A REVISION OF THE AUSTRALIAN OWLS (STRIGIDAE AND TYTONIDAE)

by

G. F. MEES
Rijksmuseum van Natuurlijke Historie, Leiden [1])

Introduction

When in December 1960 the R.A.O.U. Checklist Committee was reorganised and the various tasks in hand were divided over its members, the owls were assigned to the author. While it was first thought that only the Boobook Owl, the systematics of which have been notoriously confused, would need thorough revision and that as regards the other species existing lists, for example Peters (1940), could be followed, it became soon apparent that it was impossible to make a satisfactory list without revision of all species. In this paper the four Australian species of Strigidae are fully revised, over their whole ranges, and the same has been done for *Tyto tenebricosa*. Of the other three Australian Tytonidae, however, only the Australian races have been considered: these species have a wide distribution (one of them virtually world-wide) and it was not expected that the very considerable amount of extra work needed to include extralimital races would be justified by results.

Considerable attention has been paid to geographical distribution, and it appears that some species are much more restricted in distribution than has generally been assumed. A map of the distribution of each species is given; these maps are mainly based on material personally examined, and only when they extended the range as otherwise defined, have I made use of reliable field observations and material published but not seen by me. From the section on material examined it will be easy to trace the localities; where other information has been used, the reference follows the locality.

Acknowledgements

The revision was carried out, besides the Western Australian Museum, in the following museums: Rijksmuseum van Natuurlijke Historie, Leiden; British Museum (Natural History), London; American Museum of Natural

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1) Much of this paper was written while the author held a position at the Western Australian Museum, Perth, Western Australia.

History, New York; United States National Museum, Washington, D.C.; Canterbury Museum, Christchurch; Dominion Museum, Wellington; Australian Museum, Sydney, and National Museum of Victoria, Melbourne. Loans have further been received from the South Australian Museum, Adelaide; the C.S.I.R.O. Wildlife Division, Canberra; the Zoologisches Museum, Berlin, and from Dr. D. L. Serventy (Serventy-Whittell Collection) [2]. From Mr. Mack, Director of the Queensland Museum, I received a locality list of material in his collection. I want to express my appreciation of the authorities of all these institutions for help and hospitality and must especially mention my indebtedness to the Trustees of the Frank M. Chapman Memorial Fund, whose financial aid made my stay in the United States possible.

A special word of thanks is due to Miss O. Seymour for drawing the coloured plate illustrating this article.

Suggestions for future collecting

Mayr (1943) concluded his partial revision of *Ninox novaeseelandiae* with the words: "It is.....evident.....that no permanent classification of the Australian boobook owls can be attempted without the collecting of much additional material. So far only the surface has been scratched. What we now need are well-sexed series from definite localities covering all seasons of the year. This will permit the working out of sexual dimorphism and of the influence of wear on the plumage colour". As regards the availability of material I am more optimistic: Mayr's revision was based exclusively on the, admittedly rich, collections of the American Museum of Natural History, and no attempt was made to obtain material from other institutions. Mayr's paper, of course, was written during the war, when movement of study material of this kind was very restricted. It must also be stated that the antequated regulations concerning loans prevailing in some Australian museums, dating from a period that bird skins were regarded as collector's items rather than as scientific study material, make it often difficult for workers outside Australia to receive material they need on loan. It is therefore a matter of bringing extant material together, rather than of extensive collecting. Even though I did not borrow from the Queensland Museum and the Tasmanian Museum, and utilized only part of the South Australian Museum's collections, I mustered 285 skins of *Ninox novaeseelandiae* and over a hundred of *N. connivens* from Australia alone.

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2) In the lists of material examined abbreviations are used in the same sequence: WAM, RMNH, BM, AMNH, USNM, CM, DM, AM, NMV, SAM, CSIRO, SW. HLW stands for the H. L. White Collection in the National Museum of Victoria.

While it will be apparent from the maps and the discussions of the various races, where more collecting is needed, a short enumeration of remaining problems that can be settled by collecting is given here. Of *Ninox rufa* additional material from the area round Mackay is required, to confirm (or otherwise) the validity of the race *queenslandica*. No more skins of *N. strenua* are needed. In *Ninox connivens*, the base of the Cape York Peninsula remains important, to find out if and where intergradation between *peninsularis* and the other two Australian races occurs, and how far south *peninsularis* ranges; particulars about the occurrence in inland Queensland and New South Wales are also needed. In *Ninox novaeseelandiae* I believe that further collecting will bring little of importance, but for the locality records some collecting in inland Western Australia would be desirable and a close ecological study combined with selective collecting of the race *lurida* in the Cairns area might yield interesting results: is *lurida* confined to rain forest; does a browner *boobook*-like race occur in the more open country and in recent man-made clearings? Half a dozen skins from Kangaroo Island are needed to evaluate the characters of the race *halmaturina*. The movements and winter range of *leucopsis* would be a rewarding subject to investigate.

Of the Tytonidae, the geographical variation of *Tyto tenebricosa* is now well understood, and field-observers rather than collectors should fill out its range. *Tyto longimembris* is so rare that records will remain limited to the occasional bird collected or found dead; as there is no geographical variation in Australia, large series of skins, even if they would be obtainable, are not required. *Tyto alba* is numerous in collections, and as it is a striking bird, often sent in to museums by the public, without variation in Australia, no systematic collecting is needed. The variation and distribution of *Tyto novaehollandiae*, finally, is so little understood that much more collecting is needed, mainly in the tropical part of its range, but also in south and central Western Australia — if it does occur there.

In view of the interesting size differences between the sexes of some species, properly sexed material will be of particular value. The unfortunate truth is that a high proportion of museum material of all kinds of birds in which the sexes are similar in appearance, is incorrectly sexed. Preparators should be taught that it is preferable by far to have an unsexed specimen, than to make a guess.

Sexual dimorphy

There do not seem to be any differences in plumage between males and females in the species of Striges dealt with here. Very interesting are, however, the differences in size between the sexes. Because of faulty sexing,

it has not been possible to ascertain these differences in all species, but it would appear that in *Ninox rufa, N. strenua* and *N. connivens* the males are larger than the females, in the first mentioned species considerably so. In *N. novaeseelandiae* indications are that the female is slightly the larger sex. In *Tyto novaehollandiae, T. longimembris* and *T. tenebricosa* females are much larger than males, while in *T. alba* there is little difference between the sexes.

Order Strigiformes

In agreement with most literature, but contrary to some recent authors, I prefer to keep the Strigidae and Tytonidae separate families, rather than reduce the two groups to the status of subfamilies. I do not really see what the difference is between a family and a subfamily anyway, and unless it would result in a simplification at the next higher level, so that the Strigiformes would become a family instead of an order, something that has not been suggested by anyone yet, there does not seem to be any advantage in grading down the two families contained in it.

