NESTS AND EGGS OF THE BIRDS OF THE TRUK ISLANDS

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INTRODUCTION

Comparatively little field work on nesting behavior of birds has been done in Micronesia, and information is lacking on eggs or nests of many species indigenous to Truk Atoll. Most collections of eggs were made in the nineteenth century when the islands were under Spanish and later German occupation. Inaccessibility of the islands and hostility of the natives often made intensive field studies difficult. During the Japanese Administration of Truk, from 1914 to 1945, a veil of secrecy enshrouded the area and few western investigators were permitted to collect there. Since 1945, limited work in ornithology has been done.

The present study was conducted from October, 1957, to March, 1960. During this time, nests and eggs of 27 of the 29 breeding birds of Truk were collected as well as those of *Phaëthon rubricauda rothschildi* which visits this island but nests in the Marianas Islands. Considerable previously unreported information on nesting dates, egg descriptions, clutch size, nest construction, and location of nests was obtained.

Nests and eggs of *Ducula oceanica teraokai* and *Rukia ruki* were not obtained. These two species are the rarest birds on the atoll, and although sight records of *D. oceanica* were made, *Rukia ruki* was never observed during my two and one-half years' residence.

I could find no descriptions in the literature of eggs or nesting habits of *Erythrura trichroa clara*, *Collocalia inquieta rukensis* or *Anas poecilorhyncha pelewensis* nor could I find specific reference to collections on Truk of eggs of *Phaëthon lepturus dorotheae*, *Demigretta sacra sacra*, *Nycticorax caledonicus pelewensis*, *Ixobrychus sinensis*, *Poliolimnas cinereus micronesiae*, *Sterna sumatrana sumatrana*, *Sterna fuscata oahuensis*, *Anous tenuirostris marcusi*, *Gygis alba pacifica*, and *Gallicolumba xanthonura kubaryi*. Of this latter group, collections had been made previously in several cases on islands other than Truk in the Caroline Archipelago where in some instances ecological conditions differed.

Nests and eggs collected on Truk Atoll have been deposited in the United States National Museum, The American Museum of Natural History, and the oological collections of James B. Dixon, Sidney B. Peyton, Donald J. Nicholson, Wilson C. Hanna, William Stribling, William E. Griffee, Laurie Stevens, Robert Pickering, Dan B. Bull, Edward Hall, Ed. Jay Court, and Col. L. R. Wolfe.

AVIFAUNA

Truk Atoll has thirty resident species, including the Black-breasted Weaver-Finch (*Lonchura nigerrima minor*) whose status as an indigenous form is doubtful. Fourteen known transients visit Truk during migration. All are waders with the exception of the Long-tailed New Zealand Cuckoo (*Eudynamis taitensis*) and the Amur Barn Swallow (*Hirundo rustica gutturalis*) which latter was first reported in 1959 (Brandt, 1959).

Two species, *Metabolus rugensis* and *Rukia ruki*, are found only on Truk Atoll. Three subspecies, *Myzomela cardinalis major*, *Zosterops conspicillata owstoni*, and *Myiagra oceanica oceanica*, as well as *Ducula oceanica teraokai* and *Collocalia inquieta rukensis*, are also restricted to Truk. *Ducula oceanica teraokai* was also reported during the nineteenth century from the atolls of Nukuoro and Lukunor but Momiyama (1922) did not find the bird there and could only conclude that it belonged to the same sub-

species as that found on Truk. *Collocalia inquieta rukensis* is listed also as resident on Yap Atoll although I saw no swiftlets there during several visits in 1958 and 1959 and concluded that the subspecies is probably largely limited to Truk.

LOCATION AND ENVIRONMENT

The atoll of Truk (7°N latitude, 152°E longitude) is located in the United States Administered Trust Territory of the Pacific Islands, in the eastern half of the Caroline Island Archipelago. It is within the northeast trade wind belt and lies approximately

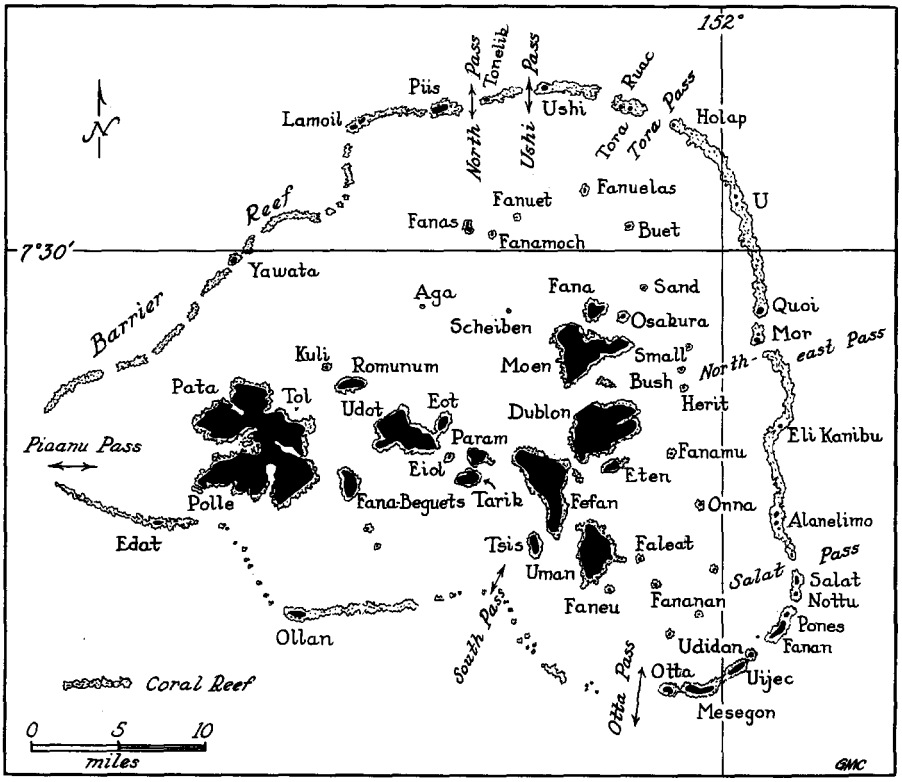

Fig. 1. Map of the Truk Islands.

550 miles southeast of Guam and about the same distance north of New Ireland. The atoll includes twelve major high islands, Moen, Fefen (Fefan), Dublon, Uman, Eot, Param, Fanabeguets, Tsis, Fana, Udot, Romunum, Tol (composed of Pata, Polle and Tol). The islands consist primarily of volcanic rock basaltic lavas, associated tuffs and agglomerates, surrounded by a barrier reef of 823 square miles studded by over 50 low coral and sand islets. The reef is some forty miles in diameter and contains a total of 98 islands with a combined land area of 38.6 square miles. The high islands make up 37 square miles of the total.

The atoll of Kuop is adjacent to the south reef of Truk Atoll. It is composed of four uninhabited islands and occupies an area of 0.19 square statute miles.

Within the zone of the Truk islands is East Fayu, an uninhabited double island of 0.144 square miles, which is approximately 75 miles north of Truk and is a major

TABLE 1

LIST OF BIRDS OF THE TRUK ISLANDS

NON-RESIDENT TRANSIENTS

Nycticorax nycticorax nycticorax. Black-crowned Night Heron
Squatarola squatarola. Black-bellied Plover
Pluvialis dominica fulva. Pacific Golden Plover
Charadrius mongolus stegmanni. Mongolian Dotterel
Numenius phaeopus variegatus. Whimbrel
Limosa lapponica baueri. Pacific Godwit
Tringa nebularia. Greenshank
Actitis hypoleucos. Common Sandpiper
Heteroscelus brevipes. Gray-tailed Tattler
Heteroscelus incanus. American Wandering Tattler
Arenaria interpres interpres. Turnstone
Erolia acuminata. Sharp-tailed Sandpiper
Eudynamis taitensis. Long-tailed New Zealand Cuckoo
Hirundo rustica gutturalis. Eastern Barn Swallow
****Puffinus pacificus chlororhynchus*. Wedge-tailed Shearwater

RESIDENT

Puffinus lherminieri dichrous. Dusky Shearwater
†*Phaëthon rubricauda rothschildi*. Red-tailed Tropic Bird
Phaëthon lepturus dorotheae. White-tailed Tropic Bird
*†*Sula sula rubripes*. Red-footed Booby
†*Sula leucogaster plotus*. Brown Booby
†*Fregata minor minor*. Pacific Man-o'-War
Demigretta sacra sacra. Reef Heron
Nycticorax caledonicus pelewensis. Rufous Night Heron
Ixobrychus sinensis. Chinese Least Bittern
Anas poecilorhyncha pelewensis. Australian Gray Duck
Gallus gallus. Red Jungle Fowl
Poliolimnas cinereus micronesiae. White-browed Rail
Sterna sumatrana sumatrana. Black-naped Tern
*†*Sterna fuscata oahuensis*. Sooty Tern
Thalasseus bergii pelecanoides. Crested Tern
Anous stolidus pileatus. Common Noddy
Anous tenuirostris marcusi. White-capped Noddy
Gygis alba pacifica. Fairy Tern
Ptilinopus porphyraceus ponapensis. Crimson-crowned Fruit Dove
Ducula oceanica teraokai. Micronesian Pigeon
Gallicolumba xanthonura kubaryi. White-throated Ground Dove
Collocalia inquieta rukensis. Carolines Swiftlet
Acrocephalus luscinia syrinx. Nightingale Reed Warbler
Metabolus rugensis. Truk Monarch
Myiagra oceanica oceanica. Micronesian Broadbill
Aplonis opacus angus. Micronesian Starling
Myzomela cardinalis major. Cardinal Honey-eater
Zosterops conspicillata owstoni. Bridled White-eye
Rukia ruki. Truk Greater White-eye
Erythrura trichroa clara. Blue-faced Parrot Finch
****Lonchura nigerrima minor*. Black-breasted Weaver Finch

† Does not breed on Truk Atoll but breeds on adjacent islands or within Micronesia.
* Not previously recorded for Truk Atoll. ** Questionable reports by early investigators.

breeding area for sea birds. The nearest high-island land mass to Truk is Ponape, some 385 miles eastward. More distant are Kusaie, 678 miles to the southeast, Yap, 832 miles to the west, and Palau, 1045 miles to the west. Numerous coral atolls of the Caroline Archipelago lie between these points.

