

## Bird Specimens from American Samoa<sup>1</sup>

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**ABSTRACT:** About 1300 specimens of birds have been taken on the seven islands that constitute American Samoa in the southwestern Pacific Ocean; about 1200 specimens representing 43 species were examined. Information on the biology of these species, especially annual cycles of breeding and molt, is presented to the extent that it can be determined from these specimens and the associated data. Most of the specimens were taken in only a few months of the calendar year, and the annual cycle remains incompletely known even for those few species with large samples of specimens. Taxonomic comments are given for a few species, and the extensive variability in *Halcyon chloris pealei* is discussed.

AMERICAN SAMOA IS AN UNINCORPORATED territory of the United States, administered by the U.S. Department of the Interior. In the 1970s the U.S. Fish and Wildlife Service recognized the need for a thorough survey of the wildlife of American Samoa, and the Division of Federal Aid issued a contract to Environment Consultants, Inc. (ECI) for a study that was carried out in 1975–1976. The reports of the ECI study (Amerson, Whistler, and Schwaner 1982a, 1982b) present a great deal of information on the physical and biological environment of the islands, and on the size and status of populations of the terrestrial vertebrates, which will not be repeated here.<sup>3</sup>

The ECI reports mention specimens taken in the course of the study, but do not provide a detailed analysis of these specimens or of others taken by previous workers. The present report is intended to supplement the ECI reports by providing such an analysis, in the hope that the additional information gleaned from the specimens will assist in the development of management plans.

American Samoa is a group of seven islands and associated islets (Figure 1) in the south-

west Pacific Ocean, more or less centered at 170°W long. and 14°S lat. The nearest neighboring islands are Western Samoa, some 90 km to the northwest, and the Fiji Islands, some 800 km farther west. The largest island of American Samoa is Tutuila, the westernmost; much smaller Aunu'u Island is a short distance east of Tutuila. Three other islands are about 120 km to the east—Ofu and Olosega, which are almost joined, and the larger and higher Ta'u Island. These three islands are frequently referred to collectively as the Manu'a Group. Rose Atoll, another 200 km southeast, is composed of two tiny islets and is a U.S. National Wildlife Refuge. The seventh island, Swains Island, is about 320 km north-northwest of Tutuila; this small, isolated island is not on the volcanic submarine ridge of which the major islands are peaks. Detailed maps of the islands are presented by Amerson, Whistler, and Schwaner (1982a, 1982b).

### THE SPECIMEN RECORD

Amerson, Whistler, and Schwaner (1982a) summarized the ornithological history of American Samoa, mentioning the major collecting efforts of which they were aware. Because many early workers treated Samoa as a unit, it is impossible to be certain how much of the historical work was directed toward American Samoa rather than to the larger and more accessible islands of Western Samoa. Most specimens with the locality designated

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<sup>3</sup> Copies of the ECI report are available from the U.S. Fish and Wildlife Service, Division of Federal Aid, 500 N.E. Multnomah Street, Portland, Oregon 97232.

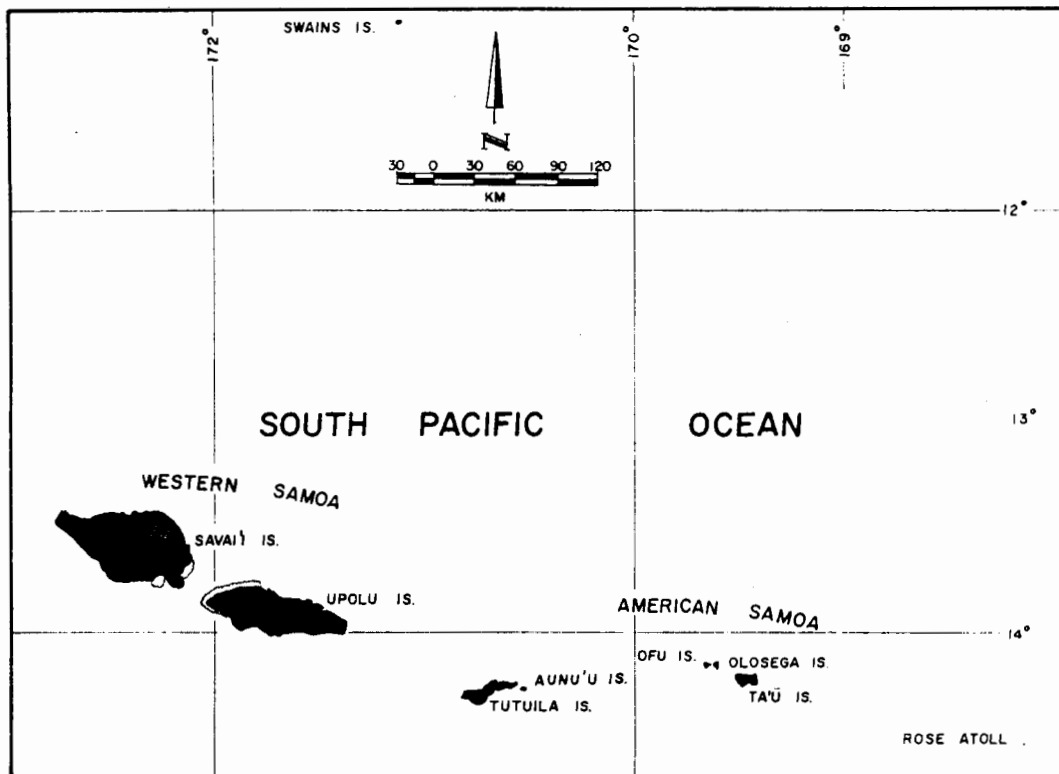


FIGURE 1. The islands of American Samoa and their relationship to Western Samoa (from Amerson, Whistler, and Schwaner 1982a).

merely as "Samoa" apparently are from Western Samoa, and have not been included in this study. Here I review the record of collecting in American Samoa.

The earliest specimens of which I am aware are those taken by the United States Exploring Expedition (USEE) in 1833 (Peale 1848, Cassin 1858). Only a few USEE specimens were taken on Tutuila Island, most notably the types of what is now known as *Halcyon chloris pealei*. At least one bird was taken at Rose Atoll. None of the USEE specimens is accompanied by data beyond the vague locality. Most USEE specimens are in the National Museum of Natural History (USNM), but some duplicates were sent to other museums.

Amerson, Whistler, and Schwaner (1982a) mentioned several German authors who reported on Samoan birds in the 1870s. I have not attempted to locate, examine, or discuss

specimens mentioned in those papers; probably few were from American Samoa. The reports deal mainly with nomenclature and distribution.

Salvin (1879) reported five specimens of five species taken on Ta'u Island, perhaps the first taken on the Manu'a Group, sent to the British Museum (Natural History) (BMNH) by T. Powell.

There is one USNM specimen taken on Tutuila Island by William Jones, U.S.N., on 16 May 1883. This seems to be the only bird donated to the USNM by Jones, and I know nothing about him or his ornithological work, if any. Date and locality are the only data with the specimen.

Richard C. Reed, U.S.N., collected birds on Tutuila Island from January to May 1921 and deposited 58 specimens in the USNM. A few of these 37 skins and 21 fluid-preserved birds, representing ten species, were later sent

on exchange to other museums. Data on these specimens are limited to locality, date, and sex when determined. These birds have not been reported previously.

The Whitney South Sea Expedition (WSSE) from the American Museum of Natural History (AMNH) spent about four months in American Samoa. J. G. Correia, assisted by his wife, collected on Tutuila from late October until early December 1923. They were joined in mid-November by Rollo H. Beck, the leader of the expedition. The party went to Rose Atoll in December 1923, collecting on that island on 11–12 December, then moved to Ta'ū. On 30 December they went to Olosega (Olosenga on their specimen labels), and on 7 January 1924 they moved to Ofu Island for 3 days. The collectors returned to Tutuila until early February. In this time, WSSE collectors obtained about 1000 bird specimens, including some eggs and nests. Prepared specimen labels had space on the reverse for data on soft part colors and sexual organs. The datum entered in the latter space was generally "large," "small," or "swelling," occasionally "nesting" or "breeding." Most of these specimens are still in the collection of the AMNH, but some have been sent on exchange to other museums, including the USNM; records on the number of birds removed from the collection are not available. Also in the AMNH are transcribed copies of the field notes made by Correia and Beck; I have used Beck's notes extensively in this report as they provide some information on nesting, habitat, and abundance that has never been published. A series of papers (e.g., Stickney 1943) has recorded the results of distributional and taxonomic studies of WSSE material, including most of the American Samoa specimens, but relatively little has been reported in these studies on molt or breeding activity. Some of the specimens from the expedition have not previously been reported, particularly those of several of the seabird groups.

