

- (1) In order to maintain leadership, your administrators have provided you with a statistical organization through which you can effectively call upon statistical theory and mathematics now in your own work.
- (2) During its first year of operation, this organization concentrated on developing good communication between biologists and statisticians and in stimulating an awareness of the potential of statistical tools. It also made significant contributions in basic methodology in wildlife research and it provided very worthwhile consulting services.
- (3) This is your organization and we invite you to use it to the fullest, not only in research, but also in administration and in educational programs.

THE GAME AND FISH RESOURCES OF THE VIRGIN ISLANDS

By G. A. SEAMAN

First of all, I would like to say that I feel it an honor and privilege to have a place on your important program, and am grateful for the opportunity of representing probably the smallest wildlife outpost under the American flag. It is also with some trepidation that I address so august a body, especially in the field of fisheries, of which I know very little. You will bear with me, I know.

Secondly, I am extremely happy to visit for the first time this great sovereign State of Mississippi, proud and beautiful and so worthy of its significant motto: "Virtute et Armis". It makes me wish that these conferences lasted much longer than they do!

Since time is short, I must on to tell you about the Virgin Islands, of which one man, when asked if he knew where they were, replied that he did not, but felt that they must most assuredly be very far from "the Isle of Man"!

In the northeastern corner of the Caribbean Sea at a point about 1,000 miles east-southeast of Miami, Florida, and approximately 1,400 miles south-east of New York City (as the plover flies) lies a small archipelago of islands, cays and rocks. Here the two great Antillean land axes meet, the one running east and west, the other north and south. It is a strategic point. To the north and east lie some of the Atlantic's spectacular deeps, to the south the comparatively warm shallows of the Caribbean. From this geologic matrix have risen the islands Columbus discovered on his second voyage in 1493 and called "Virgins".

The group is small. It consists of three main islands and about 40 islets and cays. In their entirety they total about 133 square miles. The islands are tropical, mountainous and inclined to drought. Vegetative cover, save in sheltered valleys where there is heavier growth and less evaporation, is primarily a xerophytic thorn scrub. Surface fresh water is confined to a very few small streams, which often go dry, and an occasional spring. After heavy rains, small ponds appear in depressions. These sometimes hold water from year to year. The climate is mild and salubrious with refreshing easterly trade winds blowing most of the year. Temperature ranges from 75° F in the winter months to highs of 85° F during the summer. Rainfall varies on an average from 30 to 55 inches per year.

It must be noted that, though the total land area covered by this small group of sea islands is actually tiny, their geographic position, topographical makeup and climatic advantages invest them with a unique and most interesting biota. To the naturalist and nature lover, is to be found among these islands a microcosm of rare and delicate beauty and ever recurring wonder, all free for the search and the looking.

Original Fauna

At the time of the discovery of the Virgin Islands by Columbus, Arawak and Carib Indians were the inhabitants. The little we know today about the island fauna of that time we owe to them. From the "kitchen middens" of their camps, we have unearthed the bones of the animals and birds and fish they used

for food. Clever naturalists, painstakingly piecing together the scattered fragments of Arawak dinners, have identified these for us. We thus know of several animals and birds which for one reason and another no longer live in the islands.

Among the early animals identified were two spiny rats, *Isolobodon* and *Capromys*. Two opossums and an armadillo have also been reported. The agouti (*Dasyprocta*), a favorite food of the Indians, was collected from St. Thomas as late as 1917 by deBooy, an archeologist working at Magens Bay. There are rumors that this lively little rodent existed as late as 1934. Of these early animal inhabitants of the Virgin Islands, only the land tortoise or morocoy (*Testudo tabulata*) and the large herbivorous lizard (*Iguana iguana*) are still to be found. The tortoise has been reported from Water Island and Lovango Cay. The iguana is still to be found in small numbers on the larger islands and some of the cays.

Unlike the extinct birds of the islands, most of the recorded mammals, the tortoise and iguana, were not originally native, but introduced to the area by the Indians for food. Some of these animals escaped and thus became naturalized. Early colonization by Europeans and extensive change in land use, along with the introduction of dogs and cats, probably were the chief factors in the disappearance of these animals.

