

NOTES ON THE BIRDS OF NEW GEORGIA, CENTRAL SOLOMON ISLANDS

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From Buka to San Cristobal the axis of the Solomon Islands extends for 600 miles from northwest to southeast. Almost at the middle of the chain lies the cluster of islands of the Central Solomons or New Georgia group. New Georgia, the largest island in the group, is 50 miles long and 25 miles across at the widest part. The smoothly sloping volcanic cone of Kulambangra, rising above 5000 feet in elevation, is the highest island. In order of decreasing size the other principal islands are Vella Lavella, Rendova, Vangunu, Ganonga, Gatukai, Tetipari, Arundel, WanaWana, Gizo, Bagga, and Simbo.

The high degree of endemism in the avifauna of the Central Solomons was first recognized by Rothschild and Hartert (*Nov. Zool.*, 12, 1905:244) who designated the Central Solomons as one of the four major zoogeographical subdivisions of the Solomons. Mayr (*Birds of the Southwest Pacific*, 1945:276) has made a further subdivision based on the distribution of species which show geographic variation within the group. He divides the Central Solomons as follows: a western section, composed of Vella Lavella, Bagga, Ganonga, and Simbo; a main section, including Gizo, Kulambangra, New Georgia, Vangunu, and Gatukai; and the Rendova section, comprised of Rendova and Tetipari. This division is not a completely consistent one but most polytypic species follow the pattern or parts of it. The main section (Kulambangra, New Georgia, etc.) is the most closely knit subdivision of the three. There are no wide or deep water barriers separating any two islands within this section. Between Kulambangra and New Georgia are the "stepping-stones" of Arundel and WanaWana. Likewise there is a chain of islets between New Georgia and Vangunu. Between New Georgia and Rendova, however, the barrier is much greater. Although Blanche Channel is less than two miles wide at one point, it is deep and probably has been a barrier at least since the Pleistocene. Between the main western sections the water barrier is both wide and deep.

The literature on the avifauna of the Central Solomons is contained in two serial publications and one book. Rothschild and Hartert published a series of reports on the collections made by Meek and Eichhorn in the early years of this century. The first of these (*Nov. Zool.*, 8, 1901:179-189) recorded 37 species from the island of Kulambangra. In 1905 the same authors (*Nov. Zool.*, 12, 1905:243-268) listed 22 species from New Georgia, and in 1908 they recorded the first collection from Vella Lavella (*Nov. Zool.*, 15, 1908:351-358). The collections of the Whitney South Sea Expedition have been placed on record in various numbers of the *American Museum Novitates*, and in 1945 Mayr incorporated many previously unpublished records.

The present paper adds little to the record of species known from the Central Solomons. Its principal contribution is information on the ecology, life history, behavior, and the relationship between molt and gonadal development of the birds of the region. The author was stationed at Munda on New Georgia from October 20, 1944, to February 12, 1945, a total of 116 days. During this period, 28 days were spent in the field, including one day on Rendova, one day on Kulambangra, and a three day trip to Simbo, with a short stop on Gizo.

Collecting on New Georgia was confined to the vicinity of Munda Point and all specimens were taken within a few feet of sea level. Munda is located at approximately 8 degrees 20 minutes south latitude and 157 degrees 17 minutes east longitude. Eighty-eight specimens of 37 species were collected and 20 additional species were observed. All specimens are in the collection of the Museum of Vertebrate Zoology.

The greatest length (in millimeters) of testes and ovaries was measured in all speci-

mens. Measurements of gonadal size in the following accounts refer to this dimension. The condition of molt in the adults of resident species has been determined from the specimens and correlations between gonadal development and molt condition have been investigated. In the 63 specimens of adult resident species collected the following results were obtained. Twenty-six specimens were not molting and had enlarged gonads; 20 were not molting and had regressed gonads; 12 were molting and had regressed gonads; and five were molting and had enlarged gonads. The five latter specimens showing both molt and enlarged gonads were a male *Centropus milo albidiventris*, a male *Edolisoma tenuirostre saturatus*, a female *Coracina lineata ombriosa*, a male *Coracina papuensis elegans*, and a male *Monarcha barbata browni*. The fact that three of the five are campe-

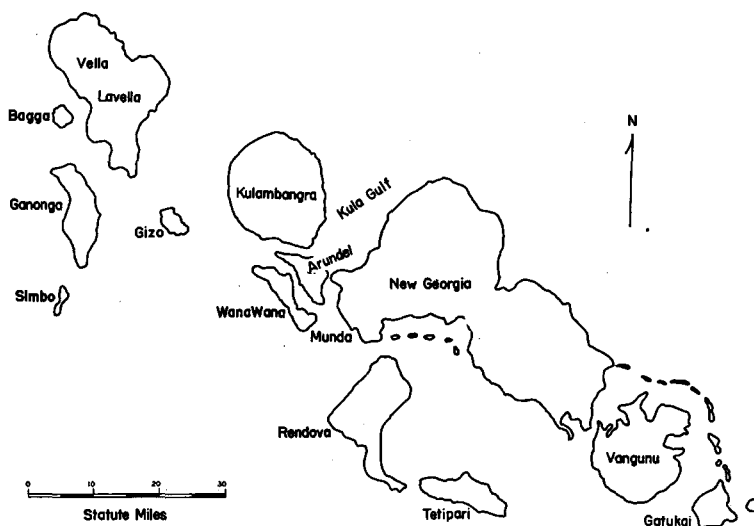


Fig. 1. Map of Central Solomon Islands.

phagids suggests that members of this family tend to molt during the time of breeding activity with greater frequency than those of the other families of birds in the Central Solomons.