The AMNH has one specimen obtained by Austin L. Rand in February 1933 at Pago Pago, Tutuila Island.

S. Dillon Ripley visited Tutuila for one day in 1937 and collected 11 specimens, now in the

Academy of Natural Sciences of Philadelphia (ANSP). Mark B. Robbins sent me copies of the catalog pages on which these birds were entered into the Academy collection but, unfortunately, they do not report any accompanying data. I have not examined these specimens.

Leonard P. Schultz collected six birds on or near American Samoan islands in May and June 1939, presumably while making ichthyological studies. One specimen from Swains Island is the first bird taken there, as nearly as I can determine. Four of his specimens were from Rose Atoll.

American Samoa was not a focus of intensive study by the Pacific Ocean Biological Survey Program (POBSP) of the Smithsonian Institution, but personnel involved in that widespread program visited Tutuila Island and Swains Island on several occasions. Clapp and Sibley (1966) summarized observations made in 1963–1965 on Tutuila, giving data for 49 specimens taken (some preserved as skeletons). Later POBSP visits to Tutuila resulted in a few additional specimens, taken in 1967–1968, which have not heretofore been reported. Observations and records of 58 specimens from POBSP visits to Swains Island, 1966–1967, were published by Clapp (1968). Most of the POBSP specimens are in the USNM.

Personnel with the ECI group were in American Samoa for 18 months. Their primary work involved ecological studies of all terrestrial vertebrates as well as extensive analysis of vegetation and habitats (Amerson, Whistler, and Schwaner 1982*a*, 1982*b*). In this time, mainly in 1976, ECI collected 104 bird specimens representing 29 species. Some of these voucher specimens have complete data, including sex and gonadal information, weight and fat condition, molt information, soft part colors, and stomach contents, but many lack data on one or more of these aspects. The specimens are in the USNM.

The Royal Ontario Museum (ROM) has one specimen from American Samoa, taken in 1970 by Richard Crossin. There may be other isolated specimens in other museums, but most of Crossin's material is presumably with a collection of primarily Western Samoan

material now housed at Southwestern College, Winfield, Kansas.

Altogether, I can account for about 1300 specimens from American Samoa, and undoubtedly there are others. For this study I have had access to about 1200 of these specimens, although I have not examined each one in detail.

One might think that this degree of specimen representation of the avifauna would permit a thorough knowledge of the various species. This is not so for several reasons. The greatest collecting effort was by the WSSE, which accounted for about 77 percent of the specimens; this work was done over a period of four months, about two on Tutuila Island and two on the other islands. For each set of islands, roughly 23 percent of the specimens represents 80 percent of the year. With a sample size of 100 specimens of a species, ten of the months would be represented by an average of only 2.3 specimens each. If these happen to be older specimens on which data are lacking, or all of the same sex, they reveal very little about the seasonality of events in the life history of the species. Further, although a few species are represented by 50–100 specimens, there are far fewer examples of most. Indeed, some 15 species are represented by 10 or fewer specimens, and 11 species that have been reported have no specimen documentation.

The tropical latitudes of American Samoa permit, or impose, an annual life style on birds that differs from that familiar to biologists versed in north temperate biology. One cannot easily extrapolate life cycles from temperate to tropical regions, or necessarily from mainland to insular tropics or even from island to island. Effective management of bird populations in fragile island ecosystems requires a knowledge of these annual cycles as well as of habitat requirements, food habits, productivity and mortality, and other ecological factors. Much of the required information can be obtained by observation, but some of it is best obtained from, or at least is best if verified from, the specimen record. Indeed, in American Samoa the amount of useful biological knowledge amassed by observation is even less than that documented by

the specimen record—and American Samoa is now relatively well studied compared with many Pacific islands.

Another limitation imposed by the skewed seasonal distribution of specimens is in making interisland comparisons for taxonomic or other purposes. As the WSSE moved from island to island, for example, good series of specimens representing one or a few months were assembled from each (Watling 1982). However, nearby island groups are represented by specimens from different months. Depending on the synchrony of island annual cycles, birds from one island may be in quite different stages of plumage than those of nearby islands. Not only does this frustrate one in making comparisons, it may lead to erroneous biogeographical conclusions.

#### SPECIES ACCOUNTS

Amerson, Whistler, and Schwaner (1982a, 1982b) listed 53 species of birds from American Samoa and considered reports of the occurrence of four others in error. The occurrence of one other species, although not identified, has been reported since (Scott, Pyle, and Coleman 1983).

I report here on 43 species for which specimen documentation is known. I attempt to give information on the number and location of specimens available, when and by whom taken, information on breeding biology and molt, weights, stomach contents, and habitat, to the extent available and deemed worthwhile. Taxonomic comments are appended for a few species. Abbreviations used in this section have been indicated in the previous section.

**TAHITI PETREL.** *Pterodroma rostrata rostrata*. Amerson, Whistler, and Schwaner (1982b) mentioned that a courting pair was captured on 15 October 1976 on Ta'ū Island. The male weighed 376 g and had testes 37 mm long; the female weighed 382.5 g, and its ovary was 8 × 4 mm.

**AUDUBON'S SHEARWATER.** *Puffinus lherminieri dichrous*. There is a series of nine speci-

mens from the WSSE in the AMNH, taken 26–27 December 1929 on Ta'ū Island. Four females are labeled "nesting." These specimens were mentioned by Murphy (1927) in the description of *P. lherminieri polynesiae*, originally separated on the basis of culmen length from *dichrous* with which it is now merged (Jouanin and Mougin 1979). Beck's notes record that some of the specimens were "taken on cliffs with dogs." Salvin (1879) mentions a specimen taken by Powell on the Manu'a Islands, probably Ta'ū, in the British Museum (Natural History).

**WHITE-THROATED STORM-PETREL.** *Nesofregatta fuliginosa*. The type specimen of *Fregatta moestissima* Salvin, 1879, now equated with this species (Bourne 1957, Jouanin and Mougin 1979), is in the BMNH, not the USNM as stated by Amerson, Whistler, and Schwaner (1982b) under the name *N. albigularis*.

**RED-TAILED TROPICBIRD.** *Phaethon rubricauda melanorhynchus*. Clapp (1968) has reported on a specimen from Swains Island. An additional Samoan specimen was taken at Rose Atoll by the USEE; further data are lacking.

**WHITE-TAILED TROPICBIRD.** *Phaethon lepturus dorotheae*. A male was taken 13 May 1976 at Vaitele Stream, on a jeep trail west of Paloa, Tutuila Island. The left testis measured 9 × 3 mm, the right, 5 × 2 mm. Its weight was 254 g. Except for slightly abraded outer primaries, the plumage appears to be fresh; no molt is apparent. A female was collected in Malaeimi Valley, Tutuila, on 10 July 1976. It was fat, but no weight was recorded. The ovary was 10 × 8 mm, with the largest ovum 1.5 mm. The plumage is moderately worn. The outer primary of the right wing is pale and badly abraded, apparently retained from an earlier feather coat. Two earlier specimens from Tutuila have been fully reported by Clapp and Sibley (1966).

A previously unreported specimen in the USNM was taken by L. P. Schultz on the bridge of a ship 25 mi southeast of Ta'ū Island, 9 June 1939. It was a male; no other data were recorded. The outer primaries of this bird are

in sheath, not fully grown. A specimen from Swains Island (Clapp 1968) was taken 14 April 1967.

The WSSE series in the AMNH includes three downy chicks from Tutuila Island dated in October, December, and January, and one from Ofu Island dated January. There are two immature birds, more fully developed but probably still dependent, from Tutuila taken in late January and early February. Most of the adults had large gonads. The AMNH has also one chick "bought in native market" in Pago Pago, Tutuila, on 8 February 1933 by A. L. Rand. The stomach of this bird contained "2 fish about 6" long."

**MASKED BOOBY.** *Sula dactylatra personata*. Amerson, Whistler, and Schwaner (1982b) reported observations of this species at Rose Atoll, but no specimens. The AMNH has five specimens taken there by the WSSE on 11 December 1923. Two were adult males with small gonads, two were full-sized immatures, a male and a female, and one was a large downy chick with partly grown back, wing, and tail feathers. Beck's notes indicate that the masked boobies had begun to nest earlier on this island than the brown boobies.