The hills of Truk Atoll are heavily forested, with virgin jungle crowning the mountain tops. The highest mountain is located on Tol, elevation 1483 feet. Lesser mountain peaks form the other high islands. Shores of the islands often support heavy mangrove swamp, and lowland areas support extensive coverage of sedge, *Phragmites karka*, and other cane grasses. Larger coral reef islands are mostly planted with coconut palms, breadfruit and pandanus. Fresh water bogs support patches of taro on all islands.

The area has an average annual rainfall of 127.4 inches. The average temperature is 81°F. and the relative humidity is 83 per cent. Only the larger islands have small creeks which drain rainwater to the lagoon. Occasional typhoons and severe tropical storms do extensive damage to nesting birds, and colonial nesting sea birds suffer regular predation by islanders. There are few natural enemies, although domestic cats, monitor lizards, and the introduced rats, *Rattus exulans* and *Rattus rattus*, do some evident damage to nesting birds. Destruction of a nest of *Aplonis opacus angus* by *Rattus rattus* was observed.

NESTING DATA

Puffinus lherminieri dichrous. Dusky Shearwater. The Dusky Shearwater is the only representative of the family Procellariidae on Truk. Its habit of coming to the island only at night and nesting on high isolated mountain tops makes it an unfamiliar bird to most observers. On Truk, its principal nesting site seems to be the islands of the Tol group, and it is found to a lesser extent on Dublon and Fefen. All these islands have high volcanic peaks. The Dusky Shearwater at times nests in holes of cliffs frequented by White-tailed Tropic Birds and the Common Noddy. Hartert (1900) reported one egg measuring 42×35 mm. taken at Truk on June 16. It was in a hole four feet deep in the side of a cliff. Yamashina (1932) took one heavily incubated egg measuring 49×34 mm. on May 26, 1931, at Arakabesan, Palau Islands.

On June 25, 1959, I collected one egg on Fefen Island. It was located at the end of a cavity beneath a rock at the top of a high ridge. The hole was approximately two feet deep. No nesting material was evident. The egg measured 56×36 mm. and weighed 29.7 gm. The shell was buffy white and had a slightly pitted or porous surface.

Phaëthon rubricauda rothschildi. Red-tailed Tropic Bird. The Red-tailed Tropic Bird has been reported infrequently in the Caroline Islands, including Truk. In view of present knowledge, it is generally accepted that the bird does not breed as far south as the Carolines and seems to be resident only in the Northern Marianas. I have personally never seen this species at Truk nor are the natives familiar with it.

Seven eggs collected on the Island of Pagan, Northern Marianas, on March 1, 1959, averaged 62.5×43.9 mm. Length varied from 59.5 to 65.0 mm. and width from 41.5 to 46.0 mm. Yamashina (1932) reports one egg measuring 64.5×45.0 mm. taken at Pagan on February 15, 1931. The ground color of the eggs I collected was white and they were finely sprinkled with light brown and russet uniformly over the entire surface. Two eggs had heavy chocolate colored smudges at the large end. One egg formed the clutch.

Phaëthon lepturus dorotheae. White-tailed Tropic Bird. This bird is resident on all the high islands of Truk and to a lesser extent on the neighboring coral atolls. The species is, however, far less common at Truk than at Ponape or Palau. This tropic bird is in great demand for its long tail feathers and also as a table delicacy by Micronesians. The bird is a very close sitter and does not generally leave its nest when it is approached. Many adults consequently are captured in each nesting period.

This species seems to prefer nesting in the natural cavities of jungle trees. The size of the bird and the natural limitation of suitable nest sites often forces the species to attempt nesting in very crowded quarters. The long tail protruding from a hole in a tree and the habit of the bird in gliding around

the nest hole in flight while under observation makes nests easy to locate. Baker (1951) reports these tropic birds nesting in hollows of Australian pine (*Casuarina equisetifolia*) at Pelelew on the Palau Islands. The only deviation from tree nestings on Truk was one nest discovered among a colony of Common Noddy which was located on a cliff face of volcanic rock near the summit of Tonachau Peak, Moen Island. The egg was placed at the end of a natural hole in the stones. At Ponape, nestings on high sea cliffs are a common occurrence, and such locations may be limited on Truk only by the absence of a sufficient number of suitable rock outcroppings.

The nests are ordinarily quite high and difficult to reach because of the size of the trees used. Nest cavities examined had no apparent nesting material other than natural debris in the holes.

Of eighteen eggs measured, length varied from 48.0 to 55.0 mm. and width from 35.0 to 42.0 mm.; average size was 50.8×37.6 mm. The eggs are heavily marked with brown, reddish chestnut, and black. The markings are usually in the form of blotches or smudges which on most specimens tend to obscure the white ground color. Some eggs are, however, uniformly sprinkled and peppered without the usual bold markings. The shell coloring is water soluble and in damp nests occasionally the color has faded or been wiped off in places.

Nesting was recorded in every month of the year except March. The number of nests found with eggs is as follows: January, 3; February, 1; April, 6; May, 1; June, 1; July, 3; August, 6; September, 2; October, 2; November, 2; December, 2.

Sula sula rubripes. Red-footed Booby. This booby is less commonly seen at Truk than the Brown Booby. It was observed at Truk a few miles beyond the north pass near Piis Island on July 21, 1958, when a bird of this species rested for over an hour on the rigging of our ship. The species has not previously been recorded for Truk Atoll as far as I can determine.

Breeding colonies exist on East Fayu Island as well as several other remote islands in Micronesia. In former years, and perhaps to a limited extent now, it bred on Aliar Islet, Satawan Atoll (5° 20′ N, 153° 45′ E), 70 miles southwest of Truk. It has been recorded at Lukunor Atoll which is 10 miles from Satawan. Breeding is also reported by natives on Oroluk Atoll (7° 38′ N, 155° 10′ E) which is some 200 miles northeast of Truk.

This bird is abundant on East Fayu and the young are killed in large numbers for food. In mid-April, 1958, the majority of the nests had young in various stages of development. Most of the young were partly or fully feathered which would indicate that egg laying had started about the end of February.

The nests are crude platforms of sticks generally located in rather high trees if suitable limbs can be found. Several pairs, in company with Pacific Man-o'-War, often nest in the same tree. Most nests observed were from 15 to 30 feet from the ground.

Only one egg could be found on April 17, 1958. This was heavily incubated and measured 64.0× 43.2 mm. The base color of the shell was pale blue with heavy deposits of white chalky encrustation which obscured the ground color completely. The nest from which the specimen was taken contained but one egg. Mayr (1945) reports that the species lays one egg per clutch. Davie (1889) reports two eggs as composing a set. He gives measurements of 2.57×1.80 inches.

Sula leucogaster plotus. Brown Booby. Like most of the large ocean birds, the Brown Booby does not breed on Truk Atoll itself but visits the reef islands regularly. The nearest breeding location is East Fayu Island. The principal nesting season seems to be the winter months and in mid-April of 1958 almost all nests on East Fayu contained young still in the downy stage. All nests observed contained one young. Yamashina (1932) reported taking eggs at Medinilla in the Northern Marianas on February 19, 1931. The nestings as a whole appeared to be a week or two later than in the Red-footed Booby. On a visit to East Fayu in late June, 1959, no nesting activity was evident. Mayr (1945) reports the species as laying two or three eggs but states that it usually raises only one young. Yamashina (1932) reports four nests with one egg and four with two eggs. The usual nest locations were among the outer fringes of heavy vegetation along the beach. Nests were ordinarily next to fallen logs, large beach debris, or under dense bushes.

One egg collected on April 17, 1958, measured 55.0×41.5 mm. Yamashina (1932) records an average for twelve eggs as being 61.3×42.8 mm. The egg I collected showed heavy calcareous deposits which had a yellowish tinge. The underlying color was white and beneath the encrustation the shell was a pale blue.

Fregata minor minor. Pacific Man-o'-War. This bird is a visitor to Truk only on rare occasions and is considered an omen of approaching storm by the Trukese. The bird does not breed on Truk Atoll itself. However, several hundred nest regularly on the Island of East Fayu in company with the multitudinous terns and boobies. Nesting generally begins in late winter. In mid-April, 1958, most nests contained large young and only one nest with an egg well advanced in incubation was found. The normal clutch is one. The natives report that the birds only nest during the winter months when trade winds and high seas make access to the island very hazardous. However, with the approach of the doldrums, in or about May, many young man-o'-wars which have not yet left the nest are collected by natives and taken for pets or used as food.

The nests, built of twigs and small sticks, are generally placed in tall trees and most of those observed were between 20 and 30 feet from the ground. The majority of the nests were built close to the trunks of the trees. This may have been due to the fact that most of the suitable nesting limbs had been stripped by a recent typhoon.

One egg collected on April 17, 1958, was dull white in color with some yellowish nest stains. It measured 66.0×44.2 mm. The nest this was taken from contained but one egg.

