

# **SYSTEMATICS OF SMALLER ASIAN NIGHT BIRDS BASED ON VOICE**

BY

**JOE T. MARSHALL**

**ORNITHOLOGICAL MONOGRAPHS NO. 25**

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Frontispiece: *Otus icterorhynchus?* *stresemanni* of Sumatra, with apologies to G. M. Sutton and The Birds of Arizona. The absence of wings, far from implying flightlessness, emphasizes the important parts of the plumage for species comparisons—the interscapulars and flanks. These "control" the more variable patterns of head and wings, which will always be in harmony with the basic pattern of back and flanks.

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## INTRODUCTION

Scops-owls (of the genus *Otus*) and other night birds such as frogmouths (genus *Batrachostomus*) have an intricate pattern of coloration resembling bark and dry leaves. It varies geographically so that the bird is camouflaged appropriately for its regional flora while sleeping in the daytime. During study of North American *Otus* (Marshall 1967) I learned that such adaptation results in similar coloration for different species—a pitfall for taxonomists. Radically different taxonomies for the genus in Asia (compare Delacour 1941 with Peters 1940) hinted that there, too, something obscured the limits of species that authors sought to define and to agree upon. (As you will see this “something” is different color and morphology among populations of the same species.) Accordingly when I was posted in Thailand I tried to learn about these fascinating owls in life, hoping to find traits—especially vocal ones—that would resolve difficulties in the current morphologic taxonomy. Caprimulgiforms were an incidental by-product of the research.

During 13 years I traveled whenever leave time afforded, using Wallace (1869) as a guide and searching for natural forests and the night birds therein. I would listen for their territorial songs, record them on a tape recorder, then attempt to glimpse the singer. I studied museum specimens also. These are the results:

1. In Southeast Asia I encountered 13 species of *Otus*, 5 of *Batrachostomus*, 7 of Caprimulgidae, and heard the songs of all those except *Otus sagittatus*. I found no trace of certain Sunda and Philippine endemics: *Otus brookii*, *O. alfredi*, *O. angelinae*, *O. longicornis*, and *O. mindorensis*. This does not mean they are rare; for instance, several *Otus angelinae* were banded at the very spot where I searched for this species at various times of year on repeated visits to Java. Likewise *Batrachostomus auritus*, *B. harterti*, *B. poliolophus*, and *Caprimulgus concretus* failed to advertise their presence for my benefit.

2. The night birds covered in this report are denizens of natural forest, as their cryptic coloration implies. Most can exist nowhere else; some kinds spill into habitats degraded by man, whereas *Otus mantananensis* lives in coconut groves, and *O. bakkamoena* and *Caprimulgus affinis* dwell in cities as well as in forests.

3. Natural forests are hard to find and difficult to reach, being mostly contracted to high altitudes. They are disappearing at an appalling rate, invariably by clear-felling, to be replaced by wretched crops for a couple of seasons, then abandoned to desolate *Imperator*, *Eupatorium*, or other bushes. My study devolved into a crash program just to hear and tape-record the owls before they become extinct. Frills such as play-back experiments gave way to anguished efforts at identification.

4. *Otus spilocephalus* and scops-owls of small islands (*manadensis* group) are heard in abundance most of the year. The other scops-owls and caprimulgiforms are silent except during a breeding season of a few months that varies confusingly in different years and different countries according to the climate. Except for occasional pairs thought to be in a bellicose phase of their reproductive cycle, scops-owls refuse to respond or come closer to imitated or tape-recorded versions of their songs. Such harassment in the territory of some pairs seems to have a cumulative effect resulting by the third or fourth night in their being attracted into view (*beccarii*) or induced to call (*megalotis*).

5. Unlike American screech-owls, Old World scops-owls have simple songs of

only one to four notes (Weyden 1975), are shy and almost impossible to see. I learned almost nothing of their behavior and considered myself lucky if I could see enough of the bird to verify identification of its song. (*Otus megalotis* remains the only singing scops-owl in this report that I have not seen; I identified it by the process of elimination.) Therefore the new information I can provide is the territorial song, appreciated by eye from the sonograms and by ear from the disc, plus whatever can be deduced from hearing scops-owl songs: Distribution, abundance, habitat, and interactions of the pair if there are duets. However the light that vocalizations shed on taxonomy more than makes up in surprises for the dearth of life history data here.

6. Some far-flung populations regarded as unrelated or as races of *Otus scops* by Peters (1940), but correctly withdrawn from *O. scops* by Delacour (1941) have identical territorial songs. Therefore I combine them into species as follows: *Otus elegans* from Okinawa and Lanyü; *O. mantananensis* from Romblon, Sibuan, and Mantanani; *O. spilocephalus* from Taiwan, Southeast Asian mainland, Malay Peninsula, and Sumatra; *O. magicus* from Biak, Moluccas, Flores, and Seychelles. Conversely the songs of *Otus mentawi* on Mentawai and of *O. megalotis* on Luzon are different from that of *O. bakkamoena*, from which they therefore should be separated.

7. The first consequence of paragraph 6, above, is that different island populations of the same species of *Otus* can differ drastically in coloration, size, and tarsal feathering—traits that have been used overconfidently in delimiting species.

8. The second consequence of paragraph 6 is that scops-owls of unique coloration and unknown song must be listed as “taxa of unknown affinity.” They are *Otus alfredi*, *O. angelinae*, and *O. mindorensis*. Mere lack of geographic overlap as used by Hekstra (1973) is no cause for making populations conspecific.

9. A zoogeographic reward from my museum study is discovery of an “African connection.” *Otus icterorhynchus* of Africa is represented on the Andaman Islands and Sumatra by forms that should prove to be subspecies or at most, members of the same superspecies.

10. Frogmouths of the genus *Batrachostomus* apparently occur as pairs on territories. The female utters the territorial song whereas the male has shorter calls. My tape recordings backed by voucher specimens show that the taxa *affinis* and *continentalis* have the same song; that of *cornutus* is unique.

11. The Caprimulgidae pose a problem of identification in museums, which I seek to remedy with a key. The song of *Caprimulgus asiaticus* is about the same as that of *C. madagascariensis* (Stuart Keith, *in litt.*). Three different songs characterize as many populations of *Caprimulgus macrurus*, but lacking data from intervening areas, from playback experiments, and from specimens, I cannot offer a revision of this species or of the Asian part of the family.

## GENUS OTUS

Eared owls of small to medium size comprise this nearly worldwide genus. I count 25 species in the Old World, 13 in the New. They have a conspicuous facial acoustic disc and a complicated color pattern, finely pencilled and resembling bark. Size ranges from small (*Otus ireneae*, wing chord 115 mm, weight 50 g) to medium (*O. leucotis* and *O. silvicola*, wing 200 mm). Larger, big-footed owls with ear-tufts, such as *Mimizuku* and *Bubo*, have sexual dimorphism in size and a

different pattern. That of *Mimizuku gurneyi* is simple, with a plain or serrated black blotch along the shaft of the body feathers. Two taxa with inapparent ear-tufts (in the stuffed specimen) are included in *Otus* because they otherwise resemble a genuine Scops-owl on the next island. They are *capnodes* and a new form from Nicobar, both probably able to erect the tufts as does *Otus magicus insularis* in life. Excluded are the tuftless owls *Ciccaba albogularis* of simple pattern; *Gymnasio nudipes* and *G. lawrencii* with long legs, odd palates, and deep-toned, muffled voices; and *Pyrroglaux podargina* with a complicated song (described by Marshall 1949). The latter differs from *Otus* in its long legs, short claws, barred black-and-white upper and lower tail coverts, and white patch under the wrist, barred with black. Mayr (1944) regarded it as nearly conspecific with *Otus spilocephalus*, which differs in its greenish yellow eyes, montane habitat, and two-note song. Plate 2 compares the two in life.

Form and quality of song have not proved valuable as generic characters. Among bona fide species of *Otus* voices closely resemble those of *Ciccaba*, *Ninox*, and *Glaucidium*. Weyden (1975) divided the genus *Otus* vocally into two sections: The New World Screech-owls, including the exceptional *O. leucotis* of Africa, whose long trills or rhythmic phrases are faster than four notes per second; and the Old World Scops-owls, including North American *O. flammeolus*, whose short songs are of notes delivered at less than four per second.

#### New World Screech-owls

The territorial song, long and complex for an owl, is usually delivered as a duet by the mated pair. It lasts briefly for a ceremonial period. Distributed on continental North and South America, the group is absent from islands except Trinidad, Cozumel (Parkes ms), and those from Puget Sound to Sitka. Since my revision of the North and Middle American forms (Marshall 1967, summarized by Mayr and Short 1970), I have found mixed pairs between eastern and western Common Screech-owls along the Arkansas River in Colorado. In December 1972 I made tape recordings of the rare or controversial taxa *barbarus*, *lambi*, and *seductus*. Surprisingly, the females were responsible for major territorial singing at that cold season in these forms as well as *Otus trichopsis*, sympatric with *O. barbarus* in pine forest of Chiapas. Tape recordings and good ecological data on the South American species are accumulating from the field studies of Sadie Coats, J. W. Fitzpatrick, N. K. Johnson, the late M. Koepcke, C. Koford, C. C. Olrog, J. O'Neill, P. Schwartz and J. Weske. For a long time—since 1880 for one—specimens of new taxa from Peru including several full species have lain undescribed in the principal museums. Although formal description should perhaps await discovery of the song, these series are so distinct morphologically that the responsible curators should at least characterize them informally for the benefit of zoogeography.

Four suggested groupings of screech-owls other than *Otus leucotis* might comprise (1) a feathered-toed group (*Otus asio*, *O. trichopsis*), (2) a group with discrete, linear pattern (*O. choliba*, *O. sanctae-catarinae*, *O. roboratus*, etc.), (3) brownish olive birds with indistinct pattern (*O. guatemalae*, *O. ingens*, *O. watsoni/usta* complex), and (4) a cloud forest group with soft plumage coarsely spotted (*O. barbarus*, *O. clarkii*, etc.). No New World species looks like those of the Old World except for *Otus asio* and *O. barbarus*, whose colorations recall *O. silvicola* and *O. hartlaubi*, respectively.

### Old World Scops-owls

The short, simple song advertising the territory is uttered by the male for hours on end. Except for regular pair duets in *Otus umbra* and *O. mentawi*, the female scops-owls are seldom if ever heard. Distribution covers nearly all of Eurasia and Africa. (*Otus flammeolus* is an expatriate in North America.) Both the mainland species and a group evolved on small islands have exploited archipelagos and oceanic islands extraordinarily.

The scops-owls have long been adequately known as museum specimens. Only three undoubted species remained undiscovered into the 20th century. Sharpe's catalogue of owls in the British Museum (1875), well-illustrated with color plates of several Southeast Asian forms, gave detailed descriptions of plumage and treated most named forms as full species. Later the scops-owls were variously combined, usually with *Otus scops*, by many authors who never gave reasons or evidence for so doing. Peters (1940) extricated *Otus manadensis*, Delacour (1941) removed *O. mantananensis*, and Rand (MS) recognized a "small island scops-owl," *Otus elegans*, as an entity independent of *O. scops*.

I propose informally five groups of scops-owl species below:

#### *Rufescens* Group

The dorsal pattern as seen in the middle of an interscapular feather is a gleaming white mark tipped with a black arrowhead. General color is rufous in some species, asexually dichromatic rufous or fuscous in others. The wing is bluntly rounded; bill and feet are whitish; and the ear-tufts are long, conspicuous, and pointed. The song, known for only two species in the wild, is a single clear tone repeated at regular intervals. David Wells and Alec Forbes-Watson told me that it is uttered seldom and unpredictably, and is not evoked by imitation or playback.

*Otus sagittatus*, White-faced Scops-owl.—This large species (for a scops-owl) with white forecrown, tawny rufous back, and brown iris has a ventral pattern of small black arrowheads on a cinnamon rufous ground. Its tail, 64% of wing length, is relatively the longest of any *Otus*. Short feathers cover the entire tarsus. This owl occupies lowland rain forests of the Malay Peninsula.

Specimens were examined from THAILAND: Nakhon Sri Thammarat Province: MVZ 6168JTM (skeleton); Trang Province: SI 333660. WEST MALAYSIA: BM 1955.6; SNM one unnumbered specimen.

*Otus rufescens*, Rufescent Scops-owl.—This small cinnamon to tawny owlet has a relatively short wing. The iris *fide* David Wells is amber in most individuals, brown in a few. Ventrally there are small black oblongs on a cinnamon ground. The tarsus is feathered for its entire length although the tip may be sparsely feathered or bare underneath. A captive bird could spread the frontal feathers to reveal their white bases, which form a white patch connecting the conspicuous ear-tufts. The song is a slightly inflected "oooo" at about 11-second intervals. The owlet occupies lowland rain forest of the Malay Peninsula, Greater Sundas, and Sulu; it is monotypic *fide* G. P. Hekstra. David Wells introduced this bird to me in secondary woods at a suburb of Kuala Lumpur, where we heard it together with *Otus bakkamoena* and *Phodilus badius*.

Specimens examined: THAILAND: Nakhon Sri Thammarat Province (taken in bird-lime by a dealer from Tungsong Junction, who sold it to me in the Bangkok market): AMNH 6795JTM (MVZ complete skeleton). WEST MALAYSIA: BM

73.5.12.1660 (holotype of *malayensis*); SNM two unnumbered, from Perak and Negri Sembilan. The sonogram was made from a recording by Derek Holmes in lowland forest of Johore at dawn. David Wells supplied another from Tekan Forest Reserve, Pahang. INDONESIA: Sumatra: MCZ 177713; MZB 871; SNM two unnumbered; tape recording by Derek Holmes at Jambi, lowland forest, South Sumatra on 18 November 1975, 2000 hrs, moonlight. Java: BM 79.11.28.158 (holotype of *rufescens*). EAST MALAYSIA (Borneo): AMNH 630182; SI 181798; SNM one unnumbered. PHILIPPINES: Sulu: BM 83.9.20.20 (holotype of *burbidgei*).

*Otus ireneae* Ripley (1966), Irene's Scops-owl.—This smallest owlet is dichromatic and in its brownish olive phase has frosted tertials. The ventral pattern is of white arrows tipped black, as on the back. Specimen 519298 is entirely clear rufous and lacks white bases to the ventral sagittae. The iris is yellow, the bill and feet are pale pink, and the tarsus is entirely feathered. The habitat is lowland forest of Kenya. A long series of clear whistles at a little less than 2/sec comprises the territorial song. Each individual preserves a constant pitch.

Specimens were examined from Sokoke Forest near Kilifi, KENYA: LA 68578; SI 519298 (with tape recording of male by A. Forbes-Watson, original number 2742FW), 519299 (tape recording by Forbes-Watson including specimens with original numbers 2672FW and 2711FW); sonogram from tape recording by Jennifer F. M. Horne, 6 February 1968.

Superspecies *Otus icterorhynchus*, Yellow-billed Scops-owls.—These owlets also have the ventral pattern of white arrows tipped black. Size is larger than *Otus ireneae*. Dark examples of the rufous phase from Africa and the Andamans so closely resemble the specimen from Sumatra that I cannot divide them into species without vocal evidence.

a. *Otus [i.] icterorhynchus*.—Different individuals are either rufous, yellowish tawny, or brownish red. The eyelid is brightly and variously colored, the iris yellow, bill and feet pale pink, and the tarsus entirely feathered. The habitat is tropical forest of west Africa. The song of a captive purchased as a pullet in Zaire is a long moan uttered at 27-sec intervals, as heard on the recording by Emy M. Cordier, with sonogram.

Specimens were examined from LIBERIA: BM 141FW, 880FW, 1980FW. CAMEROONS: BM 1.10.29.4 (holotype of *holerythrus*), 4.7.18.125; FM 270518. GOLD COAST: BM 94.8.15.37 (holotype of *icterorhynchus*), 12.5.6.3 (holotype of *spurrelli*).

b. *Otus [i.] balli*.—Fuscous individuals are peppered on the underparts, and so are some of the darker specimens of the rufous phase. The iris varies from yellow to brown (Ali and Ripley 1969); tarsi are bare distally for one-third to half their length. A song, identical to that of the common scops of Sri Lanka, which Butler (1899) attributed to *Otus balli*, is obviously that of *O. sunia modestus*. These two owlets inhabit the Andaman Islands, which can be seen as solidly forested during the flight from Colombo to Bangkok. Foreigners are denied entry to the Andaman-Nicobar Restricted Area.

Specimens were examined from ANDAMAN ISLANDS: BM 86.2.1.445 (holotype)—86.2.1.50.

c. *Otus [i.] stresemanni*.—The unique holotype (frontispiece), BM 20.6.29.90, from 920 m, Kerintje Valley, West Sumatra, is brownish red above, paler and

more yellowish beneath. The iris is greenish yellow, bill and feet whitish, and the tarsus bare distally for 6 mm. I spent many nights listening in vain for this owl at appropriate altitudes in Sumatran forests.

### *Spilocephalus* Group

*Otus spilocephalus*, Mountain Scops.—This small owlet with slender feet and toes has a bluntly rounded wing and soft, long plumage beyond the contours of which the ear-tufts project only slightly. Filoplumes extend in dense array all about the face. The iris is greenish yellow, the bill and feet whitish. Feathering of the tip of the tarsus decreases from north to south. The color pattern, developed from white marks as in the *rufescens* group, lacks discrete sagittae. Instead it is misty, as if viewed through a frosted glass. Near the center of the feather is a single or paired whitish blotch, traversed by the gleaming white shaft. Radiating from or tipping the pale mark are various black pencillings only seldom taking the definite form of bars, a black tip, or terminal shaft streak. Dichromatism is limited to the nominate subspecies. Smythies (1953:376) describes the song as "A plaintive double whistle with the tone of a hammer on an anvil, *plew-plew*, a slight interval between the notes; uttered with great persistence." The quality is pure and silvery. Northern populations have short intervals between the two notes and between successive couplets, whereas in the south both intervals are long. The change takes place on the Malay Peninsula between Nakhon Sri Thammarat Province (short interval) and Perak State (long interval). Interval between songs is a second longer on Taiwan than in Thailand. Also Taiwan birds often double one or both notes, a rare improvisation in Thai songs.

Males call incessantly from stationary positions on territories small enough so that three or four can be heard from one spot. You cannot fail to hear this owl within a few minutes of entering suitably dense, cool, mountain forest at night at almost any time of year. It readily answers imitated whistles but seldom comes close. I have heard the female only once—a single soft note antiphonal to the male, finally becoming a soft couplet.

*Otus spilocephalus* lives and forages in the lower parts of the densest forest trees and selects for its song perch a horizontal bare twig beneath a concealing umbrella of foliage. It occupies temperate hill evergreen forest of oak, pine, and chestnut and montane tropical evergreen forest.

Geographic variation in color of *Otus spilocephalus* makes the peripheral races appear like different species. On the other hand the southeast Asian mainland birds are so variable individually that racial boundaries cannot be drawn. In the western Himalayas (*huttoni*) are pale, grayish, buffy brown birds, uniform in series. Their pattern is fine and indistinct. The tarsus is densely feathered up to and often right over the base of the toes. In Nepal (*spilocephalus*) there is the same full tarsal feathering and indistinct pattern, but the birds are richly colored, tawny, dichromatic, and individually variable. Two specimens (FM) are actually of the rufous phase. On Taiwan (*hambroeki*) the color is fuscous with a bold, coarse pattern and a whitish collar round the hind neck. The end of the tarsus is bare. Bornean specimens (*luciae*) average buffy brown freckled with black and have a coarse pattern of black marks (but the lectotype resembles the nominate race). The tarsus varies from fully feathered to bare for 8 mm distally. Most Sumatran specimens (*vandewateri*, colored like *luciae*) have a collar of white feathers with black tips. Their tarsi are bare for 5 mm to half their length distally.

Turning to the Southeast Asian mainland we find tawny populations like the nominate race, which become slightly darker from north to south. A bold, black pattern appears in some individuals, especially the West Malaysian birds. These populations might be regarded as the nominate subspecies, intergrading at the southern end of the Malay Peninsula toward *luciae*. (They are *latouchi*, like *spilocephalus* but more rufous, varying from rufous to buffy brown; *siamensis*, darker and with the tip of the tarsus often sparsely feathered or bare; and *vulpes*, with a coarse pattern and bare tip of tarsus.)

I examined the following specimens of *Otus spilocephalus* from INDIA: Uttar Pradesh State (*huttoni*): BM series and 86.2.1.246 (syntype); FM series; YPM 23061–23063. West Bengal State (*spilocephalus*): BM series; FM series. NEPAL (*spilocephalus*): I have copies of tape recordings made above Pokhara by E. van der Pol and H. A. Udo de Haes, and by Edward W. Cronin, Jr. at 2000 m in the Arun Valley. CHINA: Fukien (*latouchi*): BM 24.1.17.1 (holotype). VIETNAM (*latouchi*): FM 76405, 76406, 77838; MCZ 267109, 267110. LAOS (*latouchi*): MCZ 267108. THAILAND (*latouchi*): Chiengrai Province: B 41BK; ASRCT 3328KT, 3381KT. Mae Hongson Province: tape recordings. Chiengmai Province: ASRCT 611KT, 2146BK; MCZ 196108; MVZ 5957JTM (skeleton); SI 1977BK, 2032BK, 2103BK, 2131BK, 5903JTM, 5940JTM. Tak Province: AMNH 203155. Loei Province: TFD 912S. Pitsanulok Province: TFD 1147S. THAILAND (*siamensis*): Nakhon Nayok Province: TFD 823S; tape recordings. Prachinburi Province: tape recordings and sonogram, Khao I Phrom, 500 m, 19 December 1965, 0300 hrs, montane evergreen forest. Chantaburi Province: ASRCT 2454BK, 2524BK, 2525KT; SI 2408BK, 2425BK, 2434BK, 2481BK, 2499BK, 2500BK. Surat Thani Province: BM 36.4.12.3318 (holotype). Nakhon Sri Thammarat Province: SNM “paratype.”

WEST MALAYSIA (*vulpes*): ASRCT 5226LB, 5402LB; BM 6.7.23.361 (syntype); SNM four unnumbered specimens; UM 45M. The sonogram is from my tape at Maxwell Hill, Perak State, 1200 m, 4 March 1971 at dusk in dripping montane rain forest. EAST MALAYSIA (*luciae*): Sabah: AMNH 630187 (lectotype); MCZ 197666, 197667. Sarawak: MCZ 236755; SNM one. INDONESIA: Sumatra (*vandewateri*): AMNH 6806JTM (with tape recording), 6807JTM (sonogram from recording made at dusk 20 July 1971 at Gunung Kerintje, West Sumatra, 1500 m altitude, in montane rain forest); BM 20.6.29.91 (holotype); MCZ 177711; MZB 2B; SNM one. TAIWAN (*hambroeki*): BM 1955.6.N.20.3794 (holotype); SI 473071, 477302, 483662–483664; YI 14733. The tape recording from which the sonogram was taken is from Tsui Feng, above Sun-Moon Lake, 2300 m, 18 August 1969, 2200 hours, in cloud forest. Tapes were simultaneously made for the Laboratory of Ornithology, Cornell by S. Severinghaus, who had netted and photographed this species at the same spot in December 1967.

#### *Scops* Group

These have a fine, incisive pattern of black shaft streaks and crossbars. Ear-tufts are short; feet and toes are smallest of the genus. The wings are long and pointed, except that those of Southeast Asian forms are more rounded. Distribution is Eurasia, Africa, and North America. A few populations occupy Mediterranean islands, Socotra, and Annobon. All northern forms are migratory, the only regular migrants in the genus.

*Otus brucei*, Striated Scops-owl.—This largest species of the group is a pale

gray bird lacking rufous tints. It has the most pointed wing and relatively longest outer primary of all scops-owls and screech-owls. The entire tarsus is heavily feathered and so are the bases of the toes. Feathers run out along the top of the second phalanx of the third toe. The pattern of black shaft marks is fine, linear, and distinct. The vague crossbars are reflexed and fragmented into dots. The label of one of R. E. Cheeseman's specimens, 11946, bears the following: "Iris pale yellow, beak dark horn also claws—woodlands only—catches insects on wing in evening. Short monotonous noise like *boo-boo* of pigeon." The same double-note song is described as "ukh-ukh" by Dementiev and Gladkov (1951), who also state that the birds breed from Palestine to the Aral Sea and Afghanistan, and winter at the southern part of this range and northern India.

Specimens were examined from IRAN: BNHS 11946, 11947 (holotype of *exiguus* Mukherjee 1958). INDIA: Maharashtra State: BM 86.2.1.216 (holotype of *brucei*); BNHS 21305; YPM 23064.