Thus, out of 63 specimens, only five definitely show both molt in progress and enlarged gonads at the same time. That external size measurements of the gonads are not necessarily indicative of the internal condition has been established by Moreau, Wilk, and Rowan (Proc. Zool. Soc. London, 117, 1946:345-364). These authors found that only very small testes in tropical African *Colius*, *Pycnonotus*, and *Phyllastrephus* were invariably dormant. The same authors (*loc. cit.*) found that the three genera mentioned often showed molt and breeding activity at the same time. The slight difference in latitude between Amani in Tanganyika at 5 degrees 6 minutes south latitude and Munda at 8 degrees 20 minutes south latitude hardly seems sufficient to account for the differences. It is possible that many of the specimens from Munda with "unenlarged" gonads may actually have been in breeding condition. However, nearly one-half of the Munda specimens with definitely enlarged gonads were not molting. In view of the relatively crude determination of sexual activity which I found it necessary to use, it seems fruitless to attempt definitive interpretations of the correlation between molt and gonad cycles in the Munda birds. Taken at face value they suggest that both molt and a high

degree of sexual activity occur significantly less frequently than molt in the absence of sexual activity.

The three days of February 8, 9, and 10, 1945, were occupied with a trip to Simbo (Narovo) Island. Simbo is approximately three miles from Ganonga, the nearest island to it. Simbo itself is approximately three miles long and one mile wide. It is well wooded and its volcanic origin is attested by the still active small volcano, hot springs, and fumaroles which occur at the south end of the island.

The principal objective of my visit to Simbo was to search for representatives of the polytypic species of the Central Solomons, such as *Zosterops rendovae*, *Rhipidura cockerelli*, *Monarcha barbata*, and *Myzomela eichhorni*. Although an intensive search of the optimum habitats of the four species was made, none of them was found. Likewise, the absence of *Myiagra ferrocyanea*, *Rhipidura rufifrons*, and *Ptilinopus viridis* was apparent. The absence of these species, which occur on Ganonga only three miles away, is apparently the result of the recent igneous origin of Simbo, and the presence of a water barrier of sufficient width to prevent the easy colonization of Simbo by small, sedentary birds. Since the gap of less than two miles between New Georgia and Rendova has permitted the differentiation of *Zosterops r. rendovae* and *Z. r. kulambangrae*, it is not surprising to find that *Zosterops rendovae* is stopped by three miles of open water. The recent origin of Simbo has not yet allowed sufficient time for chance immigrants of these absent species to become established on this small island.

The following species were observed on Simbo: *Egretta sacra*, *Megapodius freycinet*, *Actitis hypoleucos*, *Ducula rubricera*, *Eos cardinalis*, *Trichoglossus haematodus*, *Larus roratus*, *Centropus milo*, *Collocalia vanikorensis*, *Halcyon saurophaga*, *Eurystomus orientalis*, *Hirundo tahitica*, *Rhipidura leucophrys*, *Monarcha castaneiventris*, *Aplonis cantoroides*, *Aplonis grandis*, and *Nectarinia jugularis*.

Fregata ariel. Least Man-o'-War. This frigate bird was not common at Munda. It was observed on November 7 and 30, two individuals being seen at each time. On December 24 several were noted at Lady Lever Plantation on Kulambangra, and on February 8 approximately 10 were observed plunging into a school of fish off Kulambangra, in company with *Sterna* sp. and *Anous* sp. Although *F. minor* may have been present, it was never positively identified.

Butorides striatus solomonensis. Mangrove Heron. This small heron was not common on New Georgia. Two specimens, taken on December 4, were foraging along a rocky beach in the open, far from mangroves or other cover. Both were males, an adult and an immature. The adult had 9 mm. testes and those of the immature measured 8 mm. Neither was molting. The colors of the soft parts in the two birds agreed and were as follows: iris yellow; bare skin of lores and adjacent facial region yellowish-green; maxilla black; mandible greenish-white along lower portion, remainder black; legs and upper surface of feet olive-green; plantar surface of feet yellow. A single bird was flushed from a mangrove thicket on Kulambangra near Lady Lever Plantation on December 24.

Egretta sacra sacra. Reef Heron. This was the common heron at Munda, as it is throughout the southwest Pacific. Individuals were observed on each visit to the shore. These large herons foraged almost exclusively in the open, usually along the littoral rocks and beaches or on the offshore reefs. Mayr and Amadon (Am. Mus. Novit., No. 1144, 1941:8) found that the gray and white plumage phases in the Solomon Islands occur in the proportion of approximately three gray to one white. This is supported by my field observations which indicate the same proportions.

Haliastur indus girrenera. Chestnut-white Kite. This was the most numerous raptor on New Georgia. It was common in practically all habitats but was most often found along the beaches and edges of the forested areas. Individuals were found perched in the dense jungle on several occasions. On November 22, one was observed perched 35 feet up in a dense jungle tree. Again, on November 30, two were found in similar situations, in the dense foliage, deep in the forest.

Accipiter novaehollandiae rubianae. Rufous-breasted Hawk. This small hawk was observed twice: on October 23, an adult was noted as it perched quietly in a small tree beside a road; on November 4,

the passage of one of these hawks caused a flurry of excitement among the *Aplonis cantoroides* near my tent. The starlings uttered strident alarm notes and dashed into the low, dense second-growth vegetation as the hawk flew over. An immature female taken on February 4 had a 10 mm. ovary. The iris was brown, bill black, and cere and feet yellow. This bird was captured alive after striking a wire.

Accipiter albogularis gilvus. Pied Hawk. This hawk was not uncommon in the jungle areas. The species was observed several times, notably on November 16, when three individuals were seen in the jungle. All were remarkably lacking in wariness and allowed close approach. They were in the understory of the jungle within 40 feet of the ground. The flight was light and slow in contrast to that of most other accipitrines. An adult circling in the open on November 30 caused sharp alarm notes to be sounded by a flock of *Aplonis cantoroides*. The starlings wheeled and dashed about in obvious fright although the hawk made no move toward them.

An immature female was shot as it was attempting to raid the chicken yard of a "sea bee" unit on December 16. This bird had a 10 mm. ovary. The iris was yellow, cere greenish-yellow, feet yellow, and bill black. This specimen is in the process of its first complete molt. The two central rectrices, the secondaries, and some of the scapulars have been replaced. The fresh tips of the new rectrices protrude 10 mm. beyond the abraded ends of the unmolted ones.

Haliaeetus sanfordi. Sanford Eagle. This large brown eagle was fairly numerous in the New Georgia group. Individuals were noted many times and occasionally two were found together. The species exhibited little fear of man, often permitting close approach. An adult male was shot on October 23 from a conspicuous roadside perch in the jungle. The bird permitted me to approach it in the open as it sat quietly and watched. The specimen was not molting and had regressed gonads which measured 10 mm.

