The Birds of Mt. Isarog National Park, Southern Luzon, Philippines, with Particular Reference to Altitudinal Distribution

Abstract

Mt. Isarog National Park is located in southeastern Luzon, Philippines, on the Camarines Peninsula. The mountain is an old volcanic peak that rises to 1966 m. The local climate is characterized by the lack of a pronounced dry season. Four distinct vegetational zones occur on the mountain: *parang* grassland (from the lowlands to 900 m), lowland forest (from 450 to 900 m), montane forest (from 900 to 1500 m), and mossy forest (from 1500 m to the summit).

Information presented herein on the birds of Mt. Isarog is based on the collections of D. S. Rabor, obtained in the spring of 1961, and our own collections and observations, made in the late winter and spring of 1988. Our survey was conducted at six focal points along an elevational transect of the mountain. In the species accounts and discussion sections particular attention is given to the altitudinal distributions of the resident birds. We also report measurements and weights of collected birds, breeding data, stomach contents, some taxonomic information, and general natural history observations.

A total of 135 bird species has been recorded on Mt. Isarog: 116 residents and 19 migrants or winter visitors. Species number and density decrease with altitude. Some of the factors that might result in this relationship are analyzed. Three distinct patterns were found in the distribution of congeners on the mountain: complete altitudinal sympatry, broad elevational disjunction, and a small amount of overlap with apparent species replacement.

The distribution of the forest birds on Mt. Isarog, based on the four vegetational zones, is compared to three other mountains on Philippine islands. In all cases the number of species on each mountain decreases with altitude. The elevations where different types of forest occurs varies between mountains. No species of mossy forest bird is endemic to any one of these mountains, nor is there a fleet of species limited to the mossy forest zone.

Since Rabor visited Mt. Isarog in 1961, much of the lowland forest has been cleared. By comparing his survey results with our 1988 information it can be estimated that about 42% (27 of 64 species) of the lowland forest (between 450 and 900 m) birds have been locally extirpated. The remaining tracts of forest within and outside the park boundaries are still being cut, and the region is severely threatened with deforestation. The deployment of rangers in the area to enforce existing laws against illegal logging, and a local education program directed towards information about habitat destruction and watershed management are suggested as important steps in conserving the remaining undisturbed forests of Mt. Isarog.

Introduction

Although the island of Luzon, Philippines, has been the site of numerous ornithological studies, most of the information on the birds of that island is contained in systematic reviews and descriptions of new taxa. Only a few studies on regional avifaunas of Luzon have been published; most of these deal with the biogeographically distinct north (e.g., Ogilvie-Grant, 1894; McGregor, 1904, 1924; Morioka & Sakane, 1979) and only a few deal with the central and southern portions of the island (Ogilvie-Grant, 1895; Wolfe, 1938; Gilliard, 1950).

Surprisingly, none of these studies contains quantified information on the altitudinal distribution of the resident montane avifauna on the island. Also, to our knowledge no detailed bird list is available for any montane Philippine national park. This monograph reviews the bird species known from Mt. Isarog National Park in southeastern Luzon, describes their altitudinal distribution and density, and compares these patterns with montane avifaunas on other islands in the Philippines.

Study Site and Methods

The southern end of Luzon is divided into the large Camarines Peninsula (including the regions Albay, Camarines, and Sorsogon) and the smaller Bondoc Peninsula. The topography of southern Luzon is dominated by several volcanic mountains: Bulusan (1560 m) in the extreme south, Mayon (2421 m) and Isarog (1966 m) in the center, and Labo (942 m) in the north. Mt. Isarog lies 5 km north and 20 km east of Naga City, at 13°40′N, 123°21′E.

The climate of the Camarines Sur Province near Mt. Isarog is characterized by the lack of a pronounced dry season, and a period of maximum rainfall between November and January. The average annual rainfall at Naga City (ca. 20 m elevation) is 280 cm and the temperature range is approximately from 16 to 30° C (O'Brien, 1968). Typhoons occur mostly in May and from September to November, principally along the Pacific Ocean coast.

The Bicolanos are the main cultural group presently inhabiting southeastern Luzon (O'Brien, 1968). Formerly, non-Bicolano tribal peoples lived on Mt. Isarog and surrounding lowland areas; their cultural identities are ambiguous but they were presumably a mixture of several different heritages (Jagor, 1870, 1875; Miller, 1911; Lynch, 1948). One of these groups were semi-nomadic forest dwellers known as Agta. At the turn of the 20th century the Agta lived on the lower slopes of Mt. Isarog, where they subsisted as hunter-gatherers and as agriculturalists (Miller, 1911). The subsequent fate of these people is not clear. We were told in spring 1988 that the last of the "mountain peoples" had left Mt. Isarog about 20 years before.

Account of the 1988 Fieldwork

Our 1988 field trip to Mt. Isarog was part of a long-term program, under the direction of L. R. Heaney, on the distribution, systematics, and biogeography of Southeast Asian animals, particularly mammals (Heaney, 1986). The 1988 survey was a joint expedition between the Philippine National Museum (PNM), the United States National Museum of Natural History (USNM), and Silliman University.

On the morning of 27 February 1988 a reconnaissance group went from Naga City to the Panicuason Central Nursery, at about 450 m on the western slope of Mt. Isarog (13°40′N, 123°20′E). The nursery is located 4 km north and 18 km east of Naga City. A local guide and Goodman spent the next two days making a survey of the western slopes of Mt. Isarog. On 1 March the balance of the field team arrived at the nursery to commence the survey.

From 3 to 31 March the field team (in various combinations), along with several local people, worked out of a series of five camps on the west and northwest slopes of the mountain: camp 1 at 900 m, camp 2 at 1125 m, camp 3 at 1350 m, camp 4 at 1550 m, and camp 5 at 1750 m (fig. 1). These camps and the Panicuason Central Nursery served as six focal points for an elevational transect. Two camps were often in simultaneous operation, each by crews of 5–10 individuals. Because the primary focus of the expedition was mammals, most efforts were devoted to rodent trapping and bat netting. Gonzales and Goodman represent exceptions to this focus. Their energies were concentrated on a bird inventory, and they were generally in different camps.

From 23 to 31 March Gonzales worked an area of secondary forest at about 400 m. Specimens were obtained at this site by netting and shooting. Because of their close proximity and similarity in habitat, data from this locality and the Panicuason Central Nursery were combined.

From 17 April to 8 May 1988 a field team returned to Mt. Isarog for further transect work. The majority of effort was directed to trapping and netting mammals and collecting plants, and no systematic ornithological work was conducted. All of the camps established on the first field trip were reoccupied and a similar field procedure was followed.

Vegetational and Ecological Types of Mt. Isarog

Following the definitions of Brown (1919) and Whitmore (1984), four vegetational zones are rec-

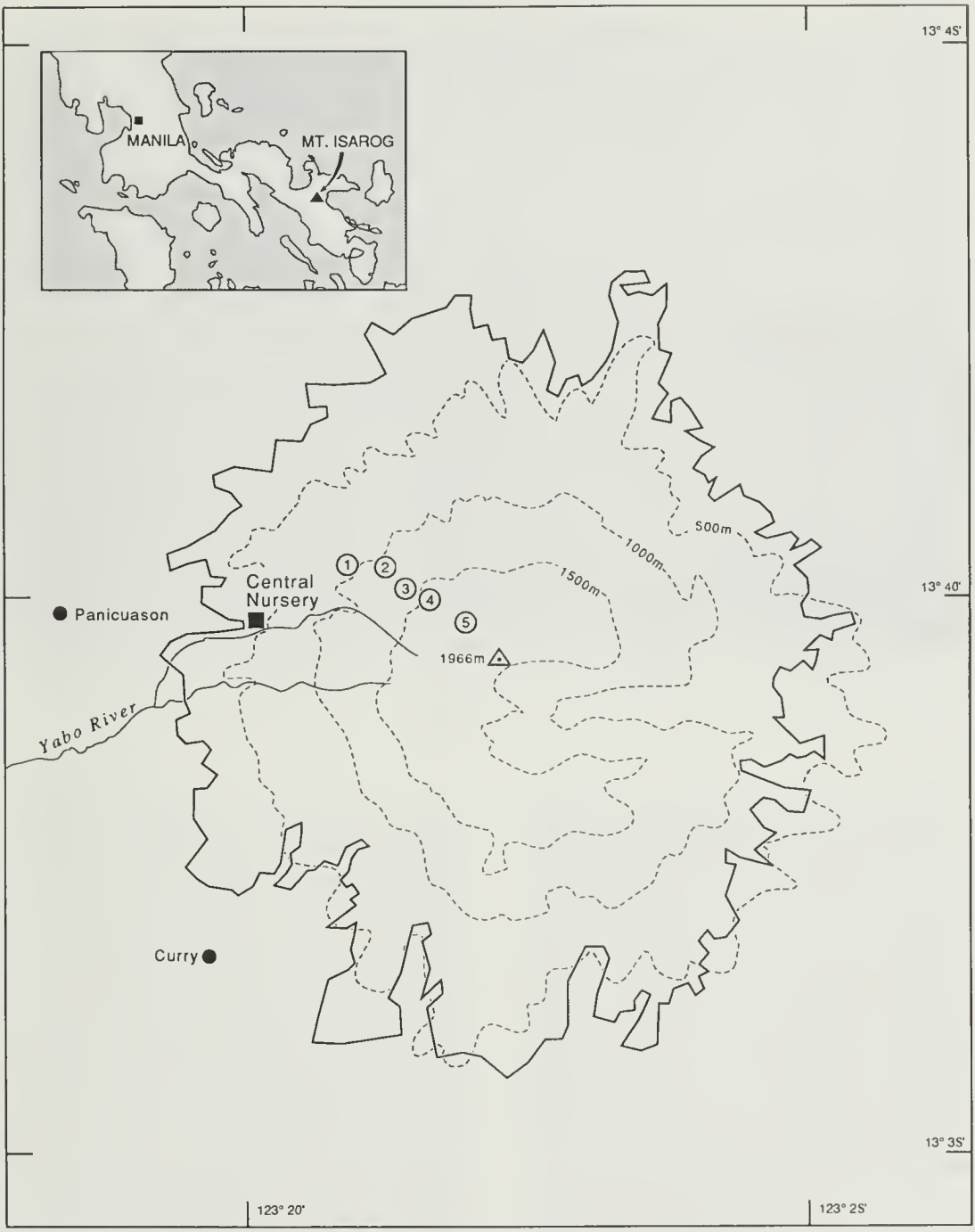

FIG. 1. Map of southeastern Luzon and Mount Isarog. The solid line surrounding the mountain represents the reforestation project boundary. The positions of the Panicuason Central Nursery and our five transect points are indicated on the west side of the mountain. The inset is of the southern portion of Luzon.

FIG. 2. View of the western side of Mt. Isarog from approximately 250 m. Note the grassland vegetation in the foreground and the cleared areas on the lower slopes of the mountain. The upper zone is shrouded in clouds. (Photo taken May 1988 by L. R. Heaney.)

ognized on Mt. Isarog: *parang* grassland, lowland forest, montane forest, and mossy forest. Brown's classification was developed for describing the plants of Mt. Makiling (= Maquiling), central Luzon, whereas Whitmore's is more generalized for Southeast Asian tropical forests. The three types of forest are *not* discrete ecological units with clearly definable boundaries but grade into one another.

PARANG (interspersed from the lowlands, including the area around the Panicuason Central Nursery, to camp 1 at 900 m)—This zone is not a natural vegetation type of the area. It is the result of the complete or partial removal of the original forest (fig. 2). Areas of *parang* often consist of large patches of grass, 1–3 m high (often *cogon, Imperata cylindrica*), and disjunct lots of secondary forest. In large tracts of land, particularly at the lower foothills of Mt. Isarog where most of the rural population resides, cleared areas were converted directly from forest to tillable land or plantations. Clearings of *parang* are regularly burned to thwart secondary forest succession. Numerous small rivers and streams that originate on the upper slopes of Mt. Isarog course through this area. As of early 1988, on the west and northwest slopes of the mountain areas, the *parang* extended up to 900 m.

LOWLAND FOREST (in small patches from 450 to 900 m; synonym of Dipterocarp Forest *sensu* Brown [1919])—The lower western slopes of Mt. Isarog have been extensively cleared, but presumably this forest type formerly extended to sea level. As of spring 1988, most of the original lowland forest on the west and northwest slopes below 450 m had been destroyed and much of it above 450 m had been extensively modified (fig. 3). When Rabor visited Mt. Isarog in 1961 (see p. 36) he found tracts of intact lowland forest down to approximately 450 m.

Small patches of forest, generally less than three hectares, have been cleared by 'slash and burn' agriculturalists. These openings are known as *kaingin,* and such an agriculturalist is known as a *kainginero.* Root crops and abaca (*Musa textilis*) are the most commonly grown domestic plants in these clearings. In spring 1988, the highest human settlements on the west side of the mountain were at about 650 m. *Kaingin* was a common feature of the landscape up to 900 m, where it abruptly

FIG. 3. Partially cleared lowland forest at 900 m. Note 12-m mist net in foreground. The view in the upper right corner is northwest, towards San Miguel Bay. (Photo taken late March 1988 by S. M. Goodman.)

stopped because of a change in topography and habitat (see below).

The remaining lowland forest had the characteristic three-storied structure associated with this ecological zone. The tallest trees were estimated to be 30–45 m and in undisturbed areas they closed off the canopy. Approximately 40% of the large trees had buttressed bases. In selectively logged areas of the forest it is these giants that are sought after and removed. Strangler figs were relatively common in both undisturbed and secondary lowland forest. During March 1988 several types of *Ficus* spp. trees and shrubs were in flower and fruit. The lower tiers of the intact lowland forest consisted mostly of young trees and lianas. Epiphytes were common and ground ferns and succulent herbs rare. In most areas, rattan, a type of climbing spiny palm (*Calamus*) used in commercial construction, had been widely harvested from the forest by local people.

The Panicuason Central Nursery is the local headquarters of the Philippine Bureau of Forest Development reforestation project on Mt. Isarog. The main focus of this program is the replanting of trees in large tracts of cleared lowland forest between about 350 and 600 m. This is primarily for watershed management and to a lesser extent for selective logging. The oldest replanted stands of forest on the west side of Mt. Isarog are about 20 years old. In virtually all replanted groves only one or two species of trees have been introduced, including Philippine mahogany (*Vitex*) and non-native ipil-ipil (*Leucaena*). One edge of the nursery lies along the national park boundary. Other habitats near the Panicuason Central Nursery include relatively large tracts of secondary lowland forest with a few remaining large dipterocarps and dense volunteer undergrowth; cleared areas used as tree plantations; and, just outside the park, small settlements surrounded by large agricultural fields. Directly above the nursery the Yabo River courses through several deep gorges, which are covered with some undisturbed lowland forest.

MONTANE FOREST (from approximately 900 to 1500 m; synonym of Midmountain Forest *sensu* Brown [1919])—Directly behind camp 1 at 900 m the mountain rose almost vertically for about 150 m. Between the bottom and the top of this steep slope many characteristics of the forest changed. Some of these differences appear diagnostic of the

FIG. 4. Transitional lowland/montane forest at about 1050 m. (Photo taken late March 1988 by S. M. Goodman.)

shift from lowland to montane forest (Brown, 1919). The trees were straighter, the structure of the forest two-storied, and the canopy more open. The understory at about 1050 m was denser than in areas below, and various types of palms, ferns, tree saplings, and bamboo were relatively common. *Ficus* spp. were rare (fig. 4). The first dense growths of epiphytic ferns, pandans, and orchids were noted here. Although rare, pitcher plants (*Nepenthes*), arborescent palms, and oaks (*Lithocarpus*) were found at this elevation. Vines of rattan at least 40 mm in diameter were not uncommon.

As one moved up in elevation, to about 1500 m, epiphytes in the subcanopy and ground plants, as well as a generally denser understory, became more widespread. Within the montane forest there was a noticeable change in the percentage of trees with structural modifications: at 1125 m about 30% of the large trees had buttressed bases and at 1350 m between 10% and 15% had them. We classify our camp 2 at 1125 m as montane forest with some transitional elements of lowland forest and camp 3 as montane forest.

MOSSY FOREST (from approximately 1500 m to the summit at 1966 m; synonym of Upper Mountain Rain Forest *sensu* Whitmore [1984])—The transition zone from montane to mossy forest was gradual. The area around our camp 4 at 1550 m still had some characteristics of montane forest; however, there was a noticeable reduction in tree size and stature, vines became rare, strangler figs completely dropped out, and there was a distinct increase in moss cover on tree branches and trunks.

At about 1650 m the transition was more dramatic (fig. 5). The tallest trees were seldom over 10 m and often were covered with luxuriant growths of mosses, liverworts, orchids, and ferns (often up to 25 cm thick). The locally high humidity and regular rains kept the forest saturated with moisture. No trees with buttressed bases were noted, although some trees had support stilts. Pandans were abundant, often covering the trunks of larger trees. In some areas the ground debris was made up largely of shed pandan leaves. This habitat continued up to the summit, where strong winds caused the trees to become even more twisted and stunted. Near the summit there were patches of grassland, up to several hectares in size.