Superspecies *Otus scops*, Common Scops-owls.—Small size and delicate, tiny feet with naked toes characterize this superspecies, which possesses rufous color at least on the wing coverts. The four Rassenkreise are inseparable by morphologic traits, yet isolated from each other in the breeding season, and their territorial songs differ in pattern. No two taxonomists agree on the way out of this dilemma. My suggestion is to remove North American *Otus flammeolus* because of its extremely low, mellow hoot and then consider the remaining three conspecific as *O. scops* because of tonal similarity of their high-pitched, basic note, "toik." Notice the explosive attack of this sound, showing as a vertical spike on the sonogram—quite unlike the horizontal line representing pure, musical tones of *Otus spilocephalus* or *O. rufescens*. Differences in timbre among populations of *Otus scops* through repetition or fragmentation of the spike are heard as a stutter if slow, a purr if faster. Here is the reasoning by which they can be connected:

*Otus scops* to *O. sunia*: The "toik" of European birds, *Otus scops scops*, sounds the same as the final (basic) note in the song from Japan, *O. sunia japonica* (Marshall 1966). *Otus sunia japonica* is tied to guttural southern populations such as *O. sunia distans* by the same rhythm and interval of the three- or four-note song.

*Otus scops* to *O. senegalensis*: Occasionally some individuals of *Otus senegalensis senegalensis* will consolidate the shattered spike of their stuttering note into the single "toik" of *O. scops scops* (Weijden 1973).

*Otus sunia* to *O. senegalensis*: The timbre of birds from southwest Saudi Arabia, *O. senegalensis pamela*, recorded by Ben King is intermediate between the stutter of *Otus senegalensis senegalensis* and the purr of *O. sunia distans* of Thailand.

Playback experiments among the subspecies *scops* with *japonica*, *scops* with *senegalensis*, and *pamela* with *distans* might disclose potentiality for interbreeding. Meanwhile the only obvious difficulties in uniting the three Rassenkreise are *Otus sunia*'s rhythmic song of three or four notes ("here comes the bride") instead of one note, and its red color phase.

a. *Otus flammeolus*, Flammulated Scops-owl.—The iris is brown; the wing is pointed; and the shaft streaks, adorned with rufous, are broad, almost square. Dense tarsal feathering is abruptly cut off just distal to the toe joint. Some individuals and some populations are strongly rufous, but a true rufous phase with

reduced pattern is unrepresented among them. I have discussed the behavior (1939), ecology (1957), and geographic variation (1967) of this owlet. Since then A. R. Phillips has examined the lectotype and finds it to be a fairly long-winged migrant from approximately the Mexican border area of the southwestern United States. The still larger type of *rarus* is definitely a migrant from the extreme north of the breeding range, and is therefore a synonym of *idahoensis* Merriam (1891, the type of which happens to be abnormally short winged). Hence if recognition of geographic populations is desired, so as to do justice to the distinctive gray form with heavy black streaks from the Great Basin and southern Rocky Mountains, it will be necessary to supply a new name also for the rufous population of the Mexican Plateau.

*Otus flammeolus* is migratory, and no evidence suggests it breeds or occurs in summer south of Mt. Orizaba, Mexico. Nevertheless the mythical Guatemalan race, based on wintering birds, continues to intrude into the literature. I have been asked by N. K. Johnson to furnish my winter record from even farther south than Guatemala, which I had withheld because of losing the evidence. In pines and oaks at the summit of Mt. Cacaguatique, Dept. Morazan, El Salvador, on 22 December 1941 I picked up from the trail a fresh pile of feathers mostly from the flanks of an owlet that had evidently been recently plucked and eaten on the spot by a predator. The feathers did not resemble those of *Otus trichopsis*, a species common in the same grove. I took them back to Berkeley and compared them with those of *Otus flammeolus*, which they proved to be.

The voice of *Otus flammeolus* is low in pitch (a' 440), a mellow hoot uttered at regular intervals and often preceded by one or two grace notes. Breeding distribution is in mountain pine forests from southern British Columbia to the Mexican Plateau. Wintering, with records scattered from California and Texas to Guatemala and El Salvador, may be concentrated in mountains peripheral to the south part of the Mexican Plateau.

My faint tape recordings, including some of birds seen while calling, are from the Santa Catalina and Santa Rita mountains of Arizona and the Chisos Mountains of Texas. The sonogram is of an owlet in pine-oak woodland, 1800 m, Bear Canyon, Santa Catalina Mountains, 8 June 1963.

b. *Otus [scops] senegalensis*, African Common Scops-owl.—The fine, incisive, frosted pattern in white, gray, and black is the most exquisite of all owls, to be compared in beauty with silvery forms of the poorwill, *Phalaenoptilus nuttalli*, also a desert bird. The iris is bright yellow, the bill and feet greenish. Tarsi are well feathered to an abrupt termination at the midpoint of the basal phalanx of the third toe. The wing is pointed. The male's territorial note in Senegal and Kenya is a single rattling "ttttoiik" repeated at intervals of about 8 sec. According to Alec Forbes-Watson the song on Socotra is identical to that in Kenya. In Saudi Arabia it is smoother. This owlet of African desert woodlands also occupies the islands of Socotra and Annobon. Delacour (1941) listed the various subspecies to which the whitest, *nivosus* (Keith and Twomey 1968) is added.

A few of the many available specimens were examined from AFRICA: AMNH 262638 (holotype of *graueri*); BM series and 45.7.6.263 (syntype of *Scops capensis*), 99.8.11.14 (syntype of *socotranus*), 37.4.17.1 (holotype of *pamelae*); LA series; SI series and 519219; YPM 2737, 35161, 36634, 50376, 50377, 50379. The first sonogram is from a recording made by W. van der Weijden in southeast

Senegal, 24 December 1971. Ben King's tape (second sonogram) from Hakama, southwest Saudi Arabia, was recorded in April 1976 and is supported by a specimen.

c. *Otus [scops] scops*, European Common Scops-owl.—A browner and larger bird than the foregoing, this monochromatic owlet has more homogeneous coloration owing to its finer, more numerous, and more diffuse markings. The wing is pointed, the tarsus completely feathered. Irides are bright yellow.

The European male *Otus scops* utters a staccato "toik" at intervals of about 3 sec. Although it sounds clear in the distance it is not a simple tone.

This woodland bird ranges over Europe and northwest Asia in summer and migrates to Africa for the winter. The population on Cyprus is sedentary (George Watson pers. comm.). Several other Mediterranean islands are populated.

I did not examine critically the many museum specimens of *Otus scops*. Vaurie (1965) detailed individual and geographic variation, distributions, and diagnoses of the various subspecies. The sonogram is from a recording made at Collobrières, Var, France, at nightfall, in July 1965 by Jean-Claude Roché.

d. *Otus [scops] sunia*, Asian Common Scops-owl.—This is the only owlet of the *scops* group to show dichromatism and a slightly rounded wing. The iris is orange-yellow. Although tarsal feathering varies irregularly with geography, at least the basal half is covered. The song is of three "toik" notes in a rhythmic phrase in Japan, becoming guttural, of three or four notes over the rest of Asia. I have heard the guttural song of the resident population of Thailand in open forests as far south as Petchburi and Prachuap provinces on the north end of the Malay Peninsula. The forests consist of pines and oaks on the temperate high slopes, teak and deciduous dipterocarps on the tropical foothills.

The rufous phase has a simplified or totally suppressed pattern at least dorsally. Specimens from Nicobar (*nicobaricus*) are an unpatterned brownish red all over. The nonrufous phases in Japan (*japonicus*), China (*stictonotus*, suggested to be synonymous with *japonicus*), and southern China (*malayanus*) are buffy brown to fuscous with an inconspicuous, fine, black pattern. The ventral crossbars are fragmented into rows of dots on a peppered ground. In the Himalayas and Burma (*sunia*) the back is grayish, the underparts white, so that the black shaft streaks and crossbars stand out. A clearer gray background and bolder black pattern is found in Thailand (*distans* Friedmann and Deignan 1939), where also the basal phalanx of the third toe is feathered. The small race of Sri Lanka (*leggei*) is dusky brown. All these populations have fully feathered tarsi except *nicobaricus* and *malayanus*, the tarsi of which are bare distally. *Otus scops modestus* of the Andamans is the same color as *O. s. sunia* but the distal third of the tarsus is bare.

The northern populations (*japonicus* and *malayanus*) are migratory, being generally distributed in winter throughout woodlands of Thailand and West Malaysia. They are frequently netted but never heard. I found one 3 February 1968 (number 6542) in a deciduous forest where the resident subspecies was in full song. At Leiden is a winter specimen of *malayanus* from Deli, Sumatra (according to Junge 1938). On Weh Island, at the northern tip of Sumatra (and close to the southern limit of the breeding range, on Nicobar), one answered my tape recording of *O. s. distans* with a similar purring call (of three notes, long-short-long, not taped) on 18 March 1974, and it called spontaneously later the same evening. I never again

heard such an owl on Weh, even in the breeding season, and must conclude that it too was a wintering bird.

From the mountains of Mindanao the one example of *Otus s. mirus* Ripley and Rabor (1968) resembles *O. s. distans* but is dappled with chestnut rufous on the back. The wing chord is 127 mm, round-tipped, and the tarsus is bare for its distal third. Even without the song there is no question that this is *Otus [scops] sunia*, based on size and appearance alone.

Specimens of *Otus [scops] sunia* were examined from NEPAL (*sunia*): BM 43.1.13.143a (syntype). INDIA: Assam (*sunia*): SI 408121; YPM 15058. Tamil Nadu (*rufipennis*): BM 45.1.10.6 (holotype). Ben King supplied tapes of the three-note song from both Kerala (Periyar Lake, March 1967, sonogram) and Sri Lanka. Andamans (*modestus*): BM 87.11.11.107 (juvenile, syntype), 87.11.11.108; BNHS 21963, 23808 (wing and feathers eaten by dog from net, Narcondam Island). Nicobar (*nicobaricus*): BM 86.2.1.444 (holotype), 109 (found and photographed by Ben King). BURMA: (*sunia*): LA 20382, SI 377557, 385003. SRI LANKA (*leggei*): BM 78.3.14.11 (holotype of *Scops minutus*), 87.11.11.111; CNM 187A, 187B, 187C. MANCHURIA (*japonicus*): YPM 12148. KOREA (*japonicus*): MVZ 144119, 144120. JAPAN (*japonicus*): SI series. The sonogram is from a recording by Tsuruhiko Kabaya. CHINA: Northern China (*japonicus*): BM 38.10.29.10 (holotype of *stictonotus*). Southern China (*malayanus*): MVZ 49045, 49046; SI 305684. VIETNAM (*distans*): SI 358657, 360654, 473750, 475384. LAOS (*distans*): CU 9881. THAILAND (*distans*): Chiengmai Province: ASRCT 358KT; SI 6390JTM (male, tape recording), 6398JTM (male, tape recording and first sonogram, pine-oak forest, Hot District, 19 March 1967, 2200 hrs.), 310836, 349931 (holotype). Tak Province: BM 21.12.31.28; another heard in teak forest. Loei Province: SI 6579JTM. Chaiyaphum Province: ASRCT 2865KT. Korat Province: SI 6626JTM (tape recordings of other individuals here). Kanchanaburi Province: sonogram from recording in deciduous forest, 3 February 1968; others heard at Saiyok, limestone hills. PHILIPPINES: Mindanao (*mirus*): SI 35409 (holotype).

Wintering specimens from the north were examined from THAILAND: With feathered tarsus (*japonicus*): AMNH V; ASRCT 343SP, 655KT, 1751BK, 2458BK, 6025JTM, 53-1681; B 6018JTM; MVZ 5998JTM (skeleton); SI 272BK, 799BK, 2030BK, 2453BK, 2457BK, 5978JTM, 5979JTM, 6361JTM, 6542JTM, 306763, 308544, 484021; SNM two. With bare tip of tarsus (*malayanus*): ASRCT 2490BK; SI 1750BK, 2501BK, 308545; SNM two. WEST MALAYSIA (*malayanus*): AMNH 629965, SNM four; UM 63.69. SINGAPORE (*malayanus*): SNM two.

#### *Manadensis* Group, Small Island Scops-owls

The "small islands," off the continental shelf and separated by deep water from adjacent large islands, range in size from Mantanani, 2 km long, to Sulawesi and Madagascar. That Scops-owls have scoured the seas for them is proved by the colonies thousands of kilometers apart yet only racially divergent. Remember that the type of *Otus elegans* came on board in the middle of the East China Sea!

No island harbors two species of the *manadensis* group, but four islands have one, plus representatives of other groups: Ryukus (*Otus bakkamoena*), Flores (*O. alfredi*, *O. silvicola*), Sumbawa (*O. silvicola*), and Nicobar (*O. scops nicobaricus*). The owls of the *manadensis* group appear to have no continental representative and are distinguished by their robust feet, thick bare toes, and rufous inner web of

ear tufts. The iris is yellow and the wing is rounded, except for the northern taxa *elegans* and *botelensis* in which it is pointed and the southern *capnodes* in which it is extremely blunt. Vocalizations are diverse; only two closely related species, *Otus mantananensis* and *O. magicus*, resemble each other in song.

Coloration within the *manadensis* group is varied, usually with a bold pattern. But a fine, fragmented pattern characteristic of Ryukyu birds crosses species lines by recurring on Indonesian Kalidupa and Wetar islands. Some populations are dichromatic, with a contrasting rufous phase in which the black pattern is reduced or simplified. Other, normal-phase birds can have rufous underparts, but in most of them the rufous of a flank feather is separated by transverse bands of white, with black dots along their boundaries, and the whole crossed by a black shaft streak. I call this "the *magicus* ventral pattern," illustrated on Plate 3 by specimens 6990, 92.10.30.4 and 12201. Those individuals of the same population whose underparts are merely white marked with black (such as specimen 5415 on Plate 3) have recurved or irregular crossbars unlike the orderly arrangement on rufous birds. I discerned the *magicus* ventral pattern late in the study, but can list a few specimens that definitely do or do not have it according to my sketches, photographs, and descriptions (Table 1). Significantly, the pattern is the same in populations of the Malay Archipelago and Indian Ocean, uniting all species of the *manadensis* group except *Otus elegans* and *O. hartlaubi*. It bears on the possible relationship of *Otus alfredi* and *O. mindorensis*, which I have placed in the "Unknown Group" even though they possess the *magicus* ventral pattern.

*Otus elegans*, Ryukyu Scops-owl.—The iris is orange-yellow, the foot robust, tarsus bare for about 4 mm at the tip, eartufts long, with concealed rufous at their feather bases and inner webs. Compared with the adjacent population of *Otus scops japonica*, the pattern is equally fine and degraded; the wing is similarly pointed; but the bird is larger and has no rufous phase. Compared with *Otus brucei*, of the same size, the feet of *O. elegans* are large out of proportion for any member of the *scops* group. The black shaft marks are fragmented and discontinuous on a given dorsal or flank feather. The combined effect of all the fine variegations of black, gray, rufous, and white is brownish olive on the back. The song of three notes is rhythmic, with short interval as in the Japanese bird, but in a different arrangement: one (optional) soft lower note, a pause, then two whistles close together. The quality of the song on Okinawa resembles the basic "toik" of *Otus scops scops* and *O. s. japonica*, suggesting a possible derivation of *Otus elegans* from the *scops* group. The Okinawan songs of two or three notes mentioned by Short (1973, tape unfortunately erased) as belonging to a large-appearing forest owl that he thought was *Otus bakkamoena* are undoubtedly *O. elegans elegans*.

On Lanyü (Orchid Island = Botel Tobago) the owls I saw at close range in the forest at night gave the same impression of large size as Short observed on Okinawa. This subspecies, *Otus elegans botelensis*, is larger, grayer, and more uniformly and finely marked so as to obliterate the white areas seen on the ventral feathers of the Okinawan bird. The beauty of its silvery bell-like song is comparable to that of *Otus manadensis*. The first note is softer and more often omitted than on Okinawa. At the height of the breeding season on Lanyü in May, the owls responded immediately to T. Kabaya's Okinawa tape.

The darker bird of Borodino Island, *interpositus*, probably belongs here also as a subspecies of *Otus elegans*.

Specimens of *Otus elegans elegans* were examined from the RYUKYU ISLANDS: AMNH 630170–630178; MCZ 37359, 37360, 41016, 41017; SI 405486, 405488–405490; YPM 20966–20968. The sonogram is from a recording made by Tsuruhiko Kabaya on Okinawa. BORODINO ISLAND (*Otus elegans interpositus*): YI. LANYÜ (*Otus elegans botelensis*): AMNH 6971JTM (male, sonogram from tape recording made 2130 hrs 23 May 1973 in the forest; others were recorded including sounds of pair); YI two.

*Otus manadensis*, Sulawesi Scops-owl.—The tarsus of this small owlet is completely feathered over the joint with the toes; the iris is orange-yellow (except for three specimens of “braun” and “hellbraun” iris Menden collected at Bumbuku in the north). Dorsal color is normally sepia or fuscous; there is also a brownish red phase. An interscapular feather presents a two-tiered black “pagoda”-shaped pattern with paired, buffy yellow windows (ocelli) caught between the two stories. Usually the chest has a ground color similar to, or more rufous than the back. Posteriorly the underparts are boldly but sparsely streaked on a white background, with freckled remnants of crossbars condensed on those feathers possessing streaks. The *magicus* ventral pattern is rare. The territorial song of stationary males is a single clear whistle of rising inflection. G. G. Musser heard it commonly in the forests of Sulawesi from sea level to 2,000 m.

Without knowledge of their songs, it is difficult for me to guess at the affinities of taxa on small islands off the spiral arms of Sulawesi (Peleng, Sangihe, Tukangbesi). They are different in coloration and tarsal feathering from *Otus manadensis*, and I shall discuss them under Moluccan *O. magicus*.

Specimens of *Otus manadensis* were examined from SULAWESI: AMNH 6923JTM (tape recording), 6924JTM (tape recording), 6930JTM (brownish red), 298918–298920, 298922–298927, 298929–298942, 629923–629927; BM several; MCZ (iris hellbraun oder braun) 270230–270232; MZB 4068, 5432, 5433, 6922JTM (tape recording and sonogram, montane rain forest at Lake Lindu, 2030 hrs, 22 January 1972), 17715–17718, 17784; SI 112688, 188935, 251778, 251779; SNM one.

*Otus umbra*, Simeulue Scops-owl.—This small owlet, the size of *Otus sunia* but with larger feet and bill, has a greenish yellow iris, rounded wing, and bare end of tarsus. It is brownish red all over with an obscure pattern on the dorsal feathers that is fractured into fine bars. Here and there on the otherwise unmarked underparts are feathers with *magicus* ventral pattern: alternating broad white and rufous bars finely margined with black. The beautiful syncopated song performed as a synchronized duet by the pair sounds like that of *Otus trichopsis* of Mexico. The female's voice is higher than the male's. Some duets and a solo of the male were performed continuously during a long flight through the treetops, which followed a curved route, bringing the singers back to the starting point. Pairs sang frequently on moonlit nights in March, from forest edge and forest remnants on steep slopes planted to cloves. The sonogram is not of a duet; it shows the male's territorial song against a steady whining of the female.

*Otus umbra* is the only one of the four brownish red taxa, the song of which is known. They are *umbra* (Simeulue), *nicobaricus* (Nicobar), *enganensis* (Engano), and *alfredi* (Flores). Although I have regarded them as heterogeneous,

their coloration is similar, peculiar, and they might be related. The large form, *enganensis*, precisely resembles *umbra* in the few details of pattern that can be discerned. The dorsal color of the Enggano birds varies from chestnut to brownish olive (Junge 1938).

Specimens of *Otus umbra* were examined from SIMEULUE: AMNH 6990JTM (female, tape recording; sonogram from the song of this one's mate recorded at 1915 hrs just after dark, 9 March 1974); SI 179101 (holotype).

*Otus umbra?* *enganensis*: ENGGANO: MZB 11753; SI 180711 (holotype); SNM one.

*Otus mantananensis*, Mantanani Scops-owl.—The iris of this moderate-sized owl is yellow and the tarsus is fully covered with short feathers, at least on top. The wing is rounded. Coloration and pattern of black marks are uniform throughout the interrupted range; populations differ in the amount of rufous, which decreases from north to south. The dorsal shaft streaks, of complex shape, may have lateral branches that enclose small, pale ocelli. The fuscous dorsum is finely peppered with black. Thin crossbars of the ventral feathers are fragmented distally and posteriorly in those individuals with white belly to give a peppered effect; whereas, the crossbars are developed into the *magicus* pattern on most birds with rufous underparts. Posterior to the usual rufous bib of papery feathers surrounding the throat are several black triangles.

The prevailing color and relative size of taxa provisionally included in *Otus mantananensis* are from north to south *calayensis*: brownish red above, cinnamon rufous beneath, medium size; *romblonis*: fuscous trimmed with tawny above, tawny rufous beneath, smaller; *cuyensis*: similar to *romblonis* but much larger; *mantananensis*: fuscous peppered to give a grayer effect to the back, scant rufous beneath, medium size; *sibutuensis*: darker than the nominate race and smaller than *romblonis*. I encountered this species only on Romblon, Sibuyan, and Mantanani islands, where songs were the same. The other taxa are included in *Otus mantananensis* because of plumage similarity and geographic proximity.

The routine advertising call is a single, goose-like honk, whereas in territorial confrontations the same honk is followed by three gruff notes at lower pitch. The second sonogram shows an actual trespass, causing the resident male to extend its gruff series to more than three notes. The intruder's honk follows immediately upon the second honk of the resident. Unless some of the Sibuyan birds mysteriously traded places between the time that I tape-recorded them and collected them, then the female definitely has the lower-pitched, harsher voice. Duets of pairs were of two contrasting pitches, and sustained, clear solos of males were the higher.

This owl abounds in all trees of Mantanani Island, including dense natural forest, coconut groves, and casuarinas dotting a scrubby, coralline plain. Six or more can be heard from any one spot, each calling steadily at his own pitch and independent interval. The total population must number over 100. During my one-night visit in November I encountered several wary, duetting pairs one of which was accompanied by fully grown young. In the Philippines I found *Otus mantananensis romblonis* common among coconut groves and scattered trees in farmlands of Romblon Island and adjacent, forested Sibuyan. I did not find *Otus* in or at the edges of the extensive virgin forests of Sibuyan, which may be due to

predation by a common large forest owl I thought might be *Bubo philippensis* (tape recording including a pair's dialogue, sing-song, vaguely like *Phodilus*).

The following specimens of *Otus mantananensis* from the PHILIPPINES were examined: Batanes Islands: Bosco and Calayan (*Otus mantananensis?* *calayanensis*): AMNH 348385; FM 19900–19901 (Calayan), 219912; PNM 2538–2540, 2542, 3482–3487, 3911–3913. Romblon Province: Sibuyan Island (*Otus mantananensis romblonis*): AMNH 6933JTM–6935JTM (sonogram from tape recording of male 6935 made at edge of woods, 1900 hrs, 1 April 1972), DM 28116–28119; Tablas I.: PNM 4833 (neotype of *romblonis*, originally described from Romblon, but the only specimen available at the time G. Alcasid designated this type). Cuyo I. (*Otus mantananensis cuyensis*): FM 19898, 19899; SI 192561, 192562. SABAH: Mantanani I. (*Otus mantananensis mantananensis*): BM 92.10.30.4, 92.10.30.5 (syntype); SNM 668, 669. The sonograms are from a reel containing songs of many individuals between dusk and 2030 hrs, 12 November 1974. PHILIPPINES: Sibutu I. (*Otus mantananensis?* *sibutuensis*): AMNH 629974, 629975; BM 3788, 94.4.20.4 (holotype), 94.4.20.5; DM 15265–15275; SI 210752 (holotype of *steerei*, Tumindao I.); UPLB 55600.

*Otus magicus*, Moluccan Scops-owl.—These far-flung populations ranging from Biak at least to the Seychelles differ in coloration, tarsal feathering, and size. Their raven-like territorial croak unites them. It mellows with distance to a sound like the huff of a deer; Ripley (1959) likens it to the barking deer. Close, it is a terrifying rasp. I have heard no harsher or more disagreeable bird sound except from the giant cuckoo, *Scythrops*. As with *Otus mantananensis* the song has two versions, a mild one of a single note at regular, long intervals and a belligerent, speeded-up one seen on the second sonogram for Biak. Induced by play-back, it was uttered during a flight close past the microphone. Also as in *Otus mantananensis* the female often sings the same song as the male but at a lower pitch. Evidence for identification of the sexes comes from duetting heard, the longer-calling, clearer-voiced birds having the higher pitch; and from a pair on Flores whose lower-voiced member fed young and called rarely whereas the higher-pitched mate croaked away steadily in the highest trees. I heard (and taped) once on each island a peculiar pair-ritual duet in which the birds came close together and sped up their calls; on Biak and Ambon the vowel quality of their notes changed from a croak to a nasal quack; on Ambon and Flores there was a terminal twitter, like a passerine's. Such a ritual is further evidence for conspecificity, whereas the female's complaining notes, heard through the genus, mean little taxonomically.