In life this species differs markedly from *Haliaeetus leucogaster*. The tail is shorter and more wedge-shaped and the wings appear shorter and more rounded. The flight involves more flapping than *H. leucogaster*, being reminiscent of the awkward, disjointed flight of the Black Vulture (*Coragyps atratus*). My experience with *H. leucogaster* indicates that it is a bird of the open, either soaring above the forest or perching on an exposed branch. *H. sanfordi*, however, was often found in the forest, well below the crown of the trees.

On January 15, two eagles were discovered at the edge of the water as they attempted to secure unidentified prey in the shallows. One was wading about in the water up to its belly, occasionally attempting to capture something with its talons. The other bird was perched on a log a few feet from the shore. Presently it made a short flight and dropped into the water.

Pandion haliaetus melvillensis. Osprey. The Osprey was seen only once when a single bird was observed circling and whistling near the shore on November 28.

Megapodius freycinet eremita. Megapode. Megapodes were frequently heard although they were rarely seen on New Georgia. Their loud, harsh calls became a familiar sound. Occasionally a bird would flush with startled cackles from beside a trail and fly off laboriously to drop into the vegetation after a short flight. On November 5 an adult female was picked up in a busy roadway where it had been hit by a vehicle. It was preserved as a complete skeleton. This bird had the ovary enlarged with the largest ovum 5 mm. in diameter.

Numerous nesting burrows were located on the slopes of a small volcano on Simbo Island on February 9. The birds had taken advantage of the volcanically warmed soil to provide incubation heat. This colony has been reported on in a separate paper (Condor, 48, 1946:92-93).

Nesoclopeus woodfordi? Woodford Rail. This forest rail was seen twice: on November 10 a fleeting glimpse was had of a bird which ran across the road in front of our vehicle; on November 19 a good view was obtained of one which walked slowly across a road in the jungle. The field impression was of a large, blackish rail with a long bill. Since the bird was not taken and since it has not previously been recorded from New Georgia, it is entered here with a question mark.

Amaurornis olivaceus. Bush-hen. The loud nocturnal calls of this small forest rail were heard far more often than the bird was seen. On several occasions I was awakened by the loud calls just outside my tent as a bird skulked about on the ground, calling as it progressed. One was observed in the open on December 20. It was first heard calling in thick second-growth vegetation and presently it appeared and proceeded methodically along the edge of the undergrowth continuing to call at intervals. It walked

along a small log, poked about under a pile of dead leaves and returned to the thick cover several yards from where it first appeared. The birds presumably are of the race *nigrifrons*.

Pluvialis dominica fulva. Golden Plover. This widespread species was a common winter visitor at Munda. It was present in numbers when I arrived on October 20, 1944, and was observed repeatedly in the following four months. The birds frequented the bare coral runways of the air strip and the rocks along the shoreline. On December 8, a male with 2 mm. testes was taken from a group of seven birds on the rocky shore near the air strip.

Actitis hypoleucos. Common Sandpiper. This was an abundant wintering species at Munda. It was frequently observed perched on clods or stumps beside the busy shore road. Often a bird would barely move aside from the road as a vehicle passed. On December 8 one was wounded at the water's edge. It flew a short distance out into the water and when pursued it dived beneath the surface to reappear several feet away. This act was repeated three times. Each time the bird came up from a dive it was noticeably lower in the water as its plumage became saturated. On the fourth dive it failed to reappear. A specimen obtained on December 8 was perched on a telephone wire 10 feet above the ground. It did not take flight although I drove to within 15 feet of it and approached it in the open while vehicles passed only 20 feet away.

Heteroscelus incanus. Wandering Tattler. On October 23 several tattlers were observed as they foraged in company with a turnstone on a rocky point near the air strip.

Arenaria interpres. Ruddy Turnstone. This was a common wintering species at Munda. It was observed on every visit to the shore in October, November, December, and January. The birds were often seen to perch by the roadside apparently oblivious to vehicles passing within a few feet.

Terns. Although flocks of terns were observed on several occasions, they were not usually satisfactorily identified to species. On November 7 a mixed flock of *Anous* and *Sterna sumatrana* was seen in Blanche Channel. *Thalasseus bergii* and *S. sumatrana* were observed in Roviana Lagoon on the same day. These last two species were again identified off Munda Point on November 13. A mixed flock of terns and man-o'-war birds was observed off the southeast side of Kulambangra on February 8.

Ptilinopus superbus superbus. Superb Fruit Dove. This species was observed on November 16 and 19 in high, fruiting, jungle trees. The species is probably more abundant than these observations indicate but dense foliage and tall trees made it difficult to see them. No specimens were obtained.

Ptilinopus viridis lewisi. Red-throated Fruit Dove. This small dove was a common resident in the jungle but was rarely seen in second-growth vegetation. The birds foraged in groups of from 5 to 25 individuals but often occurred in pairs during what was possibly the breeding period.

The call of this species consists of a series of mellow "coos" which may be fairly accurately syllabified as follows: "coo-óo-coo-whó-coo-whó-coo-whó." The first notes are slurred as "coo-óó" lacking the aspirated "w" sound of the subsequent notes. Four or five pairs of notes make up the usual series.

Mating behavior was observed on November 16 among a group of 25 birds feeding in a large "banyan." The males were "driving" the females in typical columbid fashion, that is to say, the males were closely pursuing the females, pecking at them, and attempting to mount. The birds were calling a great deal. One which was shot had its crop stuffed with the small reddish-brown fruits of the tree.

Four adult specimens were obtained. A female taken on November 1 had an unenlarged ovary of 10 mm. This bird was completing the molt. The remiges are fresh and the rectrices are replaced but not completely grown. The body plumage is fresh with an occasional ensheathed feather. Another female (November 16) had a slightly enlarged ovary (12 mm.) and no sign of molt in progress. A male obtained on November 4 had 8 mm. testes and showed no signs of molt. Another male (November 19) had somewhat enlarged testes (10 mm.) and fresh plumage with a few ensheathed feathers in the capital tract. This bird was apparently in the final stage of molt and the gonads were beginning to recrudescence. The birds agreed in color of soft parts: the bill was yellow, feet red, and iris orange.