**BROWN BOOBY.** *Sula leucogaster plotus*. Two adult specimens were taken on 9 September 1976 at Nu'utele Islet, Ofu Island, a breeding locality of this species. There is no firm indication that these two birds were breeding, and no nests were reported from this islet at this time (Amerson, Whistler, and Schwaner 1982b), but the male had testes 23 mm long and the female's ovary was 9 × 4 mm. The male weighed 1028 g, the female, 924 g. Both birds seem to be nearing the end of a molt, evident in partly grown feathers of the wing, back, and tail. The male seems to have more nearly completed the renewal of the ventral body feathers. The female has a considerably longer (98.1 vs. 94.2 mm) and heavier bill than the male, but a slightly shorter wing.

Amerson, Whistler, and Schwaner (1982b:61) reported a specimen taken on Rose Atoll by L. P. Schultz on 4 August 1938; the correct date of that specimen, in the USNM, is 11 June 1939 (cf. Amerson, Whistler, and

Schwane 1982*b*: 146, table 64). That adult bird is in fresh plumage with no evidence of molt.

The WSSE took 37 sets of eggs, two adult males with large gonads (one bird marked "nesting"), and two immature birds at Rose Atoll, 11–12 December 1923. An adult male with large gonads, a subadult female, and two immature birds were taken on Ofu Island on 8 January 1924. One of the latter, a female (now in USNM), was replacing the inner primaries and some feathers on the neck and throat.

Beck's notes from Rose Atoll mention a colony of this species nesting at the edge of the *Pisonia* grove. Most nests had eggs, and one had a young bird and an egg. A rat, presumably *Rattus exulans*, was trying to gnaw a hole in the two eggs in one nest.

**RED-FOOTED BOOBY.** *Sula sula rubripes*. A subadult female taken on Nu'utele Islet, Ofu Island, on 9 September 1976 weighed 952 g; the ovary was 9 × 4 mm. The outermost primaries are only partly grown; the other primaries and the central secondaries are new, but the outer secondaries and most body feathers are quite worn. Clapp (1968) reported on an immature bird from Swains Island.

Five WSSE specimens in the AMNH are females taken at Rose Atoll on 11 December 1923, two adults and three subadults. All are molting primaries. Two had large and two had small gonads; one was marked "swelling." An immature bird was also obtained at Tutuila on 10 April 1924.

**GREAT FRIGATEBIRD.** *Fregata minor palmerstoni*. The WSSE took three specimens at Rose Atoll on 11–12 December 1923, a subadult female, an immature female, and an immature male. One frigatebird cataloged by genus only and not found in the AMNH collection on my visit might be this species or the next.

**LESSER FRIGATEBIRD.** *Fregata ariel ariel*. An adult male was taken at Rose Atoll on 12 December 1923 (AMNH). It had small gonads.

**REEF HERON.** *Egretta sacra sacra*. Amerson, Whistler, and Schwane (1982*b*) reported an egg taken on Rose Atoll on 23 October 1975 and two skins. A male was

taken on Ofu Island on 8 September 1976; testes were 37 mm, and the weight was 376 g. A female was collected at Fagamalo, Ta'u Island, 12 October 1976. This bird weighed 425 g; the iris was brown with yellow edges, and the bill was dark gray. Both birds are of the dark, or gray, phase. The plumage of the male is worn and faded; no molt is apparent. The female's plumage is fresh except on the abdomen, where new feathers are growing. There are a few feathers still in sheath on the crown and throat.

A specimen from Tutuila was reported by Clapp and Sibley (1966) and one taken by Schultz in 1939 at Rose Atoll was mentioned by Amerson, Whistler, and Schwane (1982*b*); these are not available for examination.

Mayr and Amadon (1941) discussed geographic variation in this species and mentioned 14 specimens from American Samoa taken by the WSSE. I examined 13 of those birds in the AMNH, which represent both adult and fully grown young birds. Beck's notes from Rose Atoll state: "Black and white herons were seen on the reef, and a young white one was shot." I did not find this white bird at the AMNH.

Amerson, Whistler, and Schwane (1982*b*) mentioned a sight record of the Cattle Egret (*Bubulcus ibis*) on Tutuila, and Scott, Pyle, and Coleman (1983) reported two observations of a white egret, assumed to be either a snowy egret (*Egretta thula*) or a little egret (*E. garzetta*), on Rose Atoll. Verification of the occurrence of any of these similar white species must await specimen documentation.

**GRAY DUCK.** *Anas superciliosa pelewensis*. Two birds were obtained by the WSSE and were mentioned by Amadon (1943). A female taken 11 January 1924 on Aunu'u Island was apparently a young bird, very worn ventrally but with fresh primaries. According to Beck's notes, several birds were seen in the marsh but they were wary. An adult male dated 20 February 1924 from Tutuila Island had small gonads. This bird is regrowing all the primaries, recovering from the flightless eclipse stage.

**BANDED RAIL.** *Gallirallus philippensis goodsoni*. I have examined 65 birds from American Samoa, of which 59 were taken by the WSSE

from early November 1923 to early February 1924. Other birds are from March, April, and July. Although little information on the annual cycle can be gleaned from a series with this composition, I will treat them chronologically.

Neither of two birds taken in March is molting; one of these from 1921 (Reed) is in relatively unworn plumage, but one from 1964 (Clapp and Sibley 1966) has very worn wing feathers. One April bird (WSSE) is very worn and had small gonads.

A chick taken near the Pago Pago airport on 4 July 1968 (POBSP) is between the hair-like downy feathering of the newly hatched birds (Murphy 1924*b*) and the juvenal plumage. Whitish feathers have replaced the down on the throat in rows, so that the throat has a brown and white striped appearance. Mottled gray feathers have come in on the upper breast and barred feathers on the flanks, but there is a mid-ventral streak of brown down from the mid-breast to the vent and brown down remains on the inner surface of the thighs. No remiges or rectrices are yet in evidence.

Two adult specimens (ECI) were taken in Malaeimi Valley, Tutuila Island, a female on 9 July and a male on 10 July 1976. The former weighed 229.5 g and had slight fat; the ovary was  $15 \times 7$  mm. The male also had slight fat, but the weight was not recorded. Its testes were  $18 \times 10$  mm (left) and  $10 \times 9$  mm (right). Both birds are in fresh plumage except for the inner secondaries. The male also has some feathers in sheath on the neck.

The large WSSE series from November to February includes birds with large and small gonads; some birds were marked "breeding" or "nesting." Plumage condition ranges from fresh to very worn, with no apparent correlation with gonad size; a few birds are molting. The series includes chicks taken on 24 November, 27 December, and 3 January, as well as several older juvenile birds.

Amerson, Whistler, and Schwaner (1982*b*) stated that these rails breed twice a year in American Samoa, with chicks appearing in March–April and August–September. The chicks from July and January indicate that the breeding season is more extensive. Indeed, the

specimen evidence suggests that both nesting and molting may occur year-round in the population.

Beck's notes mention this species frequently, generally in reference to its tameness, abundance, and wide distribution. On Ta'ū Island he noted finding both rails and gallinules "in a small marsh back of the village where they eat along [the] edge with chickens in the mud; small patches of taro sometimes hold them. . . ." A few days later he reported that both rails and gallinules "range all over the island."

SOOTY RAIL. *Porzana tabuensis tabuensis*. Amerson, Whistler, and Schwaner (1982*b*) did not find this species in their survey of 1975–1976, and mention that there is a single previous record for American Samoa. Murphy (1924*b*) listed Ta'ū Island as a locality where WSSE specimens had been obtained, without indicating the number of specimens. He gave the measurements of 10 males and 10 females from throughout the range of the species, which he placed in the genus *Porzanoidea*. Amadon (1942*a*) studied variation in the species in greater detail, and gave wing length data for six and culmen and tarsus measurements for eight specimens from Samoa. Actually, there is a series of 10 sooty rails from Ta'ū in the AMNH, all taken by the WSSE in December 1923—1 chick, 4 adult males, 4 adult females, and 1 unsexed adult. As far as I am aware, these are the only specimens of this species ever taken in Samoa.

Notations on the labels of the adult birds indicate that the iris and feet were red and that the bill was black. Indications of gonad size of the adults were "large" for one, "small" for one, and "swelling" for seven. All these birds have very worn primaries, with no indication of molt.

Beck's notes from Ta'ū Island indicate that this rail occupied the same marshy habitat on the northwest side of the island as the banded rail, and that both species left the reeds to feed along the muddy edge of the marsh.