Coloration of *Otus magicus* is variable if not polychromatic. The shaft streaks and crossbars vary toward obscure barring when the streaks are fragmented and toward spotting when ocelli are enlarged. Both dorsal and ventral patterns may be miniaturized, scrambled, or magnified in endless variety.

On Biak I found no owls in disturbed vegetation. The only natural habitat in which I listened at night was a coastal swamp forest bounded by heavily forested limestone cliffs. Here I played through my tape of all available scops-owl calls and the bird, *Otus magicus beccarii*, answered overhead after my taped *O. m. albiventris* of Flores. The pair was observed here during several moonlit evenings in December over a large territory. I was unable to find an adjacent pair. The female

sometimes uttered a short "rick" or "wren-wren-wren" for long periods. Glimpsed at close range by flashlight, *beccarii* appeared to be an unpatterned, tawny, eared, medium-sized owl. Mayr and Meyer de Schauensee (1939) described specimens as having a barred pattern without streaks.

*Otus magicus leucospilus* of Halmahera utters the same song (Heinrich 1956, Ripley 1959, who also pronounced it the same as the tape from Flores). It uniformly has a fine, precise pattern with or without pagodas, ocelli, and *magicus* venter. The back is either cinnamon brown or, for the red phase, brownish red. The heel and underside of the tarsus are narrowly bare.

From the air Ambon appeared to have a good forest just south of the city. A 6-km taxi ride took us there at dusk, and we found pairs of *Otus magicus magicus* calling in the discontinuous canopy of giant trees towering over scattered houses and farms. They roamed large territories commensurate with the large size of the birds (wing ca. 180 mm, 165 g), glimpsed only in flight. This subspecies has the heel and up to 7 distal mm of the tarsus bare. Most specimens divide into two color phases of similar coarse, black pattern. One is tawny above with cinnamon rufous *magicus* ventral pattern, but is not a red phase; the other is sepia with paired white spots or bars above, and white ground color beneath.

On Flores I heard *Otus magicus albiventris* in the wildest secondary tree growths that I could find in lowlands and foothills near Reo and Maumere, namely wooded ravines within farming areas. A pair studied north of Maumere had a large territory centering on a tract of coastal swamp forest between a village and the shore, where the birds used what appeared to be large mangroves as well as breadfruit trees and coconut palms. No neighbors were found, and the male roamed to *Cocos* palms in the village late at night. Two silent young were out of the nest, being fed by what I assumed to be the female of the pair, whose low-pitched stuttering call was divided into four pulses. She perched 2 m from me and was revealed in the flashlight to be a small owlet the size of *Otus scops* with yellow eyes and tall, pointed eartufts standing straight up, white belly, and finely striped chest pattern. Specimens of *Otus magicus albiventris* show uniformly a fine, distinct, linear pattern without ocelli on the fuscous back. Compared with *Otus manadensis* the dorsal pattern is simpler with more white ventrally. The tarsus is fully feathered, often including the first phalanx of the toes.

Within the remnant of forest at the summit of Mahé in the Seychelles is *Otus magicus insularis* with yellow iris and tarsus nude except for a line of feathers on top, proximally. Jeff Watson, who is studying the bird intensively, has seen it erect conspicuous eartufts when startled. Its color is the tawny phase of *Otus m. magicus* with coarse dorsal pattern and broad shaft streaks upon the *magicus* ventral pattern. The song, of one note per sec, sounds identical to the belligerent call on Biak. Jeff Watson hears it usually as a pair duet, wherein the male and female alternate regularly for a brief bout as in Alec Forbes-Watson's tape from Mahé and mine from Ambon. Near the end of the duet the female changes the quality of her caw to a quack, also the same as heard on Ambon and Biak. The Seychelles bird differs from what I have described for Indonesian *magicus* principally in rarity of spaced-out notes. Jeff Watson (*in litt.*) has heard them briefly a few times. The female whines and "wren" note have not been heard on Mahé. I do not consider these differences sufficient for separating *insularis* as a species.

What taxa of unknown voice might belong in *Otus magicus*? The candidates will

be discussed in three groups: Moluccan forms, those near Sulawesi, and those of the Indian Ocean.

a. *Moluccan and Lesser Sunda populations*.—Scops-owls of islands enclosed within the area bounded by those of known song (*beccarii*, *leucospilus*, *magicus*, *albiventris*) should belong to the same species. They are no more heterogeneous than the above four. A Leiden specimen is from Aru fide Wouter van der Weijden. *Otus magicus obira* Jany (1955) of mangroves on Obi is smaller than *magicus* and variable in color. The holotype is sepia on the back with paired, whitish bars; its *magicus* pattern beneath is against a yellowish tawny ground intensely freckled with black. Two other specimens have normally streaked backs, fuscous and sepia, with ventral feathers having alternate bands of cinnamon rufous and of white in the “*magicus* pattern” indistinguishable from Ceram birds. The tarsus is feathered. *Otus magicus sulaensis* from Sula Mangoli, resembling the tawny phase of Ceram *magicus*, has whitish paired ocelli on the back and a tarsus bare distally for 7 mm.

Specimens of *Otus magicus bouruensis* of Buru are uniformly buffy brown above, white beneath, with a medium coarse pattern. Their large size and tarsal feathering are like neighbouring *magicus*. *Otus magicus tempestatis* of Wetar is small (wing average 147 mm); feathers cover the tarsus except for a heel spot and they extend over the toe joint in some specimens. The pattern is fine and linear against a fuscous back and white venter vermiculated with blackish. The rufous phase with vanishing dorsal pattern is common.

b. *Populations near Sulawesi*.—These might belong to *Otus manadensis* rather than to *O. magicus*. *Otus magicus?* *siaoensis* lives on Siau. *Otus magicus?* *mendeni* Neumann (1939) of Peleng is a small owl (wing average 141 mm) whose tarsus is bare distally for 8 mm. For once Menden’s labels say “*iris gelb*”! The fuscous dorsal feathers present a miniature, fine, complex pattern of faint pagodas enclosing white dots. Ventrally the pagodas are trimmed with brownish red on a peppered ground. *Otus magicus?* *kalidupae* of Kalidupa is large, with feathered tarsus (bare heel spot) and a fine pattern fragmented on the buffy brown back, linear on the whitish, freckled underparts. The effect is like *Otus elegans* or more accurately, a large version of its neighbor, *tempestatis*, without the rufous phase.

c. *Indian Ocean populations*.—Two taxa, by virtue of their morphological similarity to *insularis*, might belong with it in the species *Otus magicus*. One is *capnodes* of Anjouan, mentioned under *Otus rutilus*. The other is the single unnamed Nicobar specimen, much too large to be *Otus scops nicobaricus*, discussed by Ali and Ripley (1969: 265, footnote), Marshall (1972: 208), and Abdulali (1972: 106). At Campbell Bay, Great Nicobar on 3 March 1966, Humayun Abdulali collected this male (BNHS 22578) with wing chord 158 mm, tail 76, bill from cere 13.9, tarsus 29, bare of feathers for distal 5 mm, and no eartufts. The large feet are armed with large, dark claws. Interscapulars are buffy brown, faintly, irregularly, and finely barred with black; flank feathers have fine black shaft streak crossed by alternating bands of buffy brown and white margined with indefinite rows of black dots. The chest, which is also finely barred, shows a more distinct *magicus* pattern.

The following specimens of *Otus magicus* were examined: INDONESIA: My tape recordings of *Otus magicus beccarii* are of a pair in lowland forest of Biak. The

sonograms are first 2200 hrs 15 December 1973, second 1830 hours 19 December 1973 at dusk. Morty, Batjan, and Halmahera (*Otus magicus leucospilus*): AMNH 467585–467590, 629914, 629921, 629936; BM 73.5.12.1641 (syntype of *morotensis*), 73.5.12.1657 (syntype of *leucospilus*); MZB 21294, 21403; YPM 74787. Obi (*Otus magicus obira*): MZB 21496 (holotype), 21497, 21499, 21500. Sulu Mangoli (*Otus magicus sulaensis*): AMNH 629951 (lectotype). Buru (*Otus magicus bouruensis*): AMNH 629928–629930; BM 73.5.12.1639 (holotype); MZB 17719, 17720, 17722. Ceram and Ambon (*Otus magicus magicus*): AMNH 629933, 629934; BM two of Wallace; MCZ 12201; MZB 155, 5415, 26720, 26721. The sonograms are first from my tape recording of a pair duet at 0440 hrs 23 December 1973 and second, one of the same birds a little later, in forest 6 km southwest of the town of Ambon. Wetar (*Otus magicus tempestatis*): AMNH 629953 (holotype), 629954–629961. Lomblen, Flores, Sumbawa, and Lombok (*Otus magicus albiventris*): AMNH 629939–629950; BM 73.5.12.1659 (holotype). The sonogram of the male's song is from tape recordings of a pair in mangroves 1 km north of Maumere, Flores, 0500 hrs 23 March 1973. Peleng (*Otus magicus? mendeni*): MCZ 270564–270566. Kalidupa (*Otus magicus? kalidupae*): AMNH 629962, 629963 (lectotype). INDIA: Nicobar (*Otus magicus?* ssp.): BNHS 22578. SEYCHELLES: Mahé (*Otus magicus insularis*): AMNH 629991. I have copies of tape recordings by Tony Bemish, Jeff Watson (sonogram: male of breeding pair, 29 January 1976), and Alec Forbes-Watson (sonogram of pair duet).

*Otus rutilus*, Madagascar Scops.—This medium-sized owl has yellow irides and long eartufts rendered inconspicuous by their color similar to the crown. Usually there is white around the bill and black on the unpatterned acoustic disc. Size, color, and tarsal feathering are geographically as variable as in *Otus magicus*. Rufous individuals have a reduced, simplified, linear pattern.

a. The less rufous phase of the small *Otus rutilus pembaensis* from Pemba Island right beside the African shore is dull rufous above, flesh color below, trimmed with light gray, white and a few narrow black streaks. A partial juvenile, 1956.29.9, has remnants of complex black markings on the forehead. The dense tarsal feathers extend distally past the toe joint, where they end abruptly as if clipped. The song is a "monotonous monosyllabic call 'hu' sometimes uttered singly, sometimes in a succession of 'hu's' uttered at half-second intervals—the latter particularly when two birds are answering one another and both give utterance simultaneously, often one in a low and the other in a high key" (Packenham 1937: 112). The Pemba song "seems very similar to *rutilus*" (Benson 1960: 61).

b. Still smaller, *Otus rutilus? pauliani* Benson (1960) is, according to the original description, brown and barred above, pale rufous brown below with virtual absence of streaks. The tarsus is bare for the distal centimeter. A male was collected in high evergreen forest on Grande Comoro by Benson, who described the voice (*op. cit.*, 61) as unique, "A deliberate *cho* (*o* as in gone) repeated indefinitely at the rate of about two *cho*'s per second." In a letter of 9 February 1976 Benson emphasizes the montane habitat of this owl, unlike that of the lowland *Otus rutilus*, and reports that its voice resembles none of the songs usually heard on Madagascar.

c. *Otus rutilus mayottensis* Benson (1960) from Mayotte in the Comoros is a large bird with tarsus bare for 5 mm distally. The back is blackish brown marked with black, the venter brownish red with *magicus* pattern in all but the red phase

specimen. Black shaft streaks are conspicuous. The call "is a deep and melodious hooo-hooo-hooo-hooo" usually in fours and identical with the call heard on Madagascar from *Otus rutilus rutilus* (Benson 1960: 61). Benson (*in litt.*) declares that the recorded song of *Otus rutilus* (from which the first part of the sonogram was taken) is the same as that which he heard frequently on Mayotte and some two weeks later at Périnet, Madagascar.

d. Tarsi of the smaller *Otus rutilus rutilus* of Madagascar are usually sparsely feathered on top and sides, not quite reaching the tip. From the southwest coast and west (ROM) are birds sharply patterned in black, gray, and white. ROM 99473 has a blackish gray back and dark gray underparts both relieved by complex black marks associated with paired white diadems dorsally, and minute white bars on the venter. Most samples from Madagascar vary from the rufous phase to birds whose black pattern, resembling that of *Otus manadensis*, is laid upon fuscous interscapulars and cinnamon-based, white-tipped ventral feathers.

The voice of Madagascar *Otus rutilus* is variable, according to C. W. Benson and Stuart Keith. One song is high and clear, another is lower and rough. I supposed these to represent the male and female respectively, but Keith heard them in different places, and one bird switched from one song to the other. In a dry zone forest of southwestern Madagascar, Benson collected a male *Otus rutilus* whose call was a harsh, guttural "k-r-r-r-k" repeated some four times. (I repeat this item from Benson's letter because of possible similarity to my tape recording of an *Otus magicus* feeding young on Flores, mentioned earlier.)

e. *Otus rutilus capnodes* of Anjouan Island, Comoros, is a tawny to dusky brown owl about the same size as *insularis* and the Nicobar bird and apparently lacks eartufts. The tarsus is bare for the distal centimeter. The wing is very blunt; primary six (from inside) is longest. Pattern varies from obsolete (suppressing even the white scapular spots) to traces or full development of a miniature *magicus* ventral pattern and faintly barred dorsum. These traits, and some of those from other populations of *Otus rutilus* suggest a close relationship with *O. magicus*. Dr. Benson could not find the bird on Anjouan; he believes it is extinct owing to the zeal of the collector, Humbot.

Specimens of *Otus rutilus pemaensis* were examined from PEMBA: BM 1956.29.9, 1937.2.14.1 (holotype), 1937.2.14.2–1937.2.14.6. *Otus rutilus?* *pau-liani*: GRANDE COMORO: BM 1959.5.6 (holotype). *Otus rutilus mayottensis*: MAYOTTE: BM 1959.5.5 (holotype), 1959.5.163–1959.5.165. *Otus rutilus rutilus*: MADAGASCAR: AMNH 411011–411013, 411017–411020, 411023, 703580, 703581; BM 1931.8.18.358; ROM 99472, 99473. Tape recordings by Stuart Keith are of the clear song from Périnet forest, central highlands (first half of sonogram), and triplets from forest of Ankara Fansica about 100 km southeast of Majunga on the road to Tananarive (second half of sonogram; diagonal marks are howls of domestic dogs); Lake Iyuti in the west, and near Majunga in the northwest. *Otus rutilus capnodes*: COMOROS: Anjouan Island: AMNH 629999–630002; BM 55.6.N.20.3848 (syntype).

*Otus hartlaubi*, São Tomé Scops.—The specimen I saw, AMNH 264859, from São Tomé, an island in the Gulf of Guinea, resembles the red phase of Middle American *Otus barbarus* except for dusky freckling on *hartlaubi*. Considerable black on the acoustic disc recalls Malagasy birds and the large feet suggest a member of the *manadensis* group. The iris is yellow and the tarsus is bare along

the underside and heel. Tarsal feathers extend to the tip, but the lateral ones appear to have rubbed off for the distal 4 mm, where no scales are evident. The pattern of the AMNH specimen is bold and simple, suggestive of a true rufous phase. There is no white on the medial webs of the ear tufts so that the white bridle characteristic of *barbarus* appears interrupted, although it is prominent on the frontlet, superciliary, throat, and nuchal corona.

According to de Naurois (1975) recent specimens (at Bonn) divide into two colors, a rufous one such as described above and a browner bird with more crossbarring—the normal phase with full pattern. Their tarsi, bare underneath, are covered with short feathers on top and sides, thereby indicating relationship with *Otus magicus*. [I would add that such feathering is the same as in *O. m. leucospilus*.] The single territorial cry, of quality greatly resembling that of the scops of southern France but offered at longer intervals (15–20 sec or more) is of higher pitch and less melancholy.

Notice that true *Otus [scops] senegalensis* resides on neighboring Annobon, farther from the African mainland than volcanic São Tomé. Obviously *Otus hartlaubi* is related to nothing in Africa. Of all the traits discussed by de Naurois (1975) I am most impressed with the long interval of the one-note song, which I suggest puts this owl right alongside Indonesian *Otus magicus*, *O. mantananensis*, and *O. manadensis* in the small island scops-owls.

#### *Bakkamoena* Group, Collared Scops-owls

These are robust, heavy-bodied birds with large, powerful feet, like a miniature *Bubo*. The thick tarsi, and in some species the toes also, are heavily feathered. Eartufts are long and made conspicuous by their frosted inner webs. A whitish collar circles the hindneck in all taxa except *fuliginosus*, *mentawi*, and *silvicola*. Wings are the least pointed among scops-owls; the outer tenth primary is short and the sixth is longest. The iris is yellow or brown, in some populations perhaps varying individually. Females are larger than males in the *bakkamoena* group (Table 2).

*Otus brookii*, Brooke's Scops-owl.—The plumage is exceptionally soft, the black pattern sparse and enlarged, and the upper parts solidly deep fuscous save for the nearly immaculate whitish inner web of the eartufts and collar round the hind neck. The white ventral ground color is waved or freckled with rufous in some. The iris is yellow. The tarsus is heavily feathered and so is part or all of the basal phalanx (of the third and fourth toes). This owl is found in mountain rain forest of the Greater Sunda Islands, where I have searched in vain for it. Because of individual variation in color and size of the few specimens I have seen I cannot verify the single subspecies, *solokensis*, described from Sumatra.

Specimens were examined from BORNEO: AMNH 629912; BM 92.8.25.3 (holotype). JAVA: MZB 11752. SUMATRA: AMNH 629922; BM 20.6.29.87, 20.6.29.88, 87.11.11.82; MZB 10030; SNM one.

*Otus mentawi*, Mentawai Scops-owl.—The dark plumage of the usual red phase is saturated with chestnut (17689) or chestnut tawny; there is also a blackish brown phase (170566). Precise, small shaft marks of ornate shape enclose single or paired white ocelli, usually imprinted on a peppered ground. There is no trace of a collar. Irides are yellow (except for Menden's almost inevitable notations of

"braun" on labels, regardless of species). Tarsal feathers extend to the tip, where they either are sparse or go on to cover the toe joint. Coloration of *Otus mentawi* converges upon that of the smaller Palawan bird, *fuliginosus*, currently regarded as a subspecies of *O. bakkamoena*.

*Otus mentawi* utters a variety of gruff honking notes varying in inflection and pitch. It does not call steadily at regular intervals as *Otus bakkamoena* does. The longest sequence is only a couple of minutes consisting of the pair duet, which slows down, takes on added notes, becomes gruffer, and fades toward the end. The higher pitched bird (female?) utters two quavering notes followed by the male's (?) "po-po" which confers the local name, and this is repeated in synchrony. By himself a male will give a sequence of mellow "po-po" calls that ends in seven or eight softer "po" notes in a descending series. Another principal call is one bold cry of rising inflection, single or broken into two, heard every hour or so. Unfortunately I lack a tape of it, for it would be most instructive in comparison with the similar outburst of *Otus megalotis*.

A spontaneous duet was recorded inside the rain forest at dusk. Pairs readily answered and often came close in response to playback of this duet. The wild forest birds hid themselves, but the bolder village birds were conspicuous on bare limbs or coconut fronds. One perched on a roadside banana leaf in front of a group of Sipora villagers who shined lights on it while I saw enough in binoculars at 7 m to identify the calling bird: scops-owl facial pattern, brown belly with shaft pattern in black, and frosted frontlets leading up to eartufts.

The Mentawai Scops inhabits trees in forests and settlements from Sipora to South Pagai, all in the MENTAWAI ISLANDS from which the following specimens were examined: AMNH 6805JTM; BM 1947.60.23 (holotype); MCZ 170564-170566; MZB 17689; SI 279752, 279753; SNM two. My tape recording is from South Pagai at dusk, 9 July 1971 (sonogram).

*Otus bakkamoena*, Collared Scops-owl.—A white bridle, minutely speckled with black, extends along the inner webs of the long eartufts, down over the forehead and around the bill to give the Collared Scops-owl a distinctive, frost-trimmed face. Black freckles densely overlie the dorsal brown surfaces; the white or buffy underparts are peppered. Black marks along the shafts are of complicated shape, with a disparity in their size on a ventral tract between a lateral row of bold marks and fine ones to either side. The iris is usually deep brown. Yellow is mentioned on labels of a small minority of southern individuals (one each from West Malaysia, Borneo, Java, Palawan, Negros), whereas both specimens I have seen from an island off Honshu (*hatchzionis*) are labelled as having orange irides. Japanese field guides portray their local bird with yellow eyes. Tarsi are densely feathered to well over the toe joint in southern specimens and those from the Philippines; birds from north of the latitude of Bangkok and central India usually have the proximal phalanx of the toes also feathered; whereas in those farthest north the entire toes are plumed (*plumipes*, *ussuriensis*, *semitorques*, *hatchzionis*, the last on top only). Size decreases from the north, where wing chord is about 180 mm, weight perhaps 160 g to the small southern birds of wing 140 mm, weighing about 100 g. Average or modal coloration likewise varies geographically. There is no clear-cut dichromatism, but most populations include individuals differing in emphasis of grayish or yellowish on the upperparts. Scattered individuals (a specimen each from peninsular India, Sumatra, West Malaysia, Natuna, and

several from Palawan) have cinnamon underparts and the populations of the small islands south of Japan (*hatchizonis*, *pryeri*) are tawny rufous with their pale areas converted to buffy yellow.

Combinations of different colors, shape and prominence of the black marks, toe feathering, and wing length have been used to define many subspecies. Because the Collared Scops-owl has an uninterrupted distribution wherever there are trees, the mainland Asian geographic variation is, or should prove to be entirely clinal. Anyone willing to bring together the hundreds of specimens in Asian museums could definitively map and evaluate this variation statistically and could apportion some of the available names among populations having unique combinations of traits developed to an extreme. My cursory examination of some fresh-plumaged skins suggests an outcome that might resemble the following scheme of subspecies.

a. *Otus bakkamoena semitorques*. Northernmost populations, large, dusky brown, with coarse markings, plumed toes, and yellow (?) iris found in Japan, Korea, and Siberia (*ussuriensis*, grayer), and northwest India (*plumipes*). Union of these geographically separated forms attributes their similarity to former continuity, not convergence.

b. *Otus bakkamoena deserticolor*. Medium size, light gray above, white below. Streaks are linear; those of the underparts are crossed by fine precisely perpendicular bars. Mouth of the Indus River.

c. *Otus bakkamoena lettia*. Medium size, individually variable in color, but predominately buffy brown, lighter than (a), darker than (b). Equally variable and ill-defined as arbitrary sections of the north-south Indian clines are *gangeticus* and *marathae*; if they are included here, then the range of *lettia* is from central India and Nepal to Vietnam. The population of Darjeeling and Manipur is uniformly the darkest in this section (*manipurensis* Roonwall and Nath 1949), like *glabripes*, with which it may belong in spite of its smaller size.

d. *Otus bakkamoena bakkamoena*. Small, dark, densely patterned, and cinnamon; peninsular India and Sri Lanka.

e. *Otus bakkamoena pryeri*. Large, tawny rufous, toes feathered on top (*hatchizonis*, Seven Islands of Izu, iris orange) or bare past the basal phalanx (Okinawa).

f. *Otus bakkamoena glabripes*. Like *semitorques* but toes bare past the basal phalanx; Taiwan, China (*erythrocampus*), Hainan (*umbratilis*).

g. *Otus bakkamoena condorensis*. Medium size, uniformly pale but not as pale as *deserticolor*, grayish buffy brown, white below, with sparse pattern of small marks; Pulo Condore.

h. *Otus bakkamoena lemurum* (Deignan 1957). Small size, sepia to tawny fuscous above, contrastingly pale (white, medium gray, or cinnamon) below with coarse pattern; Borneo. Three Natuna birds, one with cinnamon underparts, have pointed crossbars more prominent than their shaft streaks.

i. *Otus bakkamoena kangeana*. Same as *condorensis* but small; Kangean Island. These last three island races with whitish bellies appear closely related.

j. *Otus bakkamoena lempiji*. Southernmost birds from West Malaysia (*cnephaeus*, Deignan 1950), Sumatra (*hypnoides*, Deignan 1950), Java and Bali are small, dark, and densely marked with the black pattern. They vary between sepia and fuscous upper parts, buffy brown to cinnamon venters.

The black marks of the following three Philippine races are flared laterally and the streaks disjointed so that the plumage appears densely and finely spotted.

k. *Otus bakkamoena fuliginosus*. Small, sepia above with no collar, pale buffy brown or chestnut tawny below. White ocelli gleam from the bases of the black marks. Except for lacking chestnut on the back, this taxon so resembles the larger *Otus mentawi* as to suggest close relationship. The only iris notation is on one specimen labelled yellowish ochre.

l. *Otus bakkamoena everetti*. Medium size, sepia, iris brown; Philippines from Mindanao north to southern Luzon.

m. *Otus bakkamoena nigrorum* Rand (1950). Small, dorsal color fuscous, underparts white, finely and sparsely speckled with black; head and face are largely bright rufous; Negros Island.