Ducula rubricera rufigula. Red-knobbed Pigeon. The loud "barking" calls of this pigeon were often heard in the jungle. It was usually found in fruiting trees in company with *Ptilinopus viridis*. In life, *D. rubricera* appears considerably smaller than *D. pistrinaria* and the wing beat is more rapid. *D. rubricera* usually was found high in the crowns of jungle trees and only rarely descended to the understory. A specimen taken on November 4 was one of the few that I observed in the lower growth.

It was perched quietly only 30 feet from the ground in a small tree. It had unenlarged (10 mm.) testes and was molting. The bill was blackish, cere and feet bright red, and iris dark red.

On February 9 large numbers of this species were found nesting on a low islet at the mouth of the bay on the north side of Simbo Island. The birds had constructed their nests in low shrubby growth, the only vegetation on the islet. A squab with down still on its feathers was brought in by the natives.

Macropygia mackinlayi arossi. Rufous Pheasant Dove. The only record for this species at Munda was obtained on October 26 when a pair was observed in a clearing in the jungle. The two birds were involved in the "circling chase" behavior pattern which in this species apparently precedes copulation. The male pursued the female swiftly around and around in a circle about 50 yards in diameter. The path taken by the female was always the same and when she paused momentarily on a branch the pursuing male attempted to mount. Neither bird uttered a vocal sound during the five minutes I watched them, nor did they deviate appreciably from the same circular path. I observed a pair of this species in the same behavior pattern on Emirau Island, St. Matthias group, Bismarck Archipelago, on April 26, 1944. The behavior of the two different pairs was identical in all important respects, even to the diameter of the circle of flight. That this is a mutual behavior pattern, and not merely a chase on the part of the male, is indicated by the fact that the female continued the stereotyped circling for several minutes instead of flying elsewhere which she could have done at any time.

Chalcophaps stephani mortoni. Green-winged Ground Dove. This was an uncommon species at Munda. One was flushed from the ground in the jungle on November 16. R. W. Brubaker reported that the birds were numerous on WanaWana where the vegetation was more open and the ground cover less dense.

Eos cardinalis. Cardinal Lory. This is the most numerous lory throughout the Solomons. At Munda it was in almost constant evidence as flocks of from 3 to 10 individuals passed over or alighted in trees to forage or to rest. The incessant chattering of the birds made their presence even more obvious. Foraging birds frequented the fruiting trees in the jungle, usually in association with *Trichoglossus haematodus*. Like *Trichoglossus*, *Eos* also frequented coconut palms where the birds apparently fed on the thick clusters of pollen. An adult male was taken on November 26. The testes were not enlarged, measuring 6 mm., and the molt was in progress. The feet were black, iris dark red, bill orange with irregular basal areas of black, and the bare skin of the chin, lores, and circumocular area was black with two irregular yellow spots on the chin.

Trichoglossus haematodus massena. Coconut Lory. This was the next most numerous parrot at Munda after *Eos cardinalis*. The two species were often associated in foraging groups and occasionally mixed flocks were observed in flight. The two species seemed to occupy the same ecological situation; at least I was unable to detect significant differences in their habitat preferences. A nest was discovered on November 22 when a lory was seen to enter a small hole 70 feet from the ground in the trunk of a large tree. The bird reappeared when I fired a light load at the opening. It hung head downward and watched me for several minutes. In an effort to cause the bird to emerge completely I whistled and shouted but it did not change position and presently it backed out of sight into the nest cavity. Two adult males, taken on November 1 and 22, had testes measuring 8 and 7 mm., respectively. Neither shows evidence of molt. The bills were reddish-orange, feet dark gray, and irides dark red.

Micropsitta finschii tristrami. Pigmy Parrot. These tiny parrots were not uncommon in the lowland jungle where they foraged in small flocks of from three to six individuals. The forage habits of this species seemed to be identical with those of *Micropsitta meeki* of the Bismarck Archipelago and *Micropsitta pusio* of New Guinea. All forage on the trunks and main branches of jungle trees, either using the spine-tipped tail as a brace, or walking "nuthatch-fashion" with the tail not appressed to the tree. The stomach of a specimen taken on November 19 contained a mashlike material. On July 23, 1944, I watched a *Micropsitta meeki* (Emirau Island, Bismarck Archipelago) as it foraged on the trunk of a smooth-barked tree. It was picking at small warty protuberances which seemed to be a kind of fungus. The stomach contents of several specimens examined could have been this same material. Mayr (Birds of the Southwest Pacific, 1945, p. 232) suggests that fungi may be the food of this genus. I examined the stomach contents of several specimens under a hand lens and could find no evidence of either insects or fruit in the diet. The call note of *Micropsitta finschii* is a flat, harsh "tzit" in contrast to the sweetly whistled "tseet" note of *Micropsitta meeki*.

An immature male and an adult male were taken on October 29 and November 19, respectively. The immature had testes only 1 mm. in length whereas the gonads of the adult measured 5 mm. The adult was not molting. The bill of the immature was light grayish with the edges horn color; that of the adult was much darker, almost blackish. The irides of the immature were reddish-brown, those of the adult orange-red. The cere of the adult was light purplish; that of the immature was grayish. The feet and legs were gray in both.

Cacatua ducorpsi. White Cockatoo. Cockatoos were less common at Munda than elsewhere in the Solomons, as on Guadalcanal, Banika, and Bougainville. They were most often observed in flight when attention was attracted to them by their constant calling. The basic structure of the calls is a group of four syllables given in pairs, the second pair on a higher pitch than the first. The calls may be poorly syllabified as "croo-croo—crak-crak." Groups of four notes follow one another with a slight interval. The slow, buoyant flight of the cockatoo contrasts markedly with the swift direct flight of other parrots. The big white birds often perch in the topmost clumps of jungle foliage or on dead snags. From an airplane cockatoos stand out as white dots against the dark green of the jungle.

