapour and placed in paper triangles bearing the date and place of capture. The paper triangles were then placed in a sealed biscuit box containing silica gel, to dry out the insects before they were transferred to another sealed box containing the preservative, paradichlorbenzene. For transport, the insects were packed between layers of tissue paper in sealed boxes with a liberal supply of the preservative.

The insects caught have been donated to the British Museum of Natural History, the beetles being given to Mr. W.O.Steel of Silwood Park Field Station for identification.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Molyneux Estate
Lodge Estate
King Christian Rock
The Crater
Mt Misery 3792
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MIDDLE RANGE
PHILLIPS LEVEL
SOUTH EASTERN RANGE
Wingfield River
Wingfield Estate
OLD ROAD TOWN
Bayfords Estate.
Monkey Hill 1159
OHLEY'S LEVEL 1709
Shadwell Estate
Airport
Sugar Factory
Sugar Association Laboratories
Conar Hills
West Farm Estate
Buckley's Estate
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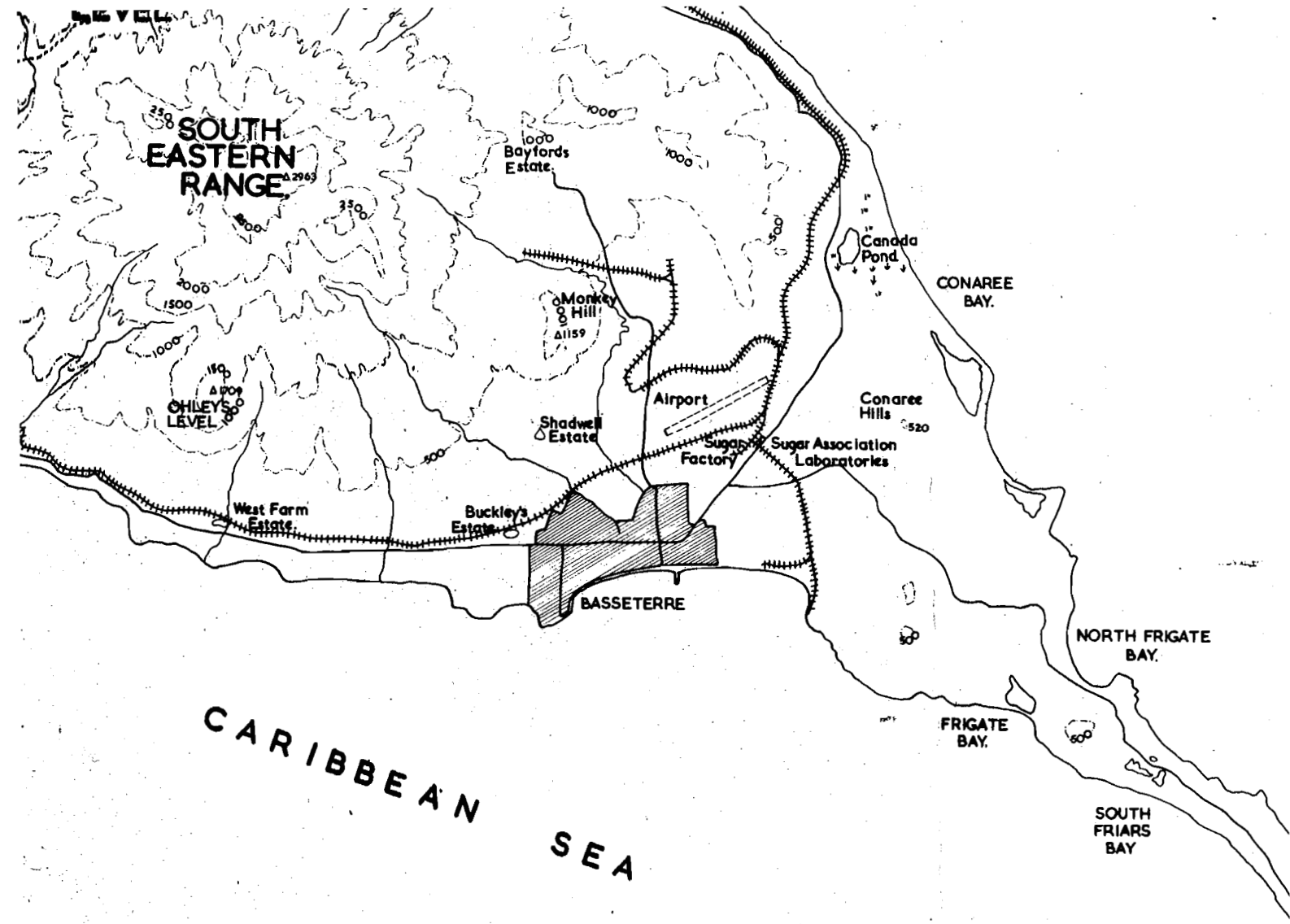