The territorial call of *Otus bakkamoena* is a single note, "boo," sung by the male (inferred) for long periods sometimes beginning in late afternoon. The interval is regularly 12 sec in Bangkok. Three or four times during 13 years in Thailand I noticed a descending series of 6 or 7 of these notes, ending a bout of calling. Otherwise each individual sticks to his particular, constant pitch and timing. I have heard the regular call of the male in Sri Lanka, Burma, all over Thailand except in mangroves and plains, Laos, West Malaysia, Singapore, Weh Island, Sumatra, Borneo, Java, and Negros and made tapes in all but Sri Lanka, Burma, Laos, and Negros. In northern populations (Nepal to Taiwan, Thailand, and down the Malay Peninsula to the Krau Reserve and Kuala Lumpur) the note is inflected downward. Ulu Gombak and Singapore calls are even, with no inflection; thus they provide a perfect vocal intergrade toward the rising call universally heard on Weh, the Greater Sundas, and Sri Lanka. The call on the last island is short, like the question "What?" Males sometimes utter a breathy, gruff, steady series of notes at 1-sec intervals, apparently as a threat toward rival territorial males. I have heard this upon imitation or playback of the normal call in Sumatra, Java, and Borneo, and at my silent intrusion into a territory on Weh.

The female's higher call is a quavering, whining, muffled "wheoc" always inflected downward. The female of the pair at my home in Bangkok rarely duets with her mate. More often she indulges in a long monologue, whereas pairs dialogue commonly in Java and Borneo.

I have been unfortunate in my search for *Otus bakkamoena* in the Philippines, whence I know of no tape recording or suitable description except "hook-hook-hook" (Rand and Rabor 1960) implying alignment with *Otus megalotis*! On Negros I twice heard a single, rising cry similar to that of Sumatran *Otus bakkamoena* which also seemed explosive, like the first note of the song of *O. megalotis*.

Specimens of *Otus bakkamoena* were examined from PAKISTAN: Murree (*plumipes*): BM 81.2.1.260, 86.2.1.262 (syntype). Hyderabad (*deserticolor*): BM 86.2.1.362, 86.2.1.364 (holotype), 49.WhL.1.579. INDIA: Uttar Pradesh (*gangeticus*): BM 86.3.25.444 (holotype). Madhya Pradesh and Bihar (*marathae*): BM 86.2.1.369 (holotype); LA 74778; ZSI 6394. Southern Maharashtra and south (*bakkamoena*): BM 45.1.10.4 (syntype of *griseus*), 86.2.1.421, 87.11.11.86 (syntype of *jerdoni*); ZSI 23932, 23951. SRI LANKA (*bakkamoena*): BM 87.11.11.101; CM series. KOREA (*ussuriensis*): MVZ 139267, 143639. JAPAN (*semitorques*): BM 94.12.23.1. Sima-oh-konohaduku (*hatchizonis*): YIO 254, 255. Okinawa (*pryeri*): BM 1955.6.N20.3786 (syntype); SI 110974, 385196. CHINA (*erythrocampae*): BM

1955.6.N20.3785 (holotype), 14.5.1.192. TAIWAN (*glabripes*): BM 86.3.25.398, 86.3.25.399 (syntype); SI 474950, 476501, 476502 and many more. HAINAN (*umbratilis*): BM 86.3.25.405 (holotype). NEPAL (*lettia*): ZSI 27087. I have copies of tape recordings of the falling tone by E. van der Pol, C. H. A. Udo de Haes, and Edward W. Cronin, Jr. INDIA: West Bengal: Moraghat Forest (*lettia*): ZSI 26673; Darjeeling and Manipur (*manipurensis*): ZSI 18192, 19286, 26672, 27083–27086, 27143. BURMA (*lettia*): BM 86.2.1.324.

THAILAND (*lettia*, tape recordings throughout the Kingdom): Nan Province: ASRCT 135KT. Mae Hongson Province: Sonogram from recording at edge of Ban Papae, a Luá mountain village, evergreen forest, 0600 hrs, 21 February 1967. Chiengmai Province: ASRCT 429KT, 1969BK; SI 1752BK, 1908BK, 5904JTM. Loei Province: B 1074. Korat Province: B 7–10; MVZ 6649JTM (skeleton). Prachinburi Province: ASRCT 236SP, 3527KT; SI 608PM. Nonthaburi Province: ASRCT 5839JTM. Bangkok: SNM series of Aagaard. Samut Prakan Province: MVZ 5837JTM (complete skeleton). Chonburi Province: SI 6360JTM (female with tape recording, woodland, Bang Phra, 2 February 1967, before dawn). Chantaburi Province: SI 2625BK. Pattalung Province (*cnephaeus*): B 6. CAMBODIA (*lettia* or *condorensis*): Kapi Island: BM 1955.1.1947.

VIETNAM: Pulo Condore (*condorensis*): BM 1936.4.12.829 (holotype, should be added to published list of Warren 1966); SI two of VP; SNM three. WEST MALAYSIA (*cnephaeus*): SI 86458, 179456 (holotype); UM two (one of them from Tioman Island). David Wells supplied a tape recording from Kuala Lumpur, and we heard others there, all with the falling tone. But my tape recording from above Ulu Gombak in the mountains near Kuala Lumpur has the level tone. SINGAPORE: SI 175142 (labelled *hypnoides*); SNM large series including WEST MALAYSIA all labelled *lempiji*. The sonogram is from my tape of two birds calling antiphonally with the level tone in secondary forest on Singapore, evening of 21 November 1965. EAST MALAYSIA and INDONESIA: Sumatra (*hypnoides*): SI 181065 (holotype). The sonogram of the rising note is of a city bird at Muara Labuh southeast of Padang, Sumatra, 2200 hrs, 17 July 1971. Great Natuna Island = Bunguran (subspecies?): AMNH 629852–629854. Borneo (*lemurum*): SI 181352, 181797, 461686 (holotype), 472560–472562; SM 18, 219, 1530–1532, 2.2.38, 3.1.26, 26.3.1a, 26.3.1c, 26.3.1j, 26.3.1k, 26.3.1q–26.3.1s, 26.3.1u–26.3.1w; UM 10980. My tapes are of a pair at headquarters, Orangutan Project, Pangkalanbun, Kalimantan Tengah. Kangean Island (*kangeana*): AMNH 629863 (holotype). Java (*lempiji*): BM 80.1.1.4754 (syntype), 87.11.11.83; MCZ 53222, 53223; MZB 1815, 4100, 14 March 73B; SI 218865, 218872, 219283, 219286, 219288, 219289, 220221. My tape recordings include a pair in the Botanical Garden, Bogor.

PHILIPPINES: Palawan (*fuliginosus*): AMNH 629937 (holotype); PNM 0-6959-0-6961; SI 314878; SNM one. Other islands besides Negros (*everetti*): SE Luzon: Sorsogon Province: FM 265621. Samar: FM 247451. Leyte: DM 13656, 19819. Dinagat: DM 19820. Bohol: FM 224489, 224490; YPM 17098. Mindanao: AMNH 629938; BM 87.11.11.64 (syntype); DM 13654, 13655, 13657, 13658; FM 184104, 215140, 227166; MU 46348 (no collar); PNM 6708; YPM 22854, 22855. Negros (*nigrorum*): FM 103133, 191233 (holotype); MU 13997, 20528, 30181; YPM 36968.

*Otus megalotis* (Walden 1875), Luzon Collared Scops.—Although it shares with other Philippine scops-owls (*bakkamoena*, *longicornis*, *mindorensis*, *mirus*) a

dense, fragmented pattern rendered inconspicuous against a dark back, *Otus megalotis* resembles non-Philippine forms of *O. bakkamoena* more than do the three other Philippine taxa currently bearing the name *bakkamoena*. It differs from neighboring Taiwanese *Otus bakkamoena glabripes* in golden brown iris, larger size, and dichromatism. The rufous phase with complete pattern can be seen in two recently collected, mounted specimens. One is in a display diorama at the Philippine National Museum with others of normal, light brownish olive phase collected at the same time from the Sierra Madre, Luzon. The fresh-plumaged red bird is buffy yellow where the normal phase is white (frosted bridle, bib, scapular spots), brownish red where the normal is brownish olive, and is dark rufous on exposed parts of remiges. The second red bird crashed into a fence and was mounted by Mr. Banaag, Entomologist at Subic Bay Naval Station. It is in a museum of the Public Works Center at that station. Edgar Mearns' specimen 208316 is molting from a solidly cinnamon juvenile plumage into normal phase adult feathers (with cinnamon-buff bases). Thus a reddish juvenile plumage may be proper to the species and the holotype is not necessarily the red phase. It is indeed a juvenile example of the species later described as *Otus whiteheadi*. The literature is full of imperious demands that it be reexamined (3 papers), which Derek Goodwin good-naturedly says sets a record for types demanded to be reexamined.

The large tarsus of *Otus megalotis* is heavily feathered like a muff; toe feathering varies from just over the basal articulation to full feathering of the proximal phalanx plus feathers along the top of the second phalanx.

Thus John Whitehead (1899: 97): "On several occasions, during my first visit to Benguit, I heard a most peculiar and powerful cry shortly after night fall. The natives of the district (as is usual when they hear nocturnal voices) declared it was the devil. The cry is best written 'oik-oik-oik oök,' with an interval between each 'oik' and the 'oök,' a well drawn out sound. It was not until the following year, when camped out on Monte Data, that I again heard this same peculiar cry, and after waiting about for several evenings in open parts of the forest we were fortunate in securing our first specimen of this fine Scops Owl, which is the largest representative of the genus in the Old World [*Otus megalotis*]." Unfortunately I associated the call of the Bukao, *Ninox philippensis*, "bu kao-kao-kao," with this collared scops (Marshall 1966) and had to retract it (Marshall 1973). I failed to hear the real *Otus megalotis* until 1977 when I was scared nearly out of my wits by its explosive song while walking along a deserted road in the forest at Los Baños. It was a descending series of 3–6 notes, each of rising inflection but longer than the similar sound of Sunda *Otus bakkamoena*. The series resembles a rare call of Thai *Otus bakkamoena*. A second, wilder bird, presumably the mate, uttered only the first one or two notes of the song. The principal singer was tame and called while Julio Leutero (assistant to Dr. Rabor) and I flashed our lights at it in fairly low trees. It must have perched on top of the crown foliage, for during five nights' effort we neither shined its eyes with faint red light nor revealed its outline with powerful torches. The frequency of its calls varied from one song at dawn or dusk of some nights to one or more bouts with an interval of 5–30 min between songs on other nights.

A pair was killed because of the dire portent of its calls at a tree-fringed farming area in Los Baños. (Throughout Southeast Asia an owl's calling near a house means someone therein will die.) The nest was in a large *Ficus* in a wooded ravine

about a mile from the nearest rain forest on Mt. Makiling. Such pastoral habitat agrees with that of James Gilliard's bird, 459261, "Found dead on coastal road bordered by farmlands and clumps of second growth forest" in showing that *Otus megalotis* exists in lowlands, farms, and villages as well as in montane pine or rain forests. The southernmost specimens from Laguna (AMNH, DM, UPLB) and Bulacan (DM) provinces show no approach, by intergradation, toward *Otus bakkamoena everetti* in Sorsogon Province, 300 km to the southeast.

Specimens of *Otus megalotis* additional to the two red-phase mounts were examined from LUZON: AMNH 6786JTM, 459261, 629913 (syntype of *whiteheadi*); BM 42.2.15.123 (the rufous, juvenile holotype), 97.5.13.251 (another syntype of *whiteheadi*); DM 2816, 3058, 3534, 3951, 4605, 14477; PNM 0-1360, 0-3488, SI 6294JTM, 208316; UPLB 5.3.76 (mount, netted at Rabor's home on campus). My tape recordings in rain forest of the upper campus, University of the Philippines at Los Baños, were made 12 January 1977 at 2115 hrs (sonogram) and 15 January 1977 at 0330–0400 hours.

*Otus silvicola*, Wallace's Giant Scops.—Owing to lack of white on the inner border of the eartufta, absence of white collar, sparse pattern, and white underparts with definite crossbars on the bold, sparse ventral streaks, this species resembles an American screech-owl such as the dark gray *Otus asio aikeni*. It is a large bird of Flores and Sumbawa, whose wing exceeds 200 mm. The tarsus and proximal phalanx are usually densely feathered and so are part or all (laterally) of the second phalanges. The iris is dull orange. The territorial song is a gruff steady series of from 5 to 12 notes at the same pitch rendered only once, or in a dawn bout of 4 to 5 songs at 3-min intervals. The bird is common enough on Flores but neither I nor the local ornithologists, Fathers Jilis Verheijen and Erwin Schmutz, have ever seen the calling bird. My identification of the song rests upon one glimpse in the rain forest above Ruteng of an owl too large for *Otus alfredi*, which flew rapidly upward to disappear into a tree beside me, whence immediately issued the harsh song. This is far above the altitudinal range of *Otus magicus*, and I am sure it is neither *Tyto alba* nor *Ninox scutulata*, the only other owls known from Flores. The birds invariably perched high or in concealment and I could neither see them nor shine their eyes, even among the open branches of *Albizia* and *Casuarina* on the Ruteng Mission grounds. I heard the song in wooded ravines along with *Otus magicus* in lowland farming areas near Maumere as well as throughout the virgin rain forest south of Ruteng as far up as I went, to 1600 m.

Specimens of *Otus silvicola* were examined from INDONESIA: Flores: AMNH 629910, 629910bis, 629911; BM 73.5.12.1652 (holotype, juvenile); MZB 11754. The sonogram is from my tape made at the Catholic Mission, Ruteng, 0530 hrs, 12 August 1975, in a tall *Casuarina*. The disc includes songs by the same bird the previous morning beginning at 0500. I also preserved fragments of calling bouts from Maumere and the forests.

#### Scops-owls of Unknown Voice and Unknown Affinity

*Otus alfredi*, Ruteng Mountain Scops.—The affinities of this owlet, which is brownish red with white belly, are hard to guess. Feather patterning is almost entirely suppressed, but remnants of it show dorsally as the gleaming white shafts, and in one specimen a few white, black-tipped arrows suggestive of the *rufescens* group. Beneath, the feathers have a vague barring in rufous and white suggesting

the *manadensis* group. Feet are delicate as in *Otus spilocephalus* and the tarsus is densely feathered to a point near the tip, which is bare in two specimens, sparsely feathered on top in the third. The plumage is compact, unlike that of *Otus spilocephalus*. Bill and feet in the dried skins appear to be yellow. I did not find *Otus alfredi* in the mossy rain forest above Ruteng, 1300–1700 m, in August 1975.

Specimens were examined from above 1000 m altitude in the mountains of Manggarai, FLORES: AMNH 630189–630191 (the last is the lectotype).

*Otus angelinae*, Java Mountain Scops.—A silent denizen of forests on the high volcanos of Java, Angeline's Owlet is represented by nine specimens. The one I examined is MZB 27811, a male with long eartufts, golden yellow iris, wing of 137 mm, long toes and fully feathered tarsus; the feathers extend well over the toe joint. The back looks like those of many other specimens of various groups but the underparts, transversely vermiculated with rufous, have a discrete black pattern like that of *Otus scops sunia*. I have spent many nights at all seasons on Pangrango and two sides of Gedé, including a spot where four *angelinae* were banded. I am confident that if this were, as supposed by all other authors, a race of *Otus spilocephalus*, then it would have answered my whistles with the usual promptness of that species and would have been seen. (Of course it refused to answer my tapes of *Otus sunia* also!) *O. angelinae* should be excluded from *Otus spilocephalus* by its habitual silence, golden instead of greenish-yellow iris, discrete ventral pattern, and tarsal feathering over the base of the toes, which would be bare in *O. spilocephalus* this far south.

*Otus longicornis*, Luzon Slender-billed Scops.—This yellow-eyed, unique species of moderately small size has a laterally compressed, slender bill, a thin tarsus feathered for slightly more than half its length; and long, slender claws. The black pattern on each feather is fragmented, with transverse marks emphasized at the expense of the shaft streaks—a feature of all the Philippine forest scops-owls. This, plus the frosted facial trim, dark hues, and collars produces a semblance of *Otus bakkamoena everetti*, but *Otus longicornis* is daubed with bright rufous on the medial webs of the long eartufts, on the face, and the basal parts of the feathers generally, especially on the chest. It can be described as a small *everetti* with the head of *nigrorum*. According to Whitehead (1899: 97) the sound of a male actually seen and collected while calling before sunset is “a peculiar whistling note, which may be written ‘quop’ and resembles that of the European Scops Owl.” Unfortunately this is insufficient information considering that so many scops-owls utter a single note. I predict that *Otus longicornis* will deserve a group or subgenus all to itself. The bird has been found in forests from 1800 m in Camarines Sur to as low as 360 m in Bulacan Province. I visited the type locality with scattered remnants of pine forest at La Trinidad, now a suburb of Baguio.

Specimens were examined from LUZON: BM 97.5.13.30 (holotype), 97.6.14.50; DM 3952; FM 252991, 265620.

*Otus mindorensis*, Mindoro Mountain Scops.—The unique holotype, BM 97.6.14.49, from the Mindoro highlands, 26 January 1896, is not a wintering bird. Its tarsal feathering as well as the size and shape of the wing are the same as those in *Otus scops mirus*. It is a female, wing 130 mm, with a bold black pattern but on a more rufous ground, more peppered with black than in either *mirus* or *distans*. The long toes and *magicus* pattern of rufous and white on the ventral feathers are like those of the *manadensis* group.

## FAMILY PODARGIDAE: FROGMOUTHS

Genus *Batrachostomus*

Frogmouth vocalizations are of wheezy, asthmatic quality, starting explosively then fading, as if the bird had filled an elastic pouch which is then collapsed to produce the sound. The calls have endless variety, at least in males, who will perform transitional calls when changing from one note to another contrasting one. At least in the best known species, *Batrachostomus hodgsoni* and *B. javensis*, the female has a long, stereotyped, easily identified phrase. As in gibbons (Marshall and Marshall 1976) hers is the principal territorial song; she can utter the short calls of her mate also. When active at night these frogmouths perch crosswise on bare horizontal twigs beneath masses of understory vines. Stomach contents of 14 specimens I collected ran to large grasshoppers, katydids, caterpillars, small beetles, and a scorpion 60 mm long. All these birds had pale yellow irides except one male *hodgsoni* which was brownish cream.

Confusing individual variation in size and local differences in color and voice prevented my understanding *Batrachostomus javensis* until recently when I found vocal evidence proving that Wells and Medway (1976) are right in uniting *Batrachostomus affinis* with *B. javensis*. I apologize for insisting that Dr. Boonsong (Lekagul and Cronin 1974) and Ben King *et al.* (1975) include *affinis* as a species in their field guides. Here I shall treat several populations of *Batrachostomus javensis* separately because of regionally novel calls.

Key to Species of *Batrachostomus*

- |  |  |
|--|--|
| 1 Wing coverts conspicuously adorned with a white or black terminal spot; small to large species with tail much shorter than wing (except in <i>stellatus</i> ) .....  | 2  |
| 1' Wing coverts without a terminal spot; tail subequal to wing (except <i>poliolophus</i> ) .....  | 6  |
| 2 Spots velvety black, tipped with white; sexually dichromatic; small, wing chord 116 mm; southwest India, Sri Lanka .....   | <i>Batrachostomus moniliger</i> , Ceylon Frogmouth |
| Specimens examined: 2 MNHN, 1 SI.  |  |
| 2' Spots on wing coverts white .....   | 3  |
| 3 Wing chord more than 200 mm .....  | 4  |
| 3' Wing chord less than 200 mm .....   | 5  |
| 4 Wing chord greater than 250 mm, paler coloration; lowland rain forest of Malay Peninsula, Sumatra, Borneo, Natuna .....  | <i>B. auritus</i> , Large Frogmouth                |
| Specimens examined: 1 MZB; Ken Scriven has tape recorded a loud call possibly belonging to this species at Lanyot Reserve, near Kuala Lumpur, May 1971.  |  |
| 4' Wing chord 225 mm, darker color; mountains of Borneo .....  | <i>B. harterti</i> , Dulit Frogmouth               |
| 5 Underparts patterned; asexually dichromatic; call a single falling tone like that of <i>Otus bakkamoena</i> , also a faint trill by the mate; lowland rain forest of Philippines .....   | <i>B. septimus</i> , Philippine Frogmouth          |
| Sonogram from rain forest, Subic Bay, Luzon, 22 June 1973, 2015 hrs. There is a spectacular increase in size from <i>microrhynchus</i> of Luzon and Panay (specimens: 1 PNM, 1 SI, 1 UPLB) to <i>septimus</i> of Samar to Mindanao (6 PNM, 2 SI, 8 UPLB).  |  |
| 5' Underparts plain, the feathers possessing a darker margin to give a scalloped effect; tail length subequal to wing chord which is 122 mm; males redder than females when contemporaneous skins similarly faded are compared; territorial phrase of male is two notes, the second higher than the first to which it is connected by a brief tremolo; lowland rain forest of Malay Peninsula, Sumatra, Borneo ..... | <i>B. stellatus</i> , Gould's Frogmouth            |
| Sonogram of male 6992 from rain forest, Sandakan, Sabah, 5 November 1974, 0500 hrs.  |  |
| Specimens examined: 1 AMNH, 2 ASRCT, 18 BM, 3 MCZ, 2 MZB, 1 SI, 12 SM, 9 SNM.  |  |
| 6 Bill relatively small, shallow, flat, of dark brown color; sexually dichromatic, male coarsely patterned in sepia and white, with short calls; female bright, yellowish rufous; her call a single,   |  |

- long whistle, which usually rises, then descends to the initial pitch; tail = wing chord, averaging 128 mm; mountain evergreen forest from Sikkim to northern Thailand and Vietnam . . . . .  
..... *B. hodgsoni*, Hodgson's Frogmouth  
Sonogram of male 6662, evergreen forest, Doi Khun Tan, 1200 m, Lampang Prov., Thailand, 12 May 1969, dusk. Specimens examined: 1 AMNH, 2 ASRCT, 21 BM, 2 MCZ, 2 MNHN, 6 SI.
- 6' Bill large, deep, arched, purse-like, straw colored ..... 7
- 7 Long auricular tufts, wing chord averaging 121 mm, tail (104 mm) much shorter than wing; brownish red, vermiculated with black at least in the presumed males; mountains of Sumatra and Borneo ..... *B. poliolophus*, Pale-headed Frogmouth  
Specimens examined: 3 AMNH, 7 SM, 1 SNM.
- 7' Auricular tufts shorter, tail approximately equal to wing chord ..... 8
- 8 Larger, wing chord averaging 134 mm, tail equal to wing; asexually dichromatic, usually coarsely patterned in black and white, but some individuals are black, brown, and white; others brown, finely vermiculated; others, dull rufous; these last two categories indistinguishable in color from *B. javensis continentalis* male and female respectively; song a series of descending "gwaa" notes all starting on the same pitch, like the caw of *Corvus macrorhynchos*; lowland rain forest of Sumatra, Billiton, Borneo, Kangean ..... *B. cornutus*, Long-tailed Frogmouth  
Sonogram of female? on jacket photo from rain forest, Pangkalanbun, Kalimantan Tengah, 3 August 1974, 0430–0500 hrs. Specimens examined: 10 MZB, 9 SM, 2 SNM, 1 YPM. Kangean specimens, *B. c. longicaudatus* Hoogerwerf 1962, differ from the corresponding black and white phase of nominate *cornutus* by being more vermiculated than spotted, slightly browner, and with a longer tail.
- 8' Smaller, wing averaging 119 mm, tail slightly shorter; sexually dichromatic, female dull rufous, her song a descending series of "gwaa" notes like maniacal laughter; male patterned in browns and grays, with black spots on the back; intermediate colorations are finely patterned and vermiculated in unspotted, brownish males (from Thailand), finely vermiculated in the least rufescent females (from Java); lowland evergreen forests from northernmost Thailand (up to 800 m altitude) and southeastern Burma south to include the entire Sunda shelf (Malay Peninsula, Sumatra, Java, Borneo) as well as Palawan and the small islands of Bintang, Banguey, and Culion ..... *B. javensis*, Javan Frogmouth  
a. *Batrachostomus javensis continentalis*.—Northern, western, and southern Thailand and adjacent parts of Burma as far south as Khao Luang on the Peninsula. The male is brown finely patterned, female plain rufous, and the tail is longer than that of other populations. The female's territorial song is a frenzied, descending "gwaa-gwaa-gwaa-gwaa." Shorter calls of the male include a plaintive whistle, single "gwaa," and a long rapid series of "quit." When the plaintive whistle is markedly inflected it is low in the middle—upside-down with respect to the corresponding call of male *Batrachostomus hodgsoni*. Light trills were uttered by a pair at Khlong Na Kha. Habitat is lowland evergreen forest and mixed deciduous forest including that on limestone crags in Kanchanaburi Province.  
Sonograms from lowland evergreen forest, Chiengdao District, Chiengmai Province, 13 February 1971 after dark; female 6525, lowland rain forest Ranong, Ranong Province, 28 January 1968, sunrise; male 6964, Salween River, Mae Hongson Province, 1 May 1973 before dawn. Specimens examined: 3 AMNH, 3 ASRCT, 4 BM including holotype no. 87.8.1.82 from Tenasserim, 4 SI.  
b. *Batrachostomus javensis affinis*.—Southeast Thailand and Malay Peninsula. Males are coarsely patterned, with black spots on the crown and back. A uniform series of males from Khao I Phrom (central Thailand) with smaller spots is intermediate toward *continentalis*. I heard the same female song as described for *continentalis* at Krau Reserve (West Malaysia) and a few times at Khao Yai National Park; at the latter, a calm, melodious variation is also heard (not recorded). There and at Khao I Phrom in the same mountain range males utter the "gwaa," "quit," and plaintive whistle. In addition, the plaintive whistle may end in a tremolo and there are two unique calls: "two-lick" and "kwia." Males at Krau Reserve call "gwaa," "quit," and a steady series of whistled "koel-koel-koel," much like a common and persistent call of the Koel, *Eudynamis scolopacea*. The habitat at Khao Yai and Khao I Phrom is the most luxuriant rain forest on north-facing slopes of ravines between 550 and 800 meters altitude; at Krau Reserve, mature lowland rain forest.  
Sonograms from mountain forest, Khao Yai National Park, Nakhon Nayok Province, 800

m, 4 November 1969, dusk 1814 hrs; lowland rain forest, Krau Reserve, Pahang, 12 May 1976, 2200 hrs; same place 13 May 1976, 2043 hrs. Specimens examined: 1 AMNH, 12 BM, 1 CU (on loan to BM), 3 MNHN, 2 SNM (one of which from Chantaburi in SE Thailand 30 April 1930 has characteristic spotted male plumage of *affinis* yet was one of the three specimens upon which Stresemann, 1937, based his composite *B. j. continentalis*!), 4 SI.

c. Culion and Palawan ("chaseni"), Borneo, Sumatra.—I can see no difference from *affinis* in these few specimens: 2 AMNH, 1 BM, 1 MZB, 1 PNM, 1 SNM. Derek Holmes made a tape recording of the male's plaintive whistle on Sumatra.

d. *Batrachostomus javensis javensis*.—Java. The male is spotted, indistinguishable from *affinis*. The female tends toward brownish and vermiculated, suggesting the male of *continentalis*. Sonogram of unseen pair from lowland rain forest, Sukabumi District, West Java, 27 December 1973, 2030 hrs. One bird uttered only the wheezy, rising whistle. Its mate chimed in with a "gwaa," various short trills, and in response to imitation of the Thai bird one rough "gwaa-a-a-a" (separated into pulses, not recorded).