Lariis roratus solomonensis. King Parrot. In the four months which I spent at Munda only two females were seen among the hundred or so birds of this species observed. The species was usually solitary, although on one occasion, November 19, five males were noted passing overhead in a closely knit flock. Even more remarkable, they were silent. Single birds observed flying overhead usually called continuously. The characteristic calls consisted of gurgling syllables interspersed with harsh notes. An adult male taken on November 1 had testes measuring 15 mm. and was not molting.

Geoffroyus heteroclitus heteroclitus. Song Parrot. This species was identified on November 30 when one was shot but was lost in the dense vegetation. The plumage of this bird so nearly matched the color of the foliage that the bird was exceedingly difficult to detect when at rest.

Cacomantis variolosus addendus. Brush Cuckoo. This cuckoo was an abundant resident on New Georgia and was seen on many occasions in the areas of jungle and second-growth vegetation. In each instance the species was located by its characteristic call and traced to a perch in thick undergrowth. A specimen taken on November 4 was sweetly whistling a trisyllabic call from a perch under the lower jungle growth. It was perched quietly and readily replied to my inept imitations of its call. This same call attracted my attention on November 16. The sound was so ventriloquial that at first I walked around behind the bird and searched up in the trees for the source. When finally located, the bird was only one foot from the ground in a thicket of low second-growth vegetation.

A vocal duet was recorded on November 19. The calling birds were perched low in a thicket of second-growth. They were uttering a greater variety of calls than I had previously heard. The basic trisyllabic call may be transcribed as "wher-cher wher." This is the pattern uttered by the single birds recorded previously. The pair heard on November 19 introduced several variations. One of these consisted of three whistled "whee" notes ahead of the basic trisyllable, thus, "whee-whee-whee—wher-cher wher." Another call, given many times, was a slight variation of this: "wher-wheer-wheer—wheet-cheer-wheer," with the last three notes given rapidly. Often a single mellow "wheer" was uttered.

Two molting adult males taken on November 4 and 16 had testes 4 and 5 mm., respectively. The colors of soft parts in these two birds agreed as follows: maxilla black; mandible horn color; iris dark reddish brown; feet light yellowish-orange; circumocular skin and eyelids lemon yellow; mouth lining bright reddish-orange.

Centropus milo albidiventris. Buff-headed Coucal. The hoarse, grating calls of this big coucal were a constant sound in the jungle on New Georgia. The sound may be crudely syllabified as, "craw-aw-aw-aw" given in a slow series. The birds were easily started calling by an imitation of their call, or by any loud noise such as a gunshot or the horn of a motor vehicle. Another call heard on October 26 was uttered by a bird sitting motionless on a low branch. It was giving a series of low pitched mellow grunts. The effect was extremely ventriloquial and at a distance was a soft owl-like hooting. An immature coucal taken on November 1 attracted my attention with a hoarse "craw" note as it moved about in a tangle of low vegetation. A coucal which was the object of attack by a flycatcher (*Myiagra ferrocyanea*) on November 16 gave a low mammal-like "growl" as the smaller bird flew at it and struck it. These coucals are most easily observed when up in the trees, but twice I observed them walking on the ground. On November 30 one was apparently foraging as it walked slowly along on the jungle floor with its tail drooping.

An adult male taken on October 23 had greatly enlarged testes measuring 25 mm. This bird was in heavy molt on the head and throat, and the remiges and rectrices were both being replaced. The stomach was filled with insects. The iris of this adult was red, whereas the iris of the immature male taken on November 1 was dull grayish. The testes of the immature measured 5 mm.

Tyto alba crassirostris. Barn Owl. This owl was not uncommon at Munda. On a visit to Bau Island (off Rendova) in March, 1944, I heard the familiar harsh call of one in the evening. On November 5 one was heard and seen at dusk. It alighted in a dead snag and remained until after dark. R. W. Brubaker reported one abroad in daylight on November 14. It alighted in a dense clump of papaya trees. The only specimen obtained was brought to me alive by R. W. Brubaker on November 30. The bird apparently had struck a wire in flight and was captured in a dazed condition. I kept it one night in a cage in my quarters. As soon as the light was turned out the owl came out of its lethargy and made much noise in its efforts to escape. In order to quiet it I placed an electric light on top of the cage and covered it with a blanket, whereupon the owl promptly went back to sleep. This was an adult male with 7 mm. testes. It was not molting. The iris was brownish.

Collocalia vanikorensis vanikorensis. Vanikoro Swiftlet. This large swiftlet was common at Munda. Foraging groups were constantly in sight ranging above the trees. The species was never observed to forage below the tree tops or in among the trees in the manner of *C. esculenta*. A nesting colony was discovered on November 17 in a small cave from which a stream issued. The stream completely covered the floor of the cavern, making it necessary to wade to enter the opening. Two adults and a nest containing two young were obtained. The nest was perched on a ledge approximately 50 feet from the entrance. The adults, while in flight inside the cave, were captured with an insect net. The female had a greatly enlarged ovary (10 mm.) with several ova containing yolk. The testes of the male were not enlarged, measuring 2 mm. Neither was molting. There is no evidence that these two birds were mated since several pairs were nesting in the cave. The irides were brownish and the feet and bills were black. The nest collected was composed entirely of moss cemented together with the birds' salivary secretions. It measured 80 mm. in diameter, 15 mm. in thickness, and the shallow cup was 10 mm. deep.

Collocalia esculenta becki. Glossy Swiftlet. This small swiftlet was the most numerous member of the genus at Munda. It was constantly in sight, foraging in among the trees, thus complementing the ecological range of the higher flying *C. vanikorensis*. A specimen taken on November 4 was foraging in an opening in the jungle. It followed the same path back and forth many times so that I was able to predetermine where it would fly. This specimen had 2 mm. testes and was not molting. The bill was black, iris brown, legs dull whitish and toes blackish.

Hemiprocne mystacea woodfordiana. Whiskered Tree Swift. This large swift was usually found either on a high, open perch such as a dead tree, or hawking about over the trees. It was not numerous at Munda but was found wherever the proper habitat occurred. A female taken on December 4 was shot from its perch on a tall bare stub. It was molting and fat. The ovary was not enlarged and measured 5 mm. The iris was brown, bill black, and feet grayish.

Alcedo atthis salomonensis. River Kingfisher. Probably this kingfisher was more numerous than my records indicate; it is included here on the basis of a single bird which was observed flying across Roviana Lagoon on November 7.