Collections

Dioscoro S. Rabor visited Mt. Isarog between 23 March and 29 April 1961 and made a collection

FIG. 5. Mossy forest at 1750 m. Note luxuriant growth of ground cover and moss. (Photo taken in late March 1988 by L. R. Heaney.)

of birds. His work on Mt. Isarog was part of a broader survey of vertebrates inhabiting the mountains in the provinces of Camarines Sur and Sorsogon (Rabor, 1966). He worked the southeastern slopes of Mt. Isarog and used Curry as his base station (fig. 1). Although we have no exact information on how Rabor obtained specimens, it is presumed he had mist nets, and on the basis of wounds on several specimens, he also had firearms. He acquired some birds from local hunters. About 750 skins in the Rabor collection from Mt. Isarog are deposited at the Field Museum of Natural History (FMNH) and another 94 at the College of Forestry, University of Philippines at Los Baños. A portion of the FMNH material is cataloged within the Conover Collection (CC). A few additional specimens from the 1961 Rabor collection were sent to the Delaware Museum of Natural History and the University of Michigan Museum of Zoology. All of this Rabor material has been studied, but only specimens housed in the FMNH have been used herein. This is because the other collections are a subset of the material in the FMNH in both species represented and altitudinal information. Six new subspecies of birds were named from this collection (Rand & Rabor, 1967). Rabor also collected mammals at Mt. Isarog, including the type specimens of the endemic genus and species *Archboldomys luzonensis* (Musser, 1982) and the species *Rhynchomys isarogensis* (Musser & Freeman, 1981).

On our 1988 trip to Mt. Isarog, between 27 February and 31 March, birds were obtained in mist nets, in mammal snap-traps, or by shooting with air rifles; a few specimens were purchased from local people. During this work 373 birds were collected. Most of these animals were prepared as skeletons or fluid-preserved specimens. On the second 1988 trip to Mt. Isarog, between 17 April and 8 May, an additional 60 bird specimens were taken. The 1988 collections were divided between the PNM and USNM. Including the 1961 Rabor material in various museums and our own 1988 collections, a total of 1,293 bird specimens have been examined from Mt. Isarog.

Measurements

Because little quantified information is available in the literature on the measurements of Luzon birds, particularly from the southern portion

of the island, summary statistics have been included for most resident species taken on Mt. Isarog. Unless explicitly noted, measurements are of adults. For sample sizes (in parentheses) less than four, the measurements for each individual are listed. Measurements for larger samples are given as mean ± standard deviation, followed by the range.

Linear measurements were taken only from dried skins; specimens saved in fluid or as skeletons are not included in these summary statistics. Measurements include (all in mm): Wing—measured from the bend of the flattened wing at carpal joint to longest primary tip. Tail—measured from the point of insertion of central rectrices to distal tip. Exposed culmen—measured from the base of the feathering on the forehead to maxilla tip. Bill from nostril—measured from anterior edge of nostril to maxilla tip. Bill width—measured across the edges of the bill rami at the level of the anterior edge of nostril. Weights are given in grams. For many Rabor specimens a range of altitudes was given on the tag; for convenience, only the median is reported here. The 1988 elevational information is based primarily on altimeter readings.

Netting

A series of mist nets was operated at each transect site. All nets used were 2.6 m high, 36-mm size mesh, and 12 m long. A net left up for a 24-hour period is termed a "net-day."

Nets were checked during daylight hours at least once every two hours, and we generally never had more than eight nets in operation at any one time per transect zone. Nets were left up throughout the night to catch bats and nocturnal birds. The bottom edge of the lowest net panel was generally set 1 m above the ground. At each transect zone the nets were placed in a variety of habitats, e.g., on the rim of ridge tops, in *parang,* and in lanes in thick understory growth.

Observations

In addition to collecting and netting specimens, members of the 1988 expedition gathered observational information on birds. The cumulative number of observer-days per transect zone was: Panicuason Central Nursery (including 400 m camp)—14; camp 1 at 900 m—14; camp 2 at 1125 m—7; camp 3 at 1350 m—9; camp 4 at 1550 m—6; and camp 5 at 1750 m—4. Regular notes were kept on the species observed or heard daily, the elevation, and surrounding habitat. Both Gonzales and Goodman carried altimeters, so precise details of the elevational ranges of identified birds could be worked out. In order to quantify this information the following "abundance measures" have been used: abundant—seen or heard numerous times each day per transect zone, common—seen or heard once each day per transect zone, uncommon—seen or heard every two or three days per transect zone, rare—seen or heard once or twice for duration of stay in any transect zone.

Systematic Order and Nomenclature

We have generally followed the systematic arrangement and common names used by Gonzales and Rees (1988); in some cases alternative names from Dickinson et al. (in press) have been presented in parentheses. An asterisk (*) at the start of any species account indicates that at least one specimen taken on Mt. Isarog of the respective taxon has been examined. In cases when a bird was only observed in the area and not collected, the presumed subspecies has been inferred on known patterns of geographic variation; this is denoted with the use of brackets ([ ]) surrounding the subspecies name.

Species Accounts

Family Accipitridae

Aviceda jerdoni [*magnirostris*] Jerdon's Baza

This species was observed once. An adult was noted on 14 March 1988 at 1550 m soaring over the forest. According to duPont (1971) this subspecies is endemic to the islands of Mindanao, Palawan, and Samar, and although not previously recorded on Luzon, it is presumably the form occurring there.

**Pernis celebensis steerei* Barred Honey Buzzard

The single record of this species on Mt. Isarog is one Rabor collected on 19 April 1961 between 610 and 760 m.

MEASUREMENTS—Immature female (1)—wing 385, tail 265, exposed culmen 32.8, weight 588.

**Pernis apivorus philippensis* Crested Honey Buzzard

An adult male collected on 20 April 1961 between 450 and 610 m is the only known record for the mountain. duPont (1971) did not list this species as occurring on Luzon. Stresemann and Amadon (1979) include Luzon in its distribution, but the basis for this was not stated.

MEASUREMENTS—Male (1)—wing 414, tail 283, exposed culmen 39.7, weight 1,004.

**Haliastur indus intermedius* Brahminy Kite

The single record of this species on Mt. Isarog is an immature bird obtained by Rabor on 19 April 1961 between 450 and 610 m. The bird was molting the wing and tail feathers.

**Spilornis holospilus* Philippine Serpent Eagle

We occasionally observed pairs of Philippine Serpent Eagles between 450 and 900 m soaring over partially cleared areas and remaining patches of forest. We did not note it at higher elevations. Rabor collected four adults between 200 and 760 m.

MEASUREMENTS—Wing—male (3) 357, 363, 368, female (1) 369; tail—male (3) 232, 237, 241, female (1) 225; exposed culmen—male (3) 32.9, 35.3, 35.6, female (1) 35.8; weight—male (3) 656, 688, 858.

**Accipiter gularis gularis* Japanese Sparrowhawk

An adult male (based on size, wing 172 and tail 111) was taken at approximately 380 m on 24 March 1961. This species is a winter visitor to the Philippines (duPont, 1971).

WEIGHT—Male (1) 123.

**Accipiter virgatus confusus* Besra

We have three records of this species on the mountain. On 18 March 1988 an immature bird was netted in primary forest at 1550 m, on 25 March 1988 an adult was captured in a heavily disturbed area at 450 m, and on 24 April 1961 an adult was taken at approximately 260 m. The 25 March bird was caught while chasing a pair of *Pachycephala philippinensis*; the raptor had insect and beetle remains in its stomach. The gizzard of the immature bird was empty.

MEASUREMENTS—Wing—male (2) 150, 166, immature male (1) 159; tail—male (2) 109, 114, immature male (1) 120; exposed culmen—male (2) 16.5, 16.6, immature male (1) 16.0; weight—male (2) 94, 97, immature male (1) 120.

**Accipiter soloensis* Chinese Goshawk

There are two records for Mt. Isarog of this migrant from the Asian mainland. On 23 March 1961 an immature bird and an adult female were collected at approximately 260 m.

WEIGHT—Female (1) 159, immature female (1) 160.

**Butastur indicus* Grey-faced Buzzard

A Grey-faced Buzzard was collected by Rabor on 23 April 1961 at about 680 m. This is the only known record for Mt. Isarog of this migrant from the Asian mainland.

WEIGHT—Immature female (1) 418.

**Hieraaetus kienerii formosus* Rufous-bellied Eagle

Records of this species include an adult male taken on 29 March 1961 at 610 m and an immature bird the following day at about 680 m.

MEASUREMENTS—Wing—male (1) 346, immature unsexed (1) 368; tail—male (1) 182, immature unsexed (1) 195; exposed culmen—male (1) 33.9, immature unsexed (1) 32.7; weight—male (1) 733, immature unsexed (1) 932.

Family Falconidae

**Microhierax erythrogenys erythrogenys* Philippine Falconet

We found this species only in the vicinity of 900 m, where adults were netted on 9 and 10 March. On 11 March an immature bird was noted in a partially cleared area hawking insects from a tree perch about 15 m above the ground. Rabor collector six adults between 450 and 760 m.

MEASUREMENTS—Wing—male (5) 107.0 ± 1.26,

106–109, female (3) 109, 113, 116; tail—male (5) 58.8 ± 2.93, 55–63, female (3) 64, 64, 67; exposed culmen—male (5) 11.9 ± 0.11, 11.7–12.1, female (3) 12.3, 12.5, 12.5; weight—male (5) 42.3 ± 2.27, 38.0–44.0, female (2) 55.8, 61.5.

Family Phasianidae

Gallus gallus [*gallus*] Red Junglefowl

Recorded only once. The distinctive call of this species was heard at dusk from a tract of primary forest above the 900 m camp. The nearest known human habitation with domestic chickens was about 400 m below in elevation and ½ km distant from this site. Other records of this species in southeastern Luzon include a female (FMNH CC 23359) "with several young chicks" taken between 100 and 300 m at Tugas, Matnog, Sorsogon Province, on 19 May 1961 and two females (FMNH CC 23358, 23360) obtained between 760 and 910 m at Mt. Bulusan, Sorsogon Province, in mid-May 1961.

Family Rallidae

**Amaurornis olivaceus olivaceus* Plain Swamphen (Bush-hen)

An adult male and female were taken by Rabor on 20 April 1961 between 450 and 610 m. These are the only known records for the mountain.

Family Scolopacidae

**Actitis hypoleucos* Common Sandpiper

The only record for Mt. Isarog of this winter visitor to the Philippines is one taken on 24 April 1961 at about 250 m.

WEIGHT—Female (1) 58.4.

Family Columbidae

**Treron pompadora axillaris* Pompadour Green Pigeon

The only record of this species from Mt. Isarog is a female collected by Rabor on 25 March 1961 between 450 and 610 m. The bird had an enlarged ovary.

MEASUREMENTS—Female (1)—wing 159, tail 86, exposed culmen 18.7, weight 219.

**Phapitreron leucotis leucotis* White-eared Brown Dove

This species was widely distributed up the slopes of Mt. Isarog. It was distinctly more common between 450 and 1125 m than in the vicinity of 1350 m, and was not recorded above the latter zone. It seemed primarily confined to dipterocarp and lower montane forest. At 900 m it was sympatric with *P. amethystina.*

One female collected on 26 March 1988 at 450 m had ovarian follicles measuring up to 5 mm; towards the end of the month White-eared Brown Doves were heard singing, and this species may have been about to commence breeding. All of the five birds obtained by Rabor in the first half of April 1961 were in or approaching breeding condition. Specimens we took at 450 m and 900 m had fig seeds in their stomachs. On several occasions this species was noted near the 1350 m camp feeding on *Lithocarpus* acorns.

MEASUREMENTS—Wing—male (2) 135, 141, female (4) 129.5 ± 1.50, 127–131; tail—male (2) 83, 89, female (4) 82.0 ± 3.16, 78–86; exposed culmen—male (2) 14.4, 15.6, female (3) 14.4, 15.2, 15.9; weight—male (2) 120, 144, female (4) 146.8 ± 27.7, 106–184.

**Phapitreron amethystina amethystina* Amethyst Brown Dove

We found the Amethyst Brown Dove only in the vicinity of the 900 m camp, where it was uncommon. This species appears to be restricted to undisturbed areas of lowland forest on Mt. Isarog. Rabor collected 10 specimens between 450 and 1060 m, including several adults in breeding condition between late March and mid-April and three fledglings in the first half of April.

MEASUREMENTS—Wing—male (1) 151, female (5) 145.8 ± 3.76, 141–151; tail—male (1) 93, female (4) 88.8 ± 5.26, 80–94; exposed culmen—male (1) 23.5, female (5) 22.8 ± 0.48, 21.9–23.2; weight—male (1) 149, female (5) 141.8 ± 8.74, 130–155.

**Ptilinopus occipitalis* Yellow-breasted Fruit Dove

We did not record this species on Mt. Isarog. Rabor collected 13 specimens in late March and

April 1961 between 300 and 1060 m; several were in or approaching breeding condition.

MEASUREMENTS—Wing—male (8) 161.9 ± 3.37, 157–167, female (5) 156.4 ± 3.07, 153–161; tail—male (6) 102.0 ± 3.37, 98–107, female (5) 97.7 ± 3.20, 94–103; exposed culmen—male (8) 16.1 ± 0.35, 15.4–16.5, female (4) 15.58 ± 0.49, 15.0–16.3; weight—male (7) 244.3 ± 15.38, 224–271, female (5) 234.8 ± 9.28, 225–252.

**Ptilinopus leclancheri leclancheri* Black-chinned Fruit Dove

The only known records of this species from Mt. Isarog are a male collected between 450 and 610 m on 29 April 1961 and a female at 700 m on 3 April 1961.

Ducula aenea [*aenea*] Green Imperial Pigeon

We noted this species on several occasions at 450 m and 1125 m. A flock of three was observed at the latter altitude feeding on acorns.

**Ducula poliocephala poliocephala* Pink-bellied Imperial Pigeon

We observed this species once in the forest at 900 m and twice in the primary forest at 1350 m. Rabor collected one adult female (with an enlarged ovary) on 6 April 1961 at 610 m.

MEASUREMENTS—Female (1)—wing 227, tail 147, exposed culmen 19.7, weight 622.

**Columba vitiensis griseogularis* Metallic Wood Pigeon

We observed the Metallic Wood Pigeon once at 900 m and twice at 1350 m, among the lower branches of forest trees. Two adult males were collected by Rabor in the first half of April 1961 at approximately 1140 and 1670 m, one of which had slightly enlarged gonads.

MEASUREMENTS—Male (2)—wing 245, 246; tail 149, 155; exposed culmen 21.7, 22.1; weight 508.

**Macropygia phasianella tenuirostris* Slender-billed (Brown) Cuckoo Dove

This species was sparsely distributed along our transect survey of Mt. Isarog. We recorded it in each transect zone, except at 1350 m. It appeared to be less common at lower altitudes, particularly in disturbed and replanted tracts of forest. This may have in part been related to relatively heavy hunting pressure on doves and pigeons by *kaingineros* living on the lower slopes of the mountain. This species' distinctive call could occasionally be heard at the higher altitudes, generally at dusk and dawn. A specimen taken on 30 March 1988 at 450 m had slightly enlarged ovarian follicles and another on 31 March 1961 at approximately 840 m had a shelled egg in the oviduct.

MEASUREMENTS—Wing—male (3) 183, 185, 186, female (3) 178, 180, 180; tail—male (3) 176, 177, 188, female (3) 173, 175, 180; exposed culmen—male (3) 15.6, 15.9, 16.1, female (2) 14.7, 15.3; weight—male (3) 157, 183, 191, female (2) 191 (with egg), 177.

Chalcophaps indica [*indica*] Emerald Dove

We have a single observation of this species in late March 1988 at 450 m.

**Gallicolumba luzonica luzonica* Luzon Bleeding-heart Pigeon

We observed a Luzon Bleeding-heart Pigeon at 450 m and Rabor collected an adult female at approximately 700 m.

MEASUREMENTS—Female (1)—wing 143, tail 90, exposed culmen 16.2, weight 133.

Family Psittacidae

Cacatua haematuropygia Philippine (Red-vented) Cockatoo

A group of two or three was observed at about 1100 m flying over the forest. The distinctive white plumage, parrot-like flight, and harsh cry were diagnostic. One of our Bicolano guides mentioned that this species was occasionally observed on Mt. Isarog.

**Bolbopsittacus lunulatus lunulatus* Guaiabero

Guaiabero were noted a few times at about 450 m. They were seen singly or in groups of up to three in partially cleared forest or at the edge of

fields. Rabor collected six specimens between 450 and 760 m. The only record above this zone is one netted in 1988 at 900 m in a disturbed area. A bird taken on 9 March 1988 at 450 m had a slightly thickened oviduct and egg follicles measuring up to 5 mm. The stomachs of two birds obtained at 450 m contained fig seeds and fruits.

MEASUREMENTS—Wing—male (7) 100.3 ± 1.01, 98–103, female (2) 103, 103; tail—male (7) 36.1 ± 1.81, 34–40, female (1) 35; exposed culmen—male (6) 18.5 ± 1.03, 17.2–20.0, female (1) 20.1; weight—male (7) 66.6 ± 6.32, 60–80, female (3) 61, 72, 77.