Family Strigidae

Genus **Ninox** Hodgson

Ninox Hodgson, 1837, Madras J. Lit. Sci. 5, p. 23 — type by original designation, *Ninox Nipalensis* Hodgson = *Ninox scutulata lugubris* (Tickell).

Hieracoglaux Kaup, 1848, Isis, Heft 10, col. 768 — based on *Ninox connivens* (Latham) and *Ninox strenuus* (Gould), introduced as a subgenus of *Ninox*. Type by subsequent designation by G. R. Gray (1855, Cat. Gen. Subgen. Birds, p. 8), *Falco connivens* Latham = *Ninox connivens* (Latham).

Spiloglaux Kaup, 1848, Isis, Heft 10, col. 768 — based on *Ninox novaeseelandiae* (Gmelin), *N. maculatus* (Vigors & Horsfield), *N. marmoratus* (Gould), and *N. boobook* (Latham), introduced as a subgenus. Type by subsequent designation by G. R. Gray (1855, Cat. Gen. Subgen. Birds, p. 8), *Strix boobook* Latham = *Ninox novaeseelandiae boobook* (Latham).

Rhabdoglaux Bonaparte, 1854, Rev. Mag. Zool. (2) 2, p. 543 — based on the species *rufa* Gould, *humeralis* "Hombron & Jacquinot" (= Bonaparte), *variegata* Quoy & Gaimard and *jacquinoti* Bonaparte. Type by subsequent designation by G. R. Gray (1855, Cat. Gen. Subgen. Birds, p. 135), *Strix humeralis* Bonaparte = *Ninox rufa humeralis* (Bonaparte).

Berneyornis Mathews, 1916, Birds Aust. V, p. 305 — type by original designation and monotypy *Athene? strenua* Gould = *Ninox strenua* (Gould).

The four Australian species of Strigidae are nowadays generally placed in the same genus, *Ninox*. The differences between the species, however, are considerable, and, while *N. novaeseelandiae* and *N. connivens* are very similar to each other, they have at first sight little in common with *N. rufa* and *N. strenua*. For each of the four species a generic name is available,

but as there is little point in arbitrarily accepting (or rejecting) genera, it seems best to keep them all under *Ninox*. A world-wide revision of the Strigidae would be needed to define the genera [3]).

Ninox rufa (Gould)

This species occurs in New Guinea, the Aroe Islands, northern Australia west of the Gulf of Carpentaria, and the east coast of Queensland. It can be divided in five races.

An interesting feature in this species is that the males are much larger than the females.

An inhabitant of tropical rain forest which in Australia is strictly confined to the high rainfall areas. When the map of its distribution is compared with the maps depicting rainfall, climate and vegetation as given by Keast (1961, figs. 4, 4a and 5) it will be seen how close the correlation is.

1. **Ninox rufa rufa** (Gould)

Athene rufa Gould, 1846, Proc. Zool. Soc. Lond. 14, p. 18 — Port Essington.

Subspecific characters. — Large, fairly light in colour both above and below. Measurements are given in the table at the end of this paper.

Distribution. — Western Australia and the Northern Territory. In Western Australia confined to the northern part of the Kimberley Division where apparently rare as only two specimens have ever been recorded (both were examined). Northern Territory: known from a number of localities all north of about 15° S.

Material examined. — Males: 25 miles east of Alligator River, 80 miles from the coast (AMNH 630252), South Alligator River (AMNH 630251), King River (HLW 5297, 5298), 100 miles south of Port Darwin (USNM 279045). Females: 6 miles south-east of Admiralty Gulf (AMNH 630250), South Alligator River (AMNH 630253, 630254), King River (HLW 5296, 5300). Sex uncertain: Napier Broome Bay (HLW 5299).

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3) Attention may be drawn to Article 57(c) of the new International Code of Zoological Nomenclature (Stoll & al., 1961) in which — contrary to previous usage — it is stated that identical names placed in different genera that bear homonymous names are not homonyms. The example given is *Noctua variegata* Quoy & Gaimard (Aves), not preoccupied by *Noctua variegata* Jung (Insecta); this means that the species listed by Peters (1940) as *Ninox solomonis solomonis* Sharpe, will once more have to be known as *Ninox variegata* (Quoy & Gaimard). Similarly *Noctua ochracea* Schlegel, renamed *Ninox perversa* Stresemann (1938), should properly be called *Ninox ochracea* (Schlegel).

Map 1. — The distribution of *Ninox rufa* in Australia: 1, six miles south-east of Admiralty Gulf. 2, Napier Broome Bay. 3, 100 miles south of Darwin. 4, South Alligator River. 5, King River. 6, Port Essington (type locality). 7, Elsey Reach, Roper River (Sedgwick, 1947). 8, Melville Bay (Humphries, 1947). 9, Claudie River and Upper Claudie River. 10, Cooktown. 11, Cairns. 12, Cardwell. 13, Mackay. 14, Water Park Creek (Wolstenholme, 1925).

2. **Ninox rufa marginata** subspecies nova [4])

Subspecific characters. — Colour as preceding race, perhaps very slightly darker on the back, but size conspicuously smaller. Type, ♂, 13 August

4) The subspecific name is given because this race is confined to the eastern margin of the Australian continent.

1916, Cardwell, Queensland, collected by H. G. Barnard, Nat. Mus. Victoria — H. L. White Coll. no. 5301.

Distribution. — Queensland, where only known from the east coast from the Claudie River to Cairns.

Discussion. — In the past this subspecies has usually been associated with *humeralis* rather than with *rufa,* for example by Robinson & Laverock (1900), Campbell & Barnard (1917, p. 13) and apparently Kinghorn (1933). A good historical review was given by Mathews (1915-1916) to whom I refer for further particulars. Later Campbell (1919, p. 179) and Mathews (1927, 1931) used the name *queenslandica* for all Queensland birds. Though Mayr (1937) is right that discoloration occurs in skins, the colour differences between *marginata, queenslandica,* and *humeralis* are certainly not due to this factor.

Peters (1940) included this population with the nominate race, to which it is similar in coloration; apparently he overlooked the great difference in size between the eastern and western populations. As it seems, moreover, likely that there is a huge gap between the ranges of the two populations, I feel perfectly justified in describing the Queensland population as a new race.

In the Australian Museum, Sydney, I found a skin from Cooktown, with written on its label: "*Ninox olivii* (type) — A. J. N[orth]", but the name has apparently never been published (see also Hindwood, 1946). This bird, collected by E. Olive, is sexed as a female, it has a wing of 352 mm. As this is much larger than any other female I have seen, I suspect that an error has been made in sexing.

Material examined. — Males: Upper Claudie River (AMNH 630256), Cooktown (AMNH 630258, AM O. 12858), Cairns (AMNH 630259), Cardwell (HLW 5301: type of *marginata*). Females: Claudie River (AMNH 630255), Cooktown (AMNH 630257, AM O. 12859: type of *olivii*), Cardwell (HLW 5302).