Halcyon chloris alberti. White-collared Kingfisher. The calls of this common kingfisher are one of the most characteristic and omnipresent sounds on every island in the southwest Pacific. At Munda the birds were numerous and evenly distributed over the areas of jungle and second-growth vegetation, usually occurring in pairs. They were often seen perched along busy roads on the telephone wires or low stubs. Certain familiar pairs were repeatedly observed at the same spots over a period of several months. A nest was located on November 19. The parent birds were making frequent trips into a cavity in the end of a broken branch approximately 90 feet from the ground in a jungle tree which was at least 120 feet high. Both birds gave low calls as they went to and from the nest. These were transcribed as "zzht-zzht." A low, croaking "grrk" was often uttered as they alighted near the nest. When away from the nest, the usual loud "curée—curée" calls were uttered.

A female obtained on November 30 was in advanced breeding condition. The ovary was greatly enlarged (20 mm. total length) with many large ova containing yolk. The largest ovum measured 10 mm. in diameter. Two males taken on November 16 and 30, had testes 5 and 7 mm., respectively.

None of these birds was molting. The iris was brownish; feet blackish gray; maxilla and terminal third and edges of mandible black; remainder of mandible dull whitish.

Halcyon saurophaga saurophaga. Beach Kingfisher. This kingfisher was observed only once when a single bird was seen on November 13. It was perched on a stump at the edge of the narrow channel between New Georgia and Arundel islands.

Eurystomus orientalis solomonensis. Dollar Bird. Each opening or small clearing in the jungle usually contained a Dollar Bird on an exposed perch from which it made sorties for flying insects. What was probably mating behavior was observed on December 3 when four birds were watched in a large tree near my tent. Although the four mixed together they usually split into two pairs. A posture noted repeatedly was enacted when one bird flew into alight near another. Both would pump their heads rapidly up and down while uttering a series of gurgling notes. Another posture involved the slow raising and lowering of the tail. The quartet was noisy, giving a variety of calls, some harsh and grating, others melodious. Two of the four suddenly engaged in combat on a high limb and finally fell off hanging together by their bills and slowly fluttered in a spiral all the way to the ground, where they separated and flew off.

Two specimens were taken on October 29. A male had 7 mm. testes which indicates that it was not in full breeding condition, while the female, taken on the same date, contained a greatly enlarged ovary with the largest ovum measuring 15 mm. in diameter. Neither was molting. These birds were not mated but were secured a considerable distance apart. In these specimens the bills and legs were bright red; the irides brownish; the circumocular skin orange; and the mouth lining light lemon yellow.

Hirundo tahitica subfusca. Pacific Swallow. This common and widespread swallow was abundant at Munda. It was always to be found along the roads where it perched in groups on telephone wires, dead snags, and other exposed perches. An adult female, taken on December 8, was one of a group perched on a telephone wire over a busy road. This bird had a 5 mm. ovary and was not molting. The iris was brown and its bill and feet were black.

Edolisoma tenuirostre saturatus. Cicada Bird. This cuckoo-shrike was common in the jungle areas at Munda where it foraged in the lower undergrowth beneath the forest canopy. A female taken on October 29 was in dense, low growth within 10 feet of the ground. Two other females and a male were all taken within 40 feet of the ground. A female taken on October 29 had an unenlarged ovary (8 mm.) and was molting the body plumage. Another female taken on November 19 had an 8 mm. ovary and was molting the body plumage and secondaries. The third female on November 22 had a 10 mm. ovary and showed no molt. The male on November 19 had enlarged testes and was molting the body plumage. All agreed in colors of the soft parts; the irides were brown, the bill and feet black, and the mouth-lining gray and flesh color.

Coracina lineata ombriosa. Yellow-eyed Cuckoo-shrike. Unlike the preceding species this one was most often found in the foliage of the forest crown more than 50 feet from the ground. It occurred in pairs or occasionally in small flocks which assembled to feed in fruiting trees. One of such a group collected on November 15 had a large pulpy fruit in its throat. The dove *Ptilinopus viridis lewisi* was feeding on the same fruit. Three adult cuckoo-shrikes were taken. Two males, November 4 and 16, had regressed testes (6 mm. and 5 mm.) and neither was molting. A female on December 18 had a greatly enlarged ovary (20 mm.) with the largest ovum 6 mm. in diameter. This bird showed some body molt but no wing or tail molt. All had the iris bright yellow, bill and feet black, and mouth lining grayish.

Coracina papuensis elegans. White-bellied Cuckoo-shrike. This was one of the common birds of the open country at Munda. It was one of the conspicuous species which was abundant in all deforested areas where it perched on telephone wires and dead snags. On November 30 an adult bird was observed to enter a nest placed on a forking branch 80 feet from the ground in a jungle tree. The bird flew into the tree, moved over to the nest and carefully placed itself over it as if brooding or incubating. Although this species was occasionally seen in the jungle with the other campephagids, it was the only one found in the wide areas which had been cleared. This was especially true in the extensive open country bordering Munda airfield along the shoreline. Three adult males were taken. One on November 4 with slightly enlarged (8 mm.) testes was molting. It had completed the wing molt but many body feathers were ensheathed. The other two taken on December 4 and 8 both had

7 mm. testes and were not molting. In all three the iris was brownish, the bill black, the feet dark grayish-black, and the mouth lining grayish.

Rhipidura rufifrons granti. Rufous-fronted Fantail. This species was a common resident in the low, dense jungle growth. It was never seen more than 15 or 20 feet above the ground and was always in a tangled thicket. It often perched in a relatively exposed position and displayed the rufous and white rectrices. The tail is "fanned" and held at right angles to the back but is not "wagged" as in *R. leucophrys*. The call note is a single sharp, metallic, "chip," often given in a staccato series when in flight. An adult male taken on November 1 was in breeding condition with 8 mm. testes. It was not molting. An immature male with 1 mm. testes taken on the same date was molting. In these birds the irides were brown, bill black, feet gray, and mouth lining flesh color.