**Loriculus philippensis philippensis* Philippine Hanging Parakeet (Colasisi)

We noted this species a few times in the vicinity of 450 m, where it was uncommon. Rabor obtained one between 450 and 760 m on 25 April 1961.

MEASUREMENTS—Immature male (1)—wing 97, tail 42, exposed culmen 15.6.

Family Cuculidae

**Cuculus fugax pectoralis* Hodgson's Hawk Cuckoo

We recorded this species twice on Mt. Isarog: single adults were netted at 450 m and 1125 m.

**Cuculus micropterus micropterus* Indian Cuckoo

Two adults were taken by Rabor: a male on 14 April 1961 at approximately 530 m and a female the following day at about 840 m. duPont (1971) considered this species a straggler in the Philippines to Mindoro and Negros. In addition to the Mt. Isarog specimens, other Luzon records include a male taken on 15 April 1960 in Cagayan Province (FMNH 258836), and one netted in 1967 and two in 1970 at Dalton Pass, Nueva Vizcaya Province (McClure & Leelavit, 1972).

**Cuculus saturatus horsfieldi* Oriental Cuckoo

Four specimens of this migrant from the Asian mainland were taken by Rabor on Mt. Isarog in 1961. On the basis of wing measurements (Medway & Wells, 1976) two males obtained at about 610 m on 5 and 17 April are referable to *C. s. horsfieldi* (wing 216 and 212, respectively); a female obtained on 7 April between 1060 and 1220 m (wing 195) and a male on 15 April between 450 and 610 m (wing 186) cannot be confidently identified to subspecies.

WEIGHT—Male (2) 73, 103; female (1) 81.

**Cacomantis variolosus sepulcralis* Brush Cuckoo

We found the Brush Cuckoo to be common between 450 and 1125 m, uncommon at 1350 m, and rare at 1550 m. Rabor collected 11 specimens between about 610 and 1220 m. Throughout March 1988 this species was regularly heard vocalizing in the early morning hours from tree perches in the forest and at the edge of clearings. Specimens taken in late March and early April had enlarged gonads, including a female on 1 April 1961 with a "ripe egg." Two immature females were obtained on 11 and 18 April 1961. Stomach contents of several individuals contained insect remains. We found no evidence for the occurrence of *Cacomantis merulinus* on Mt. Isarog.

MEASUREMENTS—Wing—male (7) 115.7 ± 0.70, 115–117, female (2) 114, 115; tail—male (7) 120.0 ± 5.07, 113–130, female (1) 115; exposed culmen—male (7) 16.8 ± 0.49, 16.0–17.7, female (2) 15.8, 16.9; weight—male (7) 32.0 ± 1.51, 30–34, female (2) 30, 33.

**Chrysococcyx xanthorhynchus amethystinus* Violet Cuckoo

The only record of this species for Mt. Isarog is an adult female taken on 4 April 1961 at 760 m containing a "ripe egg."

MEASUREMENTS—Female (1)—wing 105, tail 65, exposed culmen 15.7, weight 21.2.

**Surniculus lugubris chalybaeus* Drongo Cuckoo

We recorded this species once on Mt. Isarog. A single bird was observed and heard calling at sunrise on 2 March 1988 at 450 m. Rabor collected three adult specimens in 1961 between 610 and 680 m.

MEASUREMENTS—Wing—male (2) 128, 133, female (1) 124; tail—male (2) 105, 99, female (1)

103; exposed culmen—male (2) 19.3, 19.9, female (1) 19.6; weight—male (2) 33, 35, female (1) 36.

**Eudynamys scolopacea mindanensis* Common Koel

There are three records from the area. One was heard calling near the 1550 m camp during the night of 12–13 March and one was observed at 1125 m on 21 March 1988. Rabor collected a female with an enlarged ovary on 26 April 1961 at approximately 380 m.

MEASUREMENTS—Female (1)—wing 203, tail 186, exposed culmen 30.6, weight 223.

**Phaenicophaeus superciliosus superciliosus* Red-crested Malkoha

We found this species only in the vicinity of 450 m where it was uncommon and locally sympatric with *Phaenicophaeus cumingi*. Rabor collected 21 Red-crested Malkohas between approximately 300 and 760 m; these included fledglings and nestlings in the first half of April and adult females in breeding condition in the second half of April. A female taken on 24 March was just molting from subadult to adult plumage.

MEASUREMENTS—Wing—male (6) 161.2 ± 5.05, 155–170, female (10) 158.3 ± 2.65, 153–163; tail—male (6) 211.8 ± 2.91, 208–215, female (10) 212.4 ± 11.44, 191–224; exposed culmen—male (5) 34.5 ± 0.95, 33.1–35.6, female (10) 33.8 ± 0.99, 32.3–35.1; weight—male (5) 121.6 ± 4.27, 118–130, female (8) 123.4 ± 10.31, 105–138.

**Phaenicophaeus cumingi* Scale-feathered Malkoha

We noted this species with some regularity and heard it vocalizing in patches of undisturbed forest and replanted areas from 450 to 900 m. One bird was caught in a mammal snap-trap placed on the ground. Rabor collected 23 specimens between 300 and 760 m.

A female taken on 8 March 1988 had enlarged ovarian follicles. The stomach of one bird obtained at about 650 m contained seven caterpillars, measuring up to 100 mm. Another one from 900 m had numerous insect parts and two caterpillars, the largest about 110 mm in length.

MEASUREMENTS—Wing—male (9) 163.2 ± 6.92, 155–177, female (13) 162.9 ± 4.27, 155–171; tail—male (9) 215.7 ± 6.36, 205–227, female (13) 212.8 ± 8.31, 195–227; exposed culmen—male (9) 36.0 ± 1.54, 34.3–39.8, female (13) 34.8 ± 1.29, 32.9–36.6; weight—male (9) 179.8 ± 13.03, 160–204, female (13) 169.2 ± 21.7, 121–207.

**Centropus viridis viridis* Philippine Coucal

We found this species only in the vicinity of 450 m, where it was uncommon. Rabor collected seven specimens between late March and late April 1961 between approximately 300 and 700 m, including several adults (in or approaching breeding condition) and two nestlings. An adult male collected on 28 March 1988 had enlarged testes. The stomachs of two specimens contained insects.

MEASUREMENTS—Wing—male (4) 153.5 ± 4.39, 150–161, female (3) 170, 172, 176; tail—male (4) 222.3 ± 9.60, 212–238, female (3) 227, 228, 253; exposed culmen—male (4) 27.2 ± 0.56, 26.4–27.9, female (2) 27.8, 30.0; weight—male (3) 124, 126, 140, female (3) 152, 153, 157.

**Centropus unirufus* Rufous Coucal

There are two records of this species. In early April 1961 Rabor collected an adult female and an adult male between 550 and 760 m. The male had enlarged testes.

MEASUREMENTS—Wing—male (1) 161, female (1) 164; tail—male (1) 222, female (1) 210; exposed culmen—male (1) 34.9, female (1) 38.3; weight—male (1) 146, female (1) 215.

Family Strigidae

**Otus longicornis* Luzon Scops Owl

This species was found from 450 m to the upper reaches of the mountain. It was noted calling during the night a few times at the 1125 m camp. Near the 1350 and 1550 m camps it was generally heard every night. One bird was captured in a mammal snap-trap placed on the ground. Adult specimens collected in the second half of March 1988 were in various reproductive states, from having small to greatly enlarged gonads. The stomachs from several birds contained insects, including Coleoptera and Orthoptera. We follow Mar-

shall (1978) in considering this bird specifically distinct from *Otus scops*.

MEASUREMENTS—Wing—male (4) 144.8 ± 2.49, 141–147, female (1) 148; tail—male (4) 67.3 ± 1.79, 65–70, female (1) 69; exposed culmen—male (3) 16.5, 17.2, 17.8, female (1) 16.7; weight—male (8) 72.3 ± 3.53, 69–78, female (1) 95.

**Otus megalotis* Philippine Scops Owl

The Philippine Scops Owl was found to be widely distributed on the slopes of Mt. Isarog. It was regularly heard calling at night at 450 and 900 m, was rare from 1125 to 1550 m, and appeared to be absent at 1750 m. Several males taken in the first half of March 1988 were in or approaching breeding condition. We follow Marshall (1978) in considering this owl specifically distinct from *Otus bakkamoena*. The Mt. Isarog specimens all have heavy tarsi, feathered down to the proximal portion of the toes.

MEASUREMENTS—Male (3) wing—168, 173, 173; tail—75, 78, 81; exposed culmen—22.0, 22.5, 23.9; weight—159, 165, 182.

**Ninox philippensis philippensis* Philippine (Boobook) Hawk Owl

This species was common at 450 m and 900 m; birds were regularly heard calling or captured in mist nets at night. It was uncommon at 1125 m and not recorded above this altitude. Several birds collected in March 1988 were in or approaching breeding condition. Insects, mostly beetles, were found in the stomachs of specimens.

MEASUREMENTS—Wing—male (10) 171.6 ± 5.30, 163–179; tail—male (10) 79.6 ± 4.48, 72–86; exposed culmen—male (7) 19.0 ± 0.98, 17.4–19.9; weight—male (11) 115.7 ± 8.1, 110–135, female (1) 141.

**Ninox scutulata randi* Brown (Boobook) Hawk Owl

The only records we have for Mt. Isarog are two adult females taken by Rabor in April 1961 between 450 and 610 m.

MEASUREMENTS—Female (2)—wing 217, 221; tail 117, 117; weight 195, 205.

Family Podargidae

**Batrachostomus septimus microrhynchus* Philippine Frogmouth

Rabor collected a male Philippine Frogmouth at approximately 530 m. duPont (1971) noted that this species' distribution on Luzon was restricted to the northern portion of the island, where the endemic form *B. s. microrhynchus* occurred. The Mt. Isarog specimen matches birds from northern Luzon in plumage coloration and size. A female taken at Mt. Bulusan, San Roque, Sorsogon Province, southeastern Luzon (FMNH 265627), is the palest in plumage coloration of any Philippine *B. septimus* in the FMNH collection and has a short wing (128 mm).

MEASUREMENTS—Male (1)—wing 137, weight 69.

Family Caprimulgidae

**Eurostopodus macrotis macrotis* Great Eared Nightjar

This species was regularly seen at dusk near 450 m taking to the air and foraging for insects. The stomach of the single specimen was empty except for a few beetle parts.

Family Apodidae

Collocalia cf. *vanikorensis* Island Swiftlet

Flocks of aerial-foraging swiftlets were observed on Mt. Isarog from 450 m to the summit. On the basis of size and plumage coloration some of the swiftlets were tentatively identified as *C. vanikorensis* (*sensu* Dickinson, 1989); however, no specimens of this species have been collected on Mt. Isarog. Swiftlets comparable to *C. vanikorensis* were distinctly less common at 1550 m and 1750 m than at lower altitudes. Above 1550 m they were generally noted towards the latter portion of the afternoon, particularly on cloudy and rainy days, and on occasion in mixed flocks with at least *Collocalia esculenta*.

**Collocalia esculenta marginata* Glossy (White-bellied) Swiftlet

Flocks of Glossy Swiftlets were commonly noted flying above the slopes of the mountain. At lower elevations they regularly flew among Island Swiftlets, but above 1550 m the two species appeared segregated. The rump feathers of the single

Mt. Isarog specimen are distinctly edged with white, characteristic of *C. e. marginata* (duPont, 1971).

MEASUREMENTS—Male (1)—wing 103, tail 43, weight 7.0.

Family Trogonidae

**Harpactes ardens luzoniensis* Philippine Trogon

A single bird was noted in early March 1988 at 900 m near the transition zone between dipterocarp and lower montane forest. In 1961, Rabor collected 11 specimens between about 450 and 1060 m. These include females on 30 March and 20 April with enlarged ovaries, and a male on 29 March molting from subadult to adult plumage.

MEASUREMENTS—Wing—male (2) 134, 140, female (8) 140.4 ± 3.67, 134–145; tail—male (2) 150, 161, female (8) 155.9 ± 6.94, 150–169; exposed culmen—male (2) 18.2, 19.0, female (6) 19.5 ± 0.67, 18.6–20.7; weight—male (2) 80, 87, female (8) 85.8 ± 4.44, 80–92.

Family Alcedinidae

**Alcedo cyanopectus cyanopectus* Dwarf River Kingfisher

We recorded this species once; a female was collected on 26 March 1988 along a river at about 450 m. The specimen's stomach contained insect remains.

MEASUREMENTS—Female (1)—wing 62, tail 24, exposed culmen 35.1, weight 21.5.

**Ceyx melanurus melanurus* Philippine Forest (Jungle) Kingfisher

The only record for the area is a female (with an enlarged ovary) taken by Rabor on 5 April 1961 at about 610 m.

MEASUREMENTS—Female (1)—wing 57, tail 18, exposed culmen 32.7, weight 22.

**Halcyon chloris chloris* Collared Kingfisher

A female collected by Rabor on 21 April 1961 between 450 and 610 m is the only known record for the mountain.

**Halcyon smyrnensis gularis* White-throated Kingfisher

We observed the White-throated Kingfisher several times at 450 m, generally near streams or rivers. Rabor took an adult female, with an enlarged ovary, on 3 April 1961 between 300 and 450 m.

**Halcyon lindsayi lindsayi* Spotted Wood Kingfisher

The Spotted Wood Kingfisher was encountered every day in the 450 to 900 m zone and on two days at 1350 m. At 900 m this species' characteristic rattle-like call was heard each morning before sunrise and on several occasions birds were captured in mist nets during the predawn hours. Rabor collected nine specimens between 450 and 610 m. A female taken on 25 March 1988 had a shelled egg in the oviduct and other ova measuring 35 × 26 and 16 × 16 mm, and another bird obtained on 20 April 1961 had an enlarged ovary. The stomach contents of collected birds consisted of insects, including larvae and beetles.

MEASUREMENTS—Wing—male (10) 113.3 ± 4.47, 108–124, female (5) 112.4 ± 2.06, 109–115; tail—male (10) 84.7 ± 1.90, 82–88, female (5) 85.0 ± 2.61, 81–89; exposed culmen—male (8) 40.78 ± 1.85, 37.5–44.3, female (5) 41.56 ± 1.35, 40.0–43.7; weight—male (10) 83.7 ± 6.76, 72–96; female (3) 95, 96, 117.

Family Coraciidae

**Eurystomus orientalis cyanocollis* Dollarbird

The only record of the Dollarbird on Mt. Isarog is a male collected by Rabor on 4 April 1961 at about 610 m.

MEASUREMENTS—Male (1)—wing 185, tail 101, exposed culmen 27.5, weight 129.

Family Bucerotidae

**Penelopides panini manilloe* Tarictic Hornbill

This species was uncommon at 450 and 900 m. It was often observed in pairs, moving along stream channels, river beds, or at the edge of the forest. One was collected from a tree standing in grass-

land. Ten specimens were taken by Rabor in 1961 between 300 and 760 m. Several individuals obtained in late March 1988 and early April 1961 were in breeding condition, including a female on 6 April with a "ripe egg." Birds collected at 450 m had *Ficus* fruit and seeds in their stomachs.

MEASUREMENTS—Wing—male (11) 235.5 ± 4.79, 224–241, female (2) 224, 229; tail—male (11) 193.3 ± 5.78, 181–202, female (2) 184, 186; exposed culmen—male (11) 92.7 ± 3.64, 88.1–99.5, female (2) 78.9, 80.9; weight—male (9) 450.2 ± 26.6, 400–479, female (2) 470, 475.

**Buceros hydrocorax hydrocorax* Rufous Hornbill

An adult male obtained by Rabor on 20 April 1961 between 610 and 760 m is the only known record of this species on Mt. Isarog.

MEASUREMENTS—Male (1)—wing 420, tail 314, weight 1,824.

Family Capitonidae

**Megalaima haemacephala haemacephala* Crimson-breasted (Coppersmith) Barbet

This species was uncommon at 450 m in disturbed areas and secondary forest. We did not record it above this zone. Rabor collected two specimens, one of which had slightly enlarged testes, on 8 and 9 April 1961 between 300 and 610 m.

Family Picidae

**Mulleripicus funebris funebris* Sooty Woodpecker

We found the Sooty Woodpecker to be uncommon in the vicinity of 450 m. In 1961 Rabor recorded it between 300 and 600 m and collected four birds, including a female on 23 March with an enlarged ovary.

MEASUREMENTS—Wing—male (3) 160, 160, 164, female (1) 152; tail—male (3) 125, 131, 137, female (1) 125; exposed culmen—male (3) 35.5, 36.7, 37.4, female (1) 36.5; weight—male (3) 164, 164, 170, female (1) 161.

**Dryocopus javensis confusus* White-bellied Woodpecker

We recorded this species once on Mt. Isarog. An adult was observed at 450 m in a section of relatively undisturbed forest near the Yabo Falls. Two adults were collected by Rabor on 18 April 1961 between 450 and 610 m.

MEASUREMENTS—Wing—male (1) 205, female (1) 208; tail—male (1) 151, female (1) 150; exposed culmen—male (1) 51.5, female (1) 50.2; weight—male (1) 250, female (1) 243.

**Dendrocopos maculatus validirostris* Philippine Pygmy Woodpecker

This species was observed each day we were camped at 450, 900, and 1125 m, in both primary and secondary forests. It was uncommon at 1350 m and not recorded above this altitude. A male taken by Rabor between 910 and 1060 m on 29 March 1961 had enlarged testes.