Contrary to Onley (1982), who would recognize no subspecies in this wide-ranging rail, I use the subspecific name *tabuensis* in a restricted sense to include only the birds from

the Tonga, Fiji, and Samoa islands and Niue Island. Thus, I include *vitiensis* but exclude the other populations merged under *P. tabuensis tabuensis* by Amadon (1942a) and Ripley (1977). While examining the Samoan specimens I was struck by the short wings relative to other material available. Detailed study of my measurements of birds from a number of localities and those presented by Amadon reveals that the four populations mentioned above agree in having very short wings relative to most other populations of the species. In particular, the birds to the east in the Marquesas, Tuamotu, Society, and Austral islands have wings that average considerably longer; I suggest that the subspecific name *P. tabuensis tahitiensis* (Gmelin, 1789; type locality, Tahiti and the Friendly Islands) should be used for these eastern populations. This leaves the nomenclatural status of the populations on islands to the west and south (Norfolk Island, the Kermadecs, New Caledonia, the Santa Cruz and New Hebrides islands, and the Philippines), which have been merged along with *tahitiensis* into nominate *tabuensis* (Amadon 1942a, Ripley 1977), up in the air. Probably these are best considered part of *P. tabuensis plumbea* (type locality, New Zealand) until the pattern of variation in this species is more completely understood.

**PURPLE SWAMPHEN.** *Porphyrio porphyrio samoensis*. A male from Ofu Island, 5 June 1976, had testes  $22 \times 9$  and  $19 \times 8$  mm. It weighed 457.7 g. A notation on the label indicates that the bird was molting, but I am unable to find actively growing feathers. The plumage appears to be fresh except on the abdomen and the inner secondaries. A female taken at Tafuna, near the airport on Tutuila Island, 14 July 1976, had slight fat and weighed 539.1 g. The ovary was  $27 \times 2$  mm, with the largest ovum 10 mm. The label indicates molt for this bird also, but the entire plumage seems to be fresh. These birds appear to be in breeding readiness at the conclusion of a complete molt. The WSSE obtained a series of nearly 50 specimens in worn plumage between November 1923 and January 1924, representing all the major islands. Data on the labels indicate that most of these birds had enlarged

gonads and were breeding. Nests and eggs were taken on 3 November and 29 January.

Beck's field notes mention this species frequently, indicating its abundance and wide distribution in the islands. Swampheens frequented the same marshes and taro patches as the banded rails, but were more wary. A nest and four eggs found by J. G. Correia on 29 January on Tutuila Island was six feet up "in a thick green bushy clump on the steep hillside...."

I use the name *samoensis* in the broad sense of Mayr (1949) and Ripley (1977) rather than the restricted sense of Peters (1934) and Amerson, Whistler, and Schwaner (1982b). Measurements of birds from Samoa and some nearby island groups are presented in Table 1.

**PACIFIC GOLDEN-PLOVER.** *Pluvialis fulva*. Seventeen specimens were examined, including 8 of the 11 WSSE birds mentioned by Stickney (1943), 7 noted by Clapp (1968), 5 of which were not available when he wrote, and 2 reported by Amerson, Whistler, and Schwaner (1982b). These present a confusing array of molt patterns. Five August birds from Swains Island are all molting primaries, and some are also growing new rectrices and body feathers. An October bird has new inner primaries (1-3) and slightly worn outer ones. Of eight birds taken in November and December, some show no molt, and some are molting the outer (8, 10) primaries; primaries of some are all worn, but of others, all fresh. A February male has mixed ventral plumage, whereas a female from that month is molting on the body and growing the tenth primary. A female from May (ECI) is in worn winter plumage, with slight molt. Johnson (1977) has discussed the molt of this species in the Pacific.

Females in August, February, and May had ovaries measuring  $9 \times 4$  or  $10 \times 5$  mm; all males taken had small testes. Weights are available for nine specimens, of which two were previously reported by Clapp (1968); these are correlated with the fat condition of the birds. Four birds (sexes combined) with light fat weighed 104-121 g, two with moderate fat weighed 126-132 g, and three with heavy fat weighed 134-139 g.

TABLE I  
MEASUREMENTS (mm) OF PURPLE SWAMPHIENS FROM SAMOA AND NEARBY ISLAND GROUPS

| LOCATION       | MALES |         |                             | FEMALES |         |           |
|----------------|-------|---------|-----------------------------|---------|---------|-----------|
|                | N     | AVERAGE | RANGE                       | N       | AVERAGE | RANGE     |
|                |       |         | Length of frontal shield    |         |         |           |
| Tutuila-Aunu'u | 6     | 63.0    | 56.6-67.1                   | 6       | 59.8    | 57.9-62.2 |
| Manu'a Group   | 13    | 63.5    | 57.0-67.1                   | 21      | 59.4    | 53.8-66.9 |
| Western Samoa  | 1     | 61.3    |                             | 5       | 58.0    | 54.9-61.2 |
| Fiji           | 5     | 63.5    | 57.5-67.9                   | 8       | 61.3    | 60.2-63.2 |
| Tonga          | 5     | 61.3    | 57.4-63.8                   | 1       | 59.2    |           |
|                |       |         | Length of bill from nostril |         |         |           |
| Tutuila-Aunu'u | 6     | 26.5    | 24.3-28.0                   | 7       | 24.5    | 23.7-25.4 |
| Manu'a Group   | 13    | 26.5    | 24.7-29.1                   | 22      | 24.8    | 23.3-29.2 |
| Western Samoa  | 1     | 26.2    |                             | 5       | 24.6    | 23.3-27.0 |
| Fiji           | 5     | 27.5    | 26.0-29.6                   | 8       | 26.1    | 24.0-28.0 |
| Tonga          | 5     | 26.2    | 24.4-28.0                   | 1       | 24.0    |           |
|                |       |         | Length of tarsus            |         |         |           |
| Tutuila-Aunu'u | 6     | 79.3    | 73.1-83.8                   | 6       | 72.0    | 63.7-76.4 |
| Manu'a Group   | 13    | 79.0    | 73.1-83.1                   | 22      | 73.4    | 67.3-82.2 |
| Western Samoa  | 1     | 74.3    |                             | 5       | 70.5    | 63.7-76.7 |
| Fiji           | 3     | 77.4    | 76.1-78.6                   | 8       | 76.2    | 71.2-80.4 |
| Tonga          | 6     | 72.1    | 67.9-79.0                   | 1       | 75.3    |           |

NOTE: The sample of females from the Manu'a Group includes two large birds that are probably missexed.

This species was listed as *Pluvialis dominica fulva* by Amerson, Whistler, and Schwaner (1982a, 1982b) and earlier writers. Conners (1983) has shown that *dominica* and *fulva* differ at the species level, and I follow his treatment of these populations.

WANDERING TATTLER. *Heteroscelus incanus*. A female taken 21 May 1976 on Swains Island weighed 105 g. The ovary measured 9 × 5 mm. The slight molt noted on the label is not evident on the skin. A male bird from Olosega Island, 8 June 1976, weighed 115 g; it had very small testes. A few feathers are growing on the breast. In a male specimen taken by L. P. Schultz on Rose Atoll, 18 June 1939, the outer primaries are small and in sheath, and the next are incompletely grown. The fifth primaries are also not fully grown.

Clapp (1968) mentioned specimens taken on Swains Island by the POBSP but was unable to report on them. A male and a female were taken on 3 August 1966. The male had a testis 3 × 2 mm and heavy fat and weighed 148 g. The ovary of the female was 7 × 3 mm and granular; this bird also had heavy fat and

weighed 133 g. Both birds were molting body feathers and secondaries, but not primaries, and the male was growing new outer rectrices. Another POBSP specimen was taken 29 October 1964 on Tutuila Island. This bird weighed 105 g and had testes 2 mm long. It is in heavy body molt and is replacing the innermost primaries.

No molt is evident on five birds taken on Tutuila by the WSSE in October and November. A late December specimen from Olosega Island was replacing the middle primaries but shows no body molt. A February male from Tutuila has replaced all the primaries, with the outermost still in sheath, and was molting heavily ventrally.

BRISTLE-THIGHED CURLEW. *Numenius tahitiensis*. Stickney (1943) reported one male and two female specimens from Rose Island, 11 December 1923. Beck's notes mention an observation of this species on Olosega Island.

BAR-TAILED GODWIT. *Limosa lapponica baueri*. The USEE took a specimen on Rose Atoll, which was named *Limosa foxii* by Peale (1848). Stickney (1943) reported a single male

specimen taken on Tutuila Island on 30 November 1923.

**RUDDY TURNSTONE.** *Arenaria interpres interpres*. A female taken on Ofu Island on 2 December 1976 had a  $3 \times 6$  mm ovary and weighed 111 g. Stickney (1943) reported two December specimens from Olosega Island and one from Rose Atoll. Clapp (1968) gave data for two specimens from 30 November and two from 14 April, all taken at Swains Island. Both November specimens show very slight molt of the body feathers; a male has new or growing primaries from no. 7 inward, a female from no. 5 inward. The 2 December bird from Ofu shows no molt on the body, but the primaries are in the same stage as the 30 November male just mentioned. The Olosega birds are replacing the middle primaries but show no body molt; the Rose Atoll bird has fresh primaries. A female taken in April is in general body molt, well along to achieving the breeding plumage, but a male of the same date is not molting and is still in winter dress.