Demigretta sacra sacra. Reef Heron. The Reef Heron is represented on Truk by both color phases, blue-gray and white, as well as by a variety of mottled combinations of the two. The general habitats are mangrove flats bordering an island and beaches. The birds are, however, frequently seen feeding in open grassy areas and also along the reef at low tide. The Reef Heron seems especially well adapted to survival both on the high and the low islands. On Truk Atoll, the small islands on the reef or within the lagoon, seem to be preferred since they are generally uninhabited by people and there is less disturbance.

The nests are flat platforms of sticks and twigs placed in bushes or small trees. One nest was found in the midst of a colony of White-capped Noddy on Fana Moch Island, Truk. The nest contained a fully fledged young on July 21, 1958. Nests of Reef Herons have also been observed in the crown of coconut palms. Generally low trees are selected and the nests are ordinarily within fifteen feet of the ground. In some areas the Reef Heron is reported as building nests on the ground. Hartert (1898) reports a nest found in the grass at Saipan. This is not a normal nesting location in Truk, however.

The eggs are pale dull blue in color and clutches vary from two to four eggs. The larger clutches are less common, and in most nests observed, only one young was raised. Twelve eggs were measured and averaged 46.5×34.8 mm. Yamashina (1932) reports one egg collected at Jokaz, Ponape, on July 23, 1931, as measuring 50×36.5 mm. I collected eight sets of eggs in the months of May and June.

Nycticorax caledonicus pelewensis. Rufous Night Heron. The Rufous Night Heron is reported in Micronesia only from the islands of Palau and Truk Atoll. It is not a common bird and its camouflaged coloration makes it more difficult to see than the Reef Heron. The Rufous Night Heron seems more confined to the high islands and has not been observed on the reef. It appears to limit its feeding more to mangrove swamps and mud flats than does the Reef Heron.

One nest with two fresh eggs was discovered at Fefen Island on July 11, 1958. It was situated on a branch of a mangrove tree ten feet above the water. The nest was built of twigs and sticks. Mayr (1945) reports the bird as nesting in the true forest. Baker (1951) reported a colony of eight nests at Pelelew, Palau Islands, and states that on August 29 most nests contained young. Marshall (1949) reported breeding in August, September, and December. On Truk, no true nesting colonies were located or reported. However, the observation made by Baker (1951) that the birds at Palau had special roosting places is borne out by my own observations at Truk. Birds would proceed to some large forest tree, often high up on a mountain ridge, every evening at sundown on Moen Island.

The two eggs collected measured 35.0×50.0 mm. and were pale blue in color.

Ixobrychus sinensis. Chinese Least Bittern. This species, on Truk, is largely confined to the brackish taro patches, cane swamps, and mangrove on the high islands. I have never observed it on the reef islands. Nests of *I. sinensis* are difficult to locate due to the impenetrability of the swamp areas. I located thirteen nests; all were in dense cane on Tol Island. One nest with eggs was found in April, and six nests with eggs were found in May and June. The nests were built of cane stems, leaves and occasional twigs, intermeshed in a flat platform, perched on a cluster of cane stems or a bent-over clump of cane which furnished a suitable support for the nest. All the nests found were those of single pairs; no nests were found close together.

The eggs are a dull greenish white, rather spherical or blunt ended. The average of nineteen eggs was 31.9×24.2 mm. The length ranged from 29.0 to 35.0 mm. and the width from 23.5 to 25.5 mm. All thirteen nests examined had two eggs each.

Anas poecilorhyncha pelewensis. Australian Gray Duck. Successful colonizations by this bird in Micronesia are limited to Truk Atoll and to the Palau Islands some 1000 miles to the west. On Truk, the species is a permanent resident only on the high islands, although Mayr (1945) reports it as feeding occasionally on outer reefs as well. On Moen Island, it confines itself largely to brackish ponds adjacent to the sea. Often it is seen in small flocks feeding on the seashore or in open grassy marshes. The total population on Truk probably does not exceed a few hundred individuals.

Single nests with eggs were found during the months of February, April and June while two nests containing eggs were located in May. Nest locations were on Moen and Udot islands. Sites were frequently at a considerable distance from water. Nests were found in thick grass on Moen Island. They were well concealed and did not exhibit any great profusion of down. Two nests found on Udot were about 400 feet above sea level.

Three sets contained seven eggs and the other two contained nine and ten eggs, respectively. The eggs have a smooth, rather thick shell, and are rich buff color with slight olivaceous tinge. The longest egg measured 57.5 mm. in length and the shortest 50.5 mm. Width varied from 37.2 to 41.0 mm. Of forty specimens measured, the average size was 51.7×39.0 mm.

Gallus gallus. Red Jungle Fowl. Hachisuka (1942) believed the Micronesian Red Jungle Fowl to be a racially distinct group. This has been questioned in view of the continuous interbreeding between true feral stock and the numerous introductions of domestic fowl to the islands within historic times. In many areas it is now difficult to distinguish true Jungle Fowl from the numerous semi-wild chickens which forage in jungle areas adjacent to native villages. One apparent difference seems to be the greater inclination of the Jungle Fowl to fly when disturbed.

One female collected in May, 1958, Moen Island, Truk Atoll, had a fully formed egg in the oviduct. The egg measured 47.0×34.0 mm. and was a pale pinkish tan in color.

Poliolimnas cinereus micronesiae. White-browed Rail. Resident on Palau, Guam, Yap, and the remote island of Bikini in the Marshalls, as well as on Truk, the White-browed Rail is a secretive and elusive bird. McElroy (*in* Baker, 1951) reported the bird common in brackish swamps at Truk, but my experience has indicated that, although the bird is not rare, it is only collected or observed with great difficulty. Others have encountered similar difficulties when in search of this bird at Palau and Guam. On Truk the bird is most commonly associated with taro swamps.

One well-hidden nest containing three fresh eggs was located on June 3, 1959, at Wonip, Tol, on the west side of Truk Atoll. The nest was in dense grass in a semi-swamp area; it was made of grasses and leaves. One adult was flushed from the nest and remained close by calling continuously. Although the adult could be heard rustling in the grass and could be located by its calls, it was never actually seen.

The eggs were heavily spotted over the entire surface with chestnut brown. Coloring was often in small streaks or smudges. The ground color appeared to be white or cream. The eggs measured 31.0×22.5 mm., 29.0×23.0 mm., and 30.5×23.0 mm., respectively.

Sterna sumatrana sumatrana. Black-naped Tern. The small Black-naped Tern is occasionally confused in flight with the Fairy Tern (*Gygis alba*), but it does not have the habit of flying at high altitude in the mountains nor in perfect precision soaring as does the Fairy Tern. It also rarely perches in trees as is customary in the Fairy Tern. At close range the black-striped nape and light gray back plumage are apparent as well as the more fluttering flight.

The bird at times nests on islands in company with the White-capped Noddy. It has been my experience, however, that the Black-naped Tern usually selects small isolated islets with wide expanse of beach often on the barrier reef or sand islets within the lagoon. No nest is built and the egg is deposited in a slight depression in the sand. The nests are usually between the dense interior vegetation of the island and the high tide marks. Often the bird lays its eggs next to beach debris or, if closer to the island interior, next to fallen branches or logs. The eggs blend perfectly with the surroundings and are difficult to see. Unless the colony is large, the nests may be quite scattered.

One egg comprises the full clutch. Of 118 nests examined, only in one instance was a set of two eggs found. This was on Fana Moch Island, Truk, on February 24, 1959. Both eggs were fresh and

appeared identical in color. They measured 40.5×27.0 mm. and 39.0×27.5 mm., respectively. Since the Black-naped Tern generally displays no extreme variation in egg color, it could not be determined if the eggs were laid by different females. The possibility that the egg was kicked from one nest to another during the flight of the incubating females could not be excluded. The eggs have a clay gray ground color covered with brown and black spots which are distributed rather evenly over the surface. Occasional specimens may have a base color that is more tan than gray. Lavender splotches are intermixed with the darker spots. The shells have a dull mat texture.

Nesting appeared to be heaviest during the late winter months. The number of nests found with eggs is as follows: January, 39; February, 24; March, 23; April, 7; October, 12, and December, 13. Of 37 eggs measured, the average size was 38.7×27.8 mm. The largest egg measured 41.0×29.0 mm. and the smallest 35.0×25.5 mm.

Sterna fuscata oahuensis. Sooty Tern. This bird has not been recorded previously for Truk Atoll nor have I been able to locate any literature regarding its breeding in this immediate area. The remoteness of some of the Micronesian "bird islands" may explain this fact, since many of these places have rarely been visited by investigators. Such a location is East Fayu Island. This small island supports a huge sea bird colony among which are several thousand Sooty Terns. I have observed this species at Pisarach, Namunoito Atoll, an equal distance northwest of East Fayu, but I have not personally observed the Sooty Tern at Truk although the natives are well acquainted with the local name for the bird and claim it visits the reef islands occasionally. This seems entirely likely in view of the short distance involved between East Fayu and Truk. Close observation would probably tend to confirm the bird's visitation to Truk. For this reason I have included its nesting in this report.

Two nesting seasons seem to occur. The first is in late winter and the second in late spring or early summer. Natives claim a third nesting takes place in the fall. On April 17, 1958, the island was visited and the young of Sooty Terns covered sections of the beach in a veritable carpet. They were estimated at this time to be some two weeks old. Some eggs in a very advanced state of incubation were still to be found on this date. On June 28, 1959, the birds were nesting, and all eggs collected the last of June were freshly laid. No young were evident at this time. Single eggs were scattered over the beach above the high tide mark and well into the fringing bush of the island but not into the interior timber. No nesting material was evident.