Of the birds we know to have inhabited the early forests and marshes, but which are no longer to be found in the islands, undoubtedly the most spectacular and beautiful was the Flamingo. The bones of this regal bird are common in Indian middens, and rumor has it that it was to be found on St. Croix as late as the early 1800's. Several place names in the islands prefixed by the word "Flamingo" also assures us of the presence here of these birds. While the beautiful Flamingo's world is rapidly shrinking, we are very happy that there yet remain a few places where it finds haven and can still be found.

From middens on St. Croix and St. Thomas, bones of the following birds have been taken and identified: Manx Shearwater, Audubon's Shearwater, Blockcapped Petrel, Blue-faced Booby, Red-footed Booby, Flamingo, Lesser Snow Goose, Purple Gallinule, deBooy's Rail, Macaw, Puerto Rican Crow and Lesser Puerto Rican Crow. Of these birds, the deBooy's Rail, the Macaw and the two Crows are now extinct. The existence of the Black-Capped Petrel remains problematical. The Audubon's Shearwater, Blue-faced Booby and Red-footed Booby are still to be found. The Manx or Common Shearwater and the Lesser Snow Goose were undoubtedly migrants. The Purple Gallinule may still be found in Puerto Rico. We do not know of any other species which may have visited or inhabited these islands. With the Indian kitchen midden as our only reservoir of existing local and other fauna of that time, there is every possibility that birds and animals we now know nothing about might have existed.

Present Fauna, Mammals

The existing mammal fauna of the Virgin Islands now consists of one deer, a mongoose, two rats, one mouse and four bats. It is interesting to note that of these, only the bats are native! All the others have been introduced at one time or another since the discovery.

The Virginia, or White-tailed Deer, was introduced some time prior to 1800. We do not know by whom or from where it came. This deer has adapted itself easily, especially on St. Croix, and by 1900 was well established and quite abundant. Today it is still found on St. Croix and St. Thomas, but its numbers have declined noticeably from illegal gun pressure and poor management of the herd. Outside of the Virgin Islands and Cuba, this valuable and beautiful animal is found nowhere else in the West Indies.

The history of the Javanese Mongoose (*Herpestes javanicus auro-punctatus*) in the Virgin Islands (West Indies) is one of the classical examples of the great danger often inherent in the hasty and unstudied introduction of an animal or bird into a foreign environment. Brought into the islands in 1884 with much joy and fanfare to destroy a plague of rats (not snakes!) which seriously threatened the sugar cane economy, the mongoose in very short order turned his amazing talents to the decimation of every form of wild life, including poultry, small enough for it to tackle and destroy. It killed

rats, all right, but it also changed the natural history of the islands and became itself a much despised and dangerous pest. Today, on such islands as St. Croix, there has been calculated a density of one mongoose to the acre! A truly amazing population of any animal on such a small island.

The mongoose is one of the most self sufficient, wily and savage animals for its size known. Its control or eradication, often loosely discussed, would not be an easy matter, and a rather costly one. We keep our fingers crossed, always hoping for some fairly simple and efficient method of biological control. Until such time, the mongoose will remain with us, the small, swaggering master of the bush.

The two so-called native rats, the Norway and Alexandrine or Roof Rat, are fairly global in distribution and seem to have attached themselves to man's way of life from earliest times. Of the two, the Alexandrine is the commoner. This rat is a roof and tree inhabitant, a great lover of fruit, and the rat our mongoose was introduced to destroy. In St. Croix, we have observed as much as 22% of a small cane field destroyed by this busy rodent. Maybe we should not blame our planters too much for wanting to patch up this sizeable hole in their pockets by bringing in the mongoose.

Our mouse is too well known and common to require much description. It arrived on our shores along with European man. While we must admit it is destructive and messy around a house, it does do good by helping to keep down cockroaches and other insect pests.