3. **Ninox rufa queenslandica** Mathews

Ninox rufa queenslandica Mathews, 1911, Bull. Brit. Orn. Cl. 27, p. 62 — The Hollows, Mackay, North Queensland.

Subspecific characters. — In size probably similar to *marginata,* but colour very different, darker above, and with the cross-bands on the under surface much colder brown; cheeks rather dark.

Distribution. — Mackay, Queensland: known from the type only. A sight record from Water Park Creek, published by Wolstenholme (1925) would also be referable to this subspecies.

Discussion. — It seems dangerous to recognize a subspecies on the basis of a single skin only, but the specimen is so strikingly different from any other skin of *Ninox rufa* I have seen that I have no option but to admit it as a separate race, different from *marginata.* It is likely that this race is isolated from *marginata* by a gap of some 200 miles over which the rain forest is interrupted by a drier zone.

Material examined. Female: Mackay (AMNH 630260: type of *queenslandica*).

4. **Ninox rufa humeralis** (Bonaparte)

Athene humeralis Bonaparte, 1850, Consp. Gen. Av. I, p. 40 — Oceania (based on Hombron & Jacquinot, Voy. Pôle Sud., Ois. t. 4, 1) = Triton Bay, New Guinea (Peters, 1940).

Noctua fransenii Schlegel, 1866, Ned. Tijdschr. Dierk. 3, p. 256 — Waaigeou.

Ninox undulata Ramsay, 1879, Proc. Linn. Soc. N.S.W. 3, p. 250 — South East Coast of New Guinea. Preoccupied.

Subspecific characters. — In size similar to *marginata*; colour dark above as *queenslandica*; cross-bars on under surface slightly browner, less cinnamon than in *rufa* and *marginata,* but some individuals indistinguishable; cheeks black, darker than *rufa* and *marginata.*

Distribution. — Waigeoe and New Guinea, where recorded from the west, south and east, but not from the northern and central regions.

Material examined. — Males: Milne Bay (AMNH 630267), Wareo (AMNH 268903). Females: Waaighiou (RMNH cat. no. 1: type of *fransenii*), Mansinam (RMNH cat. no. 4), Milne Bay (AMNH 630268), Wassi Kussa River, Tarara (AMNH 425957), Boroka, Bioto Creek (AMNH 419705a), Collingwood Bay (AMNH 630266). Sex uncertain: Andai (RMNH cat. no. 2), N.W. Papua (RMNH cat. nos. 3 and 5), Mount Kebea 4000 ft. (AMNH 630264), Brown River (AMNH 630263), Ambernoh River (AMNH 630261).

5. **Ninox rufa aruensis** (Schlegel)

Noctua aruensis Schlegel, 1866, Ned. Tijdschr. Dierk. 3, p. 329 — le groupe d'Arou = Wokam.

Subspecific characters. — Much smaller than the other races.

Distribution. — Aroe Islands, where known from Wokam only.

Discussion. — As far as I know, this race is known from a single specimen only. I have examined the type, a female, in the Leiden Museum, and though it is an apparently adult bird, it has a wing of 260 mm only.

Material examined. — Female: Wokam, Arou (RMNH cat. no. 1: type of *aruensis*).

Ninox strenua (Gould)

Athene? strenua Gould, 1838, Syn. Birds Aust., pt. III, descr. and pl., fig. 2 — New South Wales.

Ninox strenua victoriae Mathews, 1912, Aust. Avian Rec. 1, p. 75 — Victoria.

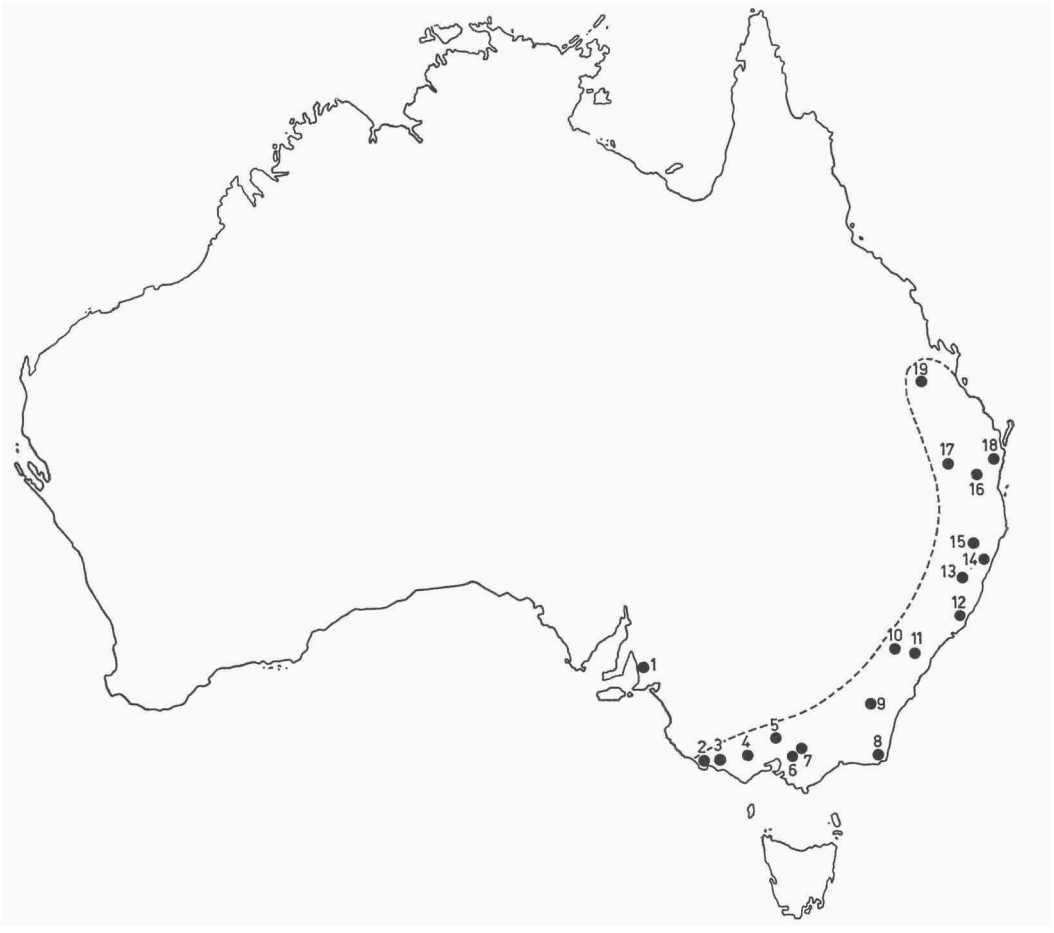
This large owl is an inhabitant of temperate and subtropical forests. It shows no geographic variation. Reference may be made to Fleay's (1944) study of its life history.