Specimens examined: 1 BM, 6 L, 2 MZB, 1 MNHN.

## FAMILY CAPRIMULGIDAE: NIGHTJARS

### Key to Southeast Asian Nightjars

- 1 No bristles round the mouth, no white patches on wing and tail; forages and sings during continuous flight; song a staccato note followed by a long, musical whistle; *Eurostopodus* ..... 2
- 1' Bristles along upper jaw; males (at least) with white patches on outer 4 primaries (except *cretus*) and outer 2 rectrices; forages and sings from a perch (except *C. affinis*); song made up of a rapid succession of knocking noises, shown as vertical marks on a sonogram; *Caprimulgus* ..... 3
- 2 Lateral tufts prolonged from cap of elongated feathers, wing 290 mm, tail 215 mm; the whistle is inflected at the beginning and sounds continuous; forests of Assam to Vietnam and south at least to Trang Province, Thailand; Philippines, Sulawesi ..... *Eurostopodus macrotis*, Eared Nightjar  
Sonograms from mountain forest, Zambales Mts., Luzon, 28 January 1966 predawn; and forested limestone hills, Saraburi Province, Thailand, 20 January 1970, 2115 hrs; both these birds were perched on treetops.
- 2' Cap not produced laterally, wing 210 mm, tail 115 mm; the whistle sounds like two notes because the inflected portion is separated; rain forest of Malay Peninsula north to Yala Province, Thailand; Sumatra, Borneo ..... *Eurostopodus temminckii*, Capped Nightjar  
Sonogram from lowland rain forest, Krau Reserve, Pahang, West Malaysia, 13 May 1976, 1900 hrs.
- 3 Underparts broadly, evenly barred; upper parts spotted; Sunda endemics ..... 8
- 3' Underparts mottled (*indicus*) or finely barred ..... 4
- 4 Tarsus bare, scaled; smaller size ..... 7
- 4' Tarsus feathered; larger birds ..... 5
- 5 Upper parts mottled blackish, the major scapulars marked with an irregular black blotch leaving a white basal or lateral portion which is marked with gray and black; wing 198 mm, tail 134 mm, 74 grams (9 specimens BK, JTM from Chiengmai Province, Thailand, between November and March—ASRCT, SI); sings at the steady rate of about 6 knocks/sec; forests of eastern Asia, wintering to southeast Asia; Palau ..... *Caprimulgus indicus*, Migratory Nightjar  
Sonogram from montane forest Maxwell Hill, Perak, West Malaysia, 5 March 1971, 0635 hrs.
- 5' Upper parts with a precisely detailed pattern; major scapulars with solid, sharply defined black area bounded laterally by a conspicuous, white or buff, immaculate border ..... 6
- 6 Prevailing color blackish; curved lateral border of major scapulars is white; smaller size, wing 166 mm, tail 121 mm; (10 specimens PNM: Luzon 1, Sibuyan 6, Samar 3); song in couplets; forest, woods, mangroves of northern Philippines ..... *Caprimulgus macrurus manillensis*  
Sonogram from forest, base of Mt. Arayat, Pampanga Prov., Luzon, 24 March 1972, dusk.
- 6' Prevailing color brownish; outer margin of main scapulars is buffy yellow; larger size, wing 200 mm, tail 155 mm (Palawan: wing 180 mm, tail 130 mm); pounding song Nepal (tape, Ted Cronin) and Thailand, slower with audible tremolo Mysore and Sri Lanka (both from tapes by

- Ben King); forests from Pakistan to northern Australia . . . . .  
 ..... other subspecies of *Caprimulgus macrurus*, Long-tailed Nightjar  
 Sonograms from deciduous forest, Salween River, Thailand, 19 April 1973, 1850 hrs, dusk;  
 and from recording by Ben King at Wirawila Refuge, Sri Lanka, March 1976.
- 7 Upper parts with no conspicuous pattern, giving effect of fine, grayish brown mottling; white tail patch of male extends to bases of two outer rectrices; wing 190 mm, tail 115 mm; sings and forages during continuous flight, song like that of Nighthawk, *Chordeiles minor*; fields, cities, and forests of India to southeast China, in Thailand south to Kanchanaburi Province; Philippines, Sulawesi, Greater and Lesser Sunda Islands . . . *Caprimulgus affinis*, Savannah Nightjar  
 Sonogram of male 6397 from pine and deciduous oak forest, west border of Hot District, Chiengmai Province, Thailand, 19 March 1967 while bird was perched.
- 7' Upper parts contrastingly patterned as an exact miniature of *C. macrurus* but with the cinnamon rufous collar more conspicuous; wing 150 mm, tail 110 mm; brief song of knocks speeded up; open country of India to Vietnam, in Thailand south to Huahin, Prachuap Province; Sri Lanka, Madagascar, Aldabra . . . . . *Caprimulgus asiaticus*, Little Indian Nightjar  
 Sonograms are from fields at Bang Phra, southeast Thailand, 21 September 1969, dawn; and from recording by G. Stuart Keith on Madagascar. Keith regards these as different species in the same superspecies. Cliff B. Frith pronounced the songs of *madagascariensis* as identical to those he has heard of *aldabrensis*.
- 8 No white spots on wing; Sumatra and Borneo . . . . . *Caprimulgus concretus*, Bonaparte's Nightjar
- 8' White spots on wing; Sumatra and Java . . . . . *Caprimulgus pulchellus*, Salvadori's Nightjar  
 Sonogram from moss forest, 2100 m, Gunung Pangerango, 30 June 1970 at dusk, identified from this fragment of tape by Dr. J. H. Becking. If the song of 5 knocks in a rhythm is complete then it is the same as the knocking of sticks by vendors of wonton noodles in Asian cities.

#### ACKNOWLEDGMENTS

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## SUMMARY

Although the title mentions "based on voice" I do not belittle morphological criteria even though they are difficult to measure in owls (because of feathers around the bill and tarsus) and to describe (because of complexity of the interscapular and flank patterns). They define groups that are real and whose differences can easily be seen when you look at specimens. Nevertheless the literature contains several embarrassing misalignments wherein subspecies have been assigned to or even originally described in the wrong group. The groups are morphological; within them territorial vocalizations by which the birds themselves distinguish their own kind are indispensable for sorting out the limits of species. All taxa with the same song belong together. Thus in spite of its wealth and diversity of forms around the world, the genus *Otus* can be hewed down to a manageable number of widely-distributed species whose zoogeography can then be better appreciated.

The most distinctive of Old World scops-owls, the *rufescens* group, are restricted to Africa, Andaman Islands, and the Sunda Shelf; their feather pattern consists of small white arrows tipped with black. *Otus spilocephalus*, of variable pattern and clear, whistled song, is placed in a group by itself. The *scops* group of species wears a normal pattern for *Otus* consisting of black shaft streaks and crossbars. Songs are clicks or rhythmic phrases of clicks steadily repeated at short intervals. The *bakkamoena* group has normal pattern, inflected calls and perplexing Philippine representatives whose reluctance to call leaves doubts as to how they should be divided among *Otus megalotis*, *O. bakkamoena*, and *O. mentawi*. Taxa of unknown song (at least as tape recordings), hence of unknown affinities, are listed with a guess as to their possible allocation: *alfredi*, *angelinae*, *hartlaubi*, *longicornis*, *mindorensis*, *pauliani*, and a new bird from Nicobar.

The presence of genuine resident *Otus scops* (*sensu lato*) on Mindanao simplifies the quest for its relatives; all the larger, big-footed owls that other authors have placed in *O. scops* must be removed. Most of these constitute a well-knit group of species inhabiting islands: Biak, Moluccas, Ryukyus, Lanyü, a few small Philippines, Mantanani, Lesser Sundas, Sulawesi and some of its satellites, Enggano, Simeulve, Nicobar, Seychelles, Madagascar, Comoros, Pemba and São Tomé. No continental owl resembles or is even closely related to these island birds. Small island scops-owls include *Otus elegans* and *O. umbra* with rhythmic songs; *O. manadensis* with a clear whistle; and two widely-distributed, gruff-voiced species. The first of these is *Otus mantananensis*, whose goose-like honk is a two- or three-toned chord. The second is *Otus magicus*, whose raven-like caw is heard from Biak 9000 km westward to Seychelles. Its divergence into mere subspecies confirms a history of long flights over oceans and recent colonizations.

The adaptation common to these particular night birds is concealing coloration resembling bark or dead leaves. Combined with immobility, in appropriate postures it obscures the bird on nest or roost from diurnal predators. Equipped additionally with superb vision, accurate hearing, and powerful, noiseless flight these are the chosen few among birds that have wrested for themselves a part of the nocturnal world dominated by mammals.

Most of the species discussed here live only in tropical forests, where they have diversified by evolution. Diversity is indeed the goal of evolution, and the tropical

forests, including those on small islands, are the most diverse assemblages of plant and animal species on earth—the greatest genetic reservoir. As noble objects for study and esthetic appreciation these forests ameliorate the climate and regulate our water supply. Without tropical forest the world becomes an inhospitable desert characterized by raging extremes of temperature and alternations between catastrophic drought and floods. If the forests can be saved we need not worry about the perpetuation of these few interesting kinds of night birds near the top of the ecologic food pyramid.

#### LITERATURE CITED

- ABDULALI, H. 1972. A catalogue of birds in the collection of the Bombay Natural History Society—11. J. Bombay Nat. Hist. Soc. 69:102–129.
- ALI, S., AND S. D. RIPLEY. 1969. Handbook of the birds of India and Pakistan, vol. 3. London, Oxford University Press.
- BENSON, C. W. 1960. The birds of the Comoro Islands. Ibis 103b:5–106.
- BUTLER, A. L. 1899. The birds of the Andaman and Nicobar Islands. J. Bombay Nat. Hist. Soc. 12:555–571.
- DELACOUR, J. 1941. On the species of *Otus scops*. Zoologica 26:133–142.
- DEIGNAN, H. G. 1950. The races of the collared scops owl, *Otus bakkamoena* Pennant. Auk 67:189–200.
- . 1957. A trio of new birds from tropical Asia. Proc. Biol. Soc. Washington 70:43–44.
- DEMENTIEV, G. P. AND N. A. GLADKOV. 1951. Birds of the Soviet Union, vol. 1. Jerusalem, Israel Program for Sci. Transl.
- FRIEDMANN, H. AND H. G. DEIGNAN. 1939. Notes on some Asiatic owls of the genus *Otus*, with description of a new form. J. Washington Acad. Sci. 39:287–291.
- HEINRICH, G. 1956. Biologische Aufzeichnungen über Vögel von Halmahera und Batjan. J. Ornithol. 97:31–40.
- HEKSTRA, G. P. 1973. Scops and screech owls, pp. 94–115 in: Owls of the world (J. A. Burton, Ed.). Amsterdam, Eurobook.
- HOOGERWERF, A. 1962. Some ornithological notes on the smaller islands around Java (with the description of seven new subspecies). Ardea 50:180–206.
- JANY, E. 1955. Neue Vogel-Formen von den Nord-Mulukken. J. Ornithol. 96:102–106.
- JUNGE, G. C. A. 1938. On a collection of birds from Enggano. Treubia 16:339–356.
- KEITH, S. AND A. TWOMEY. 1968. New distributional records of some east African birds. Ibis 110:537–548.
- KING, B. F. AND E. C. DICKINSON. 1975. Birds of South-East Asia. London, Collins.
- LEKAGUL, B. AND E. W. CRONIN. 1974. Bird guide of Thailand. Bangkok, Association for the Conservation of Wildlife.
- MARSHALL, J. T., JR. 1939. Territorial behavior of the Flammulated Screech Owl. Condor 41:71–78.
- . 1949. The endemic avifauna of Saipan, Tinian, Guam and Palau. Condor 51:200–221.
- . 1957. Birds of pine-oak woodland in southern Arizona and adjacent Mexico. Pacific Coast Avifauna No. 32.
- . 1966. Relationships of certain owls around the Pacific. Nat. Hist. Bull. Siam Soc. 21:235–242.
- . 1967. Parallel variation in North and Middle American screech owls. Western Found. Vert. Zool. Monogr. No. 1.
- . 1972. Review of Handbook of the birds of India and Pakistan. Auk 89:207–209.
- . 1973. Letter to the editor. Nat. Hist. Bull. Siam Soc. 24:509.
- . 1977. Audiospectrograms with pitch scale: a universal “language” for representing bird songs graphically. Auk 94:150–152.
- . AND E. MARSHALL. 1976. Gibbons and their territorial songs. Science 193:235–237.
- MAYR, E. 1944. Notes on some genera from the southwest Pacific. Amer. Mus. Novitates No. 1269.
- . AND R. MEYER DE SCHAUENSEE. 1939. Birds of the island of Biak. Proc. Acad. Nat. Sci. Philadelphia 91:1–37.

- AND L. L. SHORT. 1970. Species taxa of North American Birds. Publ. Nuttall Ornithol. Club No. 9.
- MERRIAM, C. H. 1891. Annotated list of birds observed in Idaho during the summer and fall of 1890, with notes on species previously recorded from the state. North Amer. Fauna 5:89–108.
- MUKHERJEE, A. K. 1958. A new race of the Striated Scops Owl, *Otus brucei* (Hume), from west Asia. Rec. Indian Mus. 53:301–302.
- NAUROIS, RENÉ DE. 1975. Le "scops" de l'Île de São Tomé *Otus hartlaubi* (Giebel). Bonner Zoologische Beiträge 26:319–355.
- NEUMANN, O. 1939. Six new races from Peling. Bull. Brit. Ornithol. Club 59:104–108.
- PACKENHAM, R. H. W. 1937. A new Scops Owl from Pemba Island. Bull. Brit. Ornithol. Club 57:112–114.
- PETERS, J. L. 1940. Checklist of birds of the world, vol. 4. Cambridge, Massachusetts, Harvard Univ. Press.
- RAND, A. L. 1950. A new race of owl, *Otus bakkamoena*, from Negros, Philippine Islands. Nat. Hist. Misc. No. 72. Chicago, Field Museum.
- AND D. S. RABOR. 1960. Birds of the Philippine Islands: Siquijor, Mount Malindang, Bohol, and Samar. Fieldiana: Zoology 35:223–439.
- RIPLEY, S. D. 1959. Birds from Djailolo, Halmahera. Postilla 41:1–8.
- . 1966. A notable owllet from Kenya. Ibis 108:136–137.
- AND D. S. RABOR. 1968. Two new subspecies of birds from the Philippines and comments on the validity of two others. Proc. Biol. Soc. Washington 81:31–36.
- ROONWALL, M. L. AND B. NATH. 1949. Contributions to the fauna of Manipur State, Assam, part 2, birds. Rec. Indian Mus. 46:127–182.
- SHARPE, R. B. 1875. Catalogue of birds in the British Museum, vol. 2. London, British Museum (Natural History).
- SHORT, L. L. 1973. Notes on Okinawan birds and Ryukyu island zoogeography. Ibis 115:264–267.
- SMYTHIES, B. 1953. The birds of Burma. Edinburgh, Oliver and Boyd.
- STRESEMANN, E. 1937. Kritische Studien über die Gattung Batrachostomus. Mitt. Zool. Mus. Berlin 22:304–329.
- VAURIE, C. 1965. The birds of the Palearctic fauna, vol. 2. London, Witherby.
- WALDEN, A. V. 1875. A list of the birds known to inhabit the Philippine Archipelago. Trans. Zool. Soc. London 9:125–252.
- WALLACE, A. R. 1869. The Malay Archipelago. London, MacMillan.
- WARREN, R. L. M. 1966. Type-specimens of birds in the British Museum (Natural History), vol. 1, non-passerines. London, British Museum (Natural History).
- WEIJDEN, W. J. VAN DER. 1973. Vocal affinities of the African and European scops owls *Otus scops* (Strigidae). Bull. Inst. Fond. de l'Afrique Noire 35:716–722.
- WELLS, D. R. AND LORD MEDWAY. 1976. Taxonomic and faunistic notes on birds of the Malay Peninsula. Bull. Brit. Ornithol. Club 96:20–34.
- WEYDEN, W. J. VAN DER. 1975. Scops and screech owls: vocal evidence for a basic subdivision in the genus *Otus* (Strigidae). Ardea 63:65–77.
- WHITEHEAD, J. 1899. Field-notes on birds collected in the Philippine Islands in 1893–6 by John Whitehead. Ibis 41:81–101.

## APPENDIX I

## Abbreviations

## MUSEUMS

AMNH	American Museum of Natural History, New York
ASRCT	Centre for Thai National Reference Collections, Applied Scientific Research Corporation of Thailand, Bangkok
B	Boonsong Lekagul Collection, Bangkok
BM	British Museum (Natural History), Tring
BNHS	Bombay Natural History Society, Bombay
CNM	Colombo National Museum, Colombo
CU	Chulalongkorn University, Bangkok
DM	Delaware Museum of Natural History, Greenville
FM	Field Museum, Chicago
L	Rijksmuseum van Natuurlijke Historie, Leiden (loan of six frogmouths)
LA	Los Angeles County Museum, Los Angeles
MCZ	Museum of Comparative Zoology, Harvard College, Cambridge
MNHN	Muséum National d'Histoire Naturelle, Paris
MU	Mindanao State University, Marawi City
MVZ	Museum of Vertebrate Zoology, University of California, Berkeley
MZB	Museum Zoologicum Bogoriense, Bogor
NOF	Neotropical Ornithological Foundation, Tucson
PNM	Philippine National Museum, Manila
ROM	Royal Ontario Museum, Ottawa
SI	Smithsonian Institution, Washington
SNM	Singapore National Museum, Singapore (study collection now at Univ. Singapore)
SM	Sarawak Museum, Kuching
TFD	Royal Thai Forest Department, Bangkok
UM	University of Malaya, Kuala Lumpur
UPLB	University of the Philippines, Los Baños
YI	Yamashina Institute of Ornithology, Tokyo
ZSI	Zoological Survey of India, Indian Museum, Calcutta

## COLLECTORS

B	Mr. Boeadi
BK	Ben King
FW	Alec Forbes-Watson
JTM	Joe T. Marshall, Jr.
KT	Kitti Thonglongya
LB	Lim Booliat
M	Gathorne, Lord Medway
PM	Peter Marshall
R	Dioscoro Rabor
S	Somtob Chaiyaphun
SP	Somsak Pantuwatana
V	Vandee Nongnork
VP	P.F. D. van Peenen

## APPENDIX II

## Suggested Amendments to Peters' Check-list of Birds of the World Volume IV

- p. 87. Add *Otus ireneae* Ripley (1966) from Kenya.
- p. 89. The taxa *stresemanni* and *angelinae* are not races of *Otus spilocephalus*; *vandewateri* is.
- p. 91. Confine *modestus* to Andamans and divide its continental range between nominate *sunia* and *Otus sunia distans* Friedmann and Deignan (1939) of Thailand; *malayanus* is wintering from southern China.
- p. 92. The taxa *interpositus*, *elegans*, *botelensis*, and *calayensis* comprise the species *Otus elegans*. *Otus longicornis* is a unique, monotypic species. Add *Otus sunia mirus* Ripley and Rabor (1968) of Mindanao.
- p. 93. The taxa *romblonis*, *cuyensis*, and *mantanensis* are races of *Otus mantananensis*, whose range includes (PNM) Tres Reyes Islands next to Marinduque as well as Dicabaito, Linapacan, and Rasa islands near Palawan.
- p. 95. The taxon *rarus* is a synonym of *Otus flammeolus idahoensis* Merriam (1891) from Idaho, wintering in Guatemala. Add *Otus rutilus?* *pauliani* and *O. rutilus mayottensis* Benson (1960) from Grande Comoro and Mayotte, respectively.
- p. 96. *Sibutuensis* and *steerei* pertain to *Otus mantananensis*; *sulaensis*, *kalidupae*, and *morotensis* to *O. magicus*.
- p. 97. All on this page are races of *Otus magicus* except for two species, *Otus silvicola* and *O. megalotis* (Waldon 1875) of Luzon, a prior name for *O. whiteheadi*. The giant, nominate race of *Otus megalotis* occurs on Marinduque I. (2 PNM); see p. 100 for the small ones.
- p. 99. Add *Otus bakkamoena lemurum* Deignan (1957) from Sarawak and recognize *O. mentawi* as a species.
- p. 100. Add *Otus megalotis nigrorum* Rand (1950) from Negros. *Boholensis* is a synonym of *Otus megalotis everetti*.
- p. 179. *Batrachostomus cornutus* is a species with a subspecies, *B. cornutus longicaudatus* Hoogerwerf (1962) from Kangean Island. The taxa *continentalis*, *affinis*, *chaseni*, and *javensis* belong in the species *Batrachostomus javensis*. *Chaseni* occurs on Busuanga I. and is a valid subspecies through unique coloration of the crown of the three males I have seen: no black dots and two are heavily spotted with white (PNM, SNM).
- p. 206. *C. madagascariensis* and *aldabrensis* belong with *Caprimulgus asiaticus* on p. 211.

*Please note.*—After page proof I observed and tape-recorded *Otus megalotis everetti*, *O. m. megalotis*, *O. elegans calayensis*, and *Mimizuku gurneyi* and found range extensions among PNM specimens. Necessary changes are in Appendix II, not in the text. Although I intimated (p. 23) that all Philippine Collared Scops-owls except *fuliginosus* might belong in *Otus megalotis*, I was amazed to hear small *everetti* voice the strident tones of the giant. This species utters a series of faint growls at regular intervals from a horizontal position while the tail is raised at each note to a vertical position over the back.