There are four bats recorded from the Virgin Islands. These are our only presently existing indigenous mammals. The two "fruit bats" (*Brachyphylla cavernarum*) and (*Artibeus jamaicensis*) are both fairly large brownish colored bats which inhabit old buildings and densely foliated trees. They are colonial in habit and may often be seen at night deftly feeding on some fruit such as mesple, genep or sugar apple. *Brachyphylla*, the cave bat, is an insect eater as well and not as damaging to fruit as *Artibeus*. On St. Croix, colonies of two to three thousand have been observed.

The commonest and probably best known bat is our smallest, (*Molossus major*). This little bat loves to occupy the eaves of houses. It is often seen at dusk swiftly chasing and capturing flying insects.

Our largest, most unusual and least known bat is the "fish bat" (*Noctilio*). These large, grayfish bats are not common. They are to be met with at dusk and always near a pond or quiet bay scooping the water for small fish or aquatic insects. It is a very interesting sight to see these bats fishing and well worth the effort involved to find one of their fishing grounds. They can at times be seen right in the harbor of Charlotte Amalie fishing by the lights of the dock.

Present Fauna, Birds:

Slightly over a hundred years ago, the Newtons, Alfred and Edward, recorded 65 species of birds in the Virgin Islands, mostly from St. Croix. In 1930, Mr. Harry Beatty, an outstanding local ornithologist, recorded 105 species divided into resident breeding birds and migratory forms. Mr. Robert Nichols, in charge of the Agricultural Station at Dorothea, St. Thomas, found 63 breeding species there in 1943. Recently, over 140 species have been recorded in the Virgin Islands. To those who complain over the paucity of birds to be found in the islands, we think that this figure is exceptionally good for such a small area.

The birds of the Virgin Islands are, in general, North American in origin rather than South American. The only bird we might call "native", and this only in a subspecific sense, since the genus is widely distributed through the American tropics, is our little "yellow breast" or Honey Creeper. These agile and colorful little birds with slightly hooked bills were known in the old days as "sugar birds" from their habit of frequenting sugar-making establishments in search of syrup or sugar. They are still rather common and can easily be attracted to any sweets offered them.

There are three hummingbirds in the Virgin Islands and among these is our tiniest bird, the Antillian Crested Hummer (*Orthorhyncus cristatus*). This pugnacious little fellow is but 1.25 inches larger than the smallest bird in the world, the Cuban Bee Hummingbird which measures 2.25 inches! Our little fellow's nest made of vegetable down plastered over with lichens holds two

white eggs which measure but 12 x 8 millimeters! However, please do not underestimate Orthorhyncus. For all his diminutiveness, he fears nobody and will aggressively attack the biggest hawk. It is really an amazing and amusing sight to see this little midget practically sit on a hawk's head and torment that great bruiser into open flight.

The largest bird on the island, that is the tallest, is the Great Blue Heron. This is known locally as "Gray Gaulin" and stands close to four feet. He is a frequenter of ponds and swamps where he spears crabs and fish with unerring aim.

The king of the air and the bird with the greatest expanse of wing is, of course, the magnificent Frigate Bird. Locally they go by the name of "Hurricane" or "Weather" bird, since it is believed they may be seen most frequently at the approach of bad weather. However this may be, no one can look upon this great bird effortlessly planing the skies, in calm or storm, without agreeing that it is the master of those upper elements. The male frigate is entirely black with a red throat pouch. The female can easily be distinguished by its white breast and abdomen. These birds sometimes attain a wingspread of five feet.

There are five doves and pigeons in the Virgin Islands. The smallest of these is the dainty and ubiquitous little Ground Dove. The Red-neck or Red-head Pigeon is our largest pigeon. This is a frequenter of mountains and heavy forest. Our rarest dove, locally known as "Barbary Dove" or "Partridge" is a ground-inhabiting species. It is the only one of our doves that does not lay a white egg. Quail Doves, as these birds are known to ornithologists, lay salmon-colored eggs, always two in number and placed in a frail open nest of twigs. The biggest population of Quail Doves is on St. John, where they silently roam the deep valleys and shady forests of that beautiful island. The White-head or White-crowned Pigeon is a bird of colonial habits, an inhabitant of mangrove swamps. With the gradual disappearance of its favored habitat, and the ease with which its eggs and young may be found, this bird is today becoming rare. The White-crown is a pigeon of fast and spectacular flight. Over 1,000 have been banded by the local Wildlife Service.