MEASUREMENTS—Wing—male (2) 84, 88, female (2) 82, 86; tail—male (2) 37, 37, female (2) 36, 40; exposed culmen—male (2) 17.9, 18.3, female (2) 18.4, 19.0; weight—male (2) 24, 25, female (1) 25.

**Chrysocolaptes lucidus haematribon* Greater (Flameback) Goldenback

We found this species to be uncommon in both primary and secondary forest at 900 and 1125 m, and rare at 450 m. On 23 March 1988, three adults were observed calling and moving about the forest just above our 1125 m camp. The following morning one was found nearby excavating a hole in a dead tree about 15 m above the ground. Rabor collected 16 Greater Goldenbacks in 1961 between 210 and 1060 m, including a male on 1 April with enlarged testes.

MEASUREMENTS—Wing—male (8) 144.0 ± 3.16, 139–150, female (8) 142.3 ± 4.63, 135–148; tail—male (8) 82.9 ± 3.79, 76–89, female (8) 79.6 ± 3.64, 75–86; exposed culmen—male (8) 39.03 ± 1.88, 36.4–42.4, female (8) 34.8 ± 1.44, 32.6–36.4; weight—male (8) 130.9 ± 8.01, 123–145, female (7) 126.4 ± 9.60, 110–143.

Family Pittidae

**Pitta erythrogaster erythrogaster* Red-breasted Pitta

The only record of this species for Mt. Isarog is an adult female collected by Rabor on 5 April 1961 at about 610 m.

MEASUREMENTS—Female (1)—wing 100, tail 33, exposed culmen 20.5, weight 66.

Pitta kochi Koch's (Whiskered) Pitta

Koch's Pitta was observed once on Mt. Isarog. On 19 March 1988 a single bird was watched for about three minutes foraging on the ground at a distance of up to 5 m. The salient plumage characteristics of the Koch's Pitta were clearly discernable. According to duPont (1971), this species is restricted to northern Luzon; however, single birds were captured in 1967 at Dalton Pass, Nueva Vizcaya Province, and in 1964 at Balian, Laguna Province (McClure & Leelavit, 1972).

Family Campephagidae

**Coracina striata striata* Bar-bellied Cuckoo-shrike

Three specimens of the Bar-bellied Cuckoo-shrike were collected by Rabor in 1961 between 450 and 610 m. One of the birds was an immature.

**Coracina coerulescens coerulescens* Black Cuckoo-shrike

Seventeen Black Cuckoo-shrikes were taken by Rabor in 1961 between 300 and 760 m. These included adults in late March and early April with enlarged gonads. The 1988 expedition did not record either *Coracina* species.

MEASUREMENTS—Wing—male (9) 136.2 ± 4.89, 128–143, female (6) 130.8 ± 6.87, 127–146; tail—male (10) 111.5 ± 3.23, 105–117, female (7) 106.3 ± 2.91, 103–111; exposed culmen—male (9) 22.2 ± 0.75, 21.3–23.6, female (7) 21.4 ± 0.47, 20.5–22.0; weight—male (8) 65.5 ± 3.04, 61–70, female (7) 60.3 ± 4.62, 53–69.

**Lalage melanoleuca melanoleuca* Black and White Triller

An adult female with an enlarged ovary and an immature bird were collected by Rabor on 23 March 1961 between 450 and 610 m.

**Lalage nigra chilensis* Pied Triller

We found the Pied Triller to be uncommon at 450, 900, and 1550 m. It is not clear if this species' altitudinal distribution on Mt. Isarog is continuous. In all cases it was observed in clearings, both natural and man-made. Rabor collected three adult specimens—two at 150 m and one between 450 and 610 m.

MEASUREMENTS—Male—wing (2) 93, 94; tail (3) all in molt; exposed culmen (3) 13.8, 14.2, 14.4; weight (2) 26.5, 27.6.

**Pericrocotus divaricatus divaricatus* Ashy Minivet

The only known records on Mt. Isarog for this migrant from the Asian mainland are a pair of adult males taken by Rabor on 3 April 1961 at 610 m.

**Pericrocotus flammeus novus* Scarlet Minivet

Specimens from Mt. Isarog include an adult male with enlarged testes taken on 24 March 1961 between 300 and 450 m and another adult male with slightly enlarged testes obtained on 1 April 1961 between 610 and 760 m.

MEASUREMENTS—Male (2)—wing 78, 85; tail 80, 86; exposed culmen 12.3, 12.4; weight 16.5, 18.0.

Family Paridae

**Parus elegans elegans* Elegant Tit

Single birds or groups of up to three were seen daily in areas between 450 and 900 m. They were often observed in tracts of undisturbed forest, and occasionally in areas with secondary and replanted forest. This species was uncommon at 1125 m and not recorded higher on the mountain. Fifteen specimens were collected by Rabor in 1961, 12 of these were taken below 900 m and 3 at about 1140 m. The majority of the Rabor birds had enlarged gonads. One fledgling was found at about 610 m on 6 April 1961. The stomachs of collected birds invariably contained parts of small insects.

A *Parus elegans* was noted on 4 March 1988 at 900 m in a mixed species foraging flock with *Sitta frontalis* and *Rhabdornis mystacalis*. The *Rhabdornis* moved at the front of the flock lifting up

bark and leaves, probing into crevices, and uprooting small epiphytes; the tit and nuthatch followed and gleaned small insects from spots visited by the *Rhabdornis*.

MEASUREMENTS—Wing—male (12) 65.5 ± 1.19, 64–68, female (6) 65.7 ± 2.29, 63–70; tail—male (12) 38.0 ± 1.15, 36–40, female (6) 37.3 ± 0.75, 36–38; exposed culmen—male (12) 10.1 ± 0.28, 9.8–10.6, female (5) 9.3 ± 0.65, 8.2–9.9; weight—male (12) 13.5 ± 1.31, 10.5–15.9, female (7) 12.2 ± 1.07, 11.4–13.4.

Family Sittidae

**Sitta frontalis isarog* Velvet-fronted Nuthatch

The Velvet-fronted Nuthatch was common in the vicinity of 900 m, and uncommon at 450 m and 1350 m. There are 13 specimens in the Rabor collection taken in 1961 between 450 and 1220 m. We found single birds or groups of up to four foraging together, occasionally in mixed species flocks, in both primary and secondary forest. Between 4 and 7 March 1988 we observed a pair gathering moss for nesting material and carrying it to a hole excavated in a dead snag about 7 m off the ground. Insects were the only food item found in the stomachs of specimens. The type locality of *S. f. isarog* is Mt. Isarog (Rand & Rabor, 1967).

On 17 March 1988 a mixed species foraging flock of single *Sitta frontalis, Rhipidura cyaniceps,* and *Pachycephala plateni* was observed at 1350 m. The nuthatch moved through the forest picking at and tearing open bark and small epiphytes, after which the flycatchers would sally forth and glean insects. (See under *Parus elegans* for another incident of *Sitta* involved in a mixed species foraging flock.)

MEASUREMENTS—Wing—male (6) 77.0 ± 1.15, 76–79, female (8) 76.6 ± 1.58, 76–80; tail—male (6) 39.3 ± 0.94, 38–41, female (8) 39.6 ± 1.80, 37–43; exposed culmen—male (6) 15.0 ± 0.65, 14.3–16.3, female (8) 14.4 ± 0.70, 13.5–15.4; weight—male (6) 16.8 ± 0.56, 16.0–17.4, female (8) 16.3 ± 0.73, 15.5–17.9.

Family Rhabdornithidae

**Rhabdornis mystacalis mystacalis* Stripe-headed Rhabdornis

We found the Stripe-headed Rhabdornis only in the zone between 450 and 900 m, where it was uncommon in primary and secondary forest. In 1961 Rabor collected 13 specimens between 300 and 910 m; 2 taken in late March had enlarged gonads. On 29 February 1988 a Stripe-headed Rhabdornis was observed entering an excavated hole in a tree, about 5 m above the ground, with food in its bill.

This species was noted on two occasions in mixed species foraging flocks. On 4 March 1988, one was observed moving through the forest at 900 m ripping up debris on trees, followed by three *Phylloscopus cebuensis*. (See under *Parus elegans* for a description of another mixed species foraging flock incident.)

MEASUREMENTS—Wing—male (9) 84.1 ± 1.20, 82–86, female (4) 82.5 ± 1.66, 81–85; tail—male (9) 47.4 ± 1.64, 44–50, female (4) 45.5 ± 0.50, 45–46; exposed culmen—male (9) 21.3 ± 0.98, 20.0–23.2, female (4) 20.5 ± 0.28, 20.0–20.7; weight—male (8) 27.8 ± 2.07, 23.5–30.9, female (4) 29.6 ± 0.71, 28.5–30.3.

Family Timaliidae

**Napothera rabori sorsogonensis* Luzon (Rabor's) Wren Babbler

This species was obtained twice on Mt. Isarog. One was captured in a mammal snap-trap placed on the ground in primary forest at 900 m and another at an unknown elevation. These specimens were compared to the type of *N. r. sorsogonensis* taken in the Sorsogon Province, southern Luzon, and they match the plumage characters that distinguish this form (Rand & Rabor, 1967; duPont, 1971). A third individual was noted above the 900 m camp foraging on the ground. The bird was watched for a few minutes as it flipped over leaf and wood debris while slowly walking across the forest floor. Although the bird was never actually observed swallowing food, it appeared to be eating invertebrates picked up from the ground.

MEASUREMENTS—Wing—male (1) 91, unsexed (1) 85; tail—male (1) 71, unsexed (1) in molt; bill from nostril—male (1) 14.2; exposed culmen—male (1) 21.1; weight—male (1) 65, unsexed (1) 57.

**Stachyris capitalis affinis* Rusty-crowned Tree Babbler

Five specimens were taken by Rabor on Mt. Isarog in 1961—four between 300 and 610 m and one at about 1140 m. Birds taken on 25 March and 19 April 1961 had enlarged gonads.

MEASUREMENTS—Wing—male (4) 70.5 ± 2.06, 67–72, female (1) 70; tail—male (4) 59.8 ± 2.27, 56–62, female (1) 60; exposed culmen—male (3) 14.5, 14.8, 15.4, female (1) 15.4; weight—male (4) 14.9 ± 0.90, 13.4–15.8, female (1) 15.6.

**Stachyris whiteheadi sorsogonensis* Whitehead's (Chestnut-faced) Tree Babbler

This species is one of the most common and widely distributed birds on the slopes of Mt. Isarog. Its abundance increased between 900 m and the summit. Single individuals or flocks of up to 15 birds were regularly heard calling and moving about in the forest above 1550 m. At the upper altitudes the netting success of this species was the highest of any bird (see p. 31). In the vicinity of 900 m it was uncommon and virtually all of the records from this elevation are of netted individuals.

On the basis of gonad size, the majority of specimens we obtained in March 1988 were not in reproductive condition, although a few, mostly males, had slightly enlarged gonads; perhaps this species was about to commence breeding. We observed some apparent courtship begging and feeding displays by adults. A substantial number of the birds obtained by Rabor in April 1961 had enlarged gonads, which would give credence to a late spring/summer breeding season. On several occasions this species was observed drinking water held in pitcher plants (*Nepenthes* sp.).

MEASUREMENTS—Wing—male (61) 69.6 ± 1.54, 65–74, female (68) 67.7 ± 1.40, 63–71; tail—male (60) 55.7 ± 1.24, 53–60, female (66) 54.6 ± 1.31, 50–58; exposed culmen—male (58) 15.21 ± 0.55, 14.0–16.1, female (65) 14.65 ± 0.58, 13.0–15.9; weight—male (32) 22.8 ± 1.96, 18.0–26.7, female (35) 21.0 ± 2.10, 17.0–26.2.

Family Pycnonotidae

**Pycnonotus urostictus urostictus* Wattled Bulbul

The Wattled Bulbul was apparently confined to areas near and below 900 m. Single birds were collected on 10 March 1988 at 900 m and 11 April 1961 at 450 m.

MEASUREMENTS—Male (2)—wing 81, 83; tail 70, 74; exposed culmen 13.2, 13.6; weight 24, 27.

**Pycnonotus goiavier goiavier* Yellow-vented Bulbul

We found this species to be common in areas with secondary growth at and below 450 m. Twenty-two specimens were taken in 1961 by Rabor, 20 from below 380 m, and single birds from about 530 and 700 m. On the basis of gonad size, specimens taken in late March and April were approaching breeding condition. Immature birds were collected on 24 March and 24 April 1961. We regularly noted small groups of Yellow-vented Bulbuls in fig trees feeding on ripening fruits, a food that on the basis of gizzard analysis (N = 12) made up the predominant portion of their diet. One stomach also contained insect parts.

MEASUREMENTS—Wing—male (10) 85.1 ± 1.76, 83–88, female (13) 82.7 ± 3.14, 80–87; tail—male (10) 78.0 ± 2.28, 75–81, female (13) 76.5 ± 1.94, 74–80; exposed culmen—male (9) 15.1 ± 0.45, 14.4–15.7, female (12) 14.8 ± 0.50, 14.0–15.4; weight—male (7) 29.3 ± 1.28, 27–31, female (11) 29.3 ± 1.21, 27–31.

**Hypsipetes philippinus philippinus* Philippine Bulbul

The Philippine Bulbul was one of the most common birds on Mt. Isarog in areas up to 900 m; neither Rabor nor our group found it any higher. Birds were generally observed in secondary forest or heavily disturbed areas. Specimens taken in both March 1961 and 1988 and April 1961 had enlarged gonads. A nestling was obtained on 24 March and a fledgling on 9 April 1961.

Near 450 m, groups of up to five birds were noted in *Ficus* trees feeding on ripening fruits, and fig seeds were common in most examined stomachs. This species' diet is largely frugivorous, although insects were found in gizzards of several birds.

MEASUREMENTS—Wing—male (17) 99.9 ± 2.04, 95–102, female (18) 95.0 ± 2.94, 89–100; tail—male (16) 86.0 ± 2.12, 82–90, female (18) 81.8 ± 2.85, 77–87; exposed culmen—male (17) 20.7 ± 0.78, 19.0–22.2, female (17) 19.6 ± 2.68, 19.4–

21.8; weight—male (19) 38.3 ± 2.66, 35–43, female (19) 36.9 ± 3.75, 31–48.

Family Irenidae

**Irena cyanogaster cyanogaster* Philippine Fairy Bluebird

The distinctive call of the Philippine Fairy Bluebird was heard daily, often as part of the dawn chorus, in the vicinity of our 900 and 1125 m camps. At 450 m and 1350 m (the highest point it was noted) this species was uncommon. Rabor collected 17 specimens on Mt. Isarog, all of which were from below 1060 m. Birds taken from late March through April were in or approaching breeding condition. The stomach of one specimen was empty and another contained a few insect parts.

MEASUREMENTS—Wing—male (8) 136.8 ± 3.46, 131–142, female (9) 133.9 ± 3.38, 128–138; tail—male (8) 104.6 ± 1.32, 103–107, female (9) 101.3 ± 2.26, 98–104; exposed culmen—male (7) 25.8 ± 1.09, 24.0–26.7, female (9) 26.2 ± 0.83, 24.6–27.0; weight—male (9) 79.6 ± 3.72, 75–87, female (9) 77.4 ± 6.16, 71–90.

Family Turdidae

**Brachypteryx montana andersoni* White-browed Shortwing

The White-browed Shortwing was a characteristic bird of areas with undisturbed forest. It was uncommon at 900 m, common from 1125 to 1350 m, and abundant from 1550 m to the summit. We did not record this species below 900 m. Rabor obtained 15 specimens on the mountain, all above 1000 m, with the exception of a single female collected at 610 m.

This species was regularly captured in snap-traps placed on the ground for small mammals. The trap success rate of *Brachypteryx* was highest on the upper portion of the mountain (table 1), which concurs with our estimates of altitudinal abundance based on sight records.

This species was regularly heard singing on our March 1988 trip during the predawn and dawn chorus. Males would vocalize from the forest floor or perches up to 1 m off the ground. Most adults taken in March 1961 and 1988 and April 1961 had enlarged gonads. Immatures were obtained on 17 and 21 April 1961. Food remains in the stomachs of collected birds consisted of small insect parts and occasionally land snails. The type locality of *B. m. andersoni* is Mt. Isarog (Rand & Rabor, 1967).

MEASUREMENTS—Wing—male (11) 66.9 ± 1.31, 65–70, female (12) 65.8 ± 2.27, 62–70; tail—male (11) 44.5 ± 0.89, 43–46, female (11) 43.5 ± 2.53, 38–48; exposed culmen—male (11) 12.9 ± 0.66, 11.7–14.0, female (11) 13.1 ± 0.51, 12.7–14.0; weight—male (15) 16.9 ± 1.89, 13.0–20.0, female (17) 18.5 ± 1.29, 16.0–21.0.

**Copsychus luzoniensis luzoniensis* White-browed Shama

Rabor collected two adult male White-browed Shama in mid-April 1961 between 450 and 610 m, one of which had slightly enlarged testes.

MEASUREMENTS—Male (2)—wing 77, 80; tail 75, 76; exposed culmen 14.6, 15.5; weight 22.8, 25.3.