**SANDERLING.** *Calidris alba*. Two specimens from Swains Island were reported by Clapp (1968) and a third was mentioned. The latter is a female weighing 67 g, with heavy fat, taken on 30 November 1966. A male taken 18 February 1966 is replacing its primaries; all but the outer two are fresh or still growing. An apparent adult male taken on the same date has unworn primaries and is not in molt; most of the body feathering is fresh.

**BLACK-NAPED TERN.** *Sterna sumatrana sumatrana*. A male specimen taken at Rose Atoll on 12 December 1923 (AMNH) is marked on the label "only 1 seen." According to Beck's notes, it was the first of its kind seen on the WSSE and "came in and lit by itself ahead of the boat on a sandbar." The iris was brown, the bill black with a horn-colored tip of about 2 mm. The gonads were recorded as "swelling." The distinctive outer primary is less than half-grown on the left and just starting to grow on the right wing; otherwise, the plumage is fresh.

**SOOTY TERN.** *Sterna fuscata serrata*. The single specimen known is a female taken 12 December 1923 at Rose Atoll. The gonads

were large. Beck noted that "A flock of 1000 sooty terns were flying over the trees . . ." of the island.

**BLUE-GRAY NODDY.** *Procelsterna cerulea nebouxi*. Two males taken at Vatia, Tutuila Island, 28 September 1976 weighed 47.9 and 50.1 g. Both birds are molting both body and flight feathers; no reproductive data were recorded on the specimen labels. One of two birds taken on Tutuila in November 1923 was an immature with a mottled crown, in worn plumage; this bird had small gonads. The other November male was nesting; the 10th primary was about half-grown on the right wing and just beginning to grow on the left. A series of 14 birds taken in January on Tutuila, Aunu'u, and Ofu islands (WSSE) includes specimens with large and small gonads, with some in either category molting flight feathers, others not. Clapp and Sibley (1966) reported five specimens from February, not in breeding condition. Salvin (1879) mentioned another specimen in the British Museum (Natural History).

The subspecific name is used with considerable reservation. Both Peters (1934) and, more recently, duPont (1976) have noted the need for a thorough review of variation in this species complex.

**BROWN NODDY.** *Anous stolidus pileatus*. An immature male taken at Steps Point, Tutuila Island, 9 March 1976, weighed 219.3 g and was fat. It is in very worn plumage but is molting the primaries. The outer primaries are old and worn, no. 6 is missing or growing, and the inner ones are new. Two birds, a male and a female, were collected on Swains Island on 19 May 1976. Both are adults in excellent plumage. Each of these three birds had small gonads, and none was in breeding condition. Testes of the March male were  $2 \times 2$  mm, those of the May birds,  $7.5 \times 2$  and  $7 \times 2.5$  mm. Two previously unreported specimens from Tutuila Island are an adult male and an unsexed immature bird, 9 and 29 January 1921, respectively, taken by R. C. Reed. Both are renewing primaries; no. 7 of the adult and no. 10 of the young bird are in sheath. Clapp (1968) reported breeding and molt data from a series of birds from Swains

Island. The WSSE obtained nine specimens from Rose, Ofu, and Tutuila islands.

The extensive specimen and observational data available indicate, as Amerson, Whistler, and Schwaner (1982*b*) noted, that this species breeds year-round in American Samoa. The period of molt of the primary flight feathers, however, seems to be restricted to the winter months; molt was noted only on specimens taken from October to March.

**BLACK NODDY.** *Anous tenuirostris minutus*. An adult male (105 g) taken 20 May 1976 on Swains Island is molting the primaries; no. 7 is missing and no. 6 is about two-thirds grown with traces of its sheath present. No body molt is evident. The species was nesting on the island at that time. A female taken at Fagamalo Cove, Ta'ū Island, 4 October 1976, also weighed 105 g. No molt is evident on this bird. Adults taken on Rose and Ta'ū islands in December 1923 by the WSSE have small gonads; one was molting the inner primaries. Beck's notes report that "lesser noddies" were nesting on Rose Atoll in December. As with the last species, these birds may breed throughout the year.

**WHITE TERN.** *Gygis alba candida*. An unsexed bird taken on Swains Island on 20 May 1976 is in worn plumage with no sign of molt. A male from Malaeimi Valley, Tutuila Island, 7 July 1976, is molting on the body. Replacement of feathers is proceeding posteriorly. This bird had small testes and very little fat; it weighed 110.5 g. Clapp and Sibley (1966) and Clapp (1968) have reported on other specimens from Tutuila and Swains islands. Specimens taken by the WSSE include one from Tutuila on 19 November and two each from Rose and Ta'ū islands in December. All these were marked as being nesting birds or having large gonads. An egg was taken at Rose Atoll on 12 December 1923, and four nests were found "not over 20 feet from the ground" according to Beck's notes. The December birds were in worn plumage and not molting. As indicated by Clapp (1968) and Amerson, Whistler, and Schwaner (1982*b*), the nesting season of this species seems to be relatively restricted.

**MANY-COLORED FRUIT-DOVE.** *Ptilinopus perousii perousii*. Amerson, Whistler, and Schwaner (1982*b*) reported two specimens from Tutuila Island, and Clapp and Sibley (1966) obtained one. The USNM holds a series taken by Reed on that island in May 1921; eight of ten skins originally received are present, as are eight preserved in alcohol. The WSSE obtained a series from all the major islands (Murphy 1924*a*, Ripley and Birckhead 1942). Thus, I was able to examine a series of 74 specimens, 63 from Tutuila Island and 11 from the Manu'a group. Collecting on Tutuila was concentrated in February, May, and December, however, with only four birds from other months, and all the Manu'a birds are from December and January. Half-grown juveniles were taken in May, November, December, and February. Most of the November adults had enlarged gonads; all but one from December and February had small gonads. Birds with large testes were also taken in April and June. The May sample lacks gonadal data.

This sample suggests that molt of the body feathers is constant. Similarly, replacement of primaries was taking place in 60 percent of the specimens and in nearly every month. One apparently juvenile female, preserved in fluid in May 1921, is molting both the second and seventh primaries. This suggests that one molt rapidly follows another; if this is so, the presence of first-year birds, determined by the shape of the outer primary, in the population throughout the year indicates more or less constant breeding.

Only a few weights are available. A male taken in June 1965 weighed 88.3 g, not 108.6 as earlier reported (Clapp and Sibley 1966). A male and a female taken in September 1967 weighed 92.9 and 85.2 g, respectively.

This species apparently occurs in large isolated flocks rather than being evenly distributed. Beck's notes from Ta'ū report that a hunter with Correia "struck a tree with the yellow-back doves feeding in it and got ten ... the first we have seen on this island." More were taken at that tree the following day. On Tutuila, Correia "had a native show him where to find the rarer of two doves." Amerson, Whistler, and Schwaner (1982*b*)

also reported isolated flocks, and the series taken by Reed was obtained in a period of a few days, suggesting that they may have been in a flock. This flocking behavior might make the species seem less abundant than it really is, but also would make it more vulnerable when a flock is found.

**CRIMSON-CROWNED FRUIT-DOVE.** *Ptilinopus porphyraceus fasciatus*. Material taken by the WSSE (Murphy 1924a), Reed, the POBSP (Clapp and Sibley 1966), and ECI (Amerson, Whistler, and Schwaner 1982b) on Tutuila Island represents 10 months of the year, but mainly November and February. Most birds taken in the Manu'a Group are from December and January. Two specimens taken by Ripley, in the ANSP, were not examined.

Adult birds in breeding condition (gonads enlarged) are present from June through February; juveniles are present from August through February. Adults are molting primaries from September to January, but February birds have fresh plumage. Breeding seems to be concentrated in the last half of the calendar year, with a complete molt immediately following. Aside from very young individuals, there are no birds with first-year primaries from October to January.

Ripley and Birkhead (1942), in discussing birds from all the Samoan islands, reported both immature birds and molting adults throughout the year, and a nestling (from Western Samoa) in May. The cycle in Western Samoa may differ somewhat from that in American Samoa, but the available material does not permit a full analysis for either island group.