Distribution. — Breeding range: Victoria, New South Wales and Queensland. In South Australia known from a single specimen found dead at Fulham in 1892 (Condon & Cleland, 1942; Terrill & Rix, 1950); in the absence of any subsequent records I regard it as a straggler. In Victoria fairly widely distributed, at least as far west as the Portland district (Learmonth, 1948); from there it occupies a broad belt along the coast of New South Wales and Queensland, north to the Dawson River. It would be interesting to know if it overlaps with *N. rufa* in that region.

Early records of the occurrence at Port Essington and elsewhere in northern Australia are due to confusion with *Ninox rufa,* a confusion which lasted until the early years of this century (Campbell, 1900; Le Souëf, 1902) and even later (Condon, 1948), but see discussion. Further confusion has been caused by the fact that the loud screech of *Ninox connivens* has formerly been ascribed to *N. strenua* (Fleay, 1944); this is clearly the basis of Jackson's record of *N. strenua* from the Atherton Tablelands (Jackson, 1909; Bourke & Austin, 1947), and of the latter two authors' record from coastal scrub north of Townsville.

Discussion. — Many specimens in collections of this huge owl, which has clearly been a prized item in the museum skin trade, are insufficiently labelled: of the four in the Leiden Museum and the nine in the British Museum not a single one is properly labelled: they were provided by such dealers as Frank, Cockerell, Higgins and Whitely and supposed to have come from "North Queensland" or "Northern Australia", if not merely "Australia". These specimens may have contributed to the erroneous belief that the species occurs in northern Australia.

Material examined. — Males: Healesville, Vict. (NMV B4269), Mount Munda, Vict. (NMV B4267), Gippsland, Vict. (HLW 5357), Mallacoota, Vict. (NMV), Wolgan Valley, N.S.W. (HLW 5358), Grafton, N.S.W. (WAM 1662, 1663, 1665), Coomooboolaroo, Dawson River, Qld. (AMNH 630271). Females: Costerfield, Vict. (NMV B55), Mallacoota, near mouth of Genoa River, Vict. (NMV), Ebor, 52 miles east of Armidale, N.S.W. (USNM 279044), Grafton, N.S.W. (AMNH 630272), Dawson River, Qld. (NMV R1843). Sex uncertain: Victoria (AMNH 630274: type of *victoriae*),



Map 2. — The distribution of *Ninox strenua:* 1, Fulham. 2, Portland (Learmonth, 1948). 3, Naringal (Edge, 1960). 4, Linton (Clarke, 1963). 5, Costerfield. 6, Healesville. 7, Mount Munda. 8, Mallacoota. 9, Mt. Tidbinbilla, A.C.T. (Lamm, Wilson & Belton, 1963). 10, Bathurst District. 11, Wolgan Valley. 12, Manning River. 13, Ebor. 14, Grafton. 15, Lionsville (J. Ramsay, 1919). 16, Bunya Mountains (Qd Mus.). 17, Chinchilla (Qd Mus.). 18, Gympie (Qd Mus.). 19, Coomooboolaroo, Dawson River.

Bathurst District (USNM 85917, 85918), Manning River, N.S.W. (HLW 5356), Dawson River, Qld. (NMV R1842).

Ninox novaeseelandiae (J. F. Gmelin)

This small species ranges, in at least sixteen races, from Timor and Alor over southern New Guinea and the whole of Australia to Norfolk Island

and New Zealand. It will be noted that I have excluded *Ninox rudolfi* Meyer from Soemba, which was included as a race by Peters (1940) and Mayr (1943), from it. *Ninox rudolfi* with its cross-barred under surface, well-defined white throat, and dark head with white spots, is an entirely different bird. Further particulars on the status of *N. rudolfi* are given in the discussion of *N. novaeseelandiae plesseni.*

The species has a great ecological tolerance, and occurs in all kinds of habitat, from dense and dark forest and tropical jungle to the most arid parts of interior Australia, where it spends the day in trees along creekbeds and in caves. The forest races and populations are usually darker in colour than the birds inhabiting open country.

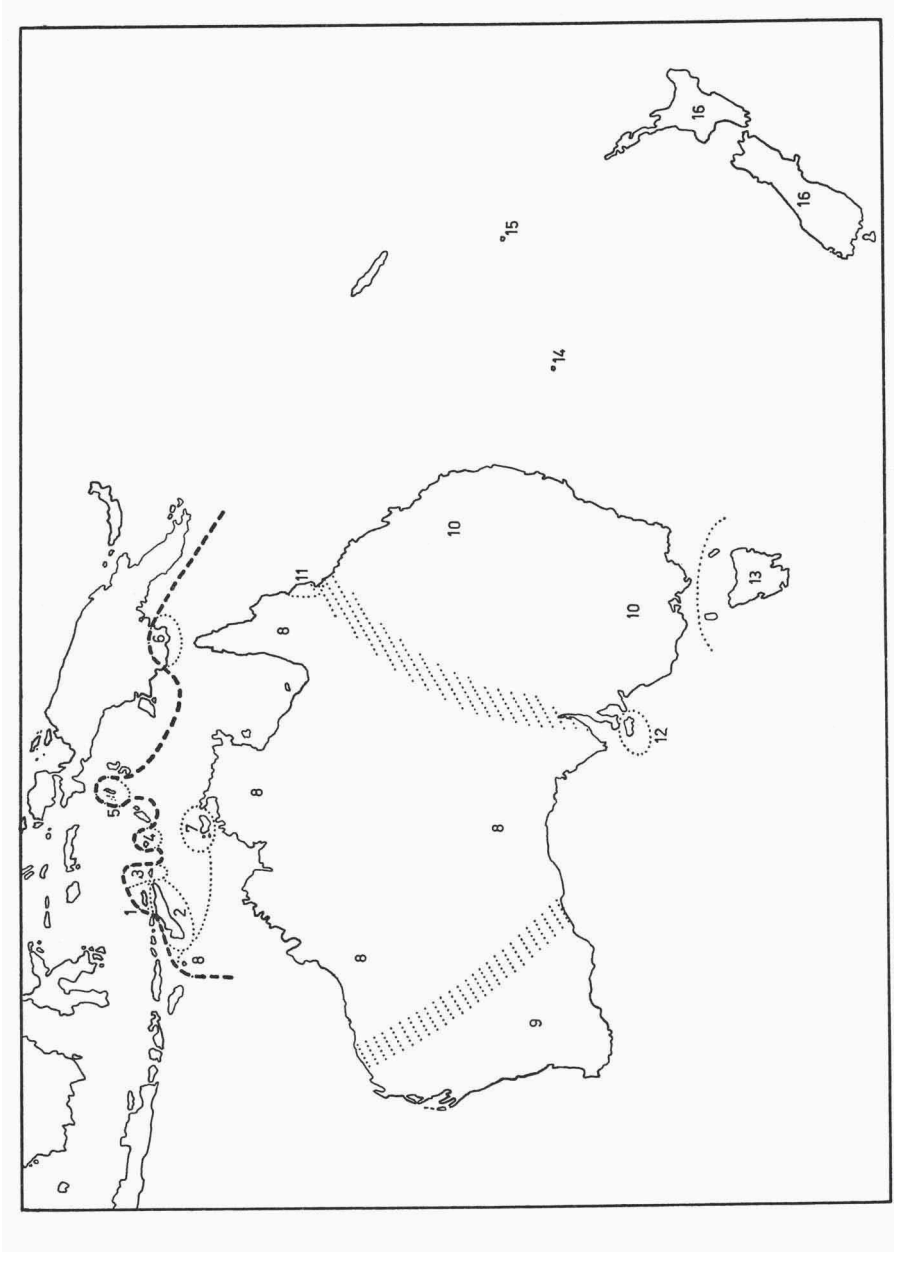
1. **Ninox novaeseelandiae plesseni** Stresemann