**Monticola solitarius philippensis* Blue Rockthrush

Adult male specimens of the Blue Rockthrush collected on Mt. Isarog include one with enlarged gonads taken on 29 March 1961 between 1060 and 1125 m and another on 1 April 1961 between 610 and 760 m. This species is a migrant to the Philippines from the Asian mainland.

**Zoothera andromedae* Sunda Thrush

This species was recorded only once on Mt. Isarog. A male was netted on 14 March 1988 at 1500 m; it had enlarged gonads.

MEASUREMENTS—Male (1)—wing 125, tail 66, exposed culmen 23.5, weight 81.

**Zoothera dauma aurea* Scaly Thrush

The Scaly Thrush, a winter visitor to Luzon from the Asian mainland, was recorded on a few occasions at 450 m. Without exception it was noted foraging on the ground, generally in undisturbed areas of forest. One bird was taken in a mammal snap-trap placed on the forest floor.

*_Turdus poliocephalus mayonensis_ Island Thrush

The Island Thrush is one of the more widely distributed forest birds on Mt. Isarog. We found this species to be common at elevations at and above 1125 m. It was generally seen singly or in pairs. It was one of the common songsters of the predawn and early morning chorus.

The plumage coloration of Mt. Isarog birds is similar to specimens of *T. p. mayonensis* taken in the Albay Province of southern Luzon. This species was regularly seen foraging on the forest floor, and several birds were captured in mammal snap-traps. The gonads of several specimens collected in March 1988 and April 1961 were enlarged.

MEASUREMENTS—Wing—male (10) 124.3 ± 2.24, 121–128, female (3) 117, 121, 127; tail—male (10) 93.3 ± 2.15, 90–97, female (3) 88, 91, 96; exposed culmen—male (9) 19.8 ± 0.91, 18.5–21.0, female (3) 19.1, 19.3, 20.4; weight—male (6) 70.5 ± 4.72, 64–77, female (3) 69, 77, 78.

*_Turdus chrysolaus chrysolaus_ Brown-headed Thrush

Two Brown-headed Thrushes were netted on 9 March 1988 at 450 m. We did not otherwise observe this species on Mt. Isarog. It appears to be a rare winter visitor to the lower elevations.

WEIGHT—Unsexed (2) 57, 59.

*_Turdus obscurus_ Eye-browed Thrush

There are two records of this mainland Asian migrant on Mt. Isarog. On 7 March 1988 an adult was netted at 900 m and on 29 March 1961 another was taken between 910 and 1060 m.

WEIGHTS—Male (2) 65, 85.

Family Sylviidae

*_Cettia diphone canturians_ Japanese Bush Warbler

An adult female Japanese Bush Warbler taken on 7 April 1961 between 450 and 610 m is the only known record of this mainland Asian migrant from Mt. Isarog.

TABLE 1. Capture rate of *Brachypteryx montana* in mammal snap-traps.

Transect point (m)	Total *Brachypteryx* taken	Total trap-nights	% Trap success
900	1	777	0.13%
1125	2	455	0.44%
1350	3	945	0.32%
1550	8	848	0.94%
1750	13	759	1.71%

*_Megalurus palustris forbesi_ Striated Grassbird

This species was common in cleared and cultivated areas with grass thickets at and below 450 m. Rabor collected an adult female on 23 March 1961 between 150 and 300 m.

*_Megalurus timoriensis_ [*tweeddalei*] Tawny Grassbird

We found the Tawny Grassbird to be uncommon at about 450 m, where it was locally sympatric with *M. palustris*. Rabor did not collect this species on Mt. Isarog, but he obtained two at Mt. Bulusan, Sorsogon Province, southeastern Luzon, on 1 May 1961 between 610 and 760 m.

*_Cisticola exilis semirufa_ Bright-capped (Golden-headed) Cisticola

There is a single record of this species on Mt. Isarog. An adult male with enlarged testes was taken by Rabor on 31 March 1961 at about 790 m.

*_Phylloscopus trivirgatus nigrorum_ Mountain Leaf Warbler

The Mountain Leaf Warbler was common on Mt. Isarog between 1350 m and the summit. From 900 to 1125 m it was uncommon, and we did not record it lower. The exceptions are birds taken by Rabor on 2 April between 610 and 760 m and on 12 April 1961 between 760 and 910 m. It was generally observed singly or in groups of up to four individuals, which tended to forage in the upper portion of the canopy. Several birds taken in March 1988 and April 1961 had enlarged gonads. This bird was noted in a mixed species foraging flock (see under *Rhipidura cyaniceps*). There was essen-

tially no altitudinal overlap on the mountain between this species and *P. cebuensis* (table 2).

MEASUREMENTS—Wing—male (14) 55.8 ± 1.32, 53–58, female (11) 53.5 ± 1.67, 52–57; tail—male (14) 38.8 ± 1.08, 37–41, female (11) 37.1 ± 1.24, 35–38; exposed culmen—male (13) 9.6 ± 0.34, 9.0–10.5, female (9) 9.2 ± 0.48, 8.3–10.2; weight—male (7) 7.3 ± 0.97, 6.0–9.4, female (6) 7.5 ± 1.08, 6.0–8.9.

**Phylloscopus cebuensis sorsogonensis* Dubois' (Lemon-throated) Leaf Warbler

We found this species uncommon at 450 m and rare at 900 m. Rabor obtained 11 specimens: 3 between 300 and 450 m, 5 between 450 and 610 m, 1 between 610 and 760 m, and 2 between 910 and 1060 m. Virtually all of the specimens taken in late March and April had enlarged gonads. Our general impression was that this species forages at a lower vertical level in the forest than *P. trivirgatus.*

P. cebuensis was noted on two occasions in mixed species foraging flocks. (See the accounts of *Rhabdornis mystacalis* and *Prionochilus olivaceus.*)

MEASUREMENTS—Wing—male (9) 58.0 ± 1.89, 55–61, female (3) 52, 53, 54; tail—male (9) 45.2 ± 1.31, 43–47, female (2) 38, 43; exposed culmen—male (9) 11.1 ± 0.26, 10.5–11.2, female (2) 10.6, 10.6; weight—male (9) 9.00 ± 0.39, 8.4–9.6, female (3) 7.9, 8.8, 10.5.

**Phylloscopus borealis* cf. *borealis* Arctic Warbler

Five specimens of the Arctic Warbler, a winter visitor to the Philippines from Asia, were taken on Mt. Isarog. All the material was collected between early March and mid-April 1988 in lowland areas between 300 and 610 m. The plumage characters used to distinguish among the potential forms wintering on Luzon are not easily discernable and these specimens are tentatively assigned to nominate *borealis.*

WEIGHT—Male (2) 8.5, 9.2; female (2) 8.5, 8.8.

Orthotomus cucullatus [*philippinus*] Mountain Tailorbird

There is only one record of this species from the area. On 28 February 1988 a group of four was observed moving through a patch of secondary forest at about 870 m. According to Watson et al. (1986) this form is the only one known from Luzon and is restricted to the northern portion of the island. A Mountain Tailorbird was captured in 1967 at Balian, Laguna Province, central Luzon (McClure & Leelavit, 1972) and a male and female of this species were collected on 22 March 1926 at Lucban, Tayabas, central Luzon (Baud, 1978).

**Orthotomus derbianus* Grey-backed Tailorbird

We found the Grey-backed Tailorbird only in the vicinity of 450 m, where it was uncommon in grassy areas in and around secondary patches of forest. Rabor collected eight specimens between approximately 210 and 760 m, including a nestling on 25 March 1961. The stomachs of two birds contained small insects.

MEASUREMENTS—Wing—male (5) 53.0 ± 0.89, 52–54, female (5) 50.6 ± 2.87, 46–54; tail—male (3) 47, 52, 54, female (4) 45.8 ± 4.44, 40–51; exposed culmen—male (5) 15.8 ± 0.43, 15.2–16.3, female (5) 15.12 ± 0.89, 14.3–16.7; weight—male (5) 10.9 ± 1.32, 9.0–12.4, female (5) 10.5 ± 0.55, 10.0–11.5.

Family Muscicapidae

**Ficedula hyperythra luzoniensis* Snowy-browed Flycatcher

We found this species to be uncommon at 1125 and 1350 m and rare at 1550 m. One was captured at 1350 m in a mammal snap-trap placed on the ground. Rabor obtained males at 1060 m and between 760 and 910 m; one taken on 11 April 1961 had enlarged testes.

MEASUREMENTS—Wing—male (3) 61, 62, 62; tail—male (3) 43, 43, 46; exposed culmen—male (3) 9.5, 11.1, 11.1; weight—male (3) 8.5, 10.0, 10.5, female (2) 9.5, 9.6.

**Ficedula westermanni westermanni* Little Pied Flycatcher

The Little Pied Flycatcher was distinctly more common between 1550 and 1750 m than between 1125 and 1350 m. The only record of it below this latter zone is one collected by Rabor in 1961 at about 1050 m. Single individuals were noted for-

aging in the upper portion of the forest canopy. On the basis of gonad size, only one of the specimens collected was in or approaching breeding condition; the exception was a female taken on 30 March 1961 with an enlarged ovary. The stomachs of two birds contained small insects.

MEASUREMENTS—Wing—male (6) 60.0 ± 1.15, 59–62, female (4) 58.0 ± 1.87, 56–61; tail—male (7) 41.1 ± 0.99, 40–43, female (4) 40.0 ± 0.71, 39–41; exposed culmen—male (7) 9.7 ± 0.60, 9.0–10.4, female (4) 10.0 ± 0.52, 9.1–10.3; weight—male (4) 8.1 ± 0.56, 7.5–9.0, female (2) 8.0, 9.7.

**Cyornis herioti camarinensis* Blue-breasted Flycatcher

Rabor collected a single Blue-breasted Flycatcher on Mt. Isarog between 300 and 450 m; this specimen is the type of *C. h. camarinensis* (Rand & Rabor, 1967). The bird was an adult male with enlarged testes. He also obtained two individuals of this form at Mt. Bulusan, Sorsogon Province, southeastern Luzon, in early May 1961 between 450 and 990 m.

MEASUREMENTS—Male—wing (2) 76, 76; tail (2) 57, 56; exposed culmen (2) 15.0, 14.2; bill from nostril (2) 11.4, 11.2; bill width (2) 5.8, 5.8; weight (1) 21.4.

Muscicapa griseisticta Grey-streaked Flycatcher

We observed a single Grey-streaked Flycatcher on 4 March 1988 at 900 m in a thicket surrounded by a partially cleared area of forest. Rabor collected five females in the second half of April 1961 between 450 and 910 m.

WEIGHT—Female (3) 14.4, 15.6, 15.7.

**Muscicapa (Eumyias) panayensis nigrimentalis* Philippine Verditer (Island Flycatcher)

We found this species to be uncommon across a relatively broad zone on Mt. Isarog, from 900 to 1550 m. Rabor collected 10 specimens: 2 at about 760 m, 1 between 760 and 910 m, 4 between 1060 and 1220 m, and 3 at 1670 m. Several birds taken in late March 1961 and 1988 and April 1961 had enlarged gonads. Singing Philippine Verditer were noted on several occasions near our 900 m camp, and two were observed feeding in a fig tree on insects attracted to the ripening fruit. Considerable variation was found in the bill length and width of this species, which does not appear related to sexual dimorphism.

MEASUREMENTS—Wing—male (8) 77.3 ± 2.49, 71–79, female (4) 77.5 ± 1.12, 76–79; tail—male (8) 63.3 ± 1.92, 59–66, female (4) 60.5 ± 0.50, 60–61; exposed culmen—male (7) 10.8 ± 0.39, 10.0–11.3, female (4) 10.4 ± 0.46, 9.8–10.9; bill from nostril—male (8) 7.6 ± 0.37, 6.9–8.2, female (4) 7.4 ± 0.32, 6.9–7.7; bill width—male (6) 5.1 ± 0.38, 4.5–5.8, female (4) 5.2 ± 0.22, 4.9–5.5; weight—male (6) 17.4 ± 2.05, 14.0–18.7, female (2) 18.9, 24.5.

Family Monarchidae

**Hypothymis azurea azurea* Black-naped Monarch

The only records from Mt. Isarog are an adult female taken on 30 March 1961 between 300 and 450 m and another female (with an enlarged ovary) taken on 24 April 1961 between 210 and 300 m.

MEASUREMENTS—Female—wing (2) 69, 70; tail (2) 65, 70; exposed culmen (2) 12.4, 13.2; weight (1) 11.8.

Hypothymis helenae [*helenae*] Short-crested Monarch

The Short-crested Monarch was rare and only found in the vicinity of 900 m. A single male was heard calling and observed two or three times in the forest canopy near our camp.

**Rhipidura cyaniceps cyaniceps* Blue-headed Fantail

The Blue-headed Fantail was one of the most common and widely distributed birds and was recorded between 450 and 1550 m. It was found in a variety of habitats ranging from heavily disturbed secondary forest to virgin primary forest. This species was regularly heard singing during our March 1988 stay on the mountain. The gonads of individuals collected in March 1961 and 1988 and April 1961 were enlarged. Food remains in the stomachs of several birds consisted exclusively of insect remains.

This fantail was noted on two occasions in mixed species foraging flocks. On 19 March 1988, one

TABLE 2. Altitudinal distribution of resident bird species on Mt. Isarog.[1]

Species	Elevation					
	450 m or below	900 m	1125 m	1350 m	1550 m	1750 m
Aviceda jerdoni	—	—	—	—	R	—
Pernis celebensis[2]	—	*	—	—	—	—
Pernis apivorus[3]	*	—	—	—	—	—
Haliastur indus[3]	*	—	—	—	—	—
Spilornis holospilus	U	U	—	—	—	—
Accipiter virgatus	R	—	—	—	R	—
Hieraaetus kieneri[4]	*	—	—	—	—	—
Microhierax erythrogenys	*	U	—	—	—	—
Gallus gallus	—	R	—	—	—	—
Amaurornis olivaceus[3]	*	—	—	—	—	—
Treron pompadora[3]	*	—	—	—	—	—
Phapitreron leucotis	C	C	C	U/R	—	—
Phapitreron amethystina	*	U	—	—	—	—
Ptilinopus occipitalis[5]	*	*	—	—	—	—
Ptilinopus leclancheri[6]	*	*	—	—	—	—
Ducula aenea	U	—	U	—	—	—
Ducula poliocephala[3]	*	—	—	R	—	—
Columba vitiensis[7]	—	R	*	R	*	—
Macropygia phasianella	R	*	U	—	U	U
Chalcophaps indica	R	—	—	—	—	—
Gallicolumba luzonica[6]	R	*	—	—	—	—
Cacatua haematuropygia	—	—	R	—	—	—
Bolbopsittacus lunulatus	U	R	—	—	—	—
Loriculus philippensis[2]	U	*	—	—	—	—
Cuculus fugax	R	—	R	—	—	—
Cacomantis variolosus	C	C	C	U	R	—
Chrysococcyx xanthorhynchus[2]	—	*	—	—	—	—
Surniculus lugubris[4]	R	—	—	—	—	—
Eudynamys scolopacea	*	—	R	—	R	—
Phaenicophaeus superciliosus[2]	U	*	—	—	—	—
Phaenicophaeus cumingi	U	U	—	—	—	—
Centropus viridis[6]	U	*	—	—	—	—
Centropus unirufus[2]	*	*	—	—	—	—
Otus longicornis	R	—	U/R	U	U	U
Otus megalotis	U	U	R	R	R	—
Ninox philippensis	C	C	U	—	—	—
Ninox scutulata[3]	*	—	—	—	—	—
Batrachostomus septimus	*	—	—	—	—	—
Eurostopodus macrotis	C	—	—	—	—	—
[*Collocalia vanikorensis*]	C	C	C	C	U	U
Collocalia esculenta	C	C	C	C	C	C
Harpactes ardens[5]	*	R	—	—	—	—
Ceyx cyanopectus	R	—	—	—	—	—
Ceyx melanurus[3]	*	—	—	—	—	—
Halcyon chloris[3]	*	—	—	—	—	—
Halcyon smyrnensis	U	—	—	—	—	—
Halcyon lindsayi	C	C	—	R	—	—
Eurystomus orientalis[3]	*	—	—	—	—	—
Penelopides panini	U	U	—	—	—	—
Buceros hydrocorax[2]	*	—	—	—	—	—
Megalaima haemacephala[3]	U	—	—	—	—	—
Mulleripicus funebris	U	—	—	—	—	—
Dryocopus javensis	R	—	—	—	—	—
Dendrocopos maculatus	C	C	C	U	—	—
Chrysocolaptes lucidus	R	U	U	—	—	—
Pitta erythrogaster[3]	*	—	—	—	—	—
Pitta kochi	—	—	—	R	—	—
Coracina striata[3]	*	—	—	—	—	—
Coracina coerulescens[2]	*	—	—	—	—	—

[1] Records obtained from 1961 Rabor collection from Mt. Isarog = *. Records from 1988 expedition to the area: A = abundant, C = common, U = uncommon, R = rare. See Materials and Methods for definitions of terms.

[2] Specimen(s) taken up to 760 m.

[3] Specimen(s) taken at or up to 610 m.