There seem to be average color differences between groups of birds from the various Samoan islands, most notably between those of Tutuila and Upolu, where series are most comparable by date. The Tutuila birds are brighter green dorsally and have darker purple caps, whereas those from Upolu have the neck, upper back, throat, and breast a cleaner, paler gray. The bellies of the Tutuila birds are darker, the yellow of the abdomen is deeper and more orangish, and the breast band is less distinct. However, birds from the Manu'a Group bridge the difference, al-

though they are more similar to Western Samoan birds. Certain individuals from each population look more like birds from another in one or more color characters. Further, birds from the same month are not available from the different island groups, and if the plumage cycles are out of synchrony, the material may not be as comparable as one would wish. Ripley and Birkhead (1942) have reported that there is minor size variation between birds of these islands, and suggest that there is active interchange between the subpopulations.

Only a few weights are available. Males, one each from June (Clapp and Sibley 1966) and July, weighed 108.6 and 123.7 g; the latter bird was labeled "fat." Two females from July weighed 119.5 and 222 g; these were "very fat" and "fat," respectively. Thus, this species seems to be about 25 percent larger than *P. perousii*.

**FRIENDLY QUAIL-DOVE.** *Gallicolumba stairi stairi*. A female was taken on Ofu Island on 3 June 1976. The bird was fat, but so badly shot that no weight was obtained. The iris was dark brown; the feet were reddish with faint orange. There is no sign of molt on the specimen, and no gonadal information with it. This bird is in the "retarded" female plumage discussed by Amadon (1943). Its wing length is 139.5 mm. A bird taken on that island on 1 December 1976 weighed 171.1 g.

**PACIFIC PIGEON.** *Ducula pacifica pacifica*. One female specimen was taken near the top of Lefao Ridge at Papaloa Point, Tutuila, 23 April 1976. This bird was very fat and weighed 398 g. Measurements of the ovary, 18 × 9 mm, may indicate an approach to breeding readiness. An unsexed bird was taken at Pago Pago, Tutuila, on 16 May 1883, by William Jones, U.S.N.; no other data are available. There is one specimen from Tutuila in the ANSP, not examined. The ECI group collected a female on 7 October 1976 at Fageiulu Stream, Ta'u Island; it weighed 344 g and had minute ova.

All other adult specimens available, 20 taken by the WSSE and one by Reed, were obtained between late October and late January; the WSSE also found well-grown

young birds in November. All but three of the adults had small gonads. Most showed some body molt, mainly on the neck and throat. Eight of the birds were replacing primaries, and a few birds had apparently just completed the molt. This meager evidence suggests that breeding takes place in mid-year.

Beck's notes report that pigeons and doves were rare on Olosega Island, although they were frequently seen on the other islands. On Tutuila he noted that "The natives hunt for pigeons and get 50 cents each for them in the market. I sometimes see a dozen for sale when a native boat comes in." As Clapp and Sibley (1966) and Amerson, Whistler, and Schwaner (1982*b*) suggest, hunting pressure may severely depress the population of this species.

I follow Amadon (1943) in including the Samoan populations in the wide-ranging nominate subspecies rather than separating them as *Ducula pacifica microcera*.

**BLUE-CROWNED LORY.** *Vini australis*. Two birds, an adult male and an immature probable male, were taken on Ofu Island on 4 June 1976. Testes of the adult male were  $6 \times 4$  and  $4 \times 2.5$  mm. That bird was fat and weighed 48.4 g; the other bird weighed 39 g. The adult is molting in the head region, and it appears that all but the outer four primaries have been replaced recently. Two female specimens were taken on Ta'u Island on 4 October 1976. An adult weighing 48.4 g is molting on the head and throat; an immature bird of 41.5 g shows no evidence of molt. The plumage of both birds is badly worn.

Only four of 64 WSSE birds taken in January and December had enlarged gonads. Approximately 30 percent of the birds were actively molting primaries, and on many others it appeared that the inner primaries had been replaced recently although none was actively growing.

Beck's notes mention that on Ta'u Island "Paroquets feed on flowers or fruit well up on the mountain, as well as in the coconut trees along shore." He noted that these birds were scarce on Olosega "though they come across from Tau," but they were "a bit commoner" on Ofu.

Amadon (1942*b*) has presented measurements for this species.

**NEW ZEALAND CUCKOO.** *Urodynamis taitensis*. A specimen taken at Fageula Stream, Ta'u Island, on 7 October 1976 was a female with a  $7 \times 4$  mm ovary. It weighed 175 g. There is no molt evident on this bird. A female from Swains Island, taken 10 May 1939 by L. P. Schultz, is molting on the head and neck. Clapp and Sibley (1966) and Clapp (1968) have reported on other specimens from Tutuila and Swains islands. Five of eight WSSE specimens reported by Bogert (1937), taken from November to January, remain in the AMNH. These all show some molt on the throat and flanks, and one is replacing primaries and rectrices.

**COMMON BARN-OWL.** *Tyto alba lulu*. A female weighing 320 g was taken on Ofu Island, 6 June 1976. The stomach was empty. This bird was molting on the neck, and P 6 is still in sheath. A second female was taken on Ta'u Island, 22 July 1976. This bird had an ovary of  $12 \times 4$  mm, was very fat, and weighed 393 g. "Slight molt" is indicated on the label. The October bird reported by Clapp and Sibley (1966) is growing primaries and some feathers on the breast.

There are 40 WSSE specimens in the AMNH, previously studied by Amadon (1942*b*), of which I examined 20 in some detail. Most of the birds had small gonads, but one bird was marked "nesting." Half the specimens were molting body feathers, and several were growing primaries; other birds had either fresh or worn primaries or a mixture. About 25 percent of all the birds had primaries of two colors, older browner feathers and newer, grayer ones. One female taken 31 December 1923 had primaries in three distinct stages of wear.

Beck's notes from Olosega Island include the following: "Barn owls are reported to catch small chickens and they seem less nocturnal than the barn owls of California."

**WHITE-RUMPED SWIFTLET.** *Aerodramus spodiopygia spodiopygia*. A male (?) taken on Ofu Island on 4 June 1976 weighed 6 g. A female from Nu'utele Islet, off Ofu, 9 September 1976, weighed 7.4 g. Neither bird is molting and there are no reproductive data. Clapp and Sibley (1966) reported a nonbreeding bird taken in March. The AMNH has a

series of 21 birds from the Manu'a Group of islands taken in December and January and 6 from Tutuila taken in November and February. Only one bird was noted as having large gonads; those of four were "swelling," and the others had small organs. One very young bird from Tutuila, a male, was apparently just out of the nest; the outer wing feathers were not fully grown. There is another young male from Olosega Island. Thirteen of the specimens were replacing primaries, mainly inner ones; the few birds with all fresh primaries seem to be young. All but a few of the birds were also molting body feathers. There is no confirmation in these specimens of Dhondt's (1976) suggestion, based on Western Samoan observations, that this swiftlet breeds all year round in Samoa, nor that breeding and molt overlap.

Beck's notes from Ta'u Island reveal that he visited a cave where several swifts and bats were flying about on 26 December 1923. On 8 January 1924 Beck rowed to cliffs on the west side of Ofu Island, "seeing a colony of 200 or more swifts flying in and out of cavernous tunnel through the mountain. Many nests in the roof thirty yards from water and inaccessible." This may have been one of the caves cut by surge channels mentioned by Amerson, Whistler, and Schwaner (1982b) on Nu'utele Islet, where they were unable to confirm breeding.

**WHITE-COLLARED KINGFISHER.** *Halcyon chloris* ssp. Two subspecies of this widely distributed and highly variable species occur in American Samoa, *H. chloris manuae* on Olosega, Ofu, and Ta'u islands, and *H. chloris pealei* on Tutuila and Aunu'u islands.

The ECI group took seven examples of *Halcyon chloris manuae*, six in early June and one in late July. All but one retain traces of juvenal plumage on the sides of the breast. The four males had small testes; gonadal information is not available for the females. Four first-year birds have the outer one or two primaries in sheath and one is still molting a few crown feathers; otherwise they are in fresh plumage, apparently just finishing a near complete post-juvenal molt. The adult female is growing the central rectrices. Insects were noted in the stomachs of six of these birds.

Weights of four males ranged from 52.6 to 62.8 g, averaging 58.1 g; the adult female weighed 48 g.

Mayr (1941) gave the measurements of 59 WSSE specimens with his description of this subspecies. The AMNH series includes both immature and adult birds as well as nestlings and well-grown young. Birds with either large or small gonads were taken. None was molting primaries, and body molt was slight if present. There is much variability in the amount of rufous on the crown. Beck's notes report the finding of a nest on 5 January on Olosega Island "with three young in it twenty feet up in a big dead stump; nest in but four inches from entrance, and a hole about six inches in diameter, with no lining, on windward side of tree, but hole ran slightly upward."