The eggs, which are eaten in large quantities by visiting Micronesians, have a variety of color shades. The ground color is either white or a shade of pale greenish blue. About an equal number exhibit buff or tan ground color. The eggs are generously sprinkled or blotched with varying shades of brown and black. Many have underlying spots or blotches of lavender. Rare specimens may be virtually devoid of coloration. Egg size varies from 47.0 to 56.0 mm. in length and from 33.0 to 38.5 mm. in width. The average of 106 eggs measured was 51.0×36.0 mm. This corresponds closely with the size reported by Davie (1889) for the eggs of *S. f. fuscata* collected at Key West, Florida.

Thalasseus bergii pelecanoides. Crested Tern. This is the largest of the Micronesian terns and, although it is conspicuous, is wary of close approach. On Truk it is the least common of the various species of terns resident on the atoll.

Mayr (1945) reports the Crested Tern as breeding in small colonies. This observation holds true on Truk as well. The Crested Tern generally selects secluded sand islets on the most remote reefs for nesting. Large congregations of this species have not been noted and generally the islets selected are scattered around the outer perimeter of the atoll. The egg is placed on the sand in a small scooped out depression. Nests were not close together and were generally between high tide mark and the edge of the island vegetation. On East Fayu Island the Crested Tern was found breeding in the midst of a Sooty Tern rookery.

Twelve sets were located during April and fifteen during June. The eggs exhibit a dull white or grayish white ground color. Occasional specimens have a slightly buff shell. Markings are heavy splotches and spots of black, chestnut, and chocolate. Many sets have an underlying wash or spotting of lavender. Only one egg was found in 27 nests examined and this seems to comprise the complete clutch. Eggs varied in width from 38.0 to 48.5 mm. and in length from 54.0 to 63.0 mm. The average of 27 specimens was 57.2×40.5 mm.

Anous stolidus pileatus. Common Noddy. The Common Noddy is found less often on Truk than the White-capped Noddy. It is easily distinguished by its larger size. Its browner color tends to dif-

ferentiate it from the blacker White-capped Noddy. On Truk, the Common Noddy does not congregate in large nesting colonies as has been described for the Atlantic subspecies, *A. s. ştolidus*. It generally nests in groups of perhaps four to six pairs located in the same tree. Two known locations of rookeries on Moen and Pata islands, Truk Atoll, are in cliffs. However, even here the colonies are not large and the congregation is perhaps due largely to the limited number of such locations. Of over eighty nests of this species examined, all were located in trees or rocky cliffs. Nests on the ground have not been observed on Truk although they have been reported for this species from other areas. The birds seem to have a particular predilection for nesting in the crowns of coconut palms. Such nestings are generally by single pairs or, at most, adjoining palms may have a nest or two. No effort at colonization is evident. Nests are also frequently seen in tall mangroves or more commonly in large forest trees bordering lagoons or islets. Nests are often placed among the heavy moss and saprophytes which cover the branches. The Common Noddy does not generally breed within the colonies of White-capped Noddy. On Truk the Common Noddy seems to nest more frequently on the high islands. However, all the reef islands are utilized for nesting as well. Some islands are used as roosting sites by large numbers of the birds each evening, and they straggle in from the sea until well after dark.

Nests are bulky structures of grasses, sticks, twigs, and leaves. One nest measured was 9×12 inches in overall diameter and had an interior cup measuring 4×5 inches. Cup length was 3½ inches. At Truk, nests with eggs have been found in January, 36; February, 12; March, 10; April, 6; May, 12; June, 2; July, 1; August, 2; September, 2; November, 2; and December, 4. The Common Noddy apparently nests to some extent throughout the year. The greatest number of nests were noted during the spring months. The number of nests declined in midsummer.

Only one egg is laid per set. The eggs have a white or pinkish shell color which often becomes stained deep tan as incubation progresses. Some specimens are finely peppered with brown and black spots over the entire surface. More commonly the egg is blotched with russet or chocolate brown often concentrated around the large end. Occasionally lines or scrawls are noted and specimens may exhibit underlying lavender spots or splashes. Some specimens are virtually indistinguishable from those of the Sooty Tern. Fifty-six eggs measured averaged 53.5×37.1 mm. The length ranged from 49.0 to 59.0 mm. and width from 35.5 to 39.0 mm.

Anous tenuirostris marcusi. White-capped Noddy. This tern is abundant on most of the islands of Micronesia and congregates in large breeding colonies. At Truk, such rookeries are generally on select, uninhabited islets on the reef or within the lagoon. Colonies of several hundred are generally seen. The nests are built in mangroves, large bushes or trees, usually within 20 feet of the ground. The bird does not use coconut palms for nest sites as frequently as the Common Noddy, and no nests in cliffs were observed. On occasion, however, large trees, such as breadfruit, are utilized as nesting sites often within the confines of native villages. Such nests are often built at great height. Considerable damage to breadfruit trees by nesting birds at Kapingamarangi Atoll has been reported. The White-capped Noddy occasionally nests in such situations on Truk Atoll, but as a whole it frequents the high inhabited islands less than the Common Noddy. The colonies are often raided by natives for young birds.

Nests are built of leaves and debris, covered with excrement, and firmly fastened to the branches. The shallow cup is often barely deep enough to keep the egg from rolling out. One egg forms a clutch. However, on December 1, 1957, at Fana Moch Island, Truk Atoll, one nest was found which contained two eggs. The eggs were similar in appearance and incubation. They measured 50.5×33.0 mm. and 48.0×32.0 mm. Whether these were laid by the same female or by two different females in the same nest could not be determined. Nests with eggs were recorded in January, 51; March, 12; April, 7; May, 18; July, 10; August, 8; November, 23; December, 27.

Yamashina (1932) reports eggs taken in the Marshalls in October and November. This would indicate that the White-capped Noddy breeds throughout the year. It is apparent at Truk, however, that in the rookeries, breeding is synchronized to a certain extent and that periods of little nesting activity exist. In the Marshalls, a large colony visited at Majuro Atoll had no nesting birds in mid-August. On Truk breeding activity seems to slow down in the summer months.

Eggs are identical in appearance and variety of colors to those of the Common Noddy. Size is the only apparent difference. Of 21 eggs measured, the average was 31.7×45.4 mm. This compares favorably with 13 sets collected by Yamashina (1932) in the Marshall and Palau islands. These averaged

30.9×45.1 mm. The eggs are a malt white, often nest stained to a deep tan, and spotted and blotched sparingly with chocolate and black, chiefly around the large end. Four unusual sets collected had no coloring at all except faint nest stains.

Gygis alba pacifica. Fairy Tern. Two or three of these conspicuous birds are often seen soaring in heavily forested areas of the high peaks. The species feeds a great deal on insects, and it is encountered inland far more than other species of resident terns.

The Fairy Tern builds no nest but lays its single egg on the flattened or creased upper surface of a branch. Occasionally forks of limbs are utilized. That the egg manages to stay in place is a marvel. Two nest sites were found in which the eggs had been placed in a slight cavity on the branch. Ordinarily at Truk the large horizontal branches of breadfruit or other large forest trees are used. At times several pairs will nest in the same tree but more often the nest is individually located. Nest sites varied from 6 to 50 feet from the ground.

Colonial nesting with the White-capped Noddy has been observed at Ponape. The eggs were placed on mangrove limbs hanging over water. At Fana Moch Island, Truk Atoll, the Fairy Tern nests in the same trees with the White-capped Noddy. The incubating female is very conspicuous but once the adult is flushed from the nest the egg is extremely difficult to locate since there is no indication of a nest and the egg is hidden from the view of an observer looking upward at the branches. Hartert (1900) reports eggs of the Fairy Tern as being found on the ground at Truk in June. I was never able to find a nest so located nor did I ever see the adult birds on the ground except at small islands harboring bird colonies. There they were usually feeding in the company of noddies or Black-naped Terns. Quite uncommonly at Truk the Fairy Tern may lay its egg on a rock or ledge or a coral reef boulder surrounded by water. Such nest locations are exceptional, however.

Eighty-six eggs of this bird were examined and measurements ranged from a width of 29.0 to 34.0 mm. Length varied from 38.5 to 45.0 mm. The largest egg measured 45.0×34.0 mm. and the smallest 38.5×30.0 mm. An average of 25 eggs was 41.5×31.5 mm. Some eggs were nearly spherical and often the two ends appeared identical in degree of bluntness. Nests with eggs were found as follows: January, 21; February, 7; March, 11; April, 32; May, 6; June, 8; July, 3; August, 4; September, 4; November, 24; December, 33.

Yamashina (1932) took eggs of *Gygis alba candida* in the Marshalls during October. This would indicate that some nesting takes place throughout the year in this species.

The eggs vary in color from a grayish green shell color to buffy white. The surface is covered with spots, blotches, and scrawls of black or dark brown. Large blotches of lavender are often intermingled with the other coloration. The surface is rather uniformly covered with such markings. In addition to the obvious variation in size, the eggs of the Fairy Tern display equal diversity in coloration and no two appear exactly alike.

Ptilinopus porphyraceus ponapensis. Crimson-crowned Fruit Dove. This brightly colored dove is often encountered in heavy forest on high slopes of volcanic peaks. It is usually not seen around houses except as it passes from one patch of jungle cover to another. Its loud call is a distinctive jungle sound of Truk Atoll.