→

TABLE 2. Continued

Species	Elevation					
	450 m or below	900 m	1125 m	1350 m	1550 m	1750 m
Lalage melanoleuca[3]	*	–	–	–	–	–
Lalage nigra	U	U	–	–	U	–
Pericrocotus flammeus[2]	*	*	–	–	–	–
Dicrurus balicassius	C	U	–	–	–	–
Oriolus chinensis[2]	U	*	–	–	–	–
Corvus macrorhynchos	C	–	–	–	–	–
Parus elegans	C	C	U	–	–	–
Sitta frontalis	U	C	*	U	–	–
Rhabdornis mystacalis	U	U	–	–	–	–
Napothera rabori	–	R	–	–	–	–
Stachyris capitalis[3]	*	–	*	–	–	–
Stachyris whiteheadi	–	U	C	C	A	A
Pycnonotus urostictus	–	U	–	–	–	–
Pycnonotus goiavier[6]	C	*	–	–	–	–
Hypsipetes philippinus	A	A	–	–	–	–
Irena cyanogaster	U	C	C	R	–	–
Brachypteryx montana[3]	*	U	C	C	A	A
Copsychus luzoniensis[3]	*	–	–	–	–	–
Zoothera andromedae	–	–	–	–	R	–
Turdus poliocephalus	–	–	C	C	C	C
Megalurus palustris	C	–	–	–	–	–
Megalurus timoriensis	U	–	–	–	–	–
Cisticola exilis[8]	–	*	–	–	–	–
Phylloscopus trivirgatus	–	U	U	C	C	C
Phylloscopus cebuensis	U	R	–	–	–	–
Orthotomus cucullatus	–	R	–	–	–	–
Orthotomus derbianus[2]	U	*	–	–	–	–
Rhipidura cyaniceps	C	C	C	C	C	–
Ficedula hyperythra[2]	–	*	U	U	R	–
Ficedula westermanni	–	–	U	U	C	C
Cyornis herioti	*	–	–	–	–	–
Muscicapa panayensis	–	U	U	U	U	–
Hypothymis azurea	*	–	–	–	–	–
Hypothymis helenae	–	R	–	–	–	–
Pachycephala plateni	–	C	C	A	C	–
Pachycephala philippinensis[9]	U	U	*	–	–	–
Anthus novaeseelandiae	*	–	–	–	–	–
Artamus leucorhynchus	*	R	–	–	–	–
Aplonis panayensis[3]	*	–	–	–	–	–
Sarcops calvus	C	R	–	–	–	–
Anthreptes malacensis[3]	*	–	–	–	–	–
Nectarinia sperata[3]	*	–	–	–	–	–
Nectarinia jugularis	*	–	–	–	–	–
Aethopyga flagrans	*	*	–	–	–	–
Aethopyga pulcherrima[2]	–	*	U	C	U	–
Arachnothera clarae	R	–	–	–	–	–
Prionochilus olivaceus	U	R	–	–	–	–
Dicaeum bicolor	*	C	*	U	–	–
Dicaeum australe	C	–	–	–	–	–
Dicaeum trigonostigma[6]	*	*	–	–	–	–
Dicaeum hypoleucum	C	R	–	–	–	–
Dicaeum pygmaeum	R	–	–	–	–	–
Zosterops nigrorum	C	U	–	–	–	–
Passer montanus	C	–	–	–	–	–
Erythrura hyperythra	–	R	–	–	–	–
Lonchura leucogastra[2]	R	–	–	–	–	–
Lonchura malacca[3]	*	–	–	–	–	–
Total number of species	95	64	31	24	22	9

[4] Specimen(s) taken between 610 and 680 m.
[5] Specimen(s) taken up to 1060 m.
[6] Specimen(s) taken up to 700 m.
[7] Specimen(s) taken up to 1670 m.
[8] Specimen taken at 790 m.
[9] Specimen(s) taken between 1060 and 1220 m.

was observed moving through the forest at 1350 m, probing under and flipping over leaves. It was followed within 20 m by one *Phylloscopus trivirgatus* and one *Pachycephala plateni*. (See under *Sitta frontalis* for another mixed species foraging flock incident.)

MEASUREMENTS—Wing—male (9) 78.9 ± 2.81, 75–84, female (6) 76.0 ± 2.58, 71–79; tail—male (9) 83.0 ± 2.79, 78–88, female (6) 79.2 ± 2.48, 74–81; exposed culmen—male (8) 11.2 ± 1.08, 10.0–12.6, female (6) 11.0 ± 0.62, 10.0–11.8; weight—male (12) 13.6 ± 1.21, 12.0–15.6, female (8) 13.5 ± 0.47, 13.0–14.1.

Family Pachycephalidae

**Pachycephala plateni crissalis* Philippine Whistler

We found the Philippine Whistler to be common or abundant between 900 and 1550 m. In 1961 Rabor collected 18 specimens on the mountain, 11 of which were taken at 1670 m. This species was observed in both secondary and primary forest, and at the edge of cleared areas. There appears to be a small zone of altitudinal overlap on the mountain between this species and *P. philippinensis* (table 2).

The breeding season of the Philippine Whistler seems to be variable from year to year. The gonads of most adults collected in March 1988 were small, and this species was not breeding. Several immature birds and recent fledglings were observed and netted. This is in contrast to 1961 when the majority of birds collected by Rabor between late March and late April had enlarged gonads.

This whistler was noted on two occasions as a member of mixed species foraging flocks. (See under *Rhipidura cyaniceps* and *Sitta frontalis*.)

MEASUREMENTS—Wing—male (16) 82.1 ± 1.36, 80–85, female (13) 80.4 ± 1.08, 78–82; tail—male (16) 65.6 ± 1.97, 63–70, female (13) 65.2 ± 1.70, 63–68; exposed culmen—male (16) 14.7 ± 0.51, 13.9–15.8, female (12) 13.6 ± 2.91, 12.5–15.4; weight—male (10) 21.2 ± 6.0, 19.0–25.2, female (13) 22.1 ± 1.84, 17.5–24.5.

**Pachycephala philippinensis philippinensis* Yellow-bellied Whistler

In the spring of 1988 the Yellow-bellied Whistler was uncommon at 450 m and 900 m; it was not recorded above this zone. Rabor obtained 14 specimens on the mountain in 1961, all of which were taken below 760 m; the only exceptions were nestlings obtained on 6 and 22 April between 1060 and 1220 m. Several birds collected in late March and April had enlarged gonads and appeared to be in breeding condition. One specimen had beetle remains in its stomach.

MEASUREMENTS—Wing—male (6) 86.2 ± 3.02, 83–90, female (8) 82.6 ± 1.87, 79–85; tail—male (6) 65.7 ± 0.75, 65–67, female (8) 62.5 ± 2.12, 58–66; exposed culmen—male (6) 15.6 ± 0.35, 15.0–16.1, female (8) 15.0 ± 0.84, 13.7–16.1; weight—male (5) 23.7 ± 2.60, 21.0–27.3, female (7) 24.3 ± 1.95, 21.0–26.9.

Family Motacillidae

**Motacilla flava simillima* Yellow Wagtail

Two specimens were collected by Rabor on 24 April 1961 between 210 and 300 m. This species is a winter visitor to Luzon from mainland Asia.

**Motacilla cinerea robusta* Grey Wagtail

We found this species, a migrant to the Philippines from the Asian mainland, to be common at 450 m near the Panicuason Central Nursery in the vicinity of cleared areas and irrigated planting beds. Rabor collected five females below 450 m; his latest spring record was 24 April 1961.

WEIGHT—Female (5) 16.9 ± 2.26, 13.5–20.2.

**Anthus novaeseelandiae lugubris* Richard's (Common) Pipit

The Rabor collection contains five birds taken at Mt. Isarog on 23 and 24 April 1961, all below 300 m.

**Anthus gustavi gustavi* Petchora Pipit

A pair of Petchora Pipits was obtained on 1 April 1961 between 610 and 760 m. This species is a winter visitor to the Philippines from the Asian mainland.

WEIGHT—Male (1) 23.1, female (1) 17.7.

**Anthus hodgsoni hodgsoni* Olive Tree Pipit

The single record of this mainland Asian migrant on Mt. Isarog was a female taken on 28 March 1961 between 910 and 1220 m.

Family Laniidae

**Lanius cristatus lucionensis* Brown Shrike

We found the Brown Shrike, a winter visitor to the Philippines from the Asian mainland, to be uncommon at 450 and 900 m. One was taken by Rabor on 21 April 1961 at about 1140 m. They were generally observed perched in trees at the edge of *parang* or heavily disturbed areas. The stomachs of two birds contained insect remains.

WEIGHT—Male (8) 34.2 ± 4.20, 28.5–41.5, female (6) 32.3 ± 3.31, 26.9–36.3.

Family Sturnidae

**Aplonis panayensis panayensis* Philippine Glossy Starling

The single record of this species on Mt. Isarog is one obtained by Rabor on 29 March 1961 at 610 m.

MEASUREMENTS—Female—wing 106, tail 68, exposed culmen 17.0, weight 48.6.

**Sturnus philippensis* Chestnut-cheeked Starling

The only record of the Chestnut-cheeked Starling, a winter visitor to Luzon from Japan, is a female taken on 4 April 1961 between 300 and 450 m.

WEIGHT—Female (1) 28.8.

**Sarcops calvus calvus* Coleto

We found this species to be common in heavily disturbed areas between 450 and 600 m, and it was observed once at 900 m. It could often be seen perched in dead trees in cleared fields or *parang*. A pair collected in late March 1988 at 450 m had slightly enlarged gonads and appeared to be approaching breeding condition. Rabor obtained seven specimens in 1961, all below 760 m, including a male with enlarged testes on 19 April and a juvenile male on 25 April. The stomachs of two birds contained small fruits and fig seeds.

MEASUREMENTS—Wing—male (5) 130.6 ± 3.32, 124–133, female (3) 131, 134, 136; tail—male (5) 112.2 ± 2.71, 108–115, female (3) 108, 109, 115; exposed culmen—male (5) 27.2 ± 0.68, 26.2–28.3, female (3) 26.7, 26.7, 29.0; weight—male (5) 143.8 ± 6.24, 133–150, female (2) 149, 160.

Family Nectariniidae

**Anthreptes malacensis birgitae* Brown-throated Sunbird

The single record of this species on Mt. Isarog is a female taken by Rabor on 26 April 1961 between 450 and 610 m.

MEASUREMENTS—Female (1)—wing 61, tail 35, exposed culmen 18.5, weight 11.9.

**Nectarinia sperata sperata* Purple-throated Sunbird

Two adult males were found by Rabor in late March 1961 between 300 and 610 m. One had enlarged gonads.

MEASUREMENTS—Male (2)—wing 53, 56; tail 31, 31; exposed culmen 14.0, 15.7; weight 6.4, 8.2.

**Nectarinia jugularis jugularis* Olive-backed Sunbird

Three male Olive-backed Sunbirds were obtained by Rabor on 25 March 1961 between 150 and 300 m. These are the only known records of this species for Mt. Isarog.

MEASUREMENTS—Male—wing (3) 58, 59, 60; tail (2) 38, 39; exposed culmen (2) 18.3, 18.6; weight (3) 8.0, 9.9, 9.9.

**Aethopyga flagrans flagrans* Flaming Sunbird

In 1961 Rabor obtained seven individuals of this species on Mt. Isarog between 300 and 910 m. A male obtained on 11 April 1961 had enlarged testes.

MEASUREMENTS—Wing—male (3) 50, 51, 52, female (4) 47.5 ± 1.12, 46–49; tail—male (3) 28, 28, 31, female (4) 25.3 ± 1.30, 24–27; exposed culmen—male (2) 17.9, 18.2, female (4) 16.3 ±

0.39, 15.9–16.9; weight—male (3) 6.4, 6.5, 7.0, female (3) 6.5, 6.5, 7.3.

**Aethopyga pulcherrima jefferyi* Mountain (Metallic-winged) Sunbird

We noted the Mountain Sunbird in the zone between 1125 and 1550 m. It was most common at 1350 m, where males were regularly observed singing and displaying, often from canopy perches. Rabor obtained five specimens from elevations between 610 and 1670 m, including a male on 18 April 1961 with enlarged gonads. This species was often found feeding on the contents of a red trumpet flower, a plant most abundant near 1350 m.

MEASUREMENTS—Wing—male (2) 51, 52, female (3) 47, 48, 48; tail—male (2) 28, 29, female (3) 24, 26, 26; exposed culmen—male (2) 21.5, 21.5, female (3) 16.3, 17.9, 18.5; weight—male (1) 6.2, female (2) 5.0, 6.3.

Arachnothera clarae [*luzonensis*] Naked-faced Spiderhunter

This species was noted once in the area. On 29 February 1988, one was observed at the edge of a relatively undisturbed patch of forest at 450 m.

Family Dicaeidae

**Prionochilus olivaceus parsonsi* Olive-backed Flowerpecker

This species occurs on the lower slopes of Mt. Isarog. It was found to be uncommon at 450 m in both secondary and primary forest and was observed once at 900 m. Males taken on 25 March 1988 and 19 April 1961 were in or approaching breeding condition. Several individuals were noted at 450 m in a fig tree picking off and eating flower buds; they were followed by two *Phylloscopus cebuensis* gleaning insects from the disturbed vegetation. The stomach of one Olive-backed Flowerpecker contained both insect and plant remains. Mt. Isarog specimens are similar in size and plumage coloration to material of *P. o. parsonsi* taken in northern Luzon.

MEASUREMENTS—Wing—male (3) 57, 59, 60, female (2) 50, 52; tail—male (3) 26, 27, 28, female (2) 23, 24; exposed culmen—male (3) 8.5, 8.5, 9.5, female (2) 8.0, 8.6; weight—male (3) 10.0, 10.0, 10.0, female (2) 8.5, 9.0.

**Dicaeum bicolor inexpectatum* Bicolored Flowerpecker

In 1988 the Bicolored Flowerpecker was common at 900 m and uncommon at 1350 m. We did not record it anywhere else on the mountain. Individuals were seldom noted in the forest, and most observations were of groups feeding in fruiting trees. Thus, there was the impression that they move some distance in search of food. Rabor obtained 13 specimens in 1961 from altitudes between 450 and 1220 m.

The breeding season of this species seems variable from year to year. In March 1988 a few adults had slightly enlarged gonads and the organs seemed to be regressing; we also noted fledglings being fed by adults. Most birds taken by Rabor in April 1961 were in breeding condition, including a female on 8 April with a "ripe egg." He also obtained seven fledglings in the last third of April.

This bird seems largely frugivorous. During early March 1988 a fig tree in a clearing at 900 m was in fruit. Up to 20 Bicolored Flowerpeckers were observed in the tree at any one time feeding on ripening figs. The lack of other frugivores in the area seemed odd; this species was the only fruit-eating bird noted in the tree over the course of six days.

MEASUREMENTS—Wing—male (5) 53.2 ± 1.17, 52–55, female (3) 53, 53, 54; tail—male (5) 23.4 ± 1.02, 22–25, female (3) 23, 23, 24; exposed culmen—male (5) 8.0 ± 0.42, 7.2–8.4, female (2) 7.6, 8.5; weight—male (7) 9.3 ± 0.43, 8.7–10.0, female (2) 8.8, 10.0.

**Dicaeum australe australe* Philippine (Red-striped) Flowerpecker

This species was common at 450 m. It was not recorded at any higher elevation. A female taken on 25 March 1988 had enlarged ovarian follicles and probably would have laid eggs within a few weeks. A male obtained on 26 March 1961 had enlarged testes. One bird had small insects in its stomach.

MEASUREMENTS—Wing—male (2) 55, 57, female (1) 53; tail—male (2) 27, 28, female (1) 25; exposed culmen—male (2) 10.0, 10.3, female (1) 9.7; weight—male (2) 7.3, 8.0.

**Dicaeum trigonostigma xanthopygium* Orange-bellied Flowerpecker

Rabor obtained three adult males, all with enlarged testes, on 24 March and 6 and 16 April 1961 between 300 and 700 m.

MEASUREMENTS—Wing—male (3) 53, 53, 54; tail—male (3) 24, 24, 25; exposed culmen—male (3) 9.8, 9.9, 10.0; weight—male (3) 6.4, 6.7, 7.6.

**Dicaeum hypoleucum obscurum* White-bellied (Buzzing) Flowerpecker

The White-bellied Flowerpecker was common in the vicinity of 450 m and rare near 900 m. It seemed most common in areas of disturbed forest. Many individuals taken in late March 1961 and 1988 and late April 1961 were in or approaching breeding condition. Some variation was found in the foods consumed—stomachs contained small buds and/or insects.

MEASUREMENTS—Wing—male (8) 52.5 ± 1.66, 51–56, female (4) 52.0 ± 0.71, 51–53; tail—male (8) 21.8 ± 0.97, 20–23, female (4) 21.5 ± 0.87, 21–23; exposed culmen—male (8) 11.1 ± 0.35, 10.6–11.6, female (4) 10.9 ± 0.29, 10.6–11.3; weight—male (8) 7.6 ± 0.60, 7.0–8.4, female (3) 7.0, 8.7, 9.0.

**Dicaeum pygmaeum pygmaeum* Pygmy Flowerpecker

The single specimen from the mountain, an adult male in breeding condition, was netted on 30 March 1988 at 450 m.