With *calayensis* joined to *Otus elegans*, as Rand (MS) knew ten years ago, it is now true that except for *Otus hartlaubi* some specimens of all species of islet scops-owls have the *magicus* ventral pattern. Another trait that may run through this subgenus (*Gymnoscops*) is passerine-like cheeps concluding the pair duet (p. 15), which I heard from *Otus elegans* at Basco; there, the male's normal, low-pitched song often merges the second and third notes.

I heard the "koel" call of *Batrachostomus javensis* at Khao Yai National Park and the normal, pounding song of *Caprimulgus macrurus* on Palawan. At Khao Yai a group of *Caprimulgus indicus* foraging around street lights was identified in flight by the subterminal white bar on the tail of males; this should be in the key p. 30, contrasted with the large white tail corners of *C. macrurus*.

## APPENDIX III

Trivial Names of Scops-owls and the Respective Species Accounts Under Which They Are Discussed,  
on the Pages Mentioned in Table of Contents

NAME	EXPLAINED IN SPECIES ACCOUNT OF	NAME	EXPLAINED IN SPECIES ACCOUNT OF
<i>albiventris</i>	<i>Otus magicus</i>	<i>magicus</i>	<i>Otus magicus</i>
<i>alfredi</i>	<i>Otus alfredi</i>	<i>malayanus</i>	<i>Otus sunia</i>
<i>angelinae</i>	<i>Otus angelinae</i>	<i>manadensis</i>	<i>Otus manadensis</i>
<i>bakkamoena</i>	<i>Otus bakkamoena</i>	<i>manipurensis</i>	<i>Otus bakkamoena</i>
<i>balli</i>	<i>Otus icterorhynchus</i>	<i>mantananensis</i>	<i>Otus mantananensis</i>
<i>beccarii</i>	<i>Otus magicus</i>	<i>marathae</i>	<i>Otus bakkamoena</i>
<i>botelensis</i>	<i>Otus elegans</i>	<i>mayottensis</i>	<i>Otus rutilus</i>
<i>bouruensis</i>	<i>Otus magicus</i>	<i>megalotis</i>	<i>Otus megalotis</i>
<i>brookii</i>	<i>Otus brookii</i>	<i>mendeni</i>	<i>Otus magicus</i>
<i>brucei</i>	<i>Otus brucei</i>	<i>mentawi</i>	<i>Otus mentawi</i>
<i>calayensis</i>	<i>Otus mantananensis</i>	<i>mindorensis</i>	<i>Otus mindorensis</i>
<i>capnodes</i>	<i>Otus rutilus</i>	<i>mirus</i>	<i>Otus sunia</i>
<i>cnephaeus</i>	<i>Otus bakkamoena</i>	<i>modestus</i>	<i>Otus sunia</i>
<i>condorensis</i>	<i>Otus bakkamoena</i>	<i>Natuna</i>	<i>Otus bakkamoena</i>
<i>cuyensis</i>	<i>Otus mantananensis</i>	<i>Nicobar</i>	<i>Otus magicus</i>
<i>deserticolor</i>	<i>Otus bakkamoena</i>	<i>nicobaricus</i>	<i>Otus sunia</i>
<i>distans</i>	<i>Otus sunia</i>	<i>nigrorum</i>	<i>Otus bakkamoena</i>
<i>elegans</i>	<i>Otus elegans</i>	<i>nivosus</i>	<i>Otus senegalensis</i>
<i>enganensis</i>	<i>Otus umbra</i>	<i>obira</i>	<i>Otus magicus</i>
<i>everetti</i>	<i>Otus bakkamoena</i>	<i>pamelae</i>	<i>Otus senegalensis</i>
<i>exiguus</i>	<i>Otus brucei</i>	<i>pauliani</i>	<i>Otus rutilus</i>
<i>feae</i>	<i>Otus senegalensis</i>	<i>pembaensis</i>	<i>Otus rutilus</i>
<i>flammeolus</i>	<i>Otus flammeolus</i>	<i>plumipes</i>	<i>Otus bakkamoena</i>
<i>fuliginosus</i>	<i>Otus bakkamoena</i>	<i>pryeri</i>	<i>Otus bakkamoena</i>
<i>gangeticus</i>	<i>Otus bakkamoena</i>	<i>rarus</i>	<i>Otus flammeolus</i>
<i>glabripes</i>	<i>Otus bakkamoena</i>	<i>romblonis</i>	<i>Otus mantananensis</i>
<i>graueri</i>	<i>Otus senegalensis</i>	<i>rufescens</i>	<i>Otus rufescens</i>
<i>hambroecki</i>	<i>Otus spilocephalus</i>	<i>rutilus</i>	<i>Otus rutilus</i>
<i>hartlaubi</i>	<i>Otus hartlaubi</i>	<i>sagittatus</i>	<i>Otus sagittatus</i>
<i>hatchizonis</i>	<i>Otus bakkamoena</i>	<i>scops</i>	<i>Otus scops</i>
<i>holerythra</i>	<i>Otus icterorhynchus</i>	<i>semitorques</i>	<i>Otus bakkamoena</i>
<i>huttoni</i>	<i>Otus spilocephalus</i>	<i>senegalensis</i>	<i>Otus senegalensis</i>
<i>hypnoides</i>	<i>Otus bakkamoena</i>	<i>siamensis</i>	<i>Otus spilocephalus</i>
<i>icterorhynchus</i>	<i>Otus icterorhynchus</i>	<i>siaoensis</i>	<i>Otus magicus</i>
<i>idahoensis</i>	<i>Otus flammeolus</i>	<i>sibutuensis</i>	<i>Otus mantananensis</i>
<i>insularis</i>	<i>Otus magicus</i>	<i>silvicola</i>	<i>Otus silvicola</i>
<i>interpositus</i>	<i>Otus elegans</i>	<i>socotranus</i>	<i>Otus senegalensis</i>
<i>ireneae</i>	<i>Otus ireneae</i>	<i>solokensis</i>	<i>Otus brookii</i>
<i>japonicus</i>	<i>Otus sunia</i>	<i>spilocephalus</i>	<i>Otus spilocephalus</i>
<i>kalidupae</i>	<i>Otus magicus</i>	<i>stictonotus</i>	<i>Otus sunia</i>
<i>kangeana</i>	<i>Otus bakkamoena</i>	<i>stresemanni</i>	<i>Otus icterorhynchus</i>
<i>latouchi</i>	<i>Otus spilocephalus</i>	<i>sulaensis</i>	<i>Otus magicus</i>
<i>leggei</i>	<i>Otus sunia</i>	<i>sunia</i>	<i>Otus sunia</i>
<i>lempiji</i>	<i>Otus bakkamoena</i>	<i>tempestatis</i>	<i>Otus magicus</i>
<i>lemurum</i>	<i>Otus bakkamoena</i>	<i>umbra</i>	<i>Otus umbra</i>
<i>lettia</i>	<i>Otus bakkamoena</i>	<i>ussuriensis</i>	<i>Otus bakkamoena</i>
<i>leucospilus</i>	<i>Otus magicus</i>	<i>vanderwateri</i>	<i>Otus spilocephalus</i>
<i>longicornis</i>	<i>Otus longicornis</i>	<i>vulpes</i>	<i>Otus spilocephalus</i>
<i>luciae</i>	<i>Otus spilocephalus</i>	<i>whiteheadi</i>	<i>Otus megalotis</i>

## EXPLANATION OF TABLES AND PLATES

Because they refer to so many species, the tables and plates are not cited in the text, but are presented here at the end as independent data to support the conclusions. My insistence upon the use of logarithmic (pitch) scale, wide band, and calibration tone for the sonograms is explained in Marshall (1977). The whole width of the sonogram is presented as it comes off the analyzer but its height is trimmed to the appropriate range of pitch; it was photographed at low contrast. A gap at an angle means a lapse in time between successive calls of the same individual; whereas a vertical gap means that two different individuals not in sequence are combined on the same line. The sonograms are made from the calls on the disc and in the same order as the disc except that the high-pitched cry of *Caprimulgus affinis*, requiring a special scale, is presented at the bottom of Plate 14.

Data for the tapes presented are with the phonograph disc and also in the text, where each sonogram is documented in the lists of specimens examined, arranged in a geographic sequence from north to south.

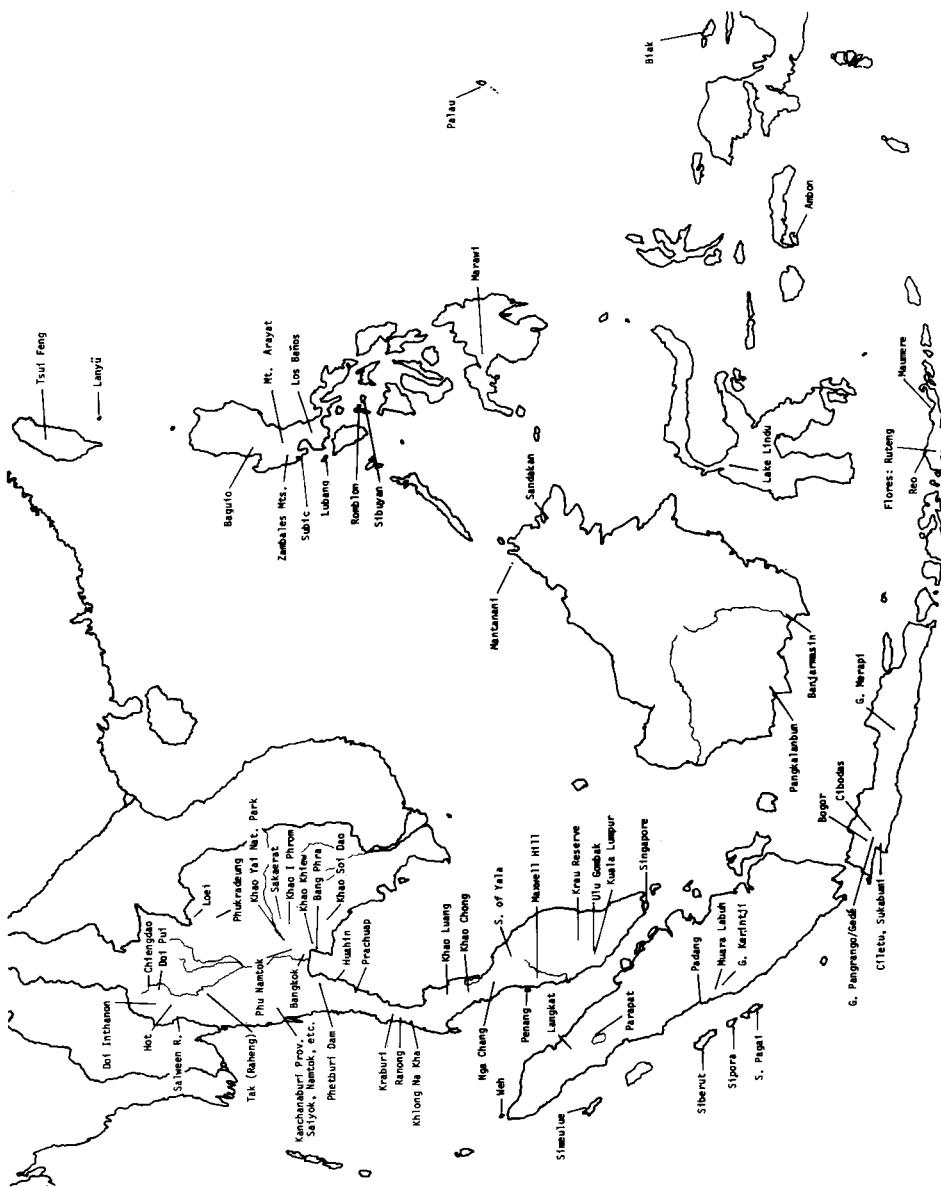


Plate 1. Map of Southeast Asia showing localities visited. Most refer not to the town but rather to a forest area in the district or province of the same name. However, *Otus bakkamoena* or *Caprimulgus affinis* were observed actually within the major cities. At Lubang, Marawi and Penang I found only *Ninox*; at Cibodas, *Phodilus*; but no owls at Baguio, Langkat Reserve, Gunung Merapi, Parapat or Khao Chong.



Plate 2. Comparison of *Pyrroglaux podargina* with *Otus spilocephalus* in life. Left, *Pyrroglaux* from Koror, photographed by the Marquis Yamashina. Right, *Otus spilocephalus*, above from Tsui Feng, Taiwan by Sheldon Severinghaus; below from Doi Inthanon, Thailand by Ben King; both printed from color slides.

→

Plate 3. Representative feathers from the middle of the back (upper) and flanks (lower) in some populations of *Otus*. Natural size. The *vulpes* specimen of Raffles' collection is a female from G. Tahan, Pahang 10.12.1920.

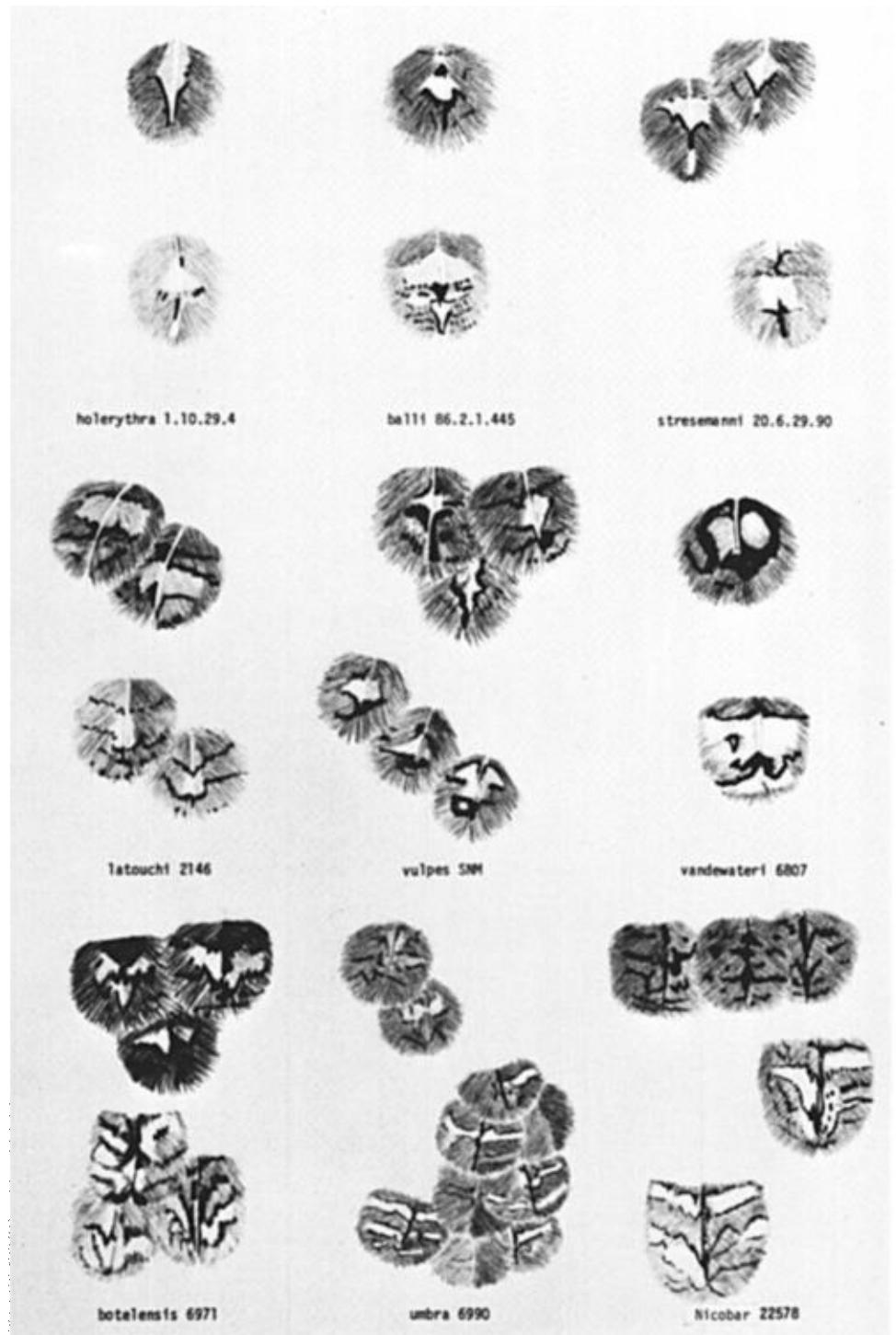


Plate 3A

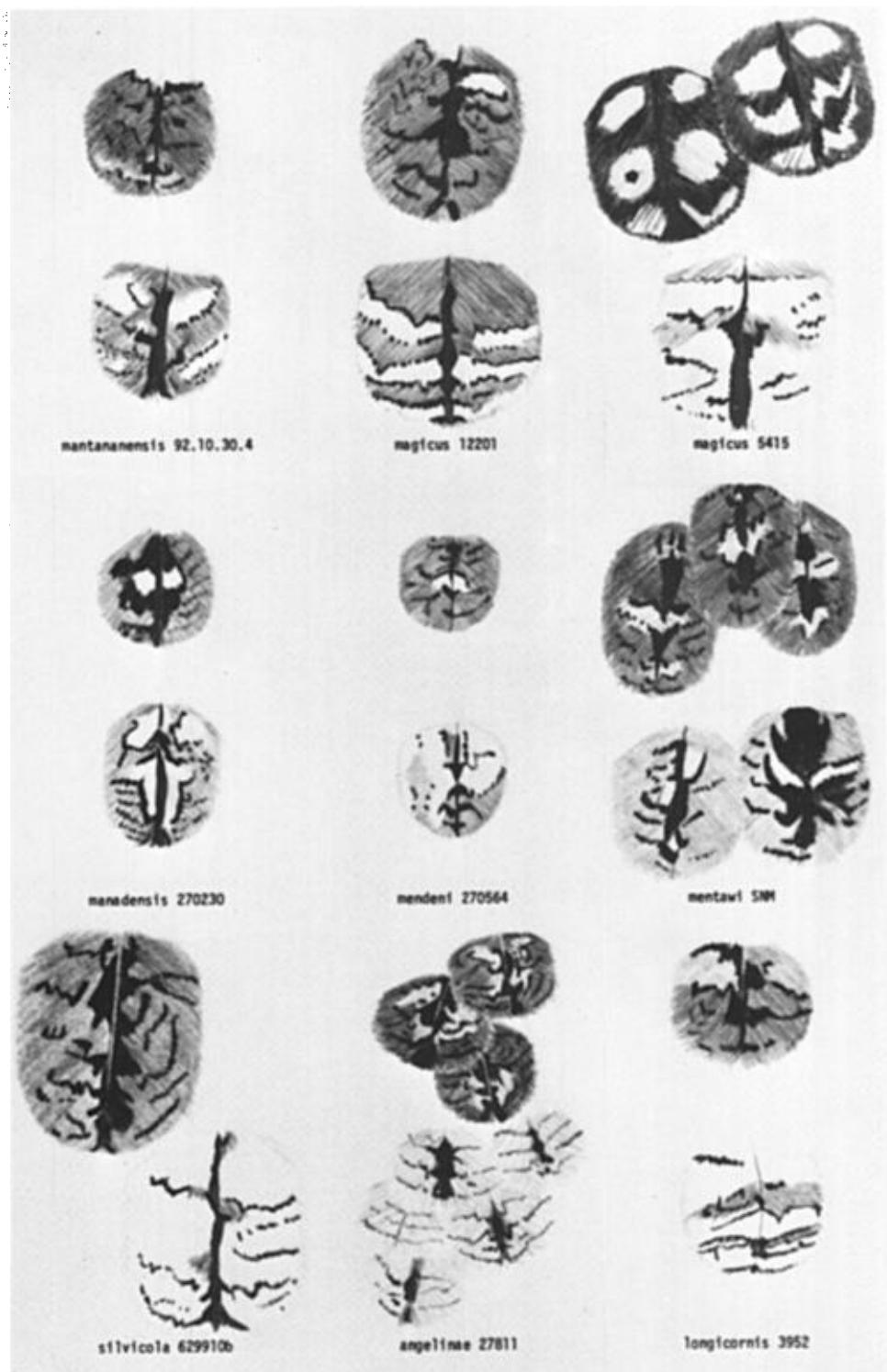


Plate 3B

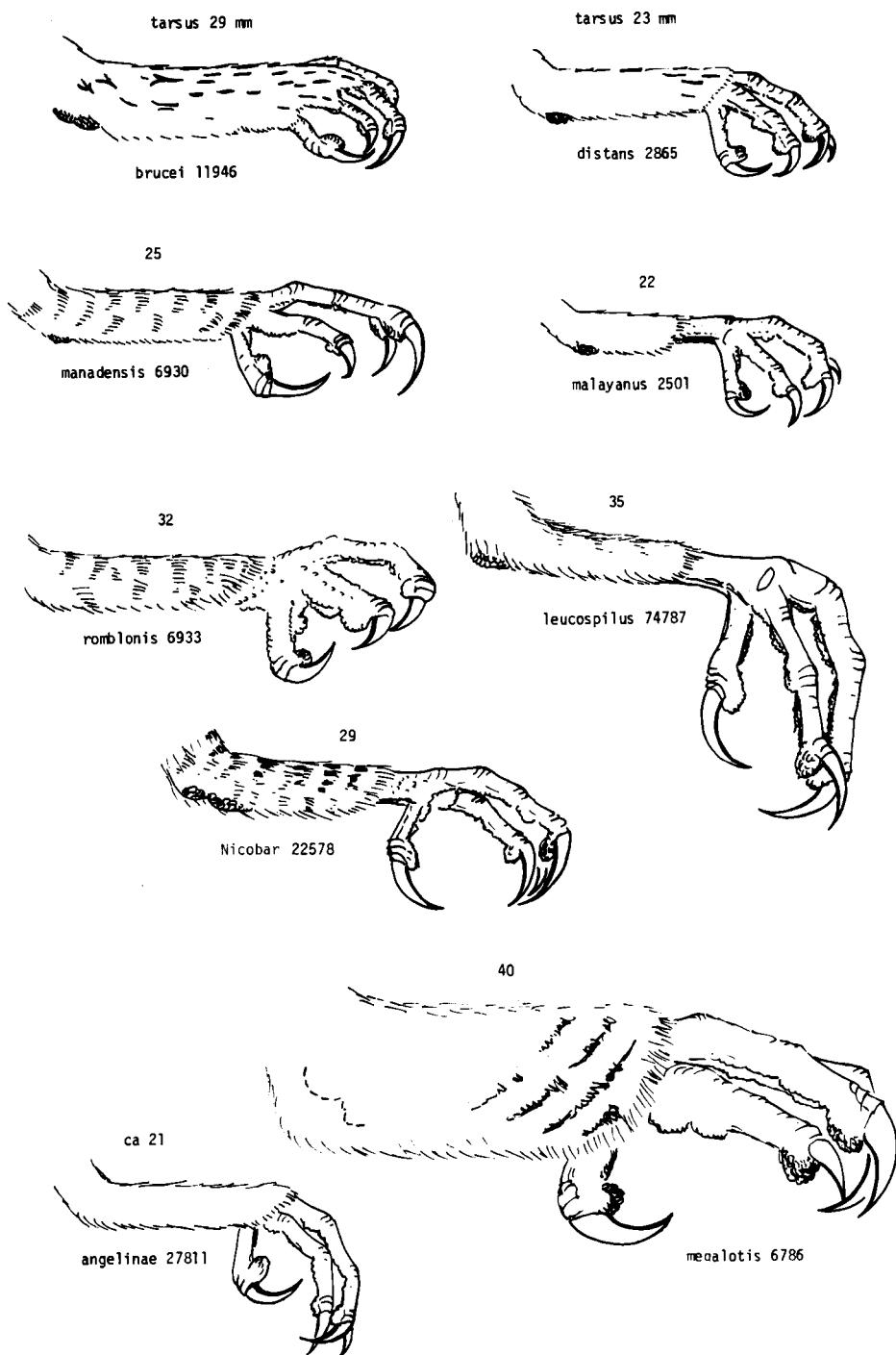


Plate 4. Size of foot and its feathering in scops-owls. Natural size. *Romblonis* and *megalotis* fresh, others dried.