The rarest bird of all is probably the little Barelegged Owl (*Otus nudipes*). There are very few reports of this bird nowadays and only twice in the last fifty years has it been seen. Mr. Nichols reported finding a nest of this owl while at Dorothea.

The following three wild ducks breed in the Virgin Islands and are therefore considered native: the Ruddy Duck, the Bahaman Pintail and the Tree Duck. Due to a lack of suitable habitat, these ducks are all uncommon. The Tree Duck or "night duck" is today exceedingly rare.

Six hawks are known from the islands including the Osprey or Fish Hawk. Of these, however, only the little "killy-killy" and the much-maligned "chicken hawk" are native. The Pigeon Hawk, Duck Hawk and Marsh Hawk are all visitants from the north. It is true that occasionally one of our Red-tailed Hawks will pounce on a chicken, but if they depended on chickens to keep them alive, they would all have disappeared long ago. The red-tailed or "chicken hawk" is one of the most consistent and effective rat catchers we have. If we gave this handsome and majestic bird the protection it deserves, we would be doing ourselves a great service. His work as a tireless predator control agent far exceeds in economic value the occasional chicken he may take. He also, by the way, destroys a good many mongooses we never hear about.

During the winter months a host of migratory birds visit the islands on their way to warmer climes. Many of these remain here and become "winter residents". These were our first "tourists". To the nature lover and the bird watcher our winter months are most exciting and rewarding since the local bird population is about doubled.

The following birds are not native but have been introduced fortuitously or otherwise to these shores: Troupial, Curacao Paroquet, Bobwhite, Chachalaca and Valley Quail. The Troupial, "parrakeet" and Bobwhite have become naturalized. The two former live in St. Thomas and the quail inhabits St. Croix.

Reptiles and Amphibians

No section of the native fauna suffered so severely from the introduction of the mongoose as did the reptiles. These small, inoffensive, mostly ground-dwelling creatures were "sitting ducks" for this ruthless viverrine. The effect of this onslaught is that, today, with the exception of the tree lizards and the frogs, most of the reptiles have vanished from the main islands and are only to be found in small numbers on some of the outlying cays. These cays are active "reservoirs" and as such have saved for us some most interesting and valuable reptile fauna.

There are four Anoles or tree lizards, two Geckos, two Ameivas or Ground Lizards, a Skink or "Slippery Back", two, or possibly three Snakes, an Iguana and a Land Tortoise.

The amphibians consist of the "Marine" Toad (an introduction) a small native toad and several Tree Frogs. These latter are quite vociferous, especially after rain, and may be heard almost any evening in city or country. It can thus be seen that though the islands take up but a very small land area, their fauna is comparatively extensive and interesting.

Fish Resources of the Virgin Islands

There are three main sources of sport fish in the Virgin Islands: Fresh water streams and ponds, inshore or reef fishing and deep sea fishing. It is actually only recently that sport fishing as such has been practiced in these islands. The use of rods, reels and the multitudinous paraphernalia of the modern sport fisherman is something new. Fish traps, seines and handlines have always been the equipment used. But a changing world has brought with it new methods and some exciting experiences.

Fresh Water Fishing

With a falling water table, all of the fresh water streams of any size have disappeared. Mountain mullet (*Agonostomus*) gobies and eels once caught in small numbers are now no longer available.

A program of stocking farm ponds with Bluegills and Largemouth Bass was initially successful. Continued drought and other causes, however, have depleted this stock to where it now offers very little sport. There is a potential here which, if followed up and managed, could be successfully developed. Bass of up to eight or more pounds have been taken from some of our ponds.