MEASUREMENTS—Male (1)—wing 46, tail 20, exposed culmen 8.7, weight 4.0.

Family Zosteropidae

**Zosterops nigrorum luzonica* Yellow White-eye

This species was found on the lower slopes of Mt. Isarog. At 450 m it was common and flocks of up to 20 were often seen feeding on swarms of small insects. Single birds or pairs were occasionally noted at 900 m where it was uncommon; we have no records above this altitude. Two birds taken in late March 1961 had enlarged testes. One taken in 1988 had small insects in its stomach.

MEASUREMENTS—Wing—male (4) 52.8 ± 1.30, 51–54, female (2) 48, 51; tail—male (4) 35.0 ± 0.0, 35–35, female (2) 32, 35; exposed culmen—male (4) 10.5 ± 0.18, 10.2–10.7, female (2) 9.7, 10.2; weight—male (3) 8.0, 8.0, 9.2, female (2) 7.0, 8.7.

Family Ploceidae

**Passer montanus saturatus* Eurasian Tree Sparrow

This introduced species was abundant in areas below 350 m, surrounding the mountain. Rabor collected several adults in breeding condition, fledglings, and immatures between late March and late April 1961. The Mt. Isarog material was compared to a series of *P. m. saturatus* from Japan and *P. m. malaccensis* from Malaca. The crown, wings, back, and rump color of Mt. Isarog birds are distinctly pale and similar to *saturatus*.

Family Estrildidae

**Erythrura hyperythra brunneiventris* Tawny-breasted Parrotfinch

On 9 March 1988 an adult female, not in breeding condition, was netted at 900 m in a partially logged area. Its stomach was empty. The specimen fits the description of *E. h. brunneiventris* given by duPont (1971). A comparison of the bird with specimens taken elsewhere in the Philippines showed no plumage differences.

MEASUREMENTS—Female (1)—wing 59, tail 32, exposed culmen 9.5, weight 12.

**Lonchura leucogastra everetti* White-bellied Munia

Records of the White-bellied Munia on Mt. Isarog include one netted at 450 m on 5 March 1988 in a partially cleared area and one taken between 610 and 760 m on 2 April 1961. The latter bird had enlarged gonads. Presumably this species and the next are common in lowland agricultural areas.

**Lonchura malacca jagori* Chestnut Munia

Rabor found this species in the zone between 450 and 610 m. A male collected on 16 April 1961 had enlarged testes.

MEASUREMENTS—Wing—male (2) 54, 57, female (3) 54, 55, 55; tail—male (2) 35, 36, female (3) 33, 34, 36; exposed culmen—male (2) 11.1, 11.2, female (3) 10.2, 11.3, 11.6; weight—male (2) 11.7, 11.7, female (2) 10.1, 11.4.

Family Oriolidae

**Oriolus chinensis chinensis* Black-naped Oriole

We found the Black-naped Oriole to be uncommon and restricted to the area near 450 m. There are 19 specimens of this bird in the Rabor collection, all of which were taken below 530 m, with the exception of an adult male and female from between 610 and 760 m. At least half of the birds taken by Rabor were in or approaching breeding condition. His collection also includes one fledgling from 100 m and three from about 530 m, all obtained in the second half of April 1961.

MEASUREMENTS—Wing—male (9) 156.4 ± 4.79, 151–163, female (4) 157.5 ± 2.87, 153–160; tail—male (9) 101.7 ± 2.11, 98–105, female (4) 104.0 ± 1.87, 102–107; exposed culmen—male (8) 35.2 ± 1.07, 33.6–36.5, female (3) 35.6 ± 0.78, 34.7–36.6; weight—male (7) 94.0 ± 1.77, 92–97, female (3) 98, 101, 101.

Family Dicruridae

**Dicrurus balicassius balicassius* Balicassiao

The Balicassiao is a characteristic bird of the lower elevations of Mt. Isarog. They were common at 450 m and regularly seen singly or in groups of up to five. This species was noted a few times at the edge of the forest near the 900 m camp, but not at any higher elevation. Rabor obtained 32 specimens of the Balicassiao on Mt. Isarog, none of which were taken above 760 m. About half of the specimens collected in late March 1961 and 1988 and April 1961 were in breeding condition. The stomach contents of these birds consisted of arthropods, including mantids, beetles, and spiders.

MEASUREMENTS—Wing—male (20) 142.3 ± 2.62, 138–147, female (16) 142.6 ± 2.71, 138–147; tail—male (20) 112.9 ± 3.89, 106–120, female (16) 114.6 ± 3.37, 109–122; bill from nostril—male (20) 20.5 ± 0.74, 18.9–21.6, female (16) 19.6 ± 4.98, 18.4–22.0; weight—male (16) 71.6 ± 3.67, 63.3–78.8, female (14) 73.0 ± 4.28, 65–80.

Family Artamidae

**Artamus leucorhynchus leucorhynchus* White-breasted Wood Swallow

We observed a single bird at about 800 m flying over a clearing surrounded by secondary forest. In 1961 Rabor obtained eight specimens, including four fledglings on 25 April, all from areas below 450 m.

MEASUREMENTS—Wing—male (3) 132, 136, 136, female (1) 133; tail—male (2) 59, 60, female (1) 57; exposed culmen—male (3) 17.7, 19.2, 20.0, female (1) 19.0; weight—male (1) 41.6, female (1) 42.9.

Family Corvidae

**Corvus macrorhynchos philippinus* Large-billed Crow

This species was common at and below 450 m. We generally noted it near cultivated lands and rarely in forested areas. Rabor collected a nestling between 240 and 300 m on 22 April 1961.

Discussion

On the basis of the combined information from the 1961 and 1988 expeditions, a total of 116 resident bird species have been recorded on Mt. Isarog. Of these, 95 species were recorded at or below 450 ± 50 m, 64 at 900 ± 50 m, 31 at 1125 ± 50 m, 24 at 1350 ± 50 m, 22 at 1550 ± 50 m, and 9 at 1750 ± 50 m. An additional 19 species of migrants and winter visitors were also documented. When the pattern of altitudinal distribution of the resident birds was examined, several interesting points and patterns emerged.

It needs to be stated that our work on Mt. Isarog was not exhaustive and that aspects of the local avifauna still remain unknown, particularly seasonal movements and the distribution of rare and secretive birds. The comparison of the Mt. Isarog information with data sets from various mountains in the Philippines gathered by other research-

ers in a nonstandard manner presents further problems. However, because there has not been any published review of the altitudinal distribution of Philippine birds, we feel that even given these potential problems the comparisons made in the discussion section allow general trends to be pointed out.

Altitudinal Overlap of Congeners

Of the 87 genera of resident birds on Mt. Isarog, 25 locally contain more than one species (range from two to five). The elevational distribution of these birds was analyzed by dividing the mountain into the following zones: (1) *parang* and lowland forest, approximately 200 to 900 m; (2) montane forest, 1125 to 1350 m; and (3) mossy forest, 1550 to 1750 m. Among these 25 congeneric groups three distinct patterns were found: complete altitudinal sympatry, broad elevational disjunction, or a small amount of overlap with apparent species replacement.

Twelve of 25 (48%) congeneric groups occur in *parang* and lowland forest and have completely overlapping altitudinal ranges; these are *Pernis, Ptilinopus, Phaenicophaeus, Centropus, Ceyx, Coracina, Pycnonotus, Megalurus, Orthotomus, Hypothymis, Nectarinia,* and *Lonchura.* We have no information on finer level habitat preferences of the members of any of these groups and it is possible that some ecological segregation exists.

In 8 of 25 (32%) cases at least one species of a congeneric group was confined to *parang* and lowland forest and at least one other member occurred sympatrically and also in montane forest. For example, *Phapitreron leucotis* was found from *parang* to montane forest (up to 1350 m) and *P. amethystina* only in *parang* and lowland forest. Other congeneric groups showing a similar pattern were *Ninox, Halcyon, Lalage, Phylloscopus, Aethopyga,* and *Dicaeum.* Within a few of these groups more than one species fits the pattern. *Halcyon chloris* and *H. smyrnensis* were restricted to areas at or below 450 m, while *H. lindsayii* occurred in the same areas as well as up to 1350 m. In lowland areas five species of *Dicaeum* were sympatric, but the range of only one, *D. bicolor,* extended up to montane forest. The altitudinal distributions of the *Ducula* and *Pitta* species groups were not sufficiently well documented to clarify their range on the mountain.

In the third distinctive pattern found, congeners had broad distributions up the mountain and often replaced one another within a narrow altitudinal zone. Three of the 25 (12%) congeneric groups fit this category. For example, *Otus megalotis* was uncommon in *parang* and lowland forest, while *O. longicornis* was rare in these areas and uncommon in montane and mossy forest. The congeneric groups of *Ficedula* and *Pachycephala* showed a similar replacement pattern.

There is no single recognizable pattern in the altitudinal ranges of congeneric groups on Mt. Isarog; considerable variation was found within and between genera. This is presumably related to the ways different types of birds, whether closely related or not, respond to varying aspects of the environment. Perhaps even more importantly, subtle differences in the use of resources by congeners are difficult to quantify. Thus, our ability to understand the role of competition (Terborgh, 1971) in molding these bird distributions is severely hampered, but the apparent commonness of elevational replacement of congeners was not present on Mt. Isarog. A similar pattern has been found in mainland Southeast Asian forests (Medway, 1972).

Densities of Birds Based on Netting

We used mist nets to assess densities of ground dwelling and lower understory birds within the six transect zones (Karr, 1981). Of the total 378 net-days accrued between 3 and 31 March 1988, 97 were at 450 m, 54 were at 900 m, 56 were at 1125 m, 79 were at 1350 m, 66 were at 1550 m, and 26 were at 1750 m (table 3). The number of birds captured and the success rate per transect zone (= total captured/total number of net-days) were 76 and 0.78, 44 and 0.81, 24 and 0.43, 51 and 0.65, 97 and 1.47, and 28 and 1.08, respectively. It is important to note that the number of net-days per transect zone was relatively low, particularly at the 1750 m camp, and the conclusions drawn from this information should be considered tentative.

There does not appear to be any clear linear relationship between bird density and altitude. The highest density was found in the mossy forest zone, where *Stachyris whiteheadi* was particularly common. This species accounted for 74 of 97 birds netted at the 1550 m camp and 23 of 28 netted at the 1750 m camp. The lowest bird density was found in the midsection of the montane forest at 1125 m and 1350 m. Moderate densities were

TABLE 3. Netting success on Mt. Isarog of resident birds captured between 28 February and 30 May 1988.[1]

Species	Elevation (Total net-days)					
	450 m (97)	900 m (54)	1125 m (56)	1350 m (79)	1550 m (66)	1750 m (26)
Accipiter virgatus	1/0.01	—	—	—	1/0.02	—
Accipiter sp.	1/0.01	—	—	—	—	—
Microhierax erythrogenys	—	2/0.04	—	—	—	—
Phapitreron leucotis	—	1/0.02	—	—	—	—
Bolbopsittacus lunulatus	—	1/0.02	—	—	—	—
Cuculus fugax	—	—	1/0.02	—	—	—
Cacomantis variolosus	—	1/0.02	—	1/0.01	—	—
Otus longicornis	1/0.01	—	4/0.07	2/0.03	2/0.03	1/0.04
Otus megalotis	2/0.02	2/0.03	—	—	1/0.02	—
Ninox philippensis	5/0.05	3/0.06	—	—	—	—
Collocalia esculenta	—	1/0.02	—	—	—	—
Halcyon lindsayi	7/0.07	—	—	—	—	—
Dendrocopos maculatus	1/0.01	—	—	—	—	—
Dicrurus balicassius	8/0.08	—	—	—	—	—
Parus elegans	5/0.05	5/0.09	—	—	—	—
Sitta frontalis	—	2/0.03	—	—	—	—
Stachyris whiteheadi	—	6/0.11	3/0.05	30/0.38	74/1.12	23/0.88
Pycnonotus urostictus	—	1/0.02	—	—	—	—
Hypsipetes philippinus	17/0.18	7/0.13	—	—	—	—
Irena cyanogaster	—	1/0.02	—	—	—	—
Brachypteryx montana	—	—	1/0.02	5/0.06	4/0.06	1/0.04
Zoothera andromedae	—	—	—	—	1/0.02	—
Turdus poliocephalus	—	—	1/0.02	2/0.03	7/0.11	1/0.04
Phylloscopus trivirgatus	—	—	1/0.02	1/0.01	1/0.02	1/0.04
Phylloscopus cebuensis	1/0.01	—	—	—	—	—
Orthotomus derbianus	2/0.02	—	—	—	—	—
Rhipidura cyaniceps	6/0.06	4/0.07	3/0.05	2/0.03	1/0.02	—
Ficedula hyperythra	—	—	2/0.04	1/0.01	1/0.02	—
Ficedula westermanni	—	—	1/0.02	—	—	1/0.04
Cyornis herioti	1/0.01	—	—	—	—	—
Muscicapa panayensis	—	1/0.02	1/0.02	—	—	—
Pachycephala plateni	—	1/0.02	6/0.11	7/0.09	4/0.06	—
Pachycephala philippinensis	2/0.02	—	—	—	—	—
Prionochilus olivaceus	4/0.04	—	—	—	—	—
Dicaeum bicolor	—	3/0.05	—	—	—	—
Dicaeum australe	1/0.01	—	—	—	—	—
Dicaeum hypoleucum	10/0.10	1/0.02	—	—	—	—
Erythrura hyperythra	—	1/0.02	—	—	—	—
Lonchura leucogastra	1/0.01	—	—	—	—	—
Total success rate	76/0.78	44/0.81	24/0.43	51/0.65	97/1.47	28/1.08
Total success rate excluding *Stachyris whiteheadi*	76/0.78	38/0.70	21/0.38	21/0.27	23/0.35	5/0.19
Total number of species	19	19	11	9	11	6

[1] Entry given as total number captured per transect zone/netting success rate.

found in the lowland forest at 450 m and lower montane forest at 900 m.

There was considerable variation in the range and density of various groups on the mountain. Owls were the most evenly distributed family. Combining the data on the two *Otus* and one *Ninox* (the main food of which is large invertebrates) the rate of netting success was 0.07 at 450 m, 0.09 at 900 m, 0.07 at 1125 m, 0.04 at 1350 m, 0.05 at 1550 m, and 0.04 at 1750 m. The flycatcher guild (including *Rhipidura* and *Pachycephala*) appeared to be more common at middle elevations than at lower or upper zones. This is compared to warblers, another group of insectivores, which were sparsely distributed across the mountain. Flowerpeckers were netted with some frequency at 450 m (0.15 netting success) and at 900 m (0.07 netting success), but not at any higher elevation.

Altitudinal Distribution of Birds on Mt. Isarog and Other Philippine Mountains with Mossy Forest

From our 1988 observations and the combined 1961 and 1988 collections, it is clear that the number of resident bird species on Mt. Isarog declines with increasing altitude. We recorded 95 species at or below 450 m, 64 at 900 m, 31 at 1125 m, 24 at 1350 m, 22 at 1550 m, and 9 at 1750 m (correlation of log-transformed data, $P = 0.01$, $r = 0.92$, N = 6) (table 2). Similar patterns have been described for montane avifaunas elsewhere in the Philippines (see below) and in tropical areas on other continents (Chapman, 1917; Terborgh, 1971, 1977; Diamond & LeCroy, 1979). Philippine fruit bats show a parallel pattern of decreasing density and species diversity with increasing altitude (Heaney et al., 1989). This pattern presumably is related to decreasing habitat complexity and usable primary productivity with altitude (MacArthur et al., 1966; Orians, 1969; Kikkawa & Williams, 1971).

For comparison with the pattern found on Mt. Isarog, information on the altitudinal distribution of birds on Mt. Malindang (2420 m), western Mindanao, was tabulated from Rand and Rabor (1960); Mt. Halcon (2580 m), Mindoro, from Ripley and Rabor (1958) and Morioka and Sison (1987); and Canlaon Volcano (2500 m), Negros, from Ripley and Rabor (1956). The taxa collected near Mt. Halcon at Alcate, Makatok, and Lake Naujan (Ripley & Rabor, 1958) have not been used in the tabulation of species occurring on the mountain. In order to put the ecology of these mountains in context, particularly with respect to the habitats on Mt. Isarog, the various altitudinal zones on each will be briefly described.

On Mt. Malindang, 51 resident bird species were collected between 600 and 1065 m, 49 between 1065 and 1370 m, 38 between 1370 and 1670 m, 22 between 1670 and 1975 m, and 18 between 1975 and 2420 m (correlation of log-transformed data, $P = 0.03$, $r = 0.91$, N = 5) (fig. 6). Rand and Rabor (1960) classified the habitats on the mountain as: (1) cultivation, grassland, or second-growth from sea level to 750 m (a small amount of original lowland forest was interspersed in this zone up to 1065 m); (2) transitional lowland and montane forest from 1065 to 1520 m; (3) montane forest from 1520 to 1975 m; and (4) mossy forest from 1975 to 2420 m.