Fifteen nests of *P. p. ponapensis* were found, 14 on Truk and one on Ponape. The nests were usually in large jungle trees and at considerable height from the ground. The lowest nest found was eight feet from the ground in a small tree and the highest nest was well over 30 feet up on the outer branches of a mango. The nest is a fragile platform of sticks and twigs. Nests with eggs were recorded in February, 1; April, 5; June, 2; July, 3; August, 2; and December, 2. Yamashina (1932) reports eggs of this subspecies taken on Ponape in July and August. Hartert (1900) records eggs in May and June at Truk. Coultas (*in* Baker, 1951) reports nests with eggs in November and December at Ponape.

Measurements of 14 eggs averaged 32.2×22.7 mm. The length varied from 30.5 to 33.5 mm. and the width from 22.0 to 24.0 mm. One large egg taken on June 28, 1959, weighed 6.4 gm. Yamashina (1932) reported measurements for eight eggs collected on Ponape which averaged 32.2×23.5 mm. The egg is white and only one egg is laid per nest. Eight of the eggs collected had a slight constriction at the small end, giving them a knobbed appearance.

Ducula oceanica teraokai. Micronesian Pigeon. The period during the blockade of Truk by allied naval units in late World War II brought about intensive hunting of this species by Japanese residents of the atoll for food. Small bird populations in a limited geographic area are unable to with-

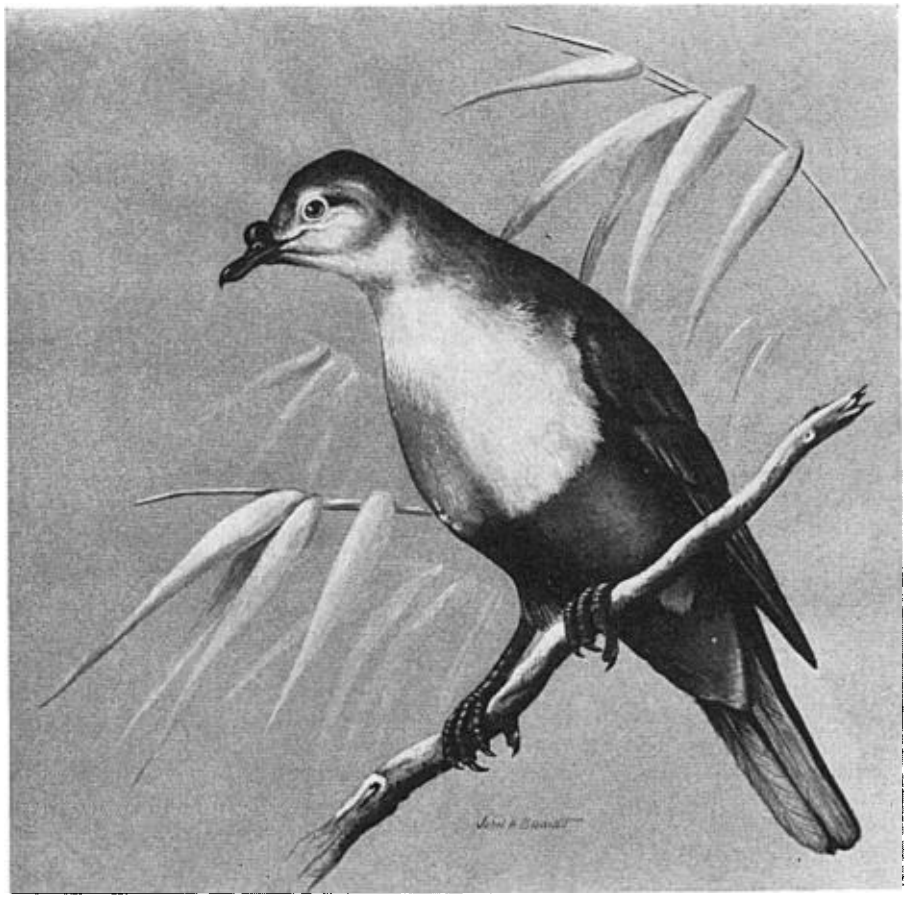

Fig. 2. Micronesian Pigeon (*Ducula oceanica teraokai*) ; this and subsequent figures reproduced from paintings by the author.

stand much hunting pressure and the bird disappeared to a large extent from its former habitat. The largest flocks are now restricted to Pata, Tol Island, with smaller groups present on a few of the other high islands.

The bird was not collected on Moen Island although occasional specimens were seen flying over high jungle slopes. The distinctive call was the most usual way of establishing its presence. Very small resident populations are maintained on the high islands. The bird rarely ventures to lowland forests and much prefers heavily timbered mountains. No nests or eggs were located and the bird appears to be badly in need of protection to prevent its extinction.

Gallicolumba xanthonura kubaryi. White-throated Ground Dove. Baker (1951) reports conflicting information regarding the habitat of this species on Truk. In 1945, McElroy reported the bird in heavily forested slopes in tall trees. In 1947 and 1948, Richards saw the bird in thickets, gullies, and flying over grassy slopes. He never found the bird in thick forest nor in elevations over 300 feet. My observations would tend to place the more normal habitat of the species in thick scrub jungles of the high slopes. Since lowland areas are being rapidly denuded by burning, on many of the high islands, the bird may be driven more and more into high forests. It feeds a great deal on the ground. Burned areas are rapidly overgrown with thick cane grass and reeds, forcing the bird to feed on the forest floor.

All the nests discovered were in deep jungle at elevations up to 600 feet. Eight nests were found

with eggs on the islands of Moen, Fana and Fefen. Two nests with eggs were recorded in February and four in April. One clutch was located in June and another in September. Three nests were well concealed in the thick foliage of mango trees and were between 20 and 30 feet from the ground. Nest height averaged 16 feet. The nest is built of twigs, fern stems, and some leaves. One nest taken on February 9, 1959, had several green leaves twisted into the shallow structure. It measured 23.0 cm. in diameter.

Fig. 3. White-throated Ground Dove (*Gallicolumba xanthonura kubaryi*), adult male.

Measurements of seven eggs averaged 29.4×22.3 mm. Length ranged from 28.5 to 30.5 mm. and width from 21.5 to 23.0 mm. The eggs are white and one egg is laid per nest. Two specimens had a rather oily covering on the shell and some eggs have a definite patina.

Collocalia inquieta rukensis. Carolines Swiftlet. This species was not observed at Moen Island, Truk Atoll, by McElroy in December, 1945, according to Baker (1951). This seems strange since it is now one of the commoner birds of the atoll and is widely distributed among the high islands. It is often seen feeding in large groups in late evening and on dull cloudy days. World War II may have had much to do with its present residence on islands where it was previously of uncommon occurrence. Trukese inform me that this swiftlet was formerly common only on the islands of Tol. Here natural caves, clefts in cliffs, and rock overhangs occurred which provided natural nesting sites for the birds. A large crevasse on Pata Island supports a tremendous colony of these birds. With military fortification of the high islands by the Japanese, numerous storage caverns and cannon emplacements were excavated into the steep slopes of the high islands. With the cessation of hostilities in 1945, these provided nesting locations for the swiftlets on islands where previously none existed. This may account for the greater dispersal of the species within recent years.

The Carolines Swiftlets congregate in small colonies in suitable caves where they share quarters with bats. If the cave ceiling is sufficiently high to discourage predation, many hundreds of birds will nest together. The nests are often only inches apart wherever suitable niches are found. They are attached to the ceiling and cave walls, at heights varying from five to 50 feet. The nests are often located at a considerable distance from the cave entrance in total darkness.

The nest is a well-cupped affair constructed of grass stems, and small tendrils; and occasionally small sticks, fern stems and, more rarely, mosses are employed. A few feathers are generally found imbedded in the nest which is glued together with copious secretions of saliva and firmly attached to the cave rocks. No lining is used. Some nests are entirely supported from underneath by stone whereas others protrude and are fastened only at the back of the nest. Forty-two nests measured averaged 50 mm. in width of cup. The cups averaged 17 mm. in depth. The nest rim was 10 mm. thick.

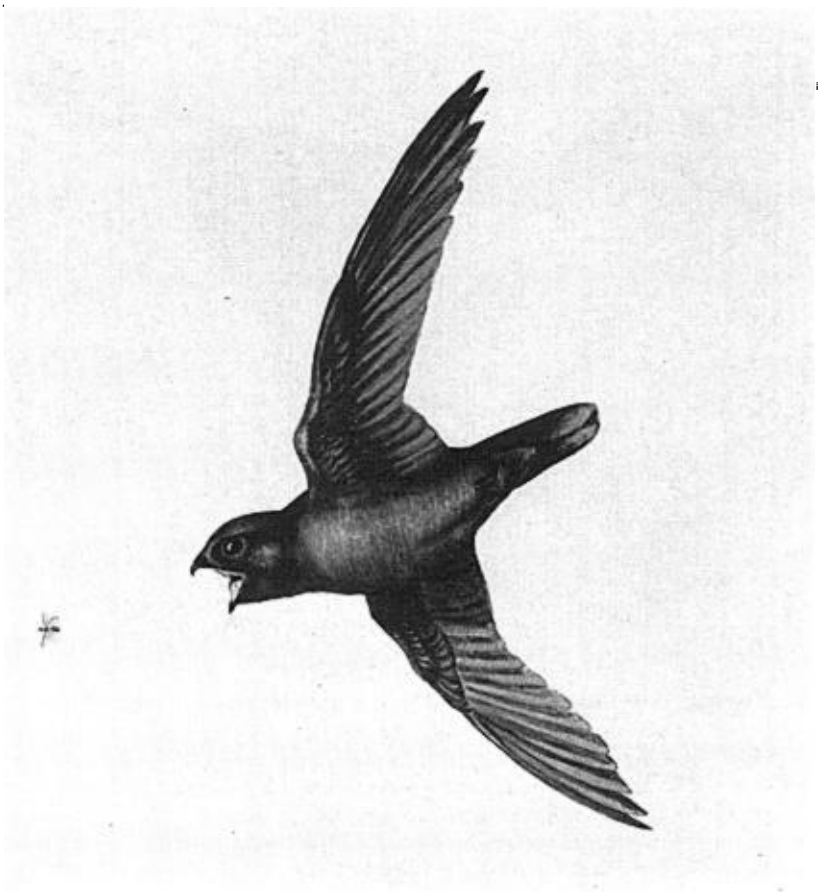

Fig. 4. Carolines Swiftlet (*Callocalia inquieta rukensis*).