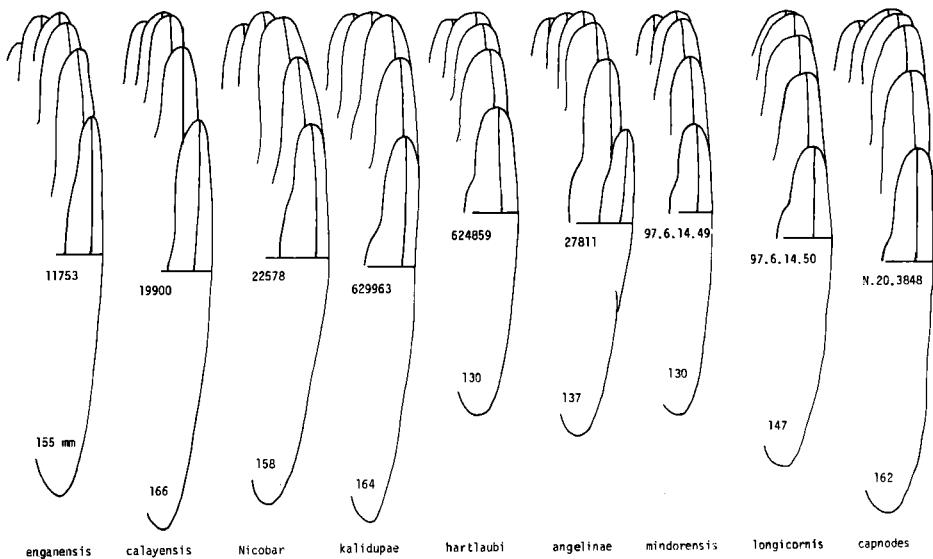
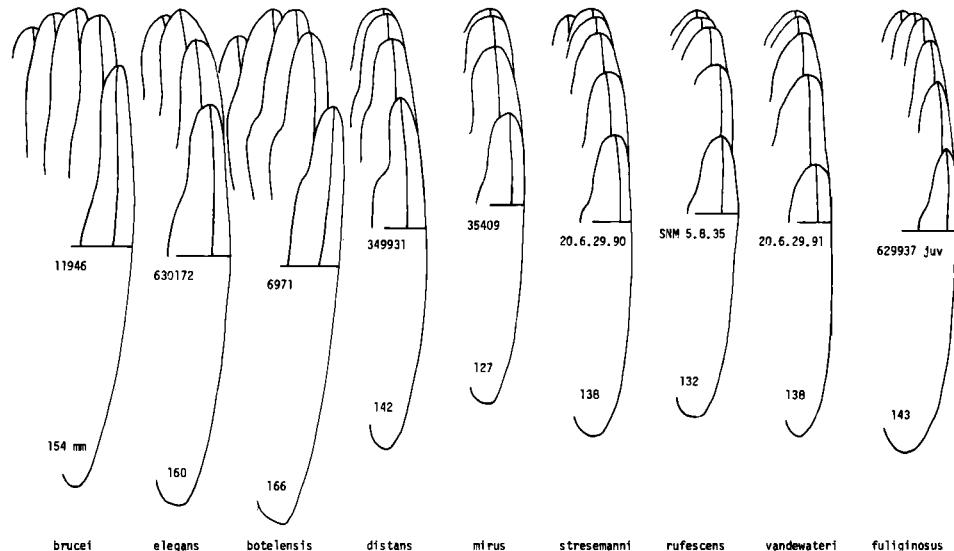


Plate 5. Shape of wing tip arranged from pointed to rounded (left to right) of scops-owls of known affinity above, unknown below.

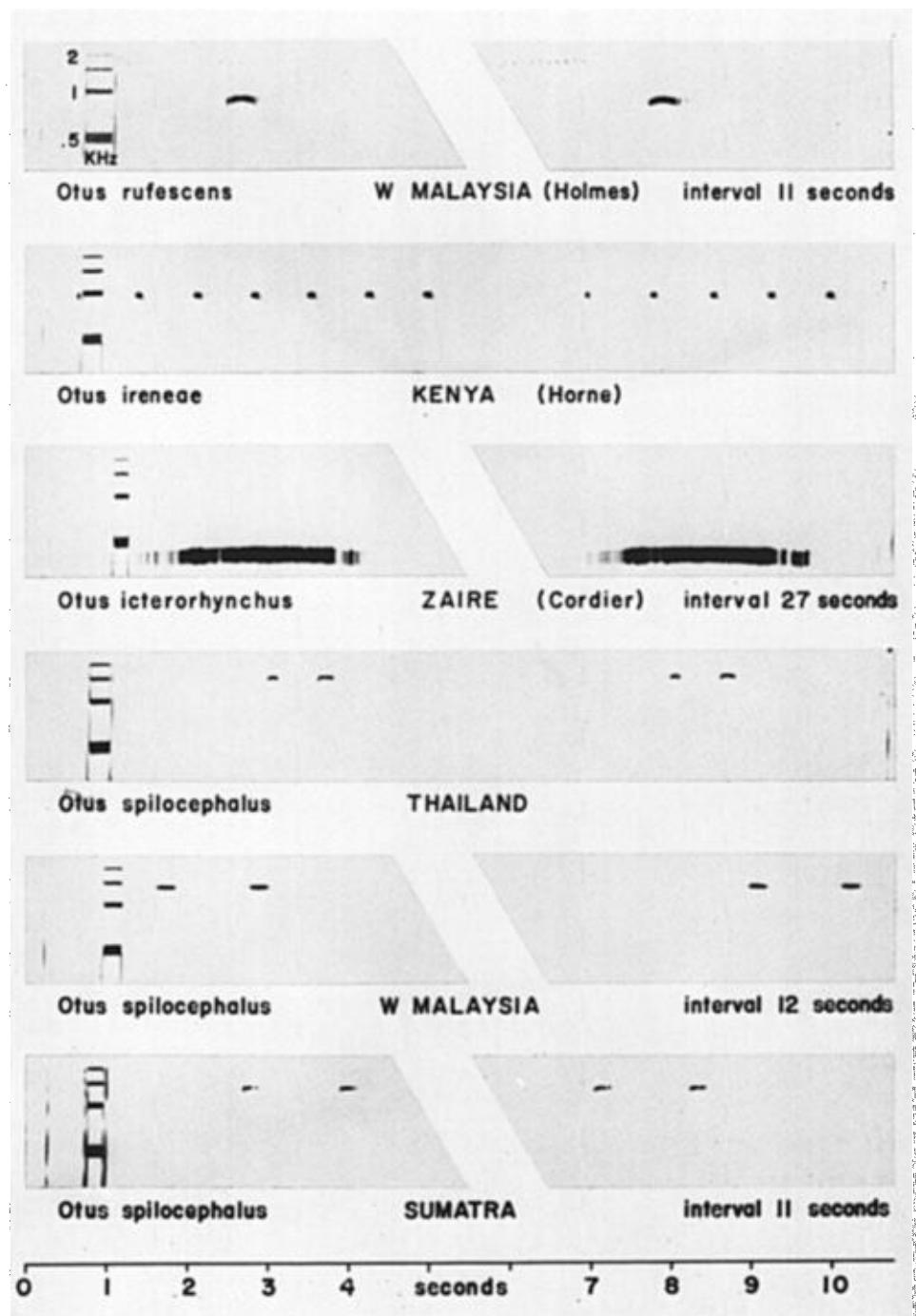


Plate 6

Plate 6-11. Sonograms of scops-owls.