Fifty-three bird species have been documented (mostly specimens, a few observations) on Mt. Halcon between sea level and 750 m, 29 between 750 and 1065 m, 31 between 1065 and 1370 m, 26 between 1370 and 1670 m, 17 between 1670 and 1975 m, and 7 between 1975 and 2580 m (correlation of log-transformed data, $P = 0.03$, $r = 0.86$, N = 6) (fig. 6). The vegetation on the mountain was classified by Ripley and Rabor (1958) as: (1) lowland forest from sea level to 460 m (apparently when they visited the area in 1954 this section of forest had not been extensively cleared); (2) transitional lowland and montane forest from 460 to 760 m; (3) montane forest from 760 to 1370 m; and (4) disjunct and interspersed climbing bamboo and mossy forest from 1220 to 2280 m. The summit of Mt. Halcon is covered with clumps of short grasses and herbs, a few shrubs, and no trees (Morioka & Sison, 1987).

On Canlaon Volcano, 68 resident birds were collected between 760 and 1370 m, 14 between 1370 and 1975 m, and 11 between 1975 and 2490 m (correlation of log-transformed data, $P = 0.18$, $r = 0.96$, N = 3) (fig. 6). The habitats were classified by Ripley and Rabor (1956) as: (1) transitional lowland and montane forest between 760 and 1370 m; some cultivation and second growth was found in this zone up to 1065 m; (2) montane forest between 1370 and 1975 m; and (3) mossy forest between 1975 and 2500 m. The summit was mostly bare rock with some clumps of grasses.

In all cases the number of resident species on each of these four mountains drops off with increasing altitude (fig. 6). However, the rate of decrease, particularly at lower altitudes, and fluctuations in the number of species as a function of elevation, vary among mountains. A greater number of resident species occurs on the lower slopes of Mt. Isarog than on any of the other three mountains; this is at least in part an artifact, because the lowest transect point on any of the four peaks is on Mt. Isarog at 450 m. Further, Mt. Isarog is the only mountain of the four on which observational information was used in the species tabulations. There are few localities in the Luzon island group where the lowland resident avifauna is well known, at least in a parallel way to Mt. Isarog. Probably the best comparison that can be made is to Catanduanes Island, which lies 85 km from Mt. Isarog (directly off southeastern Luzon) and rises in elevation to just under 900 m. The number of resident species occurring in the lowland forest or *parang* on Catanduanes is 108 (Manuel, 1937; Gonzales, 1983; Goodman & Gonzales, 1989), compared to 111 at or below 900 m on Mt. Isarog (table 2). These figures are presumably typical of

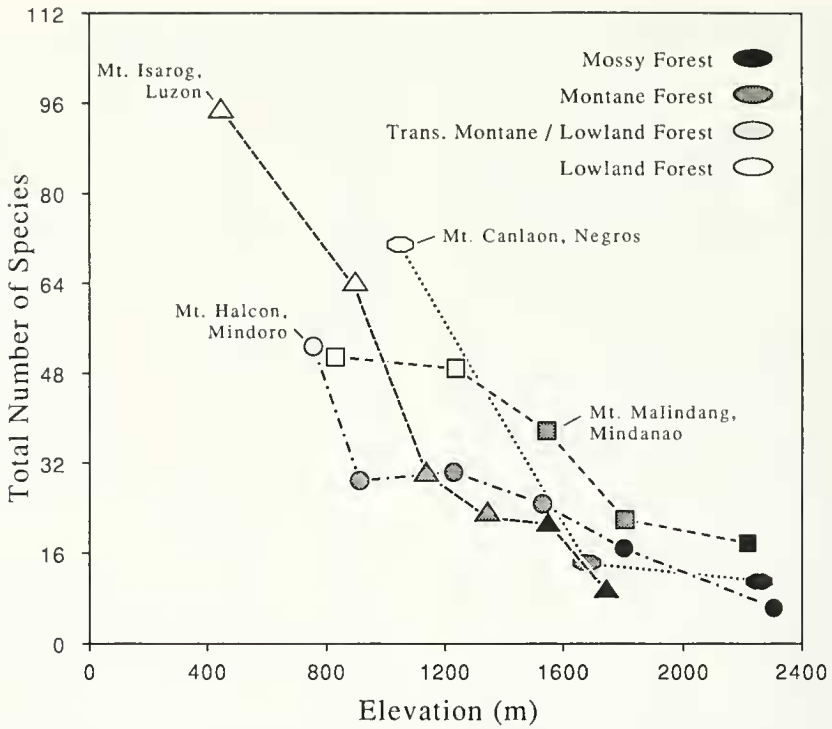

FIG. 6. Graph comparing the number of species occurring in distinct ecological zones and at various elevations on four mountains in the Philippines. Data for Mt. Canlaon, Negros, are from Ripley and Rabor (1956); Mt. Halcon, Mindoro, from Ripley and Rabor (1958) and Morioka and Sison (1987); and Mt. Malindang, Mindanao, from Rand and Rabor (1960).

the number of resident birds found in comparable types of lowland habitat throughout this portion of the Philippines. The number occurring in the lowland forest of Mt. Malindang, Mindanao, seems low, and this may be an artifact of incomplete information.

At middle to high elevations the number of resident birds on the four mountains is similar. Although the actual altitude of mossy forest varies on these mountains, each appears to hold a relatively similar number of resident birds in this zone (altitude of mossy forest in parentheses): Mt. Isarog (1550–1966 m)—7 species, Mt. Halcon (1975–2580 m)—7 species, Canlaon Volcano (1975–2230 m)—10 species, and Mt. Malindang (1975–2420 m)—18 species (table 4).

Given these patterns, two questions may be asked: (1) Is there a distinct set of species or genera that tend to occur in the mossy forest of these mountains? and (2) Is there a high degree of endemism among the resident birds of this distinct ecological zone? When the number of species occurring in the mossy forest zone of Mt. Isarog was compared to those found in the mossy forest zones of the other three mountains several interesting patterns emerged: 3 of 7 species (43%) also occur on Mt. Halcon, 5 of 10 (50%) also occur on Canlaon Volcano, and 1 of 18 (6%) also occurs on Mt. Malindang (table 4). Thus, there is considerable variation between mountains and no distinct set of species forms the mossy forest resident avifauna. Moreover, there is considerable variation in the habitat preference of certain species between the four mountains.

The only species that occurs in the mossy forest of all four mountains is *Phylloscopus trivirgatus*. *Turdus poliocephalus* and *Brachypteryx montana* are found in this zone on three of the four mountains, the exception being Mt. Malindang. Of the 30 species listed in Table 4, 19 are found on at least two of the four mountains, but not necessarily in the same ecological zones. For example, *Brachypteryx montana* on Mt. Malindang was restricted to transitional lowland/montane forest and montane forest, but on Mt. Isarog it was found from lowland forest to mossy forest. *Parus elegans* on Canlaon Volcano and Mt. Halcon is a mossy forest bird, but on Mt. Isarog it is common at low

TABLE 4. The species composition of mossy forest avifaunas on four mountains in the Philippines.[1]

Species	Mt. Malindang, Mindanao (1975–2420 m)	Canlaon Volcano, Negros (1975–2230 m)	Mt. Halcon, Mindoro (1975–2580 m)	Mt. Isarog, Luzon (1550–1966 m)
Gallus gallus	×	+	+	+
Phapitreron amethystina	×	+	+	+
Macropygia phasianella	+	×	+	×
Cuculus fugax	×	+	+	+
Otus longicornis				×
Chrysocolaptes lucidus	×	+		+
Coracina ostenta		×		
Coracina mcgregori	×			
Parus elegans	+	×	×	+
Stachyris whiteheadi				×
Brachypteryx montana	+	×	×	×
Zoothera andromedae	×		+	+
Turdus poliocephalus	+	×	×	×
Bradypterus caudatus	×			
Phylloscopus trivirgatus	×	×	×	×
Rhipidura nigrocinnamomea	×			
Ficedula hyperythra	×	×	+	+
Ficedula westermanni	+	×		×
Muscicapa panayensis	×	+	+	+
Pachycephala philippensis	×			+
Pachycephala plateni		×	+	+
Lanius validirostris	+		×	
Dicaeum nigrilore	×			
Aethopyga boltoni	×			
Aethopyga pulcherrima	+			+
Zosterops montanus	×	×	×	
Zosterops nigrorum		+	×	+
Lophozosterops goodfellowi	×			
Hypocryptadius cinnamomeus	×			
Pyrrhula leucogenys	×			
Total/mountain	18	10	7	7
Number shared with Mt. Isarog	1	5	3	
Number species shared with Mt. Isarog but occurring at lower elevations	4	0	1	

[1] This table does not include altitudinally roaming species such as swifts. × = present in mossy forest, + = present on respective mountain but not in mossy forest. A blank indicates that the species is unknown from that mountain.

and uncommon at lower middle elevations. This pattern is opposite that found in other high-mountain tropical avifaunas, such as the Andes (Haffer, 1987), areas of peninsular Malaysia (Medway & Wells, 1976), New Guinea (Beehler, 1981), and widely disjunct mountain ranges in Africa (Moreau, 1966; Dowsett, 1986), where many bird species have altitudinally limited, yet geographically extensive ranges.

What about species restricted or endemic to mossy forest? Eleven of the 30 (37%) species found in mossy forest on the four mountains (table 4) occur on only one of the four mountains. Two of these species are restricted to Luzon: *Otus longicornis* is found at all elevations of Mt. Isarog and at other localities, and *Stachyris whiteheadi* occurs at lower elevations on Mt. Isarog and on numerous other mountains (duPont, 1971). The latter species shows a considerable amount of geographical variation on Luzon, which may be related to differentiation on nonconnected mountain chains (Goodman & Gonzales, unpubl.). *Coracina ostenta* was the only 1 of the 11 species that was restricted to Canlaon Volcano. However, this bird is also known from the islands of Panay and Guimaras (duPont, 1971); these two islands were connected to Negros in the late Pleistocene (Heaney, 1986). No bird species was restricted to the mossy forest on Mt. Halcon. The situation on Mt. Malindang is distinctly different; of the 11 species in the sample that are restricted to a single mountain, 8 were found only on Mt. Malindang. Of these, six are Mindanao endemics: *Coracina mcgregori, Rhipidura nigrocinnamomea, Dicaeum nigrilore,*

Aethopyga boltoni, Lophozosterops goodfellowi, and *Hyprocryptadius cinnamomous.* Three of the six (*Rhipidura, Aethopyga,* and *Lophozosterops*) show geographical variation among several Mindanao mountains, while the other three are distributed across the island but have no recognized subspecies (duPont, 1971). Thus, although restricted to the island, none of these six birds is endemic to a single mountain. The remaining two of the eight Mindanao mossy forest birds are *Bradypterus caudatus,* which has three distinct geographical forms occurring on Mt. Malindang and Mt. Apo (Mindanao) and northern Luzon, and *Pyrrhula leucogonys,* which has two distinct subspecies, one on Mindanao and the other in northern Luzon.

There is no known bird species exclusively endemic to the mossy forest of any of these four mountains. Many of the taxa listed in Table 4 show great variability among mountains in their preferred habitat and altitudinal range. Thus, it appears that a substantial number of mossy forest birds found on these peaks are drawn from a pool of species adapted to a range of habitats rather than from an endemic and/or geographically restricted set of mossy forest taxa. The exception is Mt. Malindang, or more precisely Mindanao, an island that shows a higher degree of endemism; however, these endemics are not restricted to the mossy forest zone of any single peak. All six Mindanao mossy forest endemics discussed are members of different bird families and clearly are not the result of a single invasion and subsequent radiation.

Changes in the Resident Avifauna of Mt. Isarog Between 1961 and 1988

Although we have no quantifiable data on the amount of time that members of the 1961 expedition to Mt. Isarog spent at each elevational zone, it is clear from their collections that the complete altitudinal range of the mountain was surveyed. Information associated with the preferred ecotypes of many of the birds collected and inscriptions (particularly elevation) on the specimen labels allow some inference to be made about the condition of the Mt. Isarog lowland forest in 1961.

When Rabor conducted the 1961 survey, the area of Mt. Isarog below 450 m was probably to a large extent already cleared of the original forest and composed of large tracts of agricultural lands and *parang* (essentially as we found it in 1988). Below 450 m, he collected a long series of species associated with *parang* and modified areas and few specimens of birds characteristic of typically undisturbed woodland. In 1961 the forest from about 450 to 900 m was presumably largely intact except for relatively small clearings made by shifting subsistence agriculturalists. Since 1961 this zone has been subjected to extensive logging and partial clear-cutting. The evidence for this is based on differences between the species collected in 1961 and 1988 (see below). In 1988 we found no tracts of undisturbed lowland forest between 450 and 900 m larger than a few hectares. The forest above 900 m remains relatively intact, and the only clear disturbance is the extensive cutting of rattan.

A combined total of 116 resident birds was found on the mountain by the 1961 and 1988 surveys. Of these, 95 occurred at or below 450 m, 64 between 450 and 900 m, and 30 above 900 m. When these data are analyzed as the number of species found in a given zone by one survey and not the other, a startling pattern emerges. With one exception, differences between the 1961 and 1988 surveys in the number of species collected in any of these altitudinal zones varied from about 6 to 13% (table 5). This degree of variation is presumed to be largely sampling variation in the total number of species recorded per zone by each survey (relative to the other) and/or some aspect of species turnover. The only exception was the area between 450 and 900 m, where the 1961 survey found 27 species (42% of the total known from this zone) not recorded by the 1988 workers. This dramatic change is in exactly the habitat that has undergone the greatest ecological degradation in the past few decades. Thirty-four species (29%) collected on Mt. Isarog in 1961 were not found in 1988, and are presumed to be locally extirpated. Of these 34 species, 21 (62%) were recorded by Rabor only at or below 610 m and 28 (82%) only at or below 760 m. Further, of these 34 species, 10 (29%) are relatively large (>100 g), 4 (12%) are predators, and 5 (15%) are considered particularly good for eating. Local human-caused extinction of birds resulting from the clearing of forest and to a limited extent by hunting, has most severely impacted large, raptorial, and good-tasting birds. It is clear that when the forest is destroyed species are locally extirpated, and that hunting can have a significant impact.

The State of Mt. Isarog National Park

Mt. Isarog National Park was established 20 July 1938 by governmental proclamation no. 293.

TABLE 5. Differences in the number of resident species found on Mt. Isarog in 1961 and 1988.

	At or below 450 m (95)[1]	Between 450 and 900 m (64)	Above 900 (30)	Total (116)
Collected in 1961 but not in 1988	7 (7.4%)	27 (42.2%)	2 (6.7%)	34 (29.3%)
Collected in 1988 but not in 1961	6 (6.3%)	4 (6.3%)	4 (13.3%)	9 (7.8%)

[1] Number in parentheses is the total number of species recorded for the column heading.

It comprises an area of about 10,110 hectares (Parks and Wildlife Office, 1968). The park has been noted as a health resort with spectacular canyons, gorges, ravines, and waterfalls, and as a game refuge.

We have no specific information on the area from its establishment as a national park to the early 1960s. As discussed on p. 36, when Rabor visited the park in spring 1961 some undisturbed tracts of lowland forest still remained in the zone between 450 and 900 m. During the past few decades there have been continuous logging activities in the area. In 1977 the Bicol area (Region 5), composed of the Catanduanes, Camarines Norte, Camarines Sur, Albay, Masbate, and Sorsogon provinces, had an estimated 144,085 hectares of virgin forest; by 1988 this had been reduced to 16,885 hectares. Thus, on the average of 12,720 hectares of virgin forest were lost each year during this period (Principe, 1988). Although the 1977 figure may have been exaggerated, the extent of logging in the area has been ecologically devastating. In August 1983 the government posed a complete logging ban in the region, apparently to no avail. At present, only about 1,000 hectares are being reforested annually with important timber trees. Even some of the reforested areas are being invaded by *kaingineros* and laid to waste.

During our spring 1988 field season, the drone of chain saws could be heard from before sunrise to after sunset in forested areas within the national park boundaries. With alarming frequency we could feel the ground tremble as the remaining large dipterocarps came crashing down. These illegal, large-scale cutting operations were not conducted independently by slash and burn agriculturalists, but rather by well-financed commercial operators.

In 1975 it was estimated that 250 settlers lived within the Mt. Isarog National Park (IUCN Tropical Forest Programme, 1988). During our 1988 visit it was clear that this number had increased. There were several settlements just outside the park boundaries. Because of the steep topography and the few large dipterocarp trees, the area above 900 m appears to be relatively safe from forest clearing. Rattan is regularly gathered from the zone; however, this activity presumably has a negligible effect on the local forest. Our impression was that the majority of forest clearing within the park boundaries below 900 m had been initiated by large-scale operations for lumber and not slash and burn agriculturalists for crop lands. Once the primary forest had been removed, the *kaingineros* further cleared, maintained, and planted the area. Thus, the greatest current threat to the Mt. Isarog National Park is the illegal commercial logging operations.

The remaining tracts of undisturbed forest in the Mt. Isarog National Park are in immediate need of protection. This could be accomplished by the deployment of rangers in the area to enforce existing laws against illegal logging, strict legal prosecution against offenders, and the establishment of a local education program directed toward information about habitat destruction and watershed management. We are aware that these suggestions would only provide short-term relief; the real solution for the Philippines and many other places in the world will only come after extensive social reforms to alter present economic systems that are based on the exploitation of natural and human resources.

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