The Carolines Swiftlet typically lays two white, elongate eggs with blunt ends. Twenty-six specimens averaged 20.0×13.1 mm. Nests with eggs were found in April, 18; May, 7; July, 4; September, 8; November, 6; and December, 7.

Acrocephalus luscinia syrinx. Nightingale Reed Warbler. Seventeen sets of eggs of this widespread species were taken, fifteen collected on Truk and two on the island of Ponape. This reed warbler is established on the high islands as well as on the coral islets. It has been reported as far west as Woleai Atoll (Kittlitz, 1835), although the actual westernmost limit of its range remains to be determined. It is not reported for Yap which lies some 900 miles to the west nor for the atolls between Woleai and the Palaus. Eastward *A. l. syrinx* is reported from both Ponape and Kusaie.

On Truk it frequents gardens and second-growth forests. Although related subspecies commonly inhabit reed grown cover, on Truk the birds are seen more commonly in open or forested areas, frequently feeding on the ground. McElroy (*in* Baker, 1951) observed birds carrying nesting material

to cane swamps. Of the seventeen nests found, two, located on June 1 and August 11, 1959, were attached to cane. Hartert (1900) reports that from May to July many nests were found from seven to 20 feet above ground in breadfruit trees and in coconut and ivory nut palms. Those I examined ranged from a low of six feet to well over 40 feet. The highest nest was in the uppermost branches of a mango tree. One nest found on May 28, 1959, was built on a vine intertwining a taro plant. The nest was suspended over water. Nesting trees were usually selected from those with heavy foliage and the

Fig. 5. Nightingale Reed Warbler (*Acrocephalus luscinia syrinx*).

bulky nests were quite well concealed. The nest was often in the center of a cluster of branches so that it was supported on all sides. Nests with eggs were found in April, 2; May, 5; June, 6; August, 1; September, 2; and October, 1. Yamashina (1932) reported eggs of *A. l. syrinx* from Ponape in July and August and with McElroy's observation of nest building in December this would indicate fairly active nesting throughout the year with only January to March unreported. Birds collected by Coultas (*in* Baker, 1951) in November and December displayed enlarged gonads in only a few specimens.

Nests are crude, bulky affairs with an outer cover made of coarse grasses, weed stems, and leaves. Some leaves used measured 12.0 mm. in width. The walls of the nests are quite thick with an inner lining usually of fine grass. The depth of the cup in 15 nests averaged 45.0 mm. with an average diameter of 56.0 mm.

Twenty-one eggs were measured. The length ranged from 19.5 to 24.5 mm. and the width from 14.5 to 16.5 mm. Average of the series was 21.5×16.1 mm. Yamashina (1932) gives measurements for 13 eggs which averaged 21.8×15.7 mm. Two eggs form a normal clutch. The shell color is white, occasionally washed with a greenish tint or slight buff. Lavender spots form an undercoat heavily sprinkled with chestnut and black. Sometimes a blotch of olive tint will cover an otherwise uniformly spotted surface. Coloration is often more concentrated at the large end.

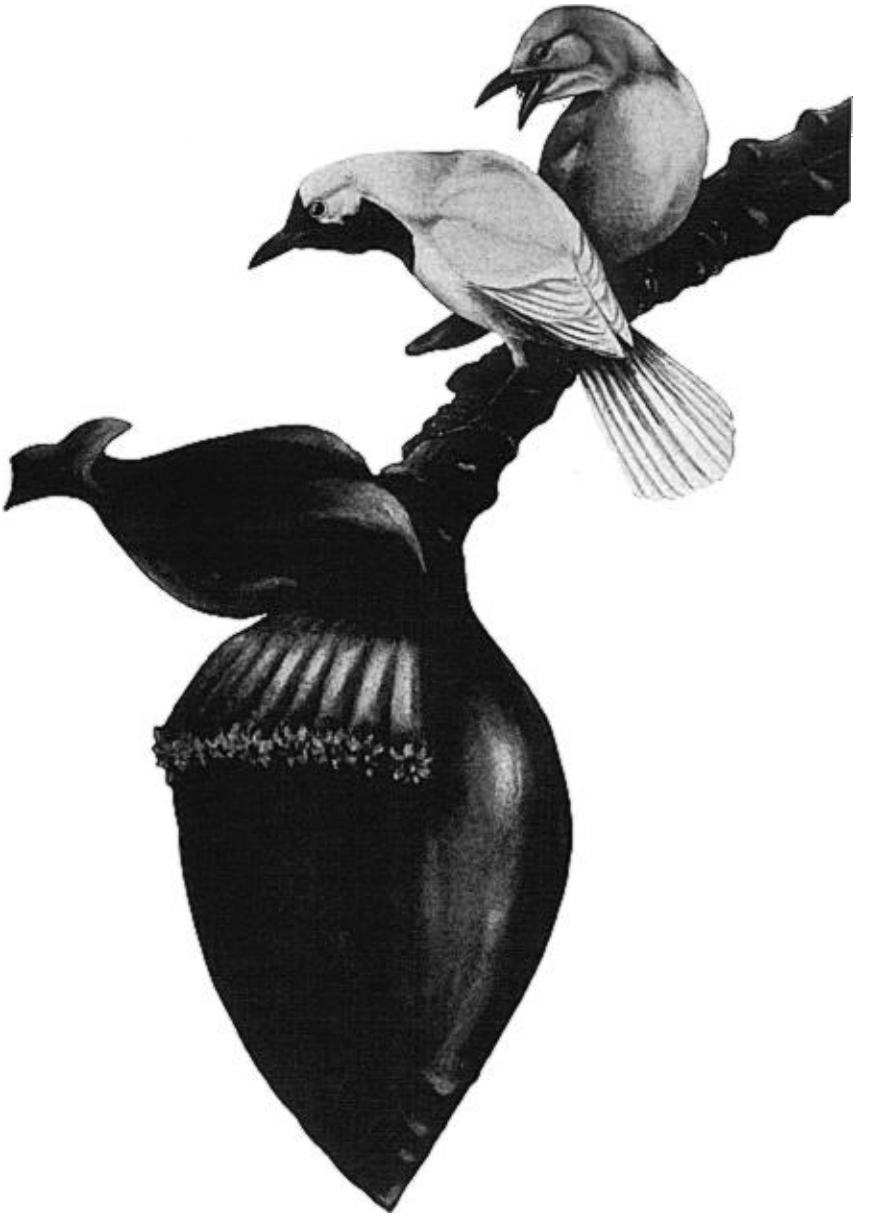

Fig. 6. Truk Monarch (*Metabolus rugensis*).
Upper, immature; lower, adult male.

Metabolus rugensis. Truk Monarch. Baker (1951) wrote that this species had become reduced in number and was perhaps threatened with extinction. Greenway (1958) indicated a similar concern regarding its "small population" status. McElroy (*in* Baker, 1951) saw no birds of this species on the several islands of Truk he visited, and Japanese residents indicated they were not acquainted with the bird. Restricted to Truk, the bird was observed only on the high volcanic islands of the atoll. Its shrill whistle and spectacular coloration makes the species appear more common than it actually is. The female is black, irregularly blotched with white, whereas the male is pure white with a black throat. The immature is bright cinnamon color. Various stages of transition between these colors are evident in molting and maturing birds. The bird lacks fear of man and may easily be approached for observation.

Fifteen nests of the Truk Monarch were located on Moen, Fefen, Fana and Tol islands. This would indicate a rather well distributed population among the high islands covering most of the atoll. Adult birds were also observed on Dublon and Uman. Nests with eggs were taken in April, 4; May, 5; June, 5; July, 1. Yamashina (1932) took one set in May, 1931, at Natsushima Island (Dublon Island), Truk. Hartert (1900) reports nests in June. Eight of the nests found were in breadfruit trees. Seven nests were in other varieties of jungle trees usually bearing dense foliage. The nests were most commonly located at the outer extremity of the branch and were from 10 to 25 feet up. Most of the nests were within 15 feet of the ground.

The nest is a thick-walled, firmly built affair with well rounded edges and a shallow cup. It is made with an outer cover of weed stems, bark, grasses, coconut fiber, and occasional bits of cobweb. The inner lining is of fine grasses. One nest taken had a considerable amount of green moss mixed into the outer cover. The nest is firmly made, and the cup averages 76.0 mm. in diameter and 40.0 mm. in depth.

The 15 eggs measured averaged 26.7×19.5 mm. The length varied from 24.5 to 28.5 mm. The width ranged from 19.0 to 21.0 mm. The eggs are frequently quite pointed. The ground color of the egg shell is white with an occasional pinkish cast. The surface is thickly sprinkled with rust-colored specks. These are distributed evenly over the entire surface with usually a heavier concentration at the large end. The eggs appear quite reddish in color. Some specimens have a few black spots scattered at various places on the shell, and often small lavender blotches decorate the egg. One egg forms the set.

A nest collected on April 17, 1959, at Tunnuk, Moen Island, and another at Wonip, Tol Island, on June 3, 1959, seemed to indicate that the male aids with incubation. Both nests contained fresh eggs, and the male flushed upon approach. Whether he was actually incubating or performing some other function at the nest could not be determined. Natives report that both sexes incubate.