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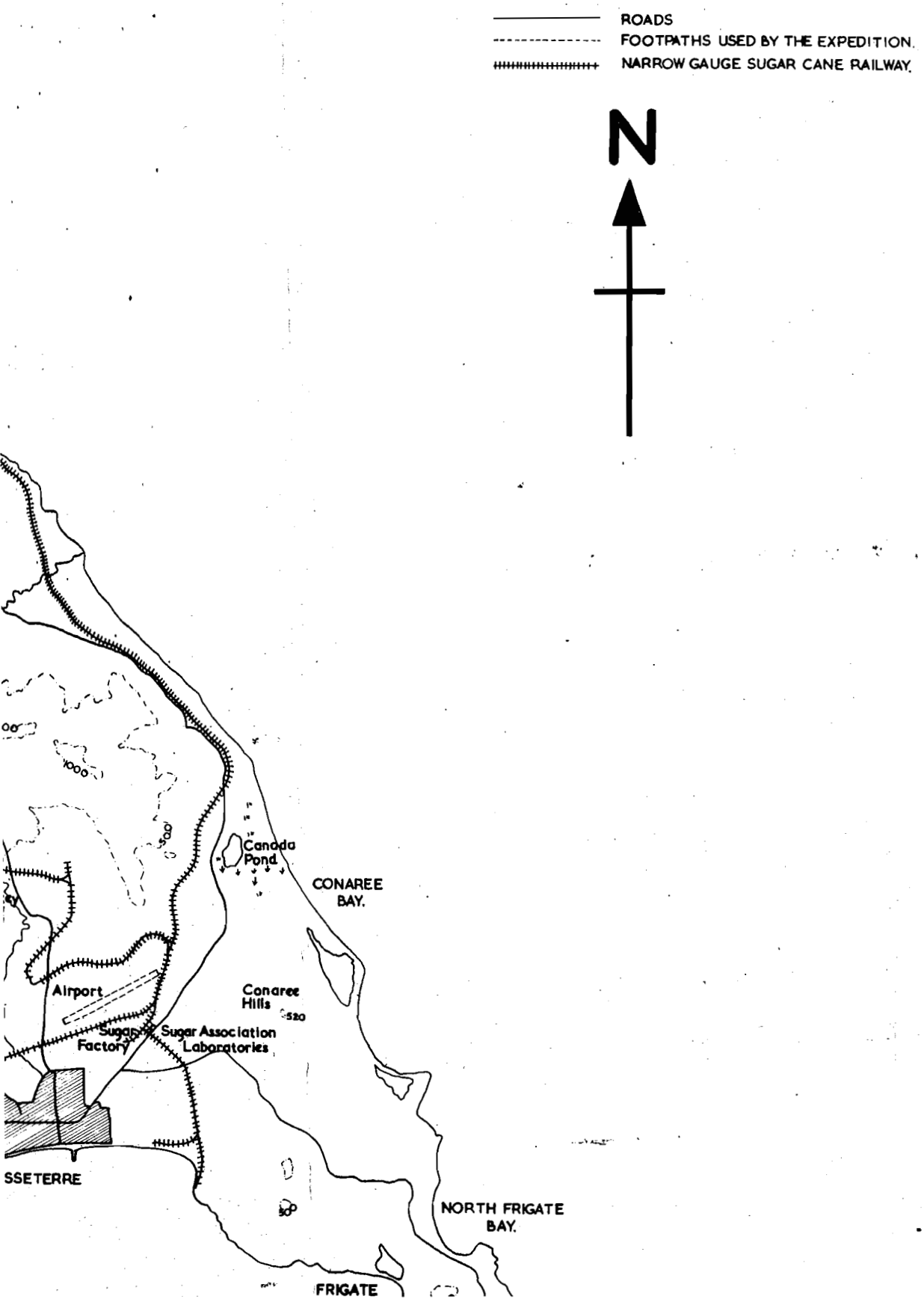
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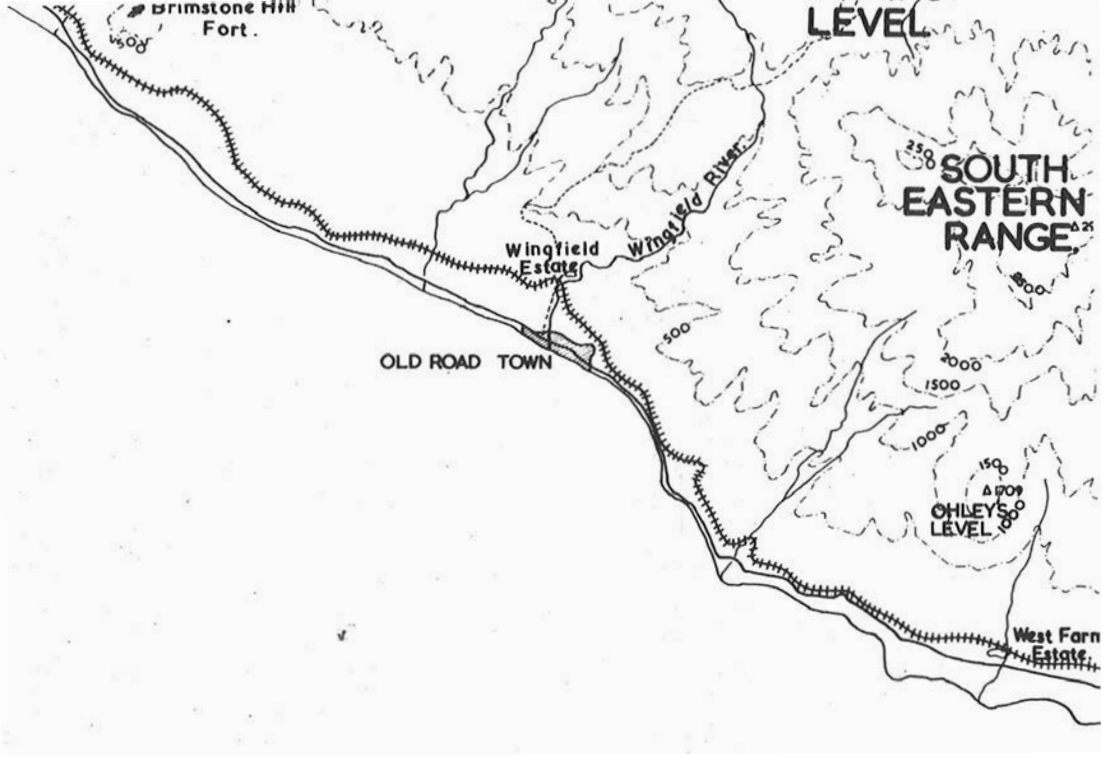