Rhipidura cockerelli albina. Cockerell Fantail. This species was an abundant resident in the jungle and second-growth where it complemented the ecological range of its congener, *R. rufifrons*. The separation was not a readily perceived one for the two species were often found in close proximity, but whereas *R. rufifrons* stayed in the low dense tangles, *cockerelli* was found most often in the area between the dense ground-cover and the forest crown. Although *cockerelli* often ventured to the ground it was observed to do so where the vegetation was sparse, not in the dense thickets inhabited by *R. rufifrons*. An immature male taken on October 26 was in low second-growth. It was a member of a loosely organized "pocket" of birds consisting of *Monarcha castaneiventris*, *Monarcha barbata*, *Myiagra ferrocyanea*, *Zosterops rendovae*, and *Rhipidura rufifrons*. This group of species was often found together on other occasions. The 7 mm. ovary of a non-molting female taken on November 1 indicated that it was not breeding. The gonads of three other specimens (October 26, November 1, and 10) were greatly regressed. Only one, an immature bird, was molting. All had brownish irides, black bills and feet, and the lining of the mouth was whitish and flesh color.

Rhipidura leucophrys melaleuca. Willie Wagtail. This large fantail was common along the shore, in coconut plantings, and in clearings at Munda. The birds perched on roadside telephone wires, dead trees, and piles of dirt or coral. Often one would stand in the middle of a road, wagging its tail, and fly only when a vehicle was almost upon it. The exaggerated lateral "wagging" of the tail, from which this widespread species has derived its vernacular name, is a spectacular display. The rectrices are "fanned" in the manner of other members of the genus and then the entire hind parts are moved slowly from side to side in the "wagging" movement.

Monarcha castaneiventris richardsii. Chestnut-bellied Monarch. This flycatcher was an abundant inhabitant of the forest and second-growth areas at Munda. It was less strictly limited in its habitat range than some of its associates, for it was equally numerous in the dense undergrowth, the "middle-story," and the forest crown. A call note recorded on November 7 consisted of a low, quavering, mellow note which was rather ventriloquial. The non-molting adult male which responded to my imitation of its call had enlarged testes (10 mm.). It also uttered a harsh note, "zzht."

A pair of birds was discovered working on an almost completed nest on October 25. The nest was situated in low second-growth vegetation on a steep hillside. It was saddled in a crotch approximately three feet from the ground in a slender sapling. The deep cup of the nest was composed of vegetable fibers with cobwebs and fine grasses interlaced. Both birds added material to the structure. The male brought a load of cobwebs, placed them around the rim and then turned 'round and 'round, shaping the bowl with his breast. Then he rubbed his bill and throat around the outer margin of the rim to shape it. Both birds left the immediate vicinity for a few minutes. When I gave "squeaks," 40 feet distant from the nest, they quickly returned to the nest, not to where I was. In structure and situation, this nest closely resembled nests of *Monarcha cinerascens* observed on Emirau Island in the Bismarck Archipelago.

A non-molting adult female taken on October 26 was in near breeding condition with a 10 mm. ovary, while a male taken the same day was in a state of sexual quiescence with 1 mm. testes. Some primaries and rectrices of this bird were ensheathed. The iris in these birds was brownish, the bill, feet, and legs gray, and the mouth lining gray and flesh color.

Monarcha barbata browni. Pied Monarch. This flycatcher was an inhabitant of the understory of the wooded areas at Munda. The species was not so abundant as *M. castaneiventris* with which it was often associated but was numerous enough to be designated as "common." The habitat of this species was the same as that described for *Rhipidura cockerelli*, namely, the semi-open section between

the dense crowns of the trees and the tangled ground cover. *Monarcha barbata* was often found in "pockets" in company with *Myiagra ferrocyanea*, *Rhipidura cockerelli*, *R. rufifrons*, *Monarcha castaneiventris*, and *Zosterops rendovae*. Three specimens were taken: An immature female on October 26 was molting. An adult male with enlarged testes (10 mm.), taken on November 10, had worn flight feathers but was molting the body plumage. An adult female taken November 19 had the ovary small (5 mm.) and was in fresh plumage but some flight feathers were still ensheathed. In this species the bill and legs are light gray, iris brownish, and mouth lining whitish and flesh color.

Myiagra ferrocyanea centralis. Broad-billed Flycatcher. The song of this species was an almost constant sound in the wooded areas. The syllabification as "turée, turée, turée, turée" gives less of a description than a characterization; the call is a perfect imitation of a person whistling for a dog. The call note is a low, harsh, "zzht." This small flycatcher forages by making flying sorties for winged insects and upon completion of such a flight often returns to its initial perch. Upon alighting, the tail is quivered in the manner of some tyrannids, for example *Empidonax*. The perching posture of *M. ferrocyanea* is the almost vertical stance of most flycatchers which forage on the wing, and the tail is "kicked" while perched.

On November 16 an adult male repeatedly flew at, and apparently struck, an adult coucal (*Centropus milo*) as the larger bird was perched quietly on a high branch. As the flycatcher darted at his huge adversary he uttered a harsh "zzht" note. The coucal gave a low pitched "growl" and moved away.

The bright reddish-orange lining of the mouth is a striking feature of this species. It is identical in color with the mouth lining of *Piezorhynchus hebetior* of Mussau Island, Bismarck Archipelago. The iris is brownish, feet and legs dark gray, bill gray with black tomia and tip.

Three adult males, two immature males, and two adult females were taken. One immature male, taken on October 26, was colored like the adult females except for a tinge of buffy across the pectoral region, on the flanks, and edgings of greater coverts. It had 1 mm. testes. The other immature male, taken on October 28, had almost completed its postjuvinal molt. Of the juvenal plumage it retains a patch of gray in the auricular region, a few white feathers on the sides of the throat, one outer rectrix, the four outer primaries, and secondaries number 4 and 5. It too had 1 mm. testes. The three adult males all had enlarged testes. Those of the two taken on October 26 measured 8 and 9 mm. and the third taken on November 10 measured 7 mm. None of these shows any evidence of molt in progress. One of the females was molting and had a regressed ovary of 3 mm. The other, a non-molting bird, had an egg in the oviduct with the yolk 10 mm. in diameter.