Ninox fusca plesseni Stresemann, 1929, Orn. Mber. 37, p. 47 — Tanglapoi in West Alor, 1000 m.

Subspecific characters. — A well-marked race. General tone of plumage similar to *fusca,* but whole upper parts marked with white and pale brown spots, which show a faint pattern of cross-barring; this gives the whole dorsal surface a mottled appearance. Under surface on the breast with longitudinal stripes, much as in *fusca,* but lower down inclining to ocellations. Rectrices stronger banded than in *fusca.*

Distribution. — Alor, where known from the type locality only.

Discussion. — This subspecies is known only from its type, a female. When Stresemann (1929) described this bird, he regarded it as more or less intermediate between *N. novaeseelandiae fusca* and *N. rudolfi,* and therefore he listed *rudolfi* as a subspecies of *fusca* (which, at the time, had not yet been united with *novaeseelandiae*). In this he was followed by Peters (1940) and Mayr (1943), neither of whom, presumably, had had an opportunity of examining *plesseni.* At the same time, I do not believe that Stresemann had material of *rudolfi* when he described *plesseni,* so that a direct comparison had never been made. Though I have examined both *plesseni* and *rudolfi,* I have not been able to make a direct comparison either. The points in which *plesseni* was believed to approach *rudolfi* are the spotting of the upper parts, and the cross-bars on the under parts. However, whitish spots occur also in several other races of *N. novaeseelandiae,* and moreover, in *rudolfi* they are far more restricted, confined to the head, while in *plesseni* the head is only weakly spotted. The pattern of cross-bars on the back does not occur in *rudolfi* and is unique to *plesseni.* As noted above, most of the ventral surface of *plesseni* has longitudinal stripes, and even on the thighs, where the stripes are shorter and broader, they show at most a remote re-



Map 3. — The distribution of *Ninox novaeseelandiae* and its races: 1, *plesseni*. 2, *fusca*. 3, *moae*. 4, *cinnamomina*. 5, *remigialis*. 6, *pusilla*. 7, *melvillensis*. 8, *ocellata*. 9, *rufigaster*. 10, *boobook*. 11, *lurida*. 12, *halmaturina*. 13, *leucopsis*. 14, *albaria*. 15, *undulata*. 16, *novaeseelandiae*.

semblance to cross-bars. On the whole, though in certain characters *plesseni* may show a slight approach to *N. rudolfi*, it is far closer to *N. novaeseelandiae*, and does not seriously affect the isolated position of *N. rudolfi* which, therefore, I prefer to retain as a distinct species.

Material examined. — Female: Tanglapoi, West-Alor, 1000 m (Zool. Mus. Berlin 28.547: type of *plesseni*).

2. **Ninox novaeseelandiae fusca** (Vieillot)

Strix fusca Vieillot, 1817, Nouv. Dict. d'Hist. Nat. VII, p. 22 — Saint-Domingue et Porto Ricco (errore!) = Timor (Sharpe, 1875).

Strix maugei Temminck, 1821, Recueil d'Ois., 8 livr., pl. 46 — Antilles (errore!) = Timor.

Strix (*Athene*) *guteruhi* S. Müller, 1845, Verh. Nat. Gesch. Ned. Overz. Bez., Land- en Volkenk., p. 279 — Timor.

Subspecific characters. — A dark, cold grey-brown race, without any trace of warm brown or rufous.

Distribution. — Timor. Meyer (1882) has recorded this form from Soemba, but presumably in error.

Material examined. — Series in RMNH (types of *guteruhi*) and AMNH.

3. **Ninox novaeseelandiae moae** Mayr

Ninox novaeseelandiae moae Mayr, 1943, Emu 43, p. 13 — Moa Island.

Subspecific characters. — Very similar to dark specimens of *ocellata*, but slightly warmer in colour on upper surface, and slightly colder on under surface.

Distribution. — Moa, Romah and Leti.

Discussion. — Mayr (1943) discussed the same material now examined by me; he remarked that a single bird (♂) from Romah Island was about half way between *fusca* and *cinnamomina* and not unlike *moae*. This, of course, makes sense only when one adds that *moae* itself is more or less intermediate between *cinnamomina* and *fusca*. I find specimens from Leti slightly less warm brown on the upper surface than topotypical *moae*, but can see no reason not to include them in that race.

Material examined. — Males: Moa (AMNH 630520, 630521, 630523: type of *moae*), Romah (AMNH 630515), Letti (AMNH 630516, 630517). Females: Moa (AMNH 630522), Letti (AMNH 630518, 630519).

4. **Ninox novaeseelandiae cinnamomina** Hartert

Ninox boobook cinnamomina Hartert, 1906, Novit. Zool. 13, p. 293 — Tepa, Babber.

Subspecific characters. — A very beautiful and distinct race, both above and below entirely deep cinnamon.

Distribution. — Babar, where known from the type locality, Tepa, only.

Material examined. — Males: Tepa, Babber (AMNH 630564, 630565, 630566, 630563: type of *cinnamomina*). Females: Tepa, Babber (AMNH 630568, 630569).

5. **Ninox novaeseelandiae remigialis** Stresemann

Ninox novaeseelandiae remigialis Stresemann, 1930, Bull. Brit. Orn. Cl. 50, p. 61 — Kei Islands.

Subspecific characters. — According to the original description this race is nearest to specimens from Leti, Moa, and Romah Island since described as *moae,* but differs by having the barring of the primaries and secondaries much less pronounced, and in a few other colour characters.

Distribution. — Kei Islands, without precise locality.

Discussion. — I have not examined material of this race, which is known from its type specimen (in the British Museum) only. Until more specimens become available it will be difficult to assess the value of some of the subspecific characters claimed for it.

6. **Ninox novaeseelandiae pusilla** Mayr & Rand

Ninox novaeseelandiae pusilla Mayr & Rand, 1935, Amer. Mus. Novit. 814, p. 3 — Dogwa, Oriomo River, Territory of Papua.

Subspecific characters. — Very similar to specimens of *ocellata* from Darwin and Groote Eylandt, but slightly darker, more vinaceous on the upper parts. There is a slight trend to ocellation of the under surface which, notwithstanding the name of that race, seems to be lacking in *ocellata.* Size smaller.

Distribution. — Lowlands of southern New Guinea opposite Cape York, where only known from the localities Dogwa, Penzara and Tarara.

Discussion. — Even though of the three males and two females examined, at least two are immature, this subspecies seems to be of slightly but distinctly smaller size than any race it is close to in plumage.

Material examined. — Males: Dogwa (AMNH 421869, 421868: type of *pusilla*), Penzara (AMNH 425943). Females: Penzara (AMNH 425945, 425946).

7. **Ninox novaeseelandiae melvillensis** Mathews

Ninox boobook melvillensis Mathews, 1912, Aust. Avian Rec. 1, p. 34 — Melville Island, Northern Territory.

Subspecific characters. — A small and dark race, distinctly darker than the populations of the adjacent mainland. Very similar to *rufigaster* but

smaller, not only as regards wing-length but also in size of bill; colour of upper surface on an average slightly less warm brown; under surface identical.

Distribution. — Melville Island.

Materal examined. — Males: Cooper's Camp (AMNH 630475: type of *melvillensis*), ten miles east of Gordon Point (AMNH 630479, 630480). Females: Cooper's Camp (AMNH 630476), ten miles south-east of Snake Bay (AMNH 630478).

8. **Ninox novaeseelandiae ocellata** (Bonaparte)

Athene ocellata Bonaparte, 1850, Consp. Gen. Av. I, p. 42 — Oceania (based on Hombron & Jacquinot, Voy. Pôle Sud., Ois. t. 3.2) = Raffles Bay, Cobourg Peninsula, Northern Territory (Peters, 1940).

Ninox boobook mixta Mathews, 1912, Novit. Zool. 18, p. 255 — North-West Australia (Parry's Creek).

Ninox boobook macgillivrayi Mathews, 1913, Aust. Avian Rec. 1, p. 194 — Cape York, North Queensland.

Spiloglaux novaeseelandiae everardi Mathews, 1916, Birds Aust. V, p. 332 — Everard Ranges, Central Australia.

Ninox ooldeaensis Cayley, 1929, Emu 28, p. 163 — near Ooldea, South Australia.

Ninox novaeseelandiae arida Mayr, 1943, Emu 43, p. 16 — Fitzroy River, five miles south-west of Mt. Anderson, West Kimberley District.

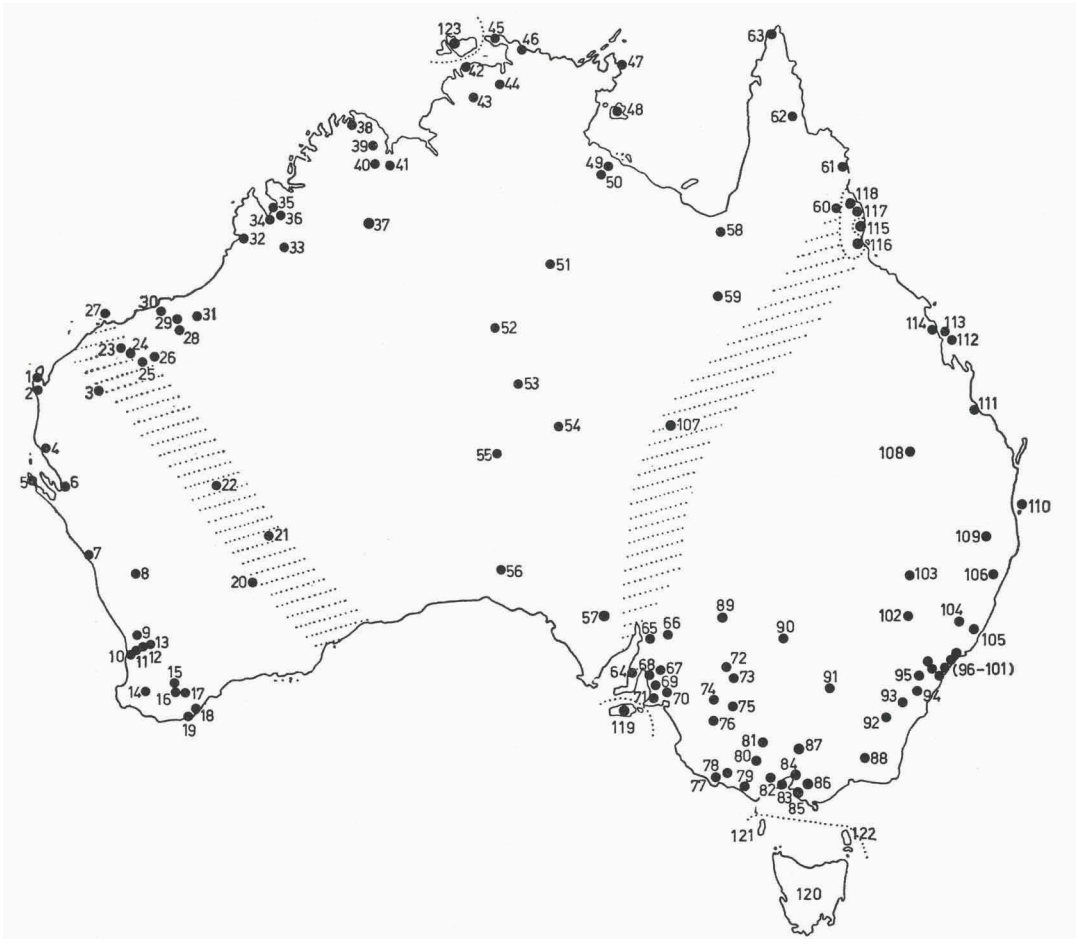
S[piloglaux] b[oobook] parocellata Mathews, 1946, Working List Aust. Birds, p. 55 — "South West Australia", but as a result of the restriction by Mees (1961, p. 106), the name has become an objective synonym of *ocellata*.

S[piloglaux] o[cellata] carteri Mathews, 1946, Working List Aust. Birds, p. 55 — Mid West Australia, restricted to Marble Bar by Mees (1961, p. 107).

Subspecific characters. — Variable both in size and in colour, but generally paler to much paler than any of the other Australian races. Odd individuals, however, can be very dark.

Distribution. — Queensland, Northern Territory, South Australia and Western Australia; also Sawoe Island between Timor and Soemba. In Queensland confined to Cape York Peninsula and the interior south of the Gulf of Carpentaria. The whole of the Northern Territory, including Groote Eylandt, but excluding Melville Island (where *melvillensis* occurs). In South Australia west of a line Port Augusta — Everard Ranges and in the northern part of the state perhaps farther east. The whole of Western Australia (as far as known), except the range of *rufigaster*.

Discussion. — Mayr (1943) began his revision of the northern races of *Ninox novaeseelandiae* with the words: "The classification of the boobook owls is one of the most difficult taxonomic problems I have ever encountered. The main difficulty is that variation seems not to be correlated with geographical districts, but more or less with rainfall or humidity. One there-



Map 4. — The distribution of *Ninox novaeseelandiae* in Australia: 1, Tantabiddy. 2, Point Cloates. 3, Glen Florrie. 4, Carnarvon. 5, Dirk Hartog Island. 6, Hamelin Pool. 7, Chapman River. 8, Wannarra Stn. 9, Wanneroo. 10, Perth and suburbs. 11, Guildford. 12, Mahogany Creek. 13, Chidlow's Well. 14, Bridgetown. 15, Tambellup. 16, Broome Hill. 17, Stirling Range. 18, King River. 19, Albany. 20, Kurrawang. 21, Laverton. 22, Lake Way. 23, Fortescue River (Millstream). 24, Tambrey. 25, Coolawanyah. 26, Hooley. 27, Dolphin Island. 28, Marble Bar. 29, Coongan. 30, Strelley. 31, Barramine. 32, Roebuck Bay. 33, Mungi Rock Hole. 34, Derby. 35, Point Torment. 36, Meda. 37, Soda Springs. 38, Napier Broome Bay. 39, Forrest River Mission. 40, Durack River. 41, Parry's Creek. 42, Darwin. 43, Mt. Shoebridge. 44, South Alligator River. 45, Port Essington (the type locality of *ocellata*, Raffles Bay, is covered by the same dot). 46, King River. 47, Arnhem Peninsula. 48, Groote Eylandt. 49, Borroloola. 50, McArthur River Station. 51, Tennant's Creek. 52, Cockatoo Creek. 53, Palm Valley. 54, Finke River. 55, Everard Ranges. 56, Ooldea. 57, 20 miles south-west of Iron Knob. 58, 180° South, 141° East. 59, Sedan. 60, Walsh River. 61, Cooktown. 62, Coen. 63, Jardine River. 64, Port Victoria. 65, Laura. 66, Nackara. 67. Eudunda. 68, Outer Harbour.

fore encounters, not infrequently, indistinguishable populations at widely-separated localities". The difficulties expressed by Mayr occur mainly in the range of *ocellata*; and though the classification used by me is at first sight very different from that proposed by Mayr, and much closer to that of Peters (1940), the difference is a matter of opinion on nomenclature rather than one of interpretation.

First about the applicability of the name *ocellata* for the mainland birds. As Peters (1940) has shown, the type was collected at Raffles Bay, Cobourg Peninsula. Mayr (l.c.) had not seen material from this area, but he decided to use the name *ocellata* for the dark birds from Melville Island, with which he presumed that those of the Cobourg Peninsula would be identical. I have examined specimens from Port Essington (admittedly very old ones), and also from other localities in the northwestern part of the Northern Territory (Darwin, Oenpelli) and they are all definitely paler than birds from Melville Island. Note also Gould's (1848) remark: "I have seen individuals of this owl from every one of the Australian colonies, all presenting similar characters, with the exception of those from Port Essington, which differ from the others in being a trifle smaller in size and paler in colour".

Within the large range here assigned to *ocellata,* much geographical variation occurs, and Mayr, though restricting himself to northern Australia, recognised three races in the area, which can succinctly be described as fairly dark (*macgillivrayi*), medium (*mixta*) and pale (*arida*). When the requirement is made that a subspecies, to be admitted, must be reasonably uniform and must have a definable geographical range, I do not think that three different names can stand. Even Mayr had to admit that a specimen from near the type locality of *arida* was much darker. I have now seen far more material than Mayr, and would like to make the following points.

The palest birds occur in West Kimberley and the Pilbara District; Sedan, Cloncurry River, Queensland, and Ooldea, South Australia. I have compared three almost topotypical specimens of *arida* with the type of *ooldeaen-*

69, Adelaide and suburbs. 70, Mt. Barker. 71, Aldinga. 72, Mildura. 73, Irymple South. 74, Kow Plains. 75, Rosebery. 76, Yanac. 77, Portland. 78, Orford. 79, Heytesbury. 80, Linton. 81, Marong. 82, Mt. Moriac. 83, Queenscliff. 84, Melbourne and suburbs, from Werribee and Melton to Ringwood, Frankston and Mornington. 85, Western Port. 86, Nyora. 87, Alexandra. 88, Gelantipy. 89, Broken Hill. 9, Clare. 91, Yanco. 92, Canberra. 93, Goulburn. 94, Berrima. 95, Square Rock. 96, Blacktown. 97, Parramatta. 98, Sydney and suburbs. 99, Manly. 100, Gosford. 101, Ourimbah. 102, Cobbora. 103. Narrabri. 104, Tubrabucca. 105, Gloucester. 106, Grafton. 107, Roseberth. 108, Mt. Hutton. 109, Emu Vale. 110, Moreton Island. 111, Port Curtis. 112, Percy Islands. 113, Beverley Group. 114, Mackay. 115, Innisfail. 116, Cardwell. 117, Bellenden Ker Hills and Bartle Frere. 118, ranges behind Cairns. 119, Kangaroo Island. 120, Tasmania. 121, King Island. 122, Flinders Island. 123, Melville Island.

sis [5]) and found no differences. The two skins from Sedan were well described by Mayr, with whose conclusion that they "are not clearly separable from *arida*" I fully agree. Hence, the palest birds are known from three separate areas, each about 1000 miles away from the others.

Slightly darker is the type of *mixta* from Parry's Creek [6]), and the type of *everardi* from the Everard Ranges, South Australia, is indistinguishable from topotypical material of *mixta*. Unfortunately, just as a bird from Roebuck Bay that should be *arida* is closer to *mixta*, one specimen from the type locality of *mixta* is similar to *arida* (AMNH 630470).

Birds from Cape York (*macgillivrayi*) average slightly darker than *mixta*, but there again some from the South Alligator River are similar. Mayr also recognised this and concluded that birds from this area are "intermediate between *ocellata* and *mixta* and only by convergence similar with *macgillivrayi*". However he would, just the same, include them under the name *macgillivrayi*, and adds that *macgillivrayi* would become a synonym of *ocellata* if the Cobourg Peninsula is not included in the range of the dark Melville Island race. As he includes birds from the southern coast of the Gulf of Carpentaria in *mixta*, this would give *macgillivrayi* a disjunct range. In the extreme north of the Northern Territory there is also a distinct tendency towards smaller size.

On Groote Eylandt (6 skins examined) there is a tendency to having the under surface smooth cinnamon; if all the specimens showed this, it would be justified to separate them, but one skin does not differ from mainland birds. Birds from the island are also rather small, but at present it seems best to keep them under the name *ocellata*.

From South Australia insufficient material was available, but a skin collected twenty miles west of Iron Knob is definitely paler than *boobook*, and closer to *ocellata*.

Within the range of *ocellata* very dark birds occur occasionally. I have previously recorded one from Tambrey (plate 1). This bird, which was collected by me personally, had a greyish green iris, and therefore is fully adult, A similar bird from Tennant Creek, N.T., mentioned by Condon (1951, p. 31) was also examined by me. At present I feel unable to explain the existence of these very dark individuals, I doubt that it is a simple matter of dimorphism.

Finally there is the puzzling population of Sawoe (Savu) previously commented upon by Peters and Mayr. Though from the zoogeographic point

5) The types of *Ninox ooldeaensis* and *Ninox yorki* in the Australian Museum, which were missing (Mees, 1961, p. 107), have now been found.

6) Parry's Creek is a tidal creek 15 miles south of Wyndham.

of view it would be desirable to separate it, I agree with Mayr that there is no morphological basis for doing so. Incidentally, the prominent white spots on the wings which Mayr thought might be a character of this population are due to the way these specimens have been prepared, with many white-spotted feathers of the wing coverts showing. There is a possibility that the inclusion of Sawoe birds with *ocellata* reflects historical fact and that the island has been independently colonized from the Australian mainland, rather than from Timor, in fairly recent times. The species has not yet been collected on Roti, though it is likely to occur there.

Material examined. — Sawoe Island. Males: Savu I. (AMNH 630509, 630510, BM 97.11.1.89). Females: Savu I. (AMNH 630512, 630513, BM 97.11.1.135, BM 1955.6N.20.4659).

Western Australia. Males: Fortescue River (HLW 6769), Coolawanyah (WAM A 7255), Marble Bar (AMNH 630489, WAM 9518), Mungi Rock Hole, 8 miles South-east of Mt. Alexander (AMNH 630474), Point Torment (AMNH 630466, 630467, 630468), Mission Station Napier Broome Bay (AMNH 630460), Napier Broome Bay (AMNH 630459, HLW 5336), Durack River (AMNH 630472), Forrest River, 60 miles up (AMNH 630473), Parry's Creek (AMNH 630470, 630471). Male?: Barramine Station (WAM A 8772). Females: Tambrey (WAM A 8361), Fortescue River (HLW 6768), Hooley (SW), Dolphin Island, Dampier Archipelago (WAM A 8773), Coongan River (HLW 5342), Roebuck Bay (AMNH 630457), Derby (AMNH 630461), Soda Springs, Hall's Creek Road (AMNH 630458), Napier Broome Bay (HLW 5337), Forrest River Mission (AM O. 38980), Parry's Creek (AMNH 630469: type of *mixta*, 630470). Sex uncertain: Tambrey (WAM A 8362), Strelley River (AMNH 630474), Meda, Kimberley (WAM 0211). Intermediate between *ocellata* and *rufigaster*. Male: Lake Way (AMNH 630452). Female: Lake Way (HLW 5341).

Northern Territory (North). Males: Mt. Shoebridge (AMNH 630490), Darwin (USNM 405816), South Alligator River (AMNH 630482, 630483), King River (HLW 5331), Groote Eylandt (USNM 405819, HLW 5349), Borroloola (NMV 4257). Females: Mt. Shoebridge (AMNH 630491), Port Darwin (USNM 279040), Alligator River (WAM 7885), South Alligator River (AMNH 630484), King River (HLW 5352), Eureka (AMNH 630488), Arnhem Peninsula (USNM 405820), Groote Eylandt (USNM 405817, 405818, HLW 5350), McArthur Station, McArthur River (HLW 5338), Borroloola, McArthur River (HLW 5339, 5340). Sex uncertain: Port Essington (BM 404c, 404d), Groote Eylandt (BM 1925.11.1.957).

Northern Territory (South). Male: Finke River (SAM B 18440). Female:

Cockatoo Creek (SAM B 14883). Sex uncertain: Tennant's Creek (SAM B 8809), Palm Valley, James Range (HLW 7745).

South Australia. Males: Everard Ranges (AMNH 630494: type of *everardi*), 407 miles East West Line (AM O. 26604: type of *ooldeaensis*). Female: 20 miles south-west of Iron Knob (SAM B 5692).

Queensland. Males: Lat. 18° S., Long. 141° E. (BM 57.9.18.44), Walsh River, 1200 ft (AMNH 630508), Coen (HLW 5343), Cooktown (AMNH 630506), Jardine River (AMNH 630502). Females: Sedan, Cloncurry River (AMNH 630495, 630496), Jardine River (AMNH 630503), Bersto Creek, Cape York (AMNH 630500), Coen (HLW 5344), Cooktown (BM 1955.6. N20-4650).

9. **Ninox novaeseelandiae rufigaster** Mees

Ninox novaeseelandiae rufigaster Mees, 1961, J. Roy. Soc. W. Aust. 44, p. 106 — Perth.

Subspecific characters. — A dark race; very similar to *melvillensis,* but larger; differs from *boobook* by being more rufous on the under surface.

Distribution. — South-western Australia, north to Tantabiddy (North-West Cape) and Glen Florrie (Ashburton River); eastern limits of range (where intergradation with *ocellata* occurs) unknown, but *rufigaster* probably ranges about 300 miles inland. Recorded from Dirk Hartog Island (specimen examined), but status not certain (Whitlock, 1921). Specimens from Lake Way are somewhat paler than *rufigaster,* but darker than *ocellata*; specimens from Kalgoorlie and Laverton (one skin each) examined in the British Museum are in too poor a condition for comparison.

Discussion. — This race is remarkably uniform over its whole range; inland, however, intergradation with *ocellata* occurs.

In April 1963 I visited the aviaries of Miss C. A. Nicholls of Nedlands, Western Australia, where I was shown a fully adult individual of this race, which was slightly colder in colour, less rufous, than two immature birds, and also seemed to have more white on the under surface. Miss Nicholls assured me that when this bird was young it had been more rufous. Whether or not all birds, under normal circumstances, show a change in colour when growing older remains to be seen. In this race young birds have the iris dark brown, while in adults it is greenish. The same probably holds true for other races (see also p. 20, and Fleay, 1934). On the other hand two specimens collected by Major Whittell at Bridgetown are marked as having had the iris yellow (see also Serventy & Whittell, 1962, p. 271): perhaps an intermediate stage, or would Major Whittell have received these specimens dead (they are sometimes found killed on the roads) and the irides have become discoloured?

Material examined. — Males: Point Cloates (AMNH 630453), Dirk Hartog Island (HLW 6402), Hamelin Pool (AMNH 701948), Wanneroo (AMNH 630451), Herdsman's Lake (WAM 6899), Bayswater (AMNH 630450), Claremont (WAM A 6467), Chidlow's Well (WAM A 1422), Broome Hill (HLW 6954, 6955, AMNH 294753), Moir Pass (WAM A 1920), Tambellup (WAM A