CAR

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SCALE:

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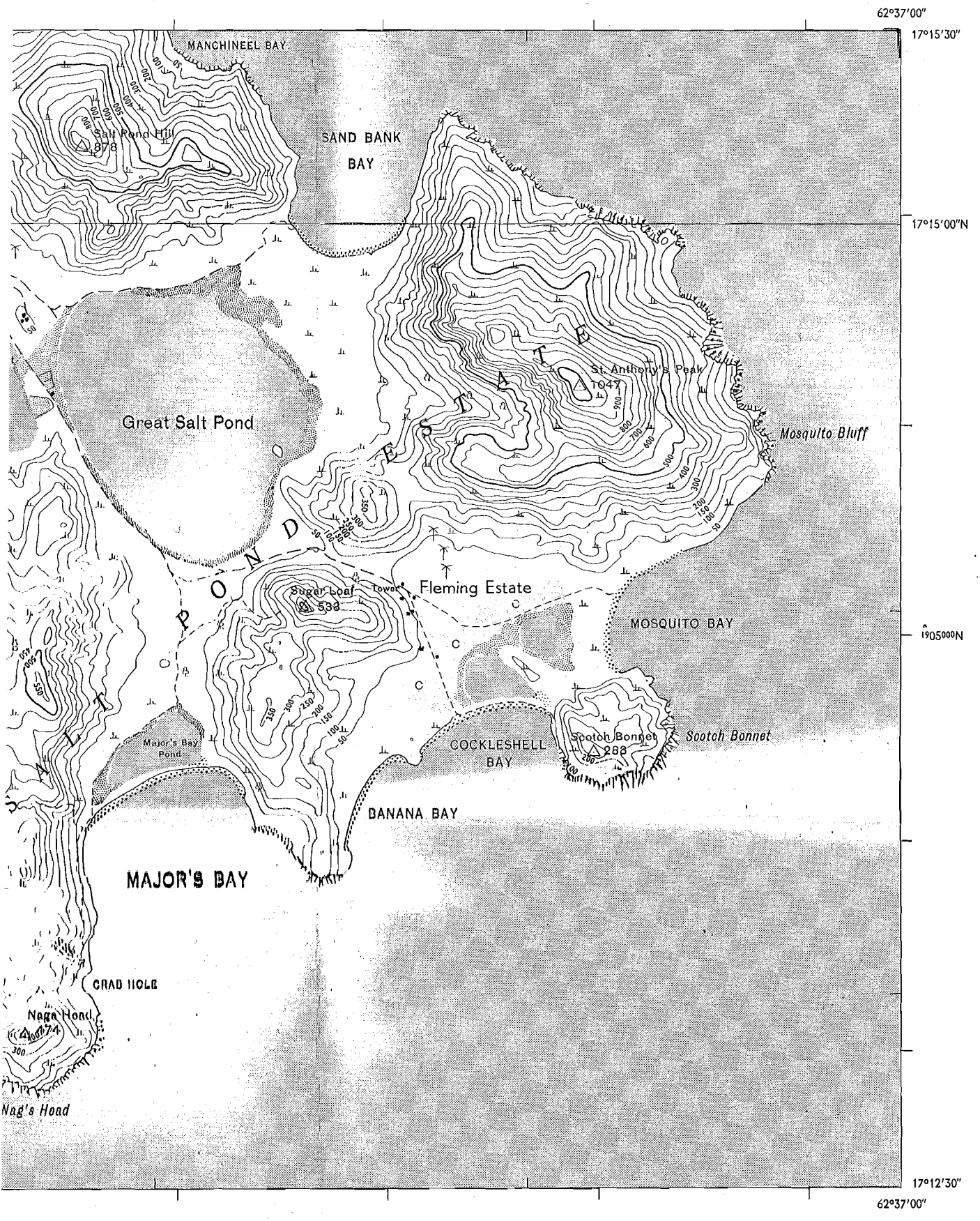
OPHER - NEVIS - ANGUILLA Sheet 2