Myiagra oceanica oceanica. Micronesian Broadbill. This active, aggressive little flycatcher is a common bird in gardens and villages. It inhabits both high and low islands and is variable in its habitat, ranging from lowland bush to high forests of the mountain slopes.

The nest is a well built, cup-like structure made of shreds of bark, grass, weed stems, and small leaves and lined with fine grass. Some nests incorporate plant down. The average nest has an inner diameter of 53.0 mm. with a cup depth of 14.0 mm. The nest is usually built between eight and 20 feet off the ground. Most locations are less than 12 feet high. The nest is often saddled in a crotch or on the upper surface of a thick branch. The outer covering of the nest blends perfectly with the bark and unless a bird is flushed from the nest, it is extremely difficult to locate. The bird seems to have a particular predilection for nesting in hibiscus trees.

Twenty-eight nests with eggs were examined on the islands of Moen, Fana, Fefen and Dublon. All contained one egg per set. Hartert (1900) reported one set with two eggs. He reports nests during the period of March to July. I recorded nests with eggs in February, 2; March, 5; April, 9; May, 9; June, 2; December, 1. The egg has a shell color of creamy white, running to olivaceous buff. The surface is profusely sprinkled with spots of brown, and a heavy band of spots concentrated in a wreath girdles the egg at its widest part. Occasional eggs exhibit a few black spots. Twenty-one eggs measured averaged 20.8×15.4 mm. The largest egg measured 22.0×16.0 mm. and the smallest 19.0×14.5 mm.

Aplonis opacus angus. Micronesian Starling. The starling is one of the most conspicuous birds on the island and is sufficiently adaptive to survive equally well on the high volcanic islands and the low reef islands. Of the land birds, it enjoys probably the widest distribution in the area. One or the other

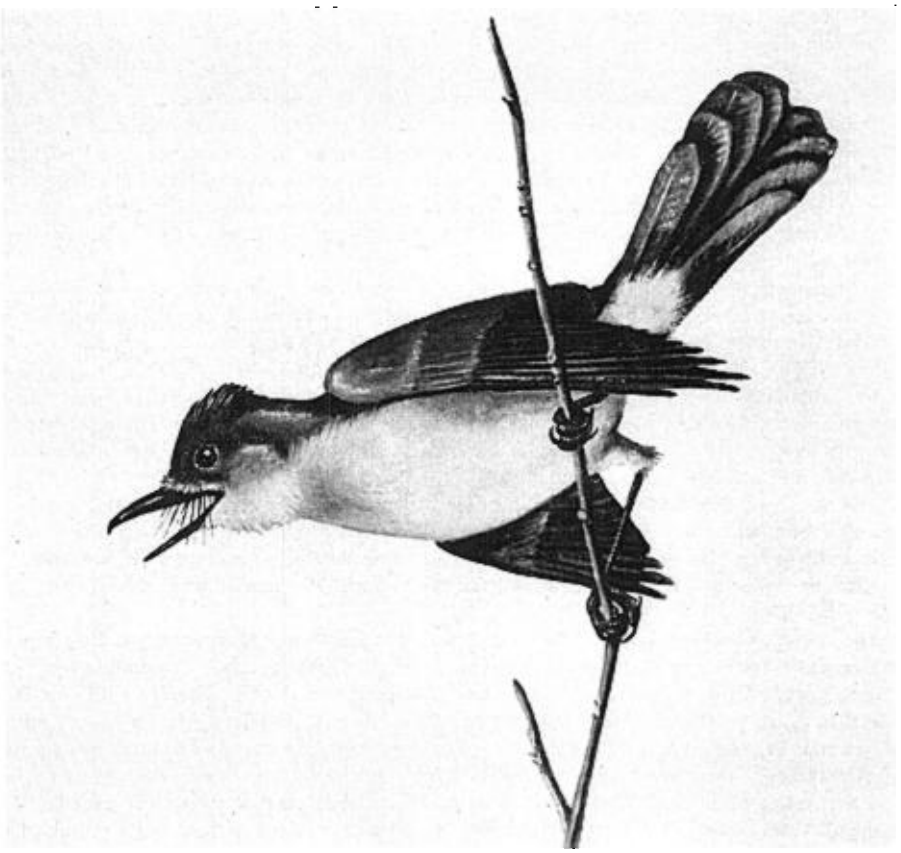

Fig. 7. Micronesian Broadbill (*Myiagra oceanica oceanica*), adult male.

of the seven subspecies are represented among the avifauna of almost all the islands of Micronesia.

Nests are usually placed in tall trees and are rarely less than 15 feet from the ground. On Truk a common nesting place is the crown of coconut palms. Nesting material is wedged in between the bases of the spreading fronds. Nests examined were usually made of coarse sticks and heavy grasses with a very shallow cup. The lining was of fine grasses.

The starling is the only land bird on Truk which regularly utilizes tree hole cavities and similar locations for nest sites if available. Since no woodpeckers are resident on this atoll, the number of suitable holes is very limited. Of 29 nests examined, 12 were in tree holes and the remainder in coconut palms. Height of nest sites varied from 12 to 50 feet with the majority of nests being within 30 feet of the ground. Nest height was usually governed by the tallness of the coconut palms on the island.

Fifty-two sets of eggs were obtained. Two eggs constitute a normal clutch. In two instances sets of three eggs were collected. Eight sets of one egg each were taken and, since incubation was advanced in some of these single sets, it appears that clutches of one may be complete at times. The possibility of predation by roof rats (*Rattus rattus*) may, however, account for the loss of the remainder of the clutch. Hartert (1900) reported clutches of one to three eggs taken on Truk in March, May, June, and July. The number of addled eggs found was also unusually high.

Eggs are greenish blue in ground color. Markings vary from chestnut brown to black. The spots are generally more heavily distributed around the large end. Some varieties show fine sprinkling of russet spots over the entire surface. Two sets were collected which showed no spots at all. Egg sizes vary in length from 25.5 to 33.0 mm. and in width from 19.5 to 23.0 mm. The average size of 29 eggs measured was 29.4×21.2 mm.

The number of nests with eggs were recorded in January, 4; February, 6; March, 9; April, 8; May, 5; June, 5; July, 3; August, 2; October, 2; and December, 3. This would seem to indicate that the Micronesian Starling on Truk breeds throughout most of the year. The largest number of occupied nests was observed between February and April.

Myzomela cardinalis major. Cardinal Honey-eater. This species is widely distributed in the area and is found on both high and low islands. Since it is especially attracted to plant blossoms, the Cardinal Honey-eater is especially conspicuous about houses and in the native villages. It more commonly nests in the proximity of dwellings than any other species on Truk.

The birds build their rather frail looking nests most frequently in small trees with thick concealing foliage. The majority of the nests were within 15 feet of the ground. They were usually placed at the outer tip of a branch and were well hidden in a terminal cluster of leaves. The nests were located in a variety of trees but usually those selected were in open locations or at the outer perimeter of wooded areas. The birds are very pugnacious around the nesting area and vigorously drive off other birds although human intrusion causes only a mild demonstration. On one occasion a Nightingale Reed Warbler perched momentarily on the rim of a nest which I later found contained one slightly incubated egg. The Cardinal Honey-eater in this case oddly offered virtually no objection. The contents of a typical nest can at times be observed from the ground by looking through the bottom of the nest. Attachment to branches is often very weak and many nests blow down in storms.

The nest is constructed of grasses, weed stems, leaf fragments, and shreds of coconut bast. The outer covering is often of blackish or dark tendrils and what appear to be aerial rootlets of saprophytes with a lining of lighter fine grasses. Outside measurements of eighteen nests averaged 20.0 mm. in depth and 50.0 mm. in width. The nest types varied. Some were constructed in small crotches whereas others hung from forks of branches.

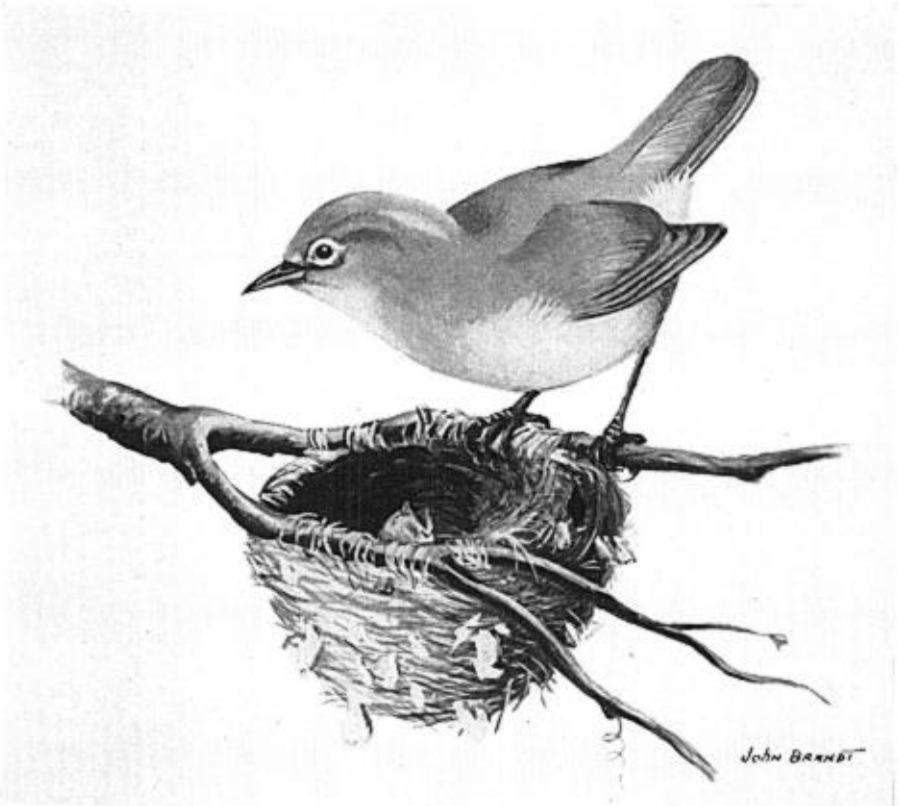

Fig. 8. Bridled White-eye (*Zosterops conspicillatus owstoni*), female at nest.