Aplonis cantoroides. Little Starling. This species was the most numerous of the three starlings at Munda. It was also the most restricted ecologically. The largest numbers were found in recently cleared areas characterized by low second-growth ground cover with scattered trees or dead stubs. It was seldom found in the jungle. Pairs and small flocks of from 5 to 15 individuals were observed daily as they foraged in low second-growth vegetation.

On Guadalcanal, Beecher (Fieldiana, 31, 1945:34) found solitary pairs of *A. cantoroides* nesting in shrapnel holes in coconut trees. At Munda the species nested in holes in shell-blasted coconut trees, but was usually found in small colonies. A count made on December 5 revealed the presence of 29 nesting pairs in three distinct colonies. All were adults and all were nesting in holes in coconut stubs. The nesting colonies were restricted to a narrow strip between the shore and the water, along the edge of the airfield. This strip is approximately two miles long and not more than 50 feet wide. The stubs of blasted coconut palms in this strip numbered at least 75 and there were many unoccupied holes which appeared to be suitable for nest sites. The first colony (most westerly) contained 15 pairs. One mile east along the road a smaller colony of five pairs was located. Of 10 available stubs in this group only four contained nests. All inhabited trees were within a radius of 50 feet. Approximately 200 feet away a single pair was nesting in a lone coconut stub. The third colony, a mile beyond, supported nine breeding pairs.

Several calls were recorded. One bird, perched on a stub, gave a series of sibilant "tseer" notes. Another, perching in the entrance to a nest, uttered a metallic "calée" at intervals. This note was heard many times in the breeding colonies. A jumbled burst of melodious notes was given by several individuals.

A male and a female, both in adult plumage, were taken from a breeding colony on December 4. The gonads of both were enlarged, measuring 10 mm. in each bird. Two specimens in the streaked

immature plumage were taken on December 4 and 8. The former, a male, had the testes somewhat enlarged, measuring 7 mm. The latter, a female, had a 5 mm. ovary. None of these birds shows evidence of molt. The two immatures were taken from a small flock feeding on ripe papaya fruit a mile from the nesting adults.

Aplonis grandis grandis. Brown-winged Starling. This large species was the least gregarious of the three starlings at Munda. Pairs or solitary individuals were usually found either in the jungle or in second-growth vegetation. A strong ecological preference was not apparent and they were absent only from areas devoid of vegetation. A pair collected on November 19 was eating fruit in a small second-growth tree at the edge of the jungle. The female had an egg in the oviduct and many enlarged follicles up to 25 mm. in diameter. The male had 8 mm. testes. Neither was molting. The irides in both birds were brownish. Two birds, presumed to be a pair, were observed in the act of nest building on November 22. Both carried beakfulls of fine plant fibers into a cavity in the end of a broken stub. The nest site was 60 feet from the ground in a large tree in the jungle.

Aplonis metallicus nitidus. Colonial Starling. This species was uncommon at Munda. A female in adult plumage was taken on November 7 from a small flock on Bau Island, an islet offshore from Rendova. The ovary measured 10 mm. On November 19 a small flock was seen in the jungle at Munda; and two adults, male and female, were taken from a flock of 10 on November 30. The male had enlarged testes measuring 9 mm. and the ovary of the female measured 8 mm. None was molting. In all, the bill and feet were black and the irides reddish-orange.

Mino dumontii krefftii. Papuan Mynah. This species was an abundant resident at Munda. The large, noisy, and strikingly-colored birds were almost constantly in evidence. They were relatively unrestricted in habitat but the greatest numbers were in the sections of second-growth where scattered dead stubs and isolated trees remained. The birds occurred in pairs or, rarely, in groups of from four to eight individuals. A pair of adults, both with regressed gonads, was collected on October 26 as they foraged close together in the jungle. This suggests that pairs may remain together although not breeding. One had the pulp of a small orange-colored fruit in its mouth. These birds agreed in colors of soft parts; the bill and circumocular skin were bright orange, and the irides, feet, and legs, light orange-yellow. The male had 7 mm. testes and the female a 12 mm. ovary. Both of these birds show molt in the body plumage. A mynah was observed to enter a cavity in the end of a broken branch on November 30. No further evidence of nesting was obtained.

Nectarinia jugularis flavigaster. Yellow-bellied Sunbird. This small sunbird was most numerous in the second-growth vegetation. Only once, on November 19, was one observed in the jungle. A male taken on December 4 had enlarged (6 mm.) testes and was not molting.

Myzomela eichhorni eichhorni. Central Solomons Honey-eater. This was an uncommon species at Munda. An adult male taken on October 22 was foraging in the understory vegetation in the jungle. It was apparently searching for insects since no flowers were present and the bird was feeding. The testes of this bird were enlarged (7 mm.). An immature male collected on October 29 had 1 mm. testes and the red rump area was less extensive than in the adult male. An adult female had a slightly enlarged ovary (7 mm.) on January 16. Only the immature was molting.

Zosterops rendovae kulambangrae. Central Solomons White-eye. This white-eye was an abundant species at Munda. Flocks of foraging birds were encountered at frequent intervals in all habitats and at all heights. They were found from within a few inches of the ground in thick undergrowth up to the topmost branches. They were equally numerous in virgin jungle or second-growth. Members of a flock seemed to maintain contact with a series of light "tsit" notes when foraging. Another call often heard was a loud "chirp" which sounded much like that of an English Sparrow (*Passer domesticus*). White-eyes were often found to associate in loosely organized "pockets" composed of several species. Their usual companions were *Myiagra ferrocyanea*, *Monarcha castaneiventris*, *M. barbata*, *Rhipidura cockerelli*, and *R. rufifrons*.

A trip to Rendova Island, on November 7, yielded 2 specimens of the typical race, *Z. r. rendovae*, an adult male with enlarged testes measuring 9 mm. and an adult female with a 6 mm. ovary. In the field the birds appeared to be identical in notes and habits to *Z. r. kulambangrae* of New Georgia. I was able to detect the lack of an eye-ring in the Rendova birds at a considerable distance. Four adult males taken at Munda on October 23 and 26 and November 10 and 16 had enlarged testes measuring 7-8 mm. None of these six birds was molting.

San Jose State College, San Jose, California, June 1, 1949.