Continuation on the same scale

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Upper Conaree
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Half Moon Pond
Half Moon Point
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Muddy Pond
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Pimple
274
Muddy Point
7
Morne Peak
566
Frigate Bay Estate
NORTH FRIGATE BAY
Morne Point
200
Tiny Tim
275
Salt Pond
POTATOE BAY
Fort Tyson
Ruins
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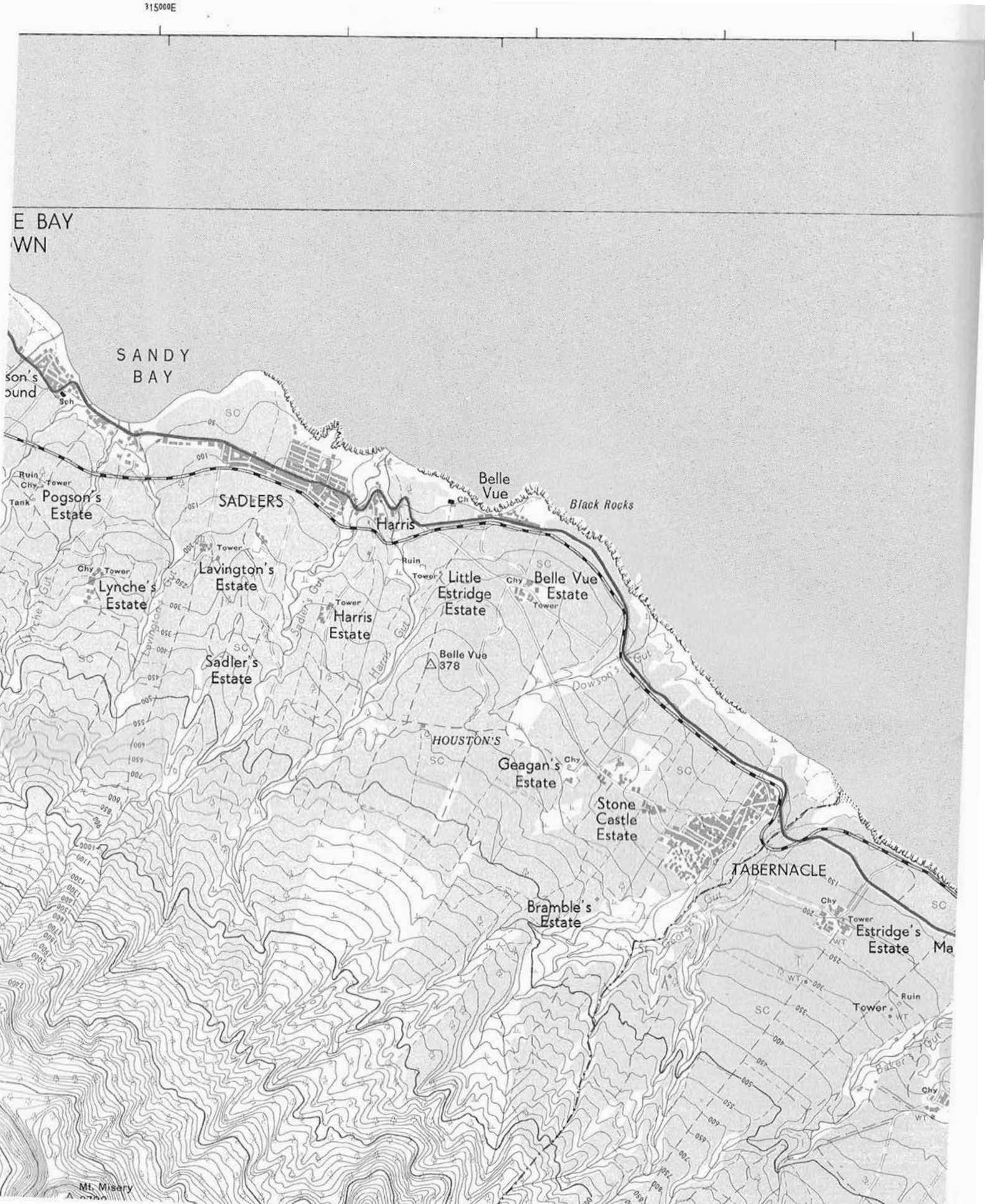
FRIGATE BAY
Sir Timothy's Hill
NORTH FRIAR'S BAY
SOUTH FRIAR'S BAY
SALT POND
Grape Tree Bottom