Seven examples of *Halcyon chloris pealei* were taken on Tutuila by the ECI personnel. The USNM has three skins and four fluid preserved birds collected by Reed in 1921, the five previously reported by Clapp and Sibley (1966) and one bird taken later by the POBSP as well as three undated, unsexed cotypes of *H. chloris coronata* Peale taken by the USSE. Most of these birds were taken from March to June, and thus complement the series of 96 October-February birds taken by the WSSE. Excluding the types, I examined 117 skins of this population. There is one specimen in the British Museum (Natural History) (Salvin 1879) and two in the ANSP.

The annual cycle on Tutuila appears to be the same as on the Manu'a island group. None of the specimens taken from March to June had enlarged gonads. Many of them are growing primaries, nearing the end of a complete molt. In October and November, a high proportion of the specimens had enlarged gonads or were labeled as being breeding or nesting birds. The few annotated January birds again had small gonads, but a February bird is marked "nesting." Nests have been found in February and March (Amerson, Whistler, and Schwaner 1982b).

A female taken in August weighed 54.6 g; males taken in April and June weighed 61.1 and 53.8 g, respectively. Insects were recorded as stomach contents. Beck's notes from Tutuila indicate that kingfishers "are accused of darting down and picking the eyes of chick-

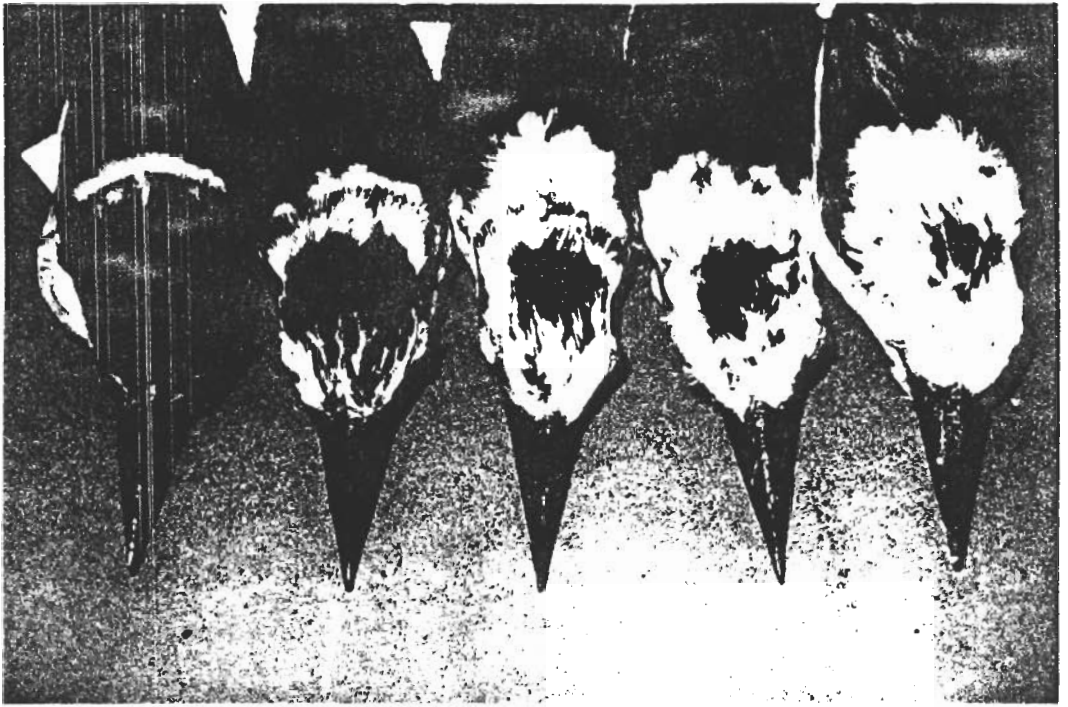


FIGURE 2. Crowns of *Halcyon chloris* showing variation in amount of blue. *H. chloris manuue* is on the left; to the right, four examples of *H. chloris pealei* represent 90, 75, 50, and 25 percent classes discussed in the text (photograph by Roger B. Clapp).

ens." On Ta'ū Island, a kingfisher was seen "with a small mouse in its bill."

*Halcyon chloris pealei* is highly variable in the extent of the blue crown patch, which ranges from nearly complete to nearly absent. This variation is not related to age, sex, or plumage condition, although wear does have some effect. Mayr (1931) mentioned *pealei* as one of the subspecies of *H. chloris* that show a tendency to more white on the pileum, leading to the condition of an all white crown as in *H. chloris albicilla* of the Northern Marianas. The fact that *pealei* expresses nearly the entire range of variation, however, has not, to my knowledge, been emphasized.

I subjectively separated all specimens of *pealei* into four categories (Figure 2) based on the amount of blue in the crown—25, 50, 75, and 90 percent. Birds in the 90 percent class have an essentially "normal" *Halcyon chloris* crown; the feathers are all blue with gray at the base except for the most posterior ones

where white tips of the crown feathers form the ringband (in the terminology of Mayr 1931). As the blue tips of these crown feathers wear off, the crown remains blue. In birds in the less blue classes, white, often combined with rufous, encroaches on the crown from the lores, superciliary stripes, and ringband, so that in the 25 percent class there is only a small patch of blue feathers in the center of the crown. In this progression, the blue feathers of the crown have white or rufous bases (especially anteriorly), edges (laterally), or tips (posteriorly). As the blue of these feathers wears, more white and rufous are exposed. Those birds with the least blue on the crown are the most worn, but the wear merely emphasizes the small amount of blue present in fresh plumage.

The results of this analysis are shown by season in Table 2. The seasonal samples are so disparate in size that comparison is difficult, but the relatively fresh summer and relatively

TABLE 2  
NUMBER AND PERCENTAGE OF SPECIMENS OF *Halcyon chloris pealei* IN CLASSES OF AMOUNT OF BLUE IN CROWN

| PERIOD           | MALE        |                |        |        |        | FEMALE |        |        |        |        |
|------------------|-------------|----------------|--------|--------|--------|--------|--------|--------|--------|--------|
|                  | CROWN CLASS |                |        |        |        |        |        |        |        |        |
|                  | N           | 25%            | 50%    | 75%    | 90%    | N      | 25%    | 50%    | 75%    | 90%    |
| March–August     | 6           | 1(17)          | 2(33)  | 3(50)  | 0      | 11     | 4(36)  | 1(9)   | 4(36)  | 2(18)  |
| October          | 13          | 4(30)          | 5(38)  | 3(23)  | 1(8)   | 11     | 1(9)   | 6(55)  | 3(27)  | 1(9)   |
| November         | 46          | 7(15)          | 18(39) | 16(35) | 5(11)  | 21     | 5(24)  | 6(29)  | 4(19)  | 6(29)  |
| January–February | 3           | 1(33)          | 1(33)  | 0      | 1(33)  | 6      | 0      | 2(33)  | 3(50)  | 1(17)  |
| TOTAL            | 68          | 13(19)         | 26(38) | 22(32) | 7(10)  | 49     | 10(20) | 15(31) | 14(29) | 10(20) |
| All Birds        |             | Sexes Combined |        |        |        |        |        |        |        |        |
|                  | 117         | 23(20)         | 41(35) | 36(31) | 17(15) |        |        |        |        |        |

worn winter birds occur in approximately the same proportions of crown class, suggesting that wear is not the primary cause of the decreasing size of the crown patch. The sexes are also similar in the proportions allotted to the four classes.

Birds in the 90 percent class are rather similar in appearance to examples of *Halcyon chloris manuae*. Birds from Tutuila generally have white feathers across the forehead whereas those from the Manu'a Group have white only in the lores, not the forehead. There may be some exchange and introgression between the populations. Two specimens from Tutuila (USNM 256986, AMNH 201331), both in the 90 percent class, have mixed feathers across the forehead and would unhesitatingly be referred to *manuae* if labeled from one of the appropriate islands. Conversely, a few examples of *manuae* have white edges to some of the feathers above the bill, but are not as extensively white in that region as are *pealei*.

RED-VENTED BULBUL. *Pycnonotus cafer bengalensis*. An adult female taken 27 June 1968 (POBSP) at Vaitapo Valley, Tutuila Island, had an ovary  $5 \times 3$  mm and weighed 40 g. This bird is in fresh plumage. An immature female, taken 9 December 1976, at Tafuna, Tutuila, weighed 32.5 g; this individual is replacing feathers both dorsally and ventrally, and has replaced the inner primaries. Three males were taken with the latter female. They weighed 36.4, 39.8, and 40.0 g, and had testes measuring  $8 \times 6$ ,  $10 \times 8$ , and

$9 \times 5$  mm. All are in worn plumage, but the heaviest is growing new feathers dorsally and ventrally and all appear to have replaced the innermost primaries.