The Cardinal Honey-eater most frequently lays two eggs. Some nests, however, contained only one egg. Whether this constituted a normal clutch or whether the other egg was lost through predators or other causes could not be determined. Yamashina (1932) also noted that of 13 sets of eggs of *M. c. dichromata* collected at Ponape, three were comprised of one egg each and 10 were of two eggs each. The eggs are a glossy white or light cream color. The large end is heavily marked with spots of reddish brown. Brown spots are sprinkled over the surface of some specimens. Twenty-two eggs averaged 18.5×13.6 mm. in size. The number of nests found with eggs is as follows: January, 2; February, 2; March, 2; April, 6; May, 4; June, 2; September, 1; and December, 1. Nesting throughout the year seems to be general. Hartert (1900) reports nests during March, May, June, and July.

Zosterops conspicillata owstoni. Bridled White-eye. Nests of this species are frequently encountered in extremely exposed locations. One nest observed on August 5, 1958, was placed in a low bush adjoining a roadway. There was no surrounding vegetation. The nest was suspended from a twig some 18 inches from the ground and had no concealment or covering leaves. The half grown young was obviously suffering from direct exposure to the sun. On October 10, 1958, a nest was located on the outer branch of a wild hibiscus tree, five feet from the ground. This nest was also in an exposed location. It contained one newly hatched young. Although ordinarily bushes or trees with low hanging limbs were used for nest sites, a nest discovered on April 8, 1959, was built on a tangle of *Phragmites* overhanging a pathway. The nest was loosely connected to the grass stems and was so placed that it was in direct view of all who passed.

The nest of this species is a small delicate cup-shaped affair, thinly woven of grass, small tendrils, pieces of dead leaves, plant down or cobweb and lined with fine, soft grasses. The nest is pensile and is often placed in the fork of a lateral branch. The structure is very similar to nests of North American vireos. Seven nests measured had an average inside diameter of 45.0 mm. with a cup depth of 25.0 mm. The nests were generally placed between 1½ to 10 feet from the ground. Nests were often located on the edge of forests surrounding villages and close to houses or gardens. Apparently the species nests throughout the year. Nests with eggs were recorded in January, 1; April, 2; May, 5; June, 1; August, 3; and October, 2.

The single egg is light blue in color with a very hard brittle shell. Occasional specimens may have a more intense band of blue around the egg at its widest point. This is more apparent in eggs advanced in incubation. Ten eggs measured averaged 17.3×11.7 mm. The length varied from 16.0×19.0 mm. and the width from 12.0×14.0 mm.

Rukia ruki. Truk Greater White-eye. In the course of this study the Greater White-eye was never collected nor observed. Intensive questioning of the natives on Moen and Fefen islands, where most of the collecting was done, failed to locate anyone who was familiar with the bird or could offer a Trukese name for it.

Specimens of *Rukia ruki*, examined at the Yamashina Institute for Ornithology in Tokyo in 1960, were collected on Tol Island prior to World War II. Tol, the largest of the high islands of Truk Atoll, has heavily wooded mountains of virgin forest including the highest peak of the atoll. It may be that this species is largely restricted to this island with perhaps only localized populations on the other islands. On Tol, pictures of the bird could not be identified by my informants. This would indicate that the species is rather uncommon on Tol as well and may perhaps be absent from some of the other high islands of the atoll entirely.

Kubary, who collected on Truk intensively for 14 months at the turn of the century, failed to secure a specimen of this bird although subsequently birds were secured by other field workers.

Erythrura trichroa clara. Blue-faced Parrot Finch. The Parrot Finch is usually noticed feeding on grass seed in small flocks along roadways and areas of heavy grass cover. The bright grass green body and blood red tail appear far more conspicuous than the name "blue-faced" would imply. The bird is generally limited to the high islands.

A variety of nesting sites are used by this species. In view of their customary haunts in lowland grass areas and their habit of feeding close to the ground, I spent a great deal of time in these localities searching for nests. The first nest was discovered on January 9, 1958, in a blast hole drilled into the wall of a World War II Japanese artillery emplacement. This artificial cave was carved into the side of Nefo Peak, Moen Island, some 500 feet above sea level. The surrounding area is heavy tropical jungle. The hole was 8 feet above the cavern floor and measured some 4 inches in diameter. It was drilled

Fig. 9. Truk Greater White-eye (*Rukia ruki*).

into moist rock and was approximately 25 feet from the mouth of the cave. The nest contained four eggs. In extracting the building material, the nest was destroyed. Other nests have been found in heavy vines overhanging the mouths of caverns. One was on the outside of a cave and the other some six feet within the entrance. The nests were approximately five feet from the ground. More usual nesting sites are the crowns of coconut palms where the nest is placed between the spreading fronds. Ordinarily young or small varieties of palms are utilized. Few nests were more than 12 to 15 feet from the ground. On occasion, however, the Parrot Finch builds at considerable height. Four nests were found in the top of an ivory nut palm more than fifty feet from the ground. Pandanus trees were used on two recorded occasions as nest sites. The nests were well concealed among the cluster of leaves near the uppermost branches and were about twenty feet from the ground.

The nests are built of a variety of grasses, leaves, ferns, bark, and rootlets, and often extremely coarse objects are incorporated. On several occasions, grasses measuring over 2 centimeters in diameter have been noted. The nest is crudely constructed. It is rounded and averages 15 centimeters across. A small hole about 4 centimeters in diameter is left in the bulky structure to allow entry for the bird. These measurements and data apply to 16 nests examined.

The eggs are dull white, unmarked, and have a relatively hard shell. However, on some occasions the eggs are so covered with nest stains and sprinklings of mud that the ground color is all but obliterated and they present the appearance of being heavily marked. Why this should be so I have not determined since the bird uses no mud in nest building and ordinarily inhabits no area which could account for such excessive staining of the eggs through soiled feathers of the bird.

The average clutch seems to be three or four eggs. One nest with three newly hatched young and two eggs was found. Some incubated sets of two have been noted. Of 16 sets examined, 9 contained 4 eggs each. The eggs averaged 15.3×12.1 mm. in size. One nest with eggs was recorded on the following dates: January 9, February 26, March 26 and 29, April 6, 13, 15, and 29, May 10, 18, and 20, June 1 and 5, July 27, September 18, and December 5.

TABLE 2

TOTAL OF NESTS WITH EGGS RECORDED BY MONTH*

Species	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Gygis alba pacifica	21	7	11	32	6	8	3	4	4		24	33
Sterna sumatrana sumatrana	39	24	23	7						12		13
Anous stolidus pileatus	36	12	10	6	12	2	1	2	2		2	4
Anous tenuirostris marcusi	51	52	12	7	18		10	8			23	27
Thalasseus bergii pelecanoides				12		15						
Sula sula rubripes				1								
Sula leucogaster plotus				1								
Phaëthon lepturus dorotheae	3	1		6	1	1	3	6	2	2	2	2
Phaëthon rubricauda rothschildi			7									
Sterna fuscata oahuensis				100+		500+						
Puffinus lherminieri dichrous						1						
Demigretta sacra sacra					4	4						
Nycticorax caledonicus pelewensis							1					
Ixobrychus sinensis				1	6	6						
Poliolimnas cinereus micronesiae						1						
Fregata minor minor				1								
Anas poecilorhyncha pelewensis		1		1	2	1						
Gallus gallus					1							
Ptilinopus porphyraceus ponapensis		1		5		2	3	2				2
Gallicolumba xanthonura kubaryi		2		4		1			1			
Aplonis opacus angus	4	6	9	8	5	5	3	2		2		3
Collocalia inquieta rukensis				18	7		4		8		6	7
Acrocephalus luscinia syrinx				2	5	6		1	2	1		
Metabolus rugensis				4	5	5	1					
Myzomela cardinalis major	2	2	2	6	4	2			1			1
Zosterops conspicillata owstoni	1			2	5	1		3		2		
Myiagra oceanica oceanica		2	5	9	9	2						1
Erythrura trichroa clara	1	1	2	4	3	2	1		1			1

* Decrease in nesting records during certain months is not to be misconstrued as indicating a decline in breeding activity in some instances. Access to certain sea bird colonies, for example, was impossible due to weather conditions, high seas, or lack of transportation to remote islets during certain seasons. Lack of records for other months was due in part to absence of native trackers or due to various circumstances that precluded field work on Truk at such times.

SUMMARY

Few data on the nesting of birds of Truk Atoll, Caroline Islands, were previously available. From October, 1957, to March, 1960, records were obtained for 27 of the 29 regularly breeding birds of the islands. Details of nest construction, location of nests, nesting dates, egg size, description of eggs and the number of eggs in a clutch are reported. Descriptions and data on eggs and nests of three subspecies are here reported apparently for the first time. Eggs of 10 subspecies, not collected before on Truk, but reported for other islands, are described. *Sula sula rubripes* and *Sterna fuscata oahuensis* both breed within the zone of the Truk Islands but were not previously included in the avifauna of Truk.

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