SAINT CH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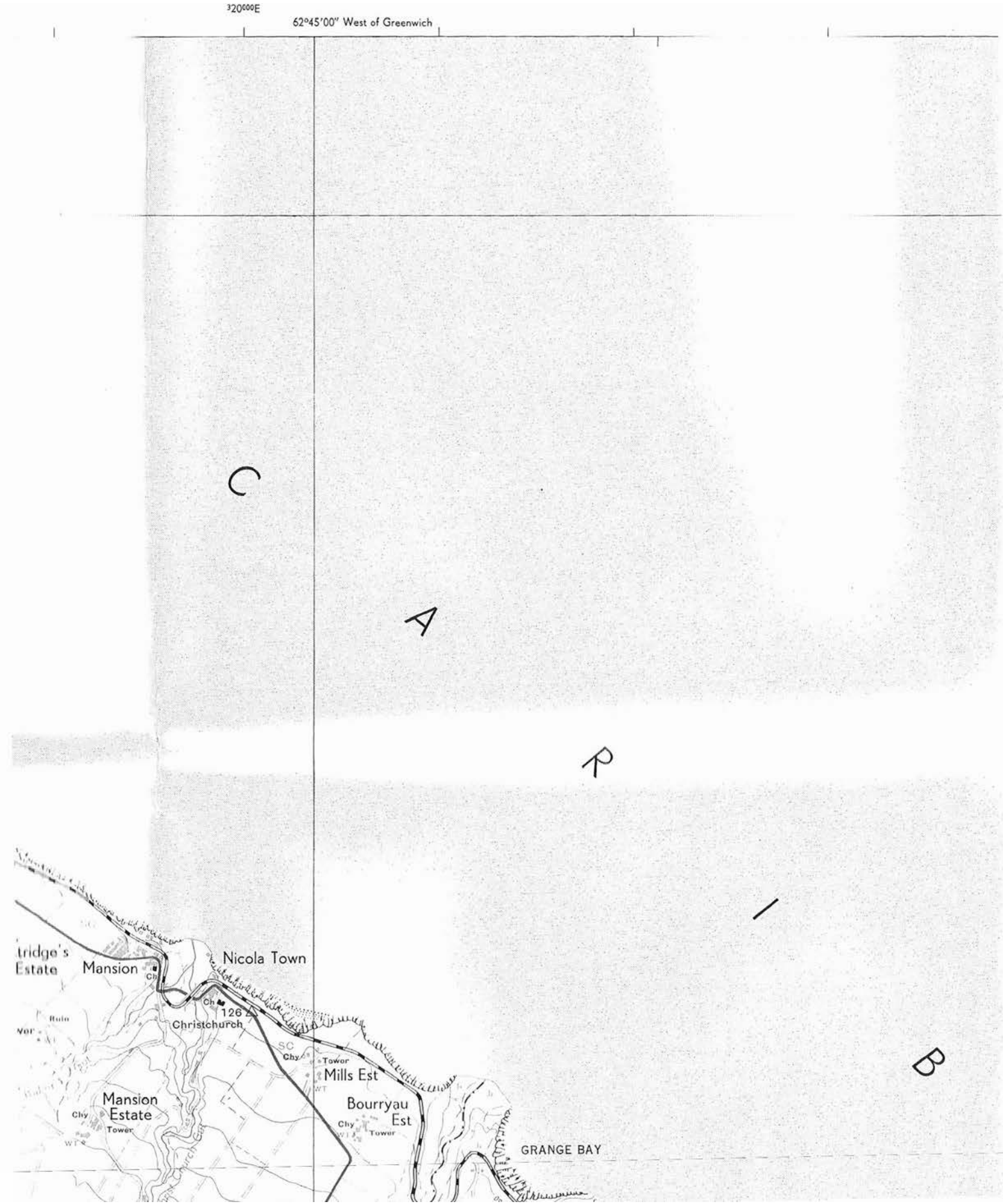
Baker's Gut

CHRISTOPHER




S
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Half Moon Pond
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Hill
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Muddy Point
Muddy Pond
Muddy Point
7
Peak
Frigate Bay Estate
NORTH FRIGATE BAY
Tiny Tim
275
Salt Pond
120
Fort Tyson Ruins
FRIGATE BAY
Sir Timothy's Hill
NORTH FRIAR'S BAY


Upper Bayford
1124
Bayford's
Ogee's
Stapleton
Parry's
Stapleton Estate
White House
Monkey Hill
Monkey Hill
1169
St Peter's
Douglas Estate
Canada Estate
Barker's Point
Tower
Ruin
Upper Canada Estate
Canada Hill
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Ruin
Ten Penny Estate
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Golden Rock
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Air Port
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Ruined Tower
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West Base
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BASSETERRE
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Fort Smith
Morne Peak
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Morne Point
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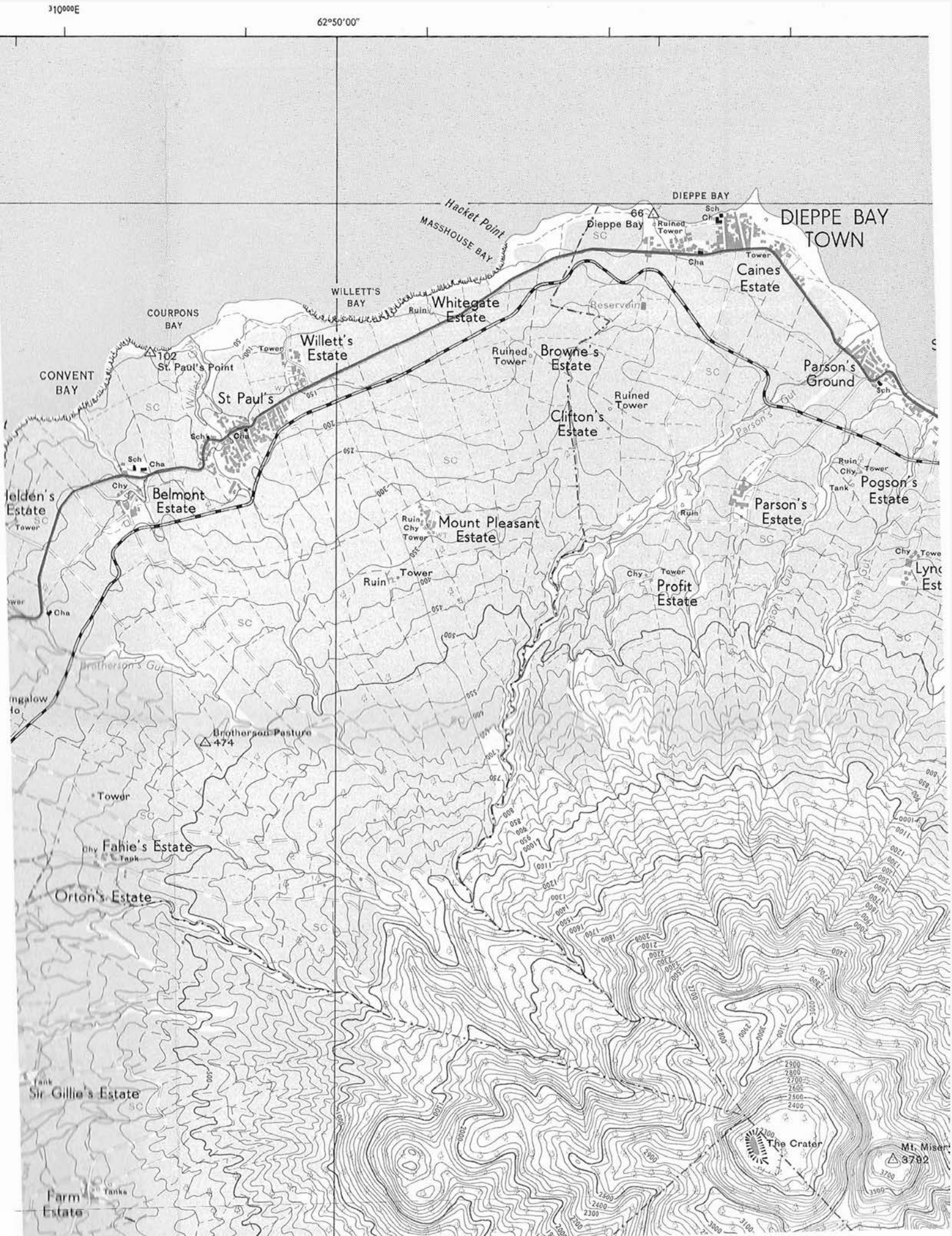
POTATOE BAY
Fort Tyson
Ruins
FRIGATE BAY
Fort Thomas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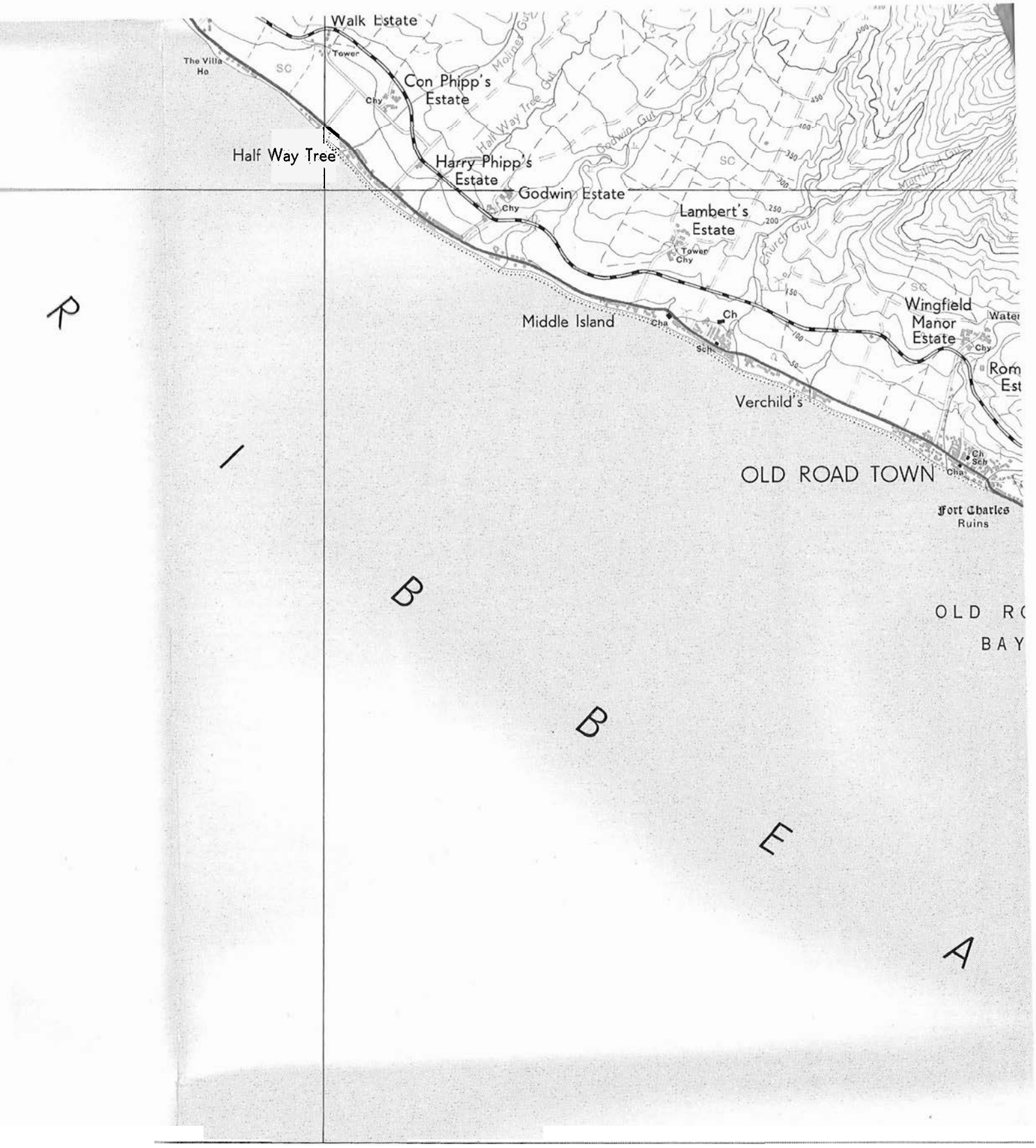
Caines Estate
WILLETT'S BAY
Whitegate Estate
Reservoir
COURPONS BAY
Willett's Estate
Ruined Tower
Browne's Estate
Parson's Ground
102
St. Paul's Point
CONVENT BAY
St Paul's
Clifton's Estate
Parson's Gut
Belmont Estate
Mount Pleasant Estate
Pogson's Estate
Parson's Estate
Profit Estate
Brotherson's Gut
Brotherson Pasture
474
Fahie's Estate
Orton's Estate
Sir Gillie's Estate
Farm Estate
The Crater
Mt. Misery
3792



SCALE 1:25,000

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Id	British West Indies
ojection	Transverse Mercator
pheroid	Clarke 1880 (Modified)
it of Measurement	Metre
ridian of Origin	62° West of Greenwich
itude of Origin	Equator
le Factor at Origin	0·9995
se Coordinate of Origin :	400,000 m Easting
	Nil m Northing

Main Roads — Tarmac — Earth — Bridge

Secondary Roads

Other Roads

Cart Tracks

Footpaths

Railways (Light)

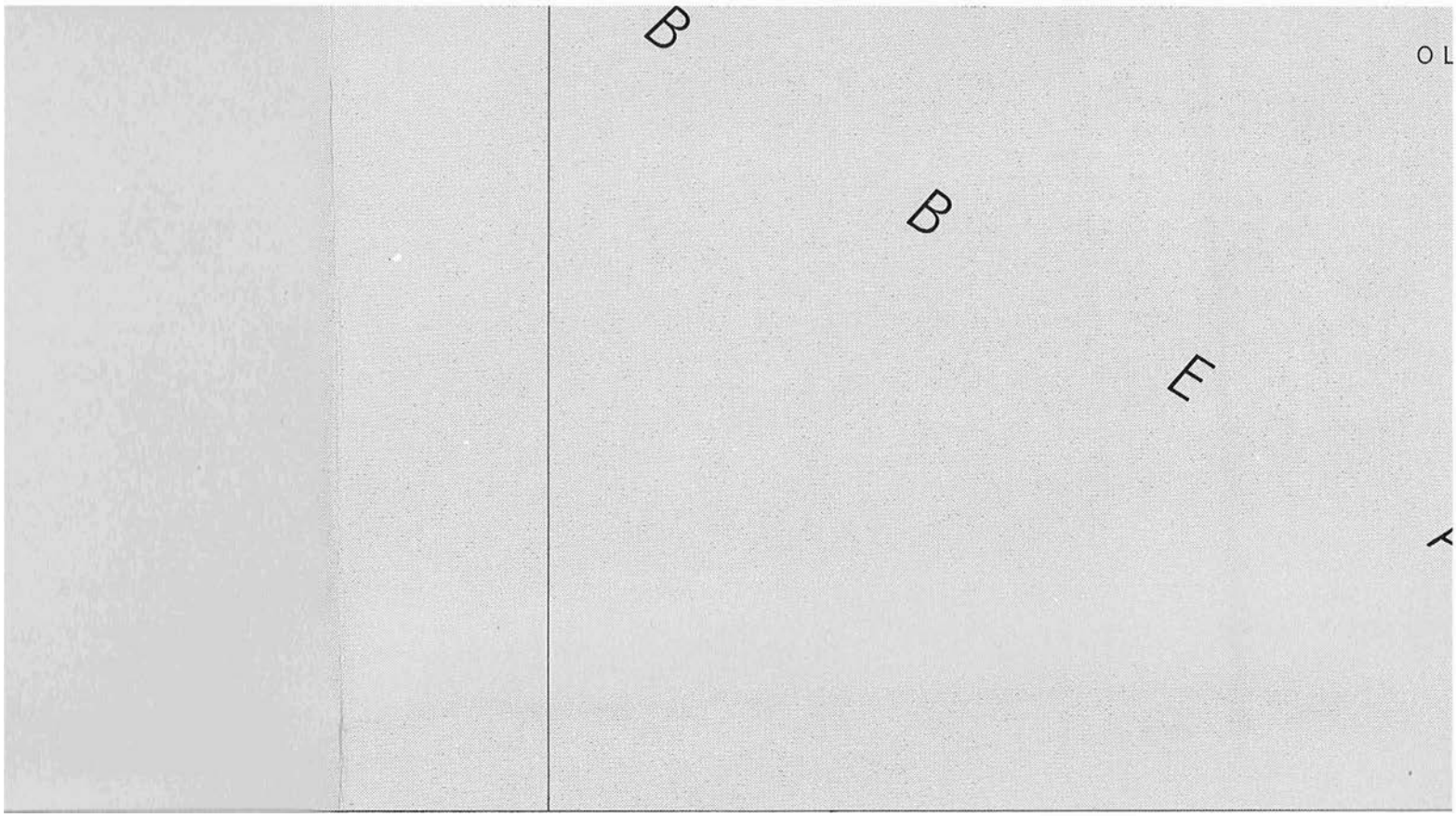
Parish Boundaries

Trigonometrical Stations :- Main

,, :- Minor

Heights in feet given to ground level

Contours V.I.50' 550 500 450



SCALE 1:25,000

1/4 0 1 2

1000 2000 3000 4000

00 500 0 1 2 3 4

Grid	British West Indies
Projection	Transverse Mercator
Spheroid	Clarke 1880 (Modified)
Unit of Measurement	Metre
Meridian of Origin	62° West of Greenwich
Latitude of Origin	Equator
Scale Factor at Origin	0·9995
False Co-ords of Origin:-	**400,000 m Easting**
	Nil m Northing

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SHEET HISTORY

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Main Roads — Tarmac / Earth
Secondary Roads — Bridge
Other Roads
Cart Tracks
Footpaths
Railways (Light)
Named Buildings
Other Buildings
Police Station — Pol Sta
Post, Telegraph Office — PT
Hospital — Hosp
Church, Chapel, School — Ch Cha Sch
Court House, Hotel — Ct H H
Lighthouse
Watercourse, Dam, Pond
Fences, Hedges
Water Tank — WT

Parish Boundaries
Trigonometrical Stations :- Main
,, :- Minor
Heights in feet given to ground level
Contours V.I.50'
Forest
Low Forest, Woodland
Scrub
Line of Trees
Palms
Swamp
Mangrove
Cultivation and Plantation (C=Coconut SC=Sugar
Sand or Mud
Cliffs

The representation on this map of a Road, Track or Footpath, is no evidence of the existence of a right o

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