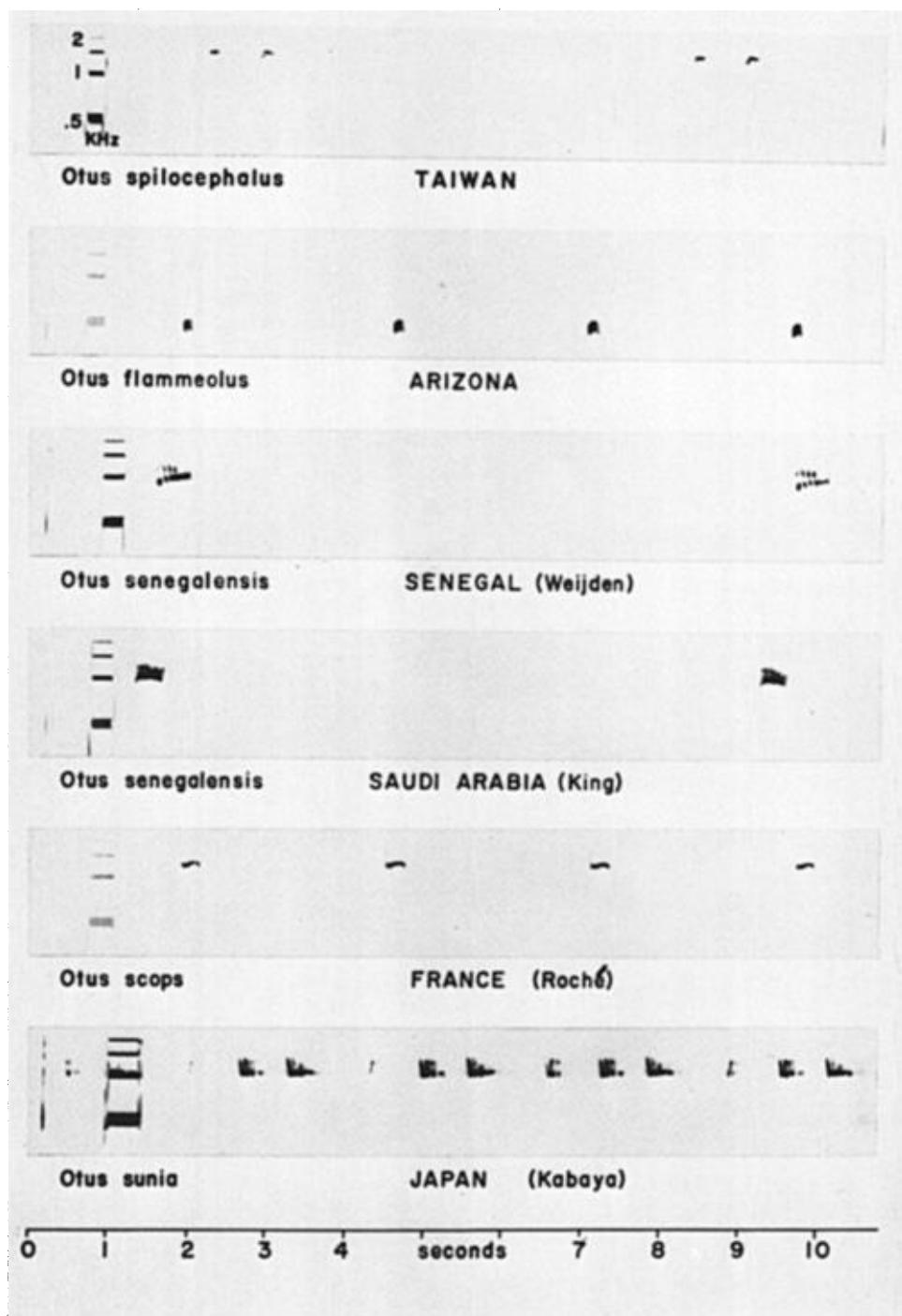


Plate 7

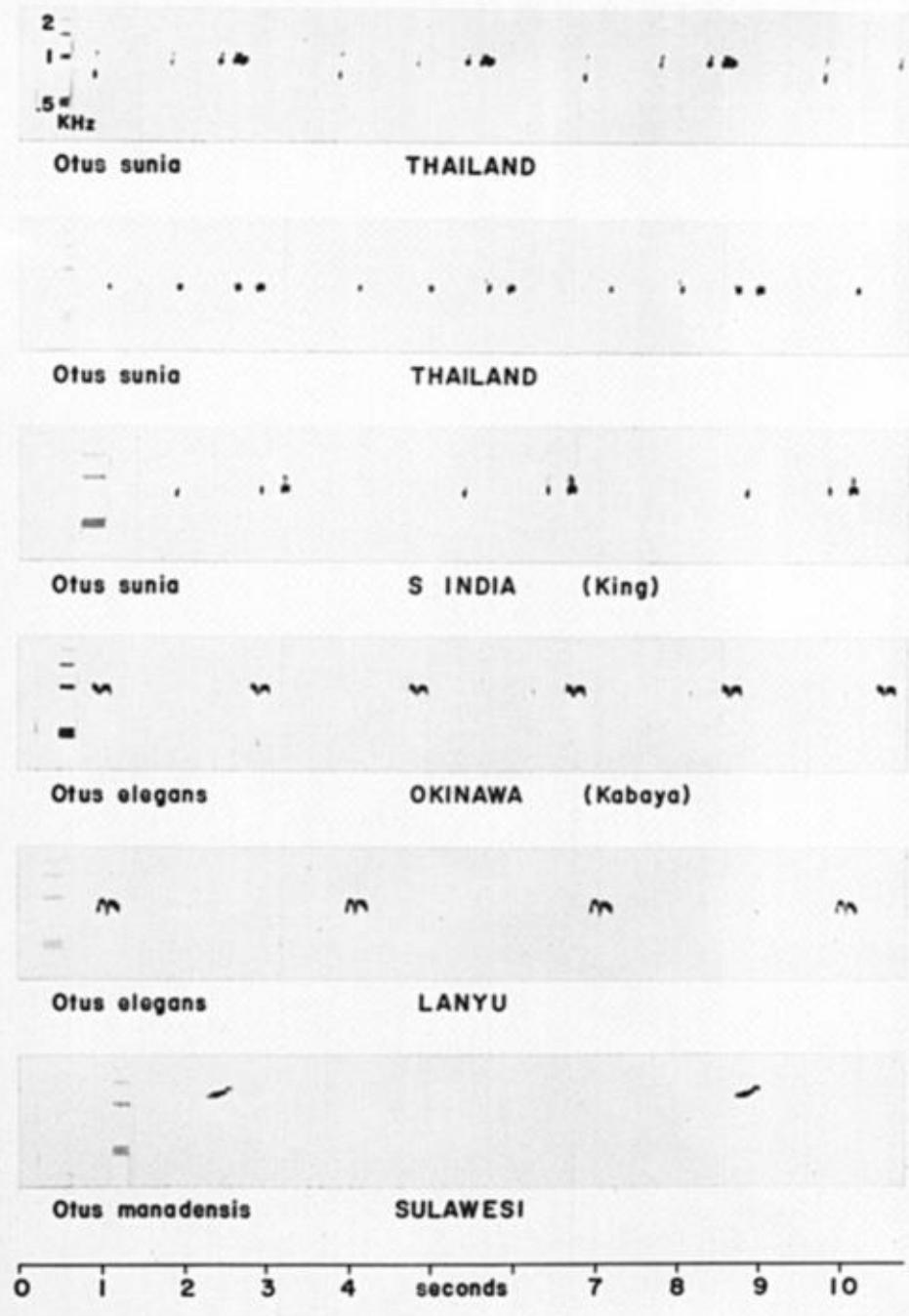


Plate 8

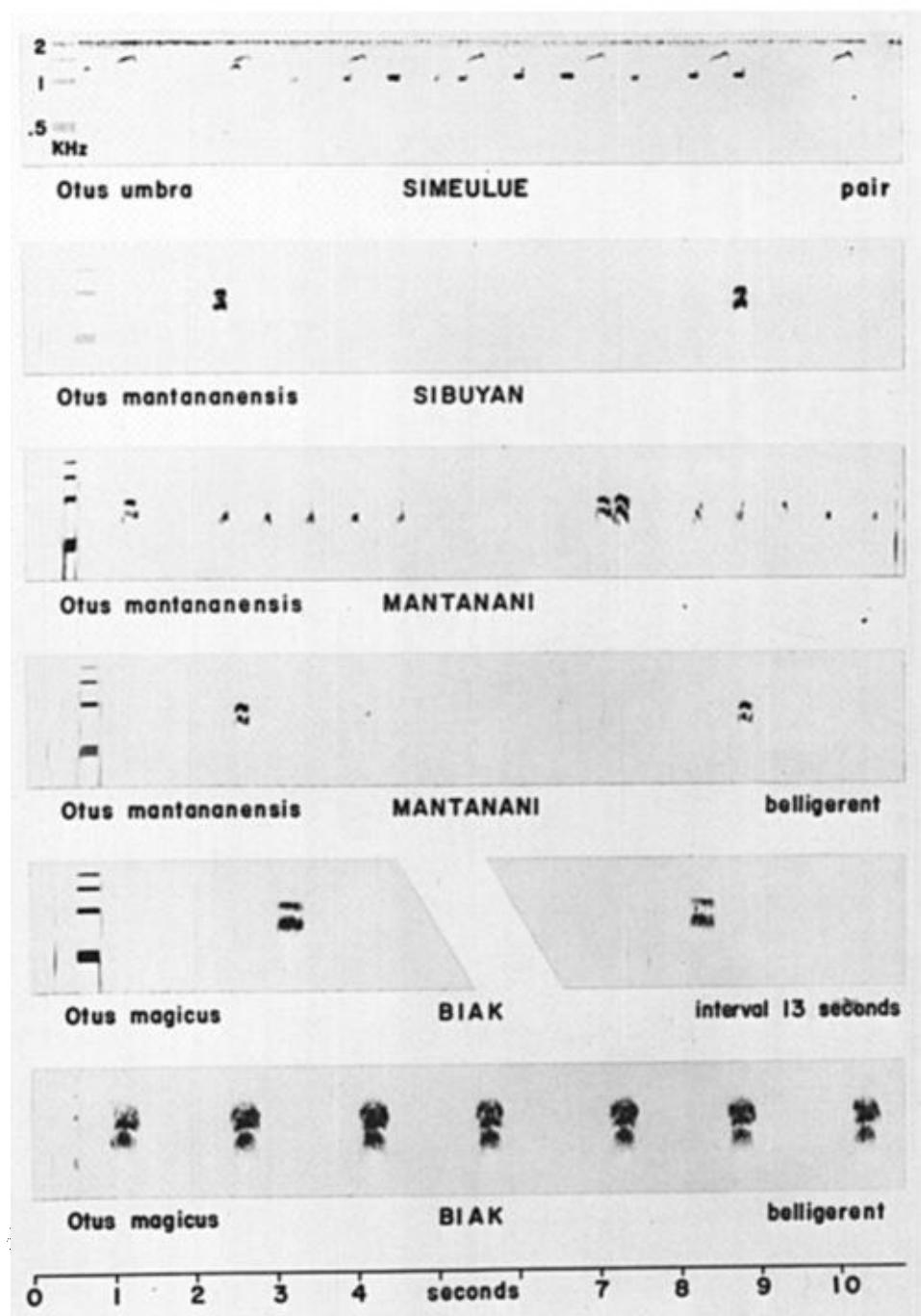


Plate 9

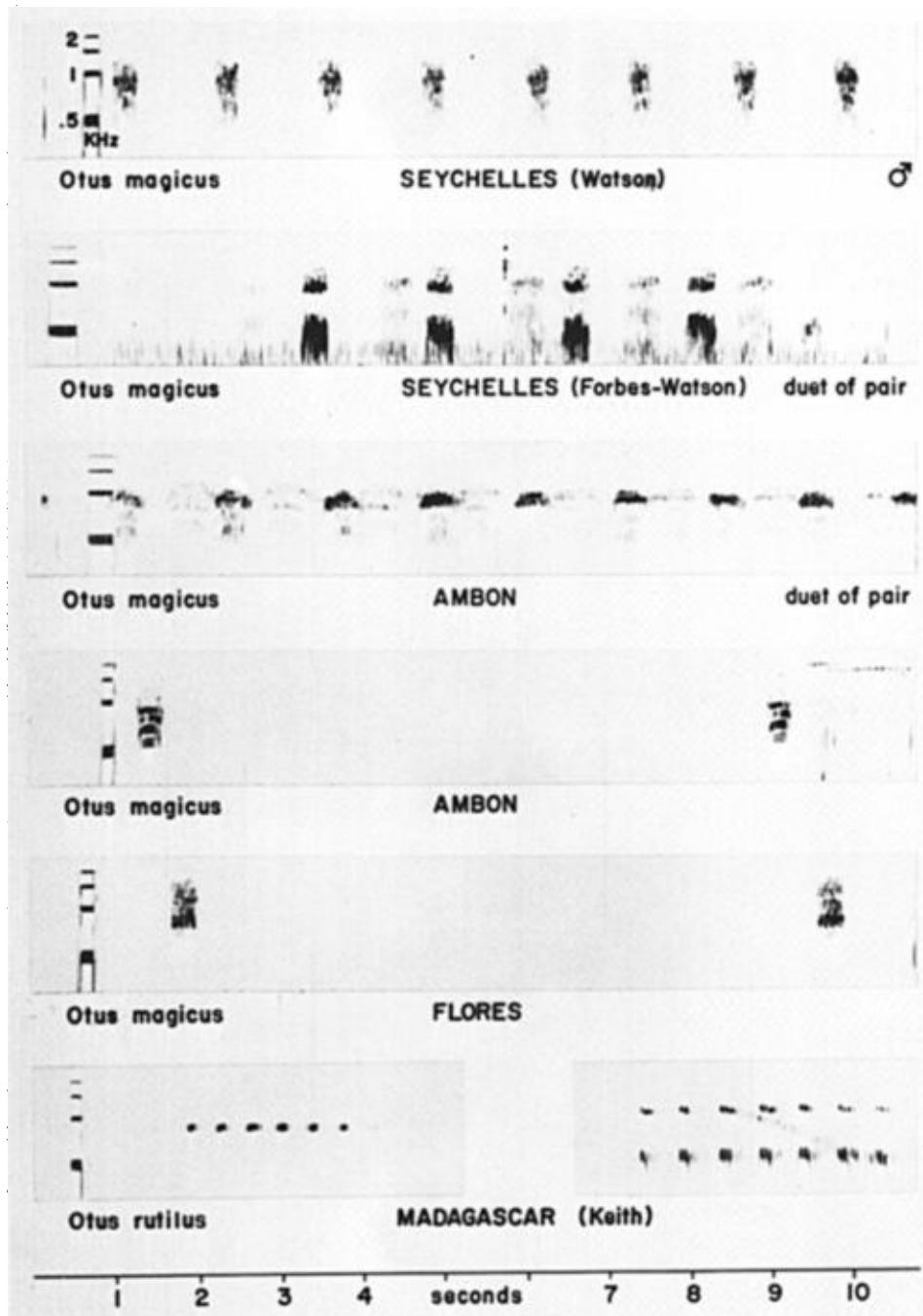


Plate 10

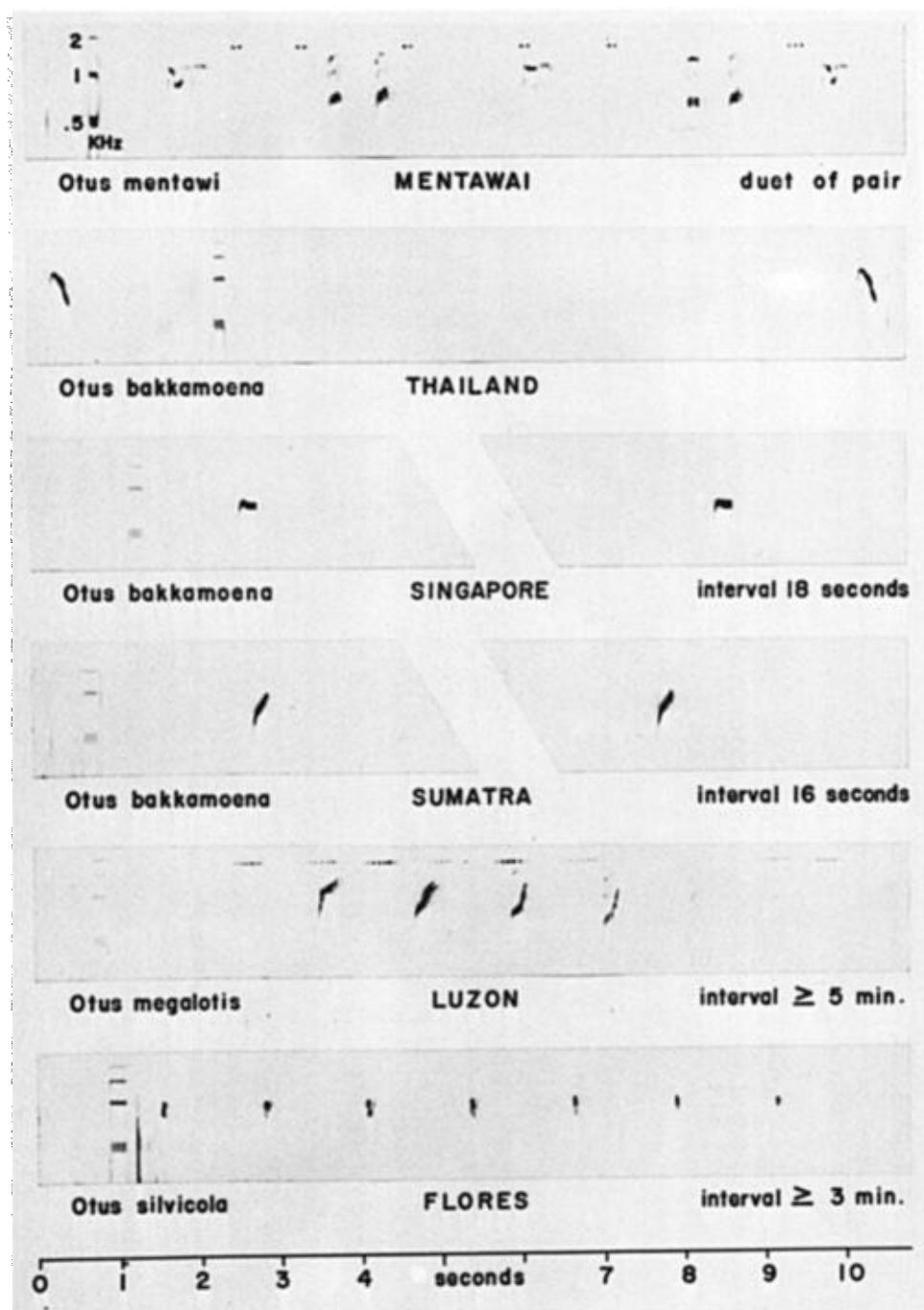


Plate 11

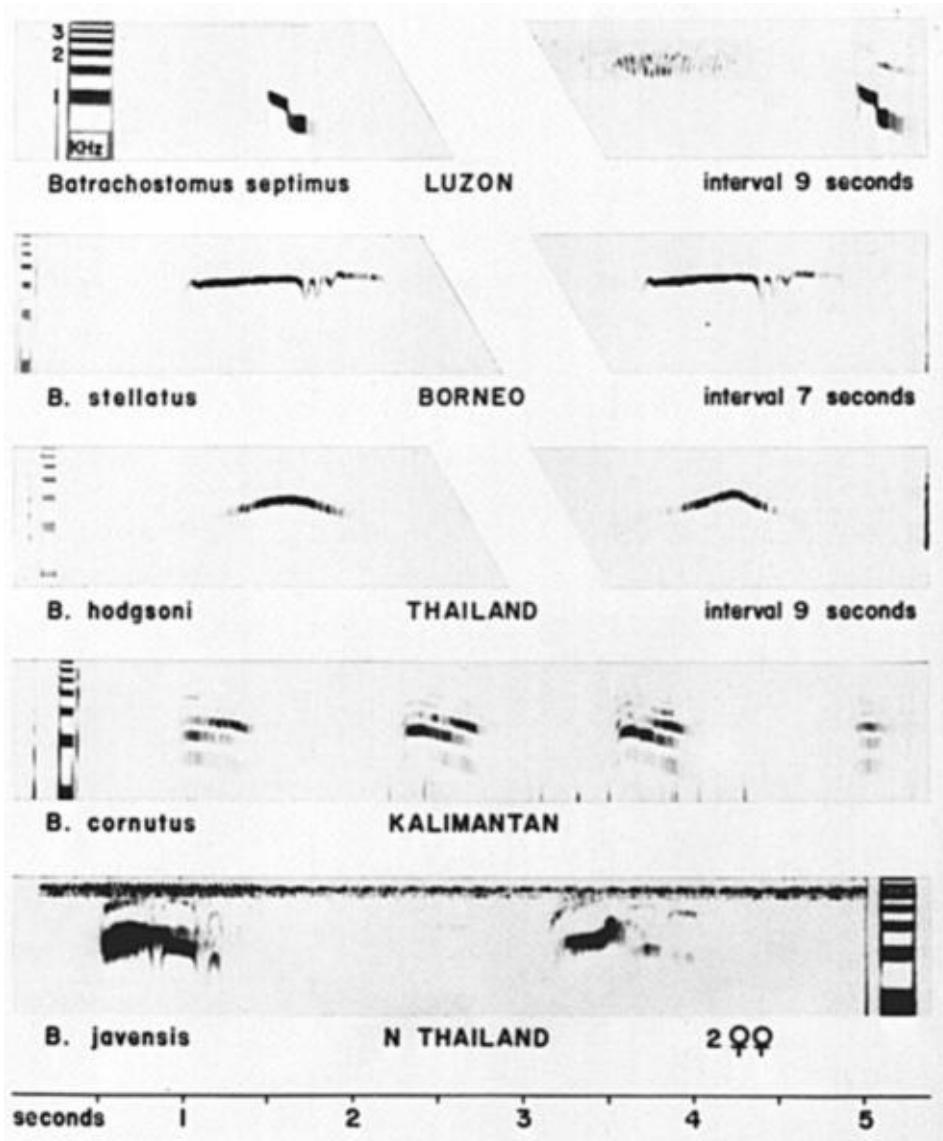


Plate 12

Plate 12-13. Sonograms of *Batrachostomus*.

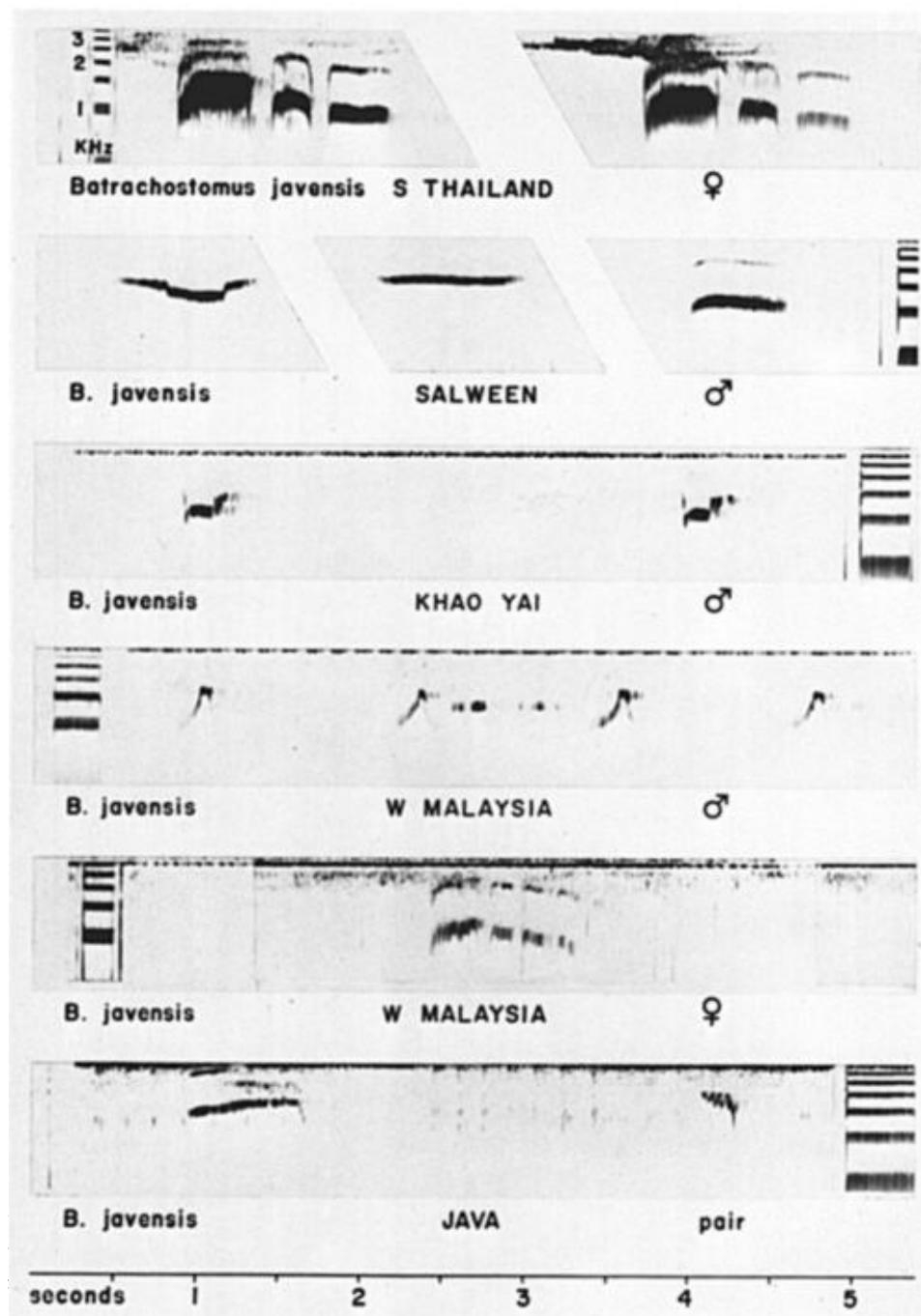


Plate 13

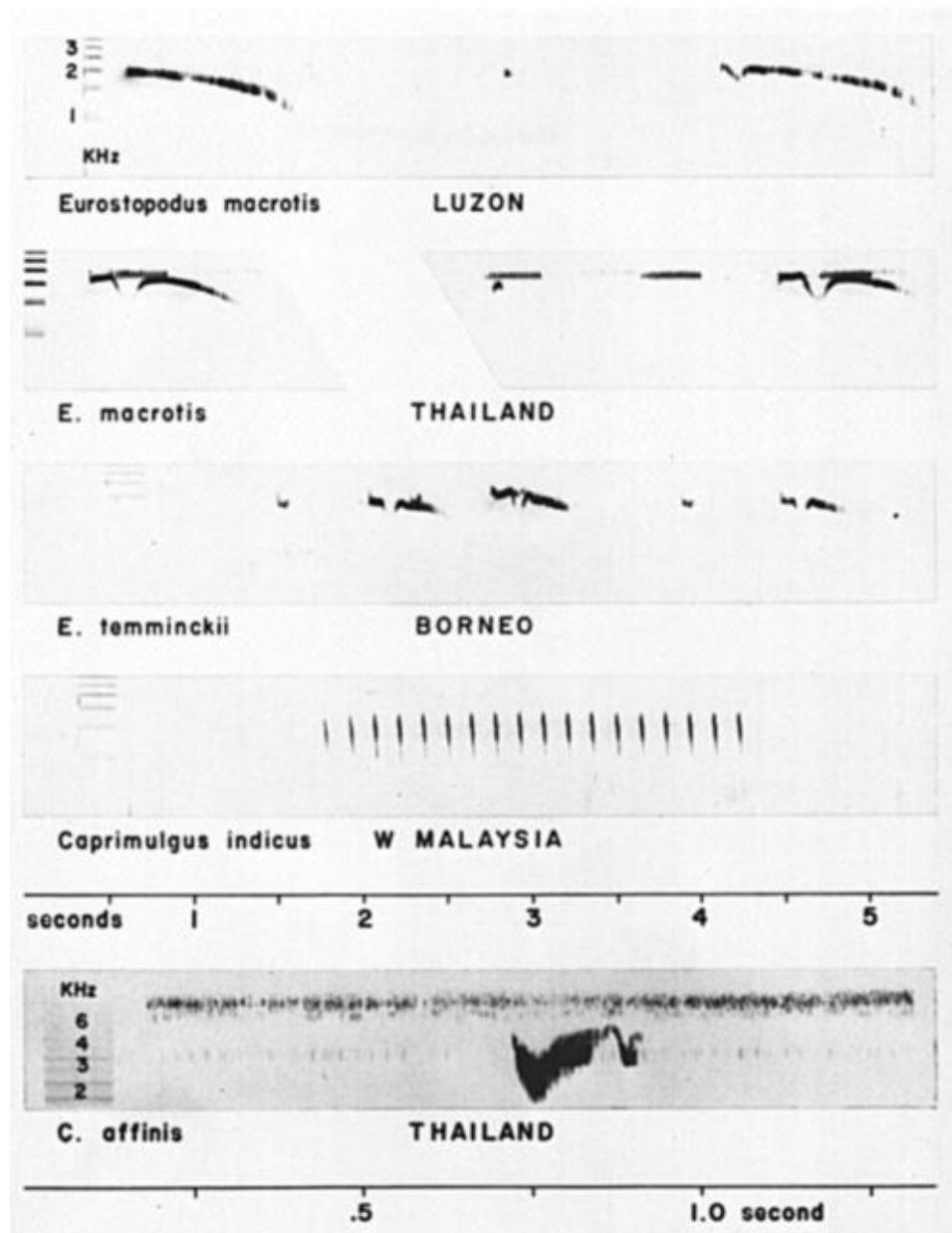


Plate 14. Sonograms of Caprimulgidae: *Eurostopodus* and *Caprimulgus*.

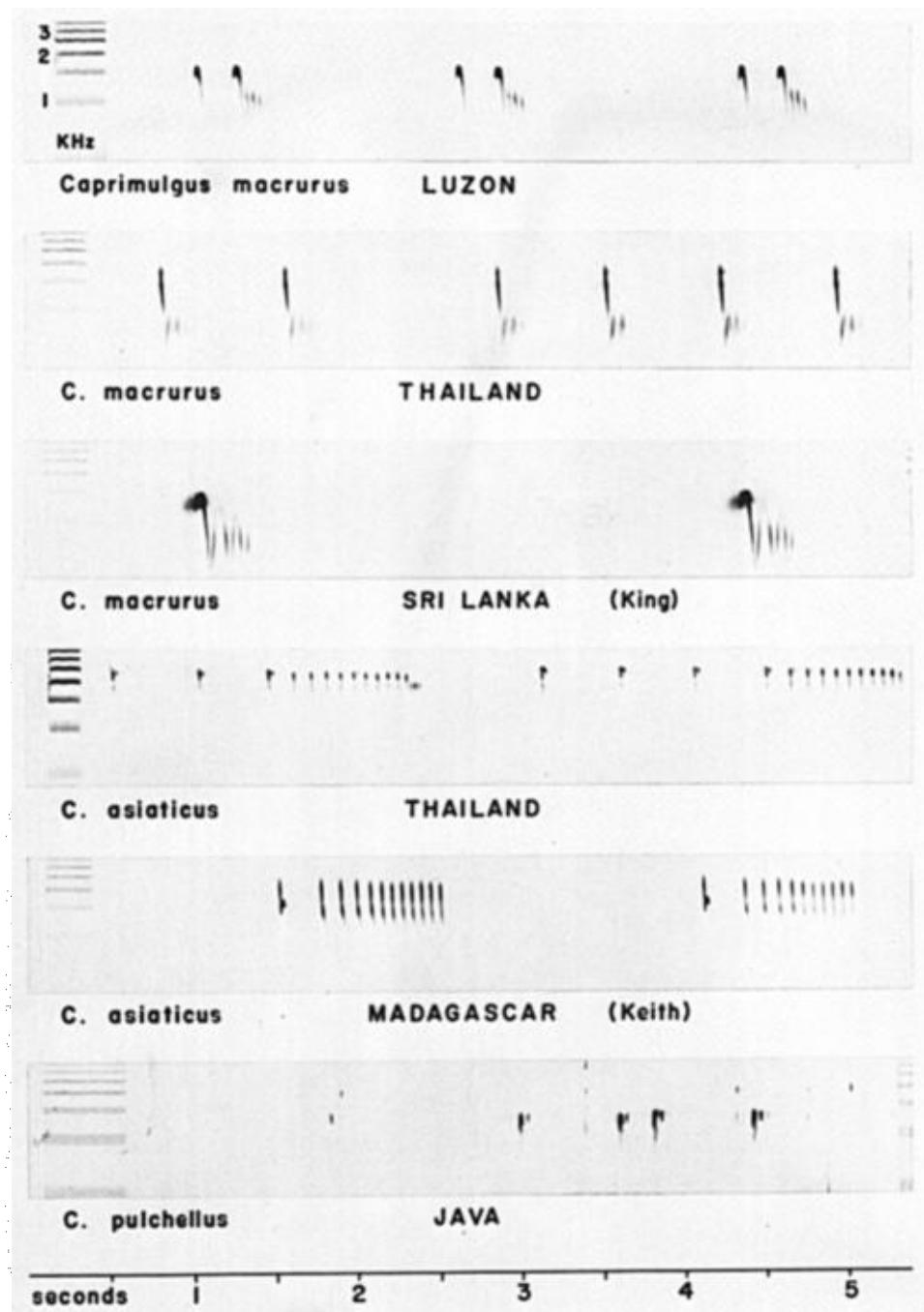


Plate 15. Sonograms of *Caprimulgus*, continued.

Table 1. Occurrence of *magicus*-style ventral pattern on island populations of *Otus*.

Taxon	Specimens possessing pattern	Specimens lacking pattern
<i>alfredi</i>	630190	630189, 630191
<i>calayensis</i>	19901	348385
<i>capnodes</i>	629999, 1955.6.N20.3848	
<i>cuyensis</i>	19898, 19899, 192562	
<i>enganensis</i>	11753, 180711	SNM
Nicobar	22578	
<i>insularis</i>	629991	
<i>leucospilus</i>	74787, 629936	18924, 21403, 629917, 629918, 629921
<i>magicus</i>	12201, 26720, 26721, 629934	155, 5415, 629933
<i>manadensis</i>	6923, 17716, 298940	6922, 6924, 2930, 112688, 188935, 270230, 298923, 298939, SNM
<i>mantananensis</i>	92.10.30.4	668, 92.10.30.5
<i>mayottensis</i>	1959.5.5, 1959.5.164, 1959.5.165	1959.5.163
<i>mindorensis</i>	97.6.14.49	
<i>obira</i>	21496, 21499, 21500	
<i>romblonis</i>	6933, 6934, 6935	
<i>sibutuensis</i>	210752, 629975, 94.4.20.4	
<i>sulaensis</i>	629951	
<i>umbra</i>	6990, 179101	

Table 2. Mean and standard deviation of wing chord and weight in taxa of *Otus*.

TAXON	WING IN MM	WEIGHT IN GRAMS
<i>sagittatus</i>	176.3	n = 3
<i>rufescens</i>	125.4 ± 5.13	n = 8
<i>ireneae</i>	119	n = 1
<i>icterorhynchus</i>	128.6 ± 7.93	n = 8
<i>balli</i>	136.8 ± 3.06	n = 6
<i>stresemanni</i>	138	n = 1
<i>huttoni</i>	135.3	n = 3
<i>latouchi</i>	140.5 ± 5.56	n = 21
<i>siamensis</i>	131.1 ± 5.26	n = 11
<i>vulpes</i>	129.7 ± 2.81	n = 8
<i>luciae</i>	136.6 ± .55	n = 5
<i>vandewateri</i>	137.3 ± 3.98	n = 6
<i>hambroeki</i>	147.7 ± 5.43	n = 6
<i>exiguus</i>	149.5	n = 2
<i>brucei</i>	164.0	n = 2
<i>graueri</i>	127	n = 1
<i>sunia</i>	145.6 ± 2.70	n = 5
<i>leggei</i>	121.7 ± 2.63	n = 4
<i>modestus</i>	136	n = 1
<i>japonicus</i> breeding	144.3	n = 3
<i>japonicus</i> winter	142.7 ± 3.51	n = 23
<i>malayanus</i> breeding	147.0	n = 3
<i>malayanus</i> winter	139.9 ± 2.43	n = 14
<i>distans</i>	132.1 ± 4.45	n = 14
<i>mirus</i>	127	n = 1
<i>elegans</i>	164.6 ± 4.64	n = 20
<i>botelensis</i>	166	n = 1
<i>umbra</i>	140.0	n = 2
<i>enganensis</i>	155.5	n = 2
<i>manadensis</i>	149.8 ± 5.19	n = 46
<i>calayensis</i>	161.3 ± 4.12	n = 17
<i>romblonis</i>	156.1 ± 2.29	n = 8
<i>cuyensis</i>	175.0 ± 1.63	n = 4
<i>mantananensis</i>	162.0 ± 2.58	n = 4
<i>sibutuensis</i>	151.9 ± 3.00	n = 18
<i>leucospilus</i>	167.6 ± 3.52	n = 19
<i>sulaensis</i>	165	n = 1
<i>obira</i>	167.7 ± 2.63	n = 4
<i>bouruensis</i>	180.1 ± 4.25	n = 9
<i>magicus</i>	178.1 ± 6.01	n = 7
<i>mendeni</i>	141.5	n = 2
<i>kalidupae</i>	164.5	n = 2
<i>tempestatis</i>	147.7 ± 3.46	n = 9
<i>albiventris</i>	154.5 ± 5.35	n = 12
Nicobar	158	n = 1
<i>insularis</i>	160	n = 1
<i>pembaensis</i>	148.3 ± 3.27	n = 6
<i>mayottensis</i>	167	n = 1
<i>rutilus</i>	155.2 ± 5.83	n = 12
<i>capnodes</i>	161.8 ± 3.77	n = 5
<i>alfredi</i>	151.7	n = 3
<i>angelinae</i>	137	n = 1

Table 2. Continued.

Taxon	Wing in mm	Weight in grams	
<i>hartlaubi</i>	130	n = 1	
<i>longicornis</i>	145.0 ± 2.00	n = 5	
<i>mindorensis</i>	130	n = 1	
<i>brookii</i>	♀ 183 ♂ 162.4 ± 1.82	n = 1 n = 5	
<i>mentawi</i>	♀ 155.0 ± 4.97 ♂ 156.2 ± 4.38	n = 4 n = 5	
<i>megalotis</i>	♀ 186.4 ± 4.72 ♂ 176.8 ± 6.43	n = 5 n = 6	310 n = 1
<i>silvicola</i>	♂ 203.3 ± 6.29	n = 4	
<i>plumipes</i>	167.0	n = 1	
<i>deserticolor</i>	♂ 153.0	n = 2	
<i>marathae</i>	♂ 150.5	n = 2	116 n = 1
<i>bakkamoena</i>	♀ 144.5 ♂ 139.0	n = 2 n = 1	
<i>semitorques</i>	173.0	n = 1	
<i>hatchizonis</i>	♀ 183.0 ♂ 168.0	n = 1 n = 1	
<i>glabripes</i>	♀ 180.0 ♂ 178.7	n = 1 n = 3	
<i>manipurensis</i>	♀ 164.3 ♂ 167.0	n = 3 n = 2	
<i>lettia</i>	♀ 158.4 ± 3.89 ♂ 156.1 ± 2.85	n = 10 n = 10	142.5 ± 13.18 108.0 n = 4 n = 3
<i>condorensis</i>	♀ 155.0 ♂ 153.6 ± 4.22	n = 1 n = 5	
<i>cnephaeus</i>	144.4 ± 5.13	n = 5	101 n = 1
<i>Natuna</i>	140.7	n = 3	
<i>lemurum</i>	♀ 144.4 ± 3.57 ♂ 140.5 ± 5.57	n = 10 n = 6	
<i>kangeana</i>	♀ 139.0	n = 1	
<i>lempiji</i>	♀ 139.8 ± 4.44 ♂ 136.7 ± 2.75	n = 5 n = 4	
<i>fulgininosus</i>	♀ 143.3 ♂ 138.0	n = 3 n = 1	
<i>everetti</i>	♀ 164.8 ± 2.86 ♂ 159.1 ± 5.16	n = 5 n = 14	152.3 125.0 ± 6.73 n = 3 n = 4
<i>nigrorum</i>	♀ 145.0 ♂ 140.3 ± 4.50	n = 2 n = 4	107.0 n = 2
<i>beccarii</i>	♀ 161.0		n = 1

(Added in page proof from Acad. Nat. Sci. Phila. no. 132601, tarsus ca. 33. The companion specimen, a ♂ coll. by S.D. Ripley is missing from the collection without a trace.)

Table 3. Mean and standard deviation of wing chord, tail, and weight of frogmouths.

		Wing length (mm)	Tail length (mm)	Weight (grams)
<i>Batrachostomus auritus</i>		261.0	n = 3	199.7 n = 3
<i>Batrachostomus septimus microrhynchus</i>		133.3	n = 3	101.5 n = 2
<i>Batrachostomus septimus septimus</i>	♂	157.2 ± 4.26	n = 6	117.0 n = 2
	♀	150.4 ± 4.98	n = 9	115.3 n = 3
<i>Batrachostomus stellatus</i>		121.2 ± 3.08	n = 10	118.1 ± 2.47 n = 8
<i>Batrachostomus hodgsoni</i>		127.4 ± 3.89	n = 12	127.3 ± 4.10 n = 11
<i>Batrachostomus poliolophus</i> from Borneo		120.2 ± 2.79	n = 11	100.1 ± 2.19 n = 9
<i>Batrachostomus cornutus cornutus</i>		132.9 ± 5.24	n = 19	129.7 ± 6.78 n = 18
<i>Batrachostomus cornutus longicaudatus</i>		135.5	n = 2	136.5 n = 2
<i>Batrachostomus javensis continentalis</i> south to Khao Luang, fine pattern		118.9 ± 4.46	n = 10	119.3 ± 5.91 n = 10
<i>Batrachostomus javensis affinis</i> north to Narathivas and Khao I Phrom, coarse pattern		116.5 ± 3.42	n = 8	112.9 ± 8.01 n = 8
<i>Batrachostomus javensis chaseni</i>		116.8 ± 6.10	n = 5	109.0 ± 5.15 n = 5
<i>Batrachostomus javensis</i> from Borneo		127	n = 1	107 n = 1
<i>Batrachostomus javensis javensis</i>		120.7 ± 4.06	n = 8	112.4 ± 5.04 n = 8

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