FIJI SHRIKEBILL. *Clytorhynchus vitiensis powelli*. Females were taken east of Laufuti Stream on Ta'ū Island on 14 and 17 July 1976, at elevations of about 250 and 300 m. Both had small ovaries. Soft part color notes on the first taken indicate brown eyes, a slate gray bill with the inside light gray, and reddish legs. There is no indication of active molt on either bird.

Mayr (1933) presented measurements of the WSSE series from the Manu'a Group of islands, noting that these birds taken in December and January were very worn or in early molt. He also clarified the origin of the type specimen, which is in the BMNH (Salvin 1879).

On Ta'ū Island, Beck recorded that "The flycatchers seem to keep to the north side of the island as I found none on the other parts. They keep fairly near the ground in the bushy sections under the high trees in the old parts of the forest." He found a nest "with two young birds in it on precipitous side of canon [*sic*], in thick underbrush only five feet from ground, on tall branch of bush." Another nest, with the male setting on one fresh egg, was "fifteen feet up in fork of a small tree." The nest was "six inches long and wide, and 1-1/2 inches deep, of shredded bark with a little green moss and lined with fine rootlets." Other nests

found on Ofu Island were similarly "of shredded bark and green moss with heavy lining of blackish rootlets." Four of these nests were collected from 4 to 10 January (AMNH).

**MAO.** *Gymnomyza samoensis*. Amerson, Whistler, and Schwaner (1982b) noted that birds had been reported (but apparently were not collected) on Tutuila Island by the USEE, and stated that the report constituted the only record for American Samoa. However, Mayr (1932) reported two males and one female, under the name *Amoromyza samoensis*, taken on Tutuila by the WSSE in February 1924. The two males, taken 13 and 15 February 1924, had testes that were "swollen" or "large." The third bird, 15 February, was originally marked male but was relabeled female, presumably because of its smaller size; the gonads were small. The males are in worn plumage but show traces of molt on the throat. The female, perhaps a young bird, has fresh primaries with traces of sheaths still on the outermost, and is also growing new feathers on the throat.

**WATTLED HONEYEATER.** *Foulehaio carunculata carunculata*. A large series of this species is available from American Samoa. Amerson, Whistler, and Schwaner (1982b) reported the taking of 11 birds from three of the islands. The 11 specimens (including 3 skeletons) mentioned by Clapp and Sibley (1966) are in the USNM, as are 11 others taken on Tutuila by the POBSP, 1967-1968. Six other specimens from Tutuila in the USNM, four in fluid, were taken by Reed in January 1921, and one was taken by the USEE. Mayr (1932) reported on a series of about 90 WSSE specimens from the Manu'a group and Tutuila. James Dick provided me information about a specimen from Tutuila in the Royal Ontario Museum, taken in 1970 by R. S. Crossin, and there are three in the ANSP. These specimens together provide a fair coverage of the year but there are major gaps from mid-April to early June, and from early July to late October.

Birds with definite indications of breeding were taken in April, June, July, December, and January, and some individuals with enlarged gonads are from the additional months

of February, October, and November. There are also birds with small gonads from February, March, October, November, December, and January. Juveniles were obtained in February and October. It appears that some breeding may occur throughout the year, perhaps with peaks in the population in mid-summer and mid-winter.

In this series, birds were involved in molt of the body feathers from March to July and from October through March, although not all birds in any month were obviously molting. Within the populations, replacement of the body feathers may occur throughout the year. Birds molting the primaries were taken from December through March. One bird was growing all the rectrices in late January.

Mayr (1932) discussed the slight morphological variation between the Tutuila and Manu'a birds and among other populations assigned to this subspecies. On the average, birds from Tutuila are larger and lighter in color than those of Manu'a, but this variation is part of a mosaic of these two characters when birds of other island groups are considered as well. The slight size difference in American Samoa is further reflected by the few weights available. Three males from Tutuila average 35.6 g, whereas five from Manu'a average 33.0 g; seven females from Tutuila average larger than two from Manu'a, 28.8 vs. 25.1 g.

Clapp and Sibley (1966) and Amerson, Whistler, and Schwaner (1982b) reported this species as the most conspicuous and abundant land bird in American Samoa, a status also revealed by Beck's field notes (under the name "warbler"). On Ta'u it was "by far the most plentiful bird" and ranged "over the island everywhere from top to bottom." Similar comments were made for Olosega Island.

**CARDINAL HONEY-EATER.** *Myzomela cardinalis nigriventris*. Amerson, Whistler, and Schwaner (1982b) reported five specimens taken in 1976. Two birds were reported by Clapp and Sibley (1966), and two others were taken by the POBSP on 4 July 1968. Mayr (1932) reported on a series taken by the WSSE, and three birds (one in fluid) collected

by Reed are in the USNM. I have had the opportunity to examine more than 60 specimens, but none taken between late July and late October. All specimens are from Tutuila Island, the only American Samoan island inhabited by the species.

Adult males had moderately enlarged testes (5–7 mm in length) from March through early July, and gonads marked "large" in October and November. A recently fledged young was taken on 27 November. Females taken in June and July had small ovaries. Molt of body feathers was occurring in birds in April, June, July, October, and November, but not in all birds from those months. There was no evidence of molt of the flight feathers except in February. November adults have worn primaries whereas most of those from February have fresh ones.

Recorded weights of three adult males were 11.5, 12.4, and 15.0 g, the latter of a July bird marked "fat." An immature male weighed 11.5 g, and three females weighed 10.0, 10.5, and 11.7 g. Notations on several labels indicate that the iris is brown, and one label reports the mouth lining as pale yellowish.

**POLYNESIAN STARLING.** *Aplonis tabuensis* ssp. Two very different appearing subspecies occur in American Samoa (Mayr 1942), *A. tabuensis manuæ* in the Manu'a Group and *A. tabuensis tutuilæ* on Tutuila and Aunu'u islands.

The WSSE obtained 80 examples of *Aplonis tabuensis manuæ* in mid-December and early January. Many of these birds were molting primaries. A male and a female taken in July (ECI) weighed 57.1 and 54.3 g, respectively.

An example of *Aplonis tabuensis tutuilæ* taken 10 July (ECI) had testes 8 and 10 mm long and a brood patch; another male had only moderately enlarged testes. Birds from October to February (WSSE) all had small gonads. A complete molt was taking place in October and November; January birds had fresh plumage. July males weighed 67.5 and 68 g.

**SAMOAN STARLING.** *Aplonis atrifusca*. Reed collected seven birds in 1921. Clapp and Sibley (1966) reported eight skins and three skeletal specimens taken, and four skins were

later obtained by the POBSP. The ECI group took six specimens. These 25 skins were all taken in the months of February–July. The WSSE series of about 40 birds is from the winter months, November–early February. Two specimens at the ANSP were not examined.

None of the birds from February–July was molting primaries, and none to early June was molting body feathers. Five birds in late June and July were in slight to heavy molt on the anterior body.

Amerson, Whistler, and Schwaner (1982b) summarized data suggesting a summer breeding season. Most birds from March and April for which reproductive information is available had small or slightly enlarged gonads, although those of one March male were large. Most June males had large testes, to 11 mm in length. Most October–November birds had large gonads, and three were noted as nesting birds, but in December–February most had small gonads. The combined data suggest either a very long breeding season, June–December, or two cycles in a year.

Weights of birds, some previously given by Clapp and Sibley (1966), are: six males from Tutuila, 132.3–158.5 g, average 144.8 g; two males from Olosega Island, Manu'a group, 156 and 164 g; two females from Tutuila, 122 and 132 g.

Mayr (1942) compared measurements of birds from Olosega Island (perhaps including Ofu and Ta'u) with those of the major islands of Western Samoa; Table 3 permits comparison of Tutuila birds as well. Birds from Tutuila average slightly smaller in wing length; females tend to have shorter tails and males have slightly longer bills. Mayr (1942) suggested that birds from Manu'a have slightly heavier and bigger bills than those from Western Samoa, but that is not apparent from my examination.

This species is rather different from most in the genus *Aplonis* in its size and relative lack of modified plumage. Mayr (1942) suggested that *atrifusca* has its nearest relatives in *A. zelandicus*, *grandis*, or *corvina*. However, *A. zelandicus* is much smaller, more like *A. tabuensis* in size; the only similarity is the rufous-chestnut on the outer webs of the



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