Inshore or Reef Fishing

Most of the fishing done falls under this category. On St. Thomas, big catches of "hardnose" (*Caranx crysos*) are often taken. Tarpon, snook and bonefish in suitable localities furnish good fishing. In the winter months, trolling with bait, generally balao, results in plenty of sport and good catches of King Mackerel, Bonito, Barracuda, Cero Mackerel, Amberjack and several other species.

Bottom fishing or trolling with wire line using bait at times results in good catches of such fish as Yellowtail, Yellowfin Grouper, Nassau Grouper, Rock Hind, Red Grouper and, of course, the ubiquitous Barracuda, very often poisonous in these waters.

Deep Sea Fishing

Unknown a few years ago, new methods and new tackle used from fast modern cruisers have discovered fish and fishing which is worthy of further investigation. Blue Marlin, White Marlin, Sailfish and Yellowfin Tuna have been taken in small numbers. Excellent Wahoo and Dolphin fishing is available in season. A Dingell-Johnson project to investigate this potential was not completed due to the leader leaving the islands to take up another assignment. It would be very worthwhile if this work were reinstated.

In closing, allow me to say that the Virgin Islands are developing fast. They are becoming what is commonly referred to as a "Tourist Attraction". We are all too well acquainted with what this can mean to wildlife resources. We would do very well to pause for a moment and weigh in the balance of God-given values this priceless world of nature we all seem hell-bent to exchange for a few pieces of silver. May the frightful thought of a world bereft of plants

and flowers, fish, animals and birds never become a reality. But it readily can, unless we possess the vision, feel the need and exert the will to safeguard and perpetuate this natural resource for ourselves and those to come. Let posterity not find us wanting. Think it over, now!

FOREST AND SMALL GAME SESSION

PROGRESS REPORT ON WHITE-TAILED DEER PRODUCTIVITY STUDIES IN MISSISSIPPI

By ROBERT E. NOBLE
*Study Leader, Deer Survey Studies
Mississippi Game and Fish Commission*

INTRODUCTION

Very little has been known about the productivity of the white-tailed deer (*Odocoileus virginianus*) in Mississippi. Up until recently no information was available relative to prenatal mortality, sex ratios in uteri, reproductive capacity, minimum and maximum breeding ages of does, and dates of breeding and fawn drop. This study is designed to provide answers to these and similar questions.

The Mississippi Game and Fish Commission initiated an extensive deer collecting program in February, 1960. During February, March, and April, 1960, sixty (60) female deer were collected. Study plans call for an additional sample of eighty-five (85) gravid does to be taken during the 1962 gestation period and perhaps 100 during 1963. The final results of this study will be based on approximately 245 female deer.

This preliminary report is based on sixty (60) specimens collected from five of the state's ten physiographic regions (Figure 1).

SPECIMEN COLLECTING PROCEDURE

Eight of the larger organized hunting clubs in the state granted written permission to collect female deer from property leased by them. Thirty-nine (39) of the specimens were taken from these lands and twenty-one (21) were killed on game management areas or refuges operated by the Mississippi Game and Fish Commission.

Mississippi has operated under a "bucks only" law for thirty-one (31) years. During this period many large hunting clubs have seen their deer herds increase tremendously and accredit the increase largely to the total protection of females. Obviously, many of these sportsmen have been strongly opposed to "doe killing." Because of such opposition, proper deer herd management has not been applied even on state game management areas. The Leaf River Game Management Area in Perry County is an example. For several years a serious over-population of deer has been known to exist on the area, but no action has been taken to reduce the herd because of local opposition to a "doe season."

One would think, therefore, that a study of this type, embracing the killing of female deer, would have met with much popular opposition. Nothing could be farther from the truth. We were, of course, criticized by a few local elements in the state and even by one or two uninformed personnel of the department. Generally speaking, however, we could not have wanted better cooperation. Interest in the study was so keen in some counties that on one occasion we autopsied deer at 11:30 P. M., with over twenty-five (25) sportsmen waiting to observe the procedure. In one county, where collecting was entirely on large private holdings controlled by organized clubs, it was necessary to inform these clubs beforehand exactly where we intended to collect deer and at what central point they would be autopsied. This was done to minimize the number of sportsmen traveling the woods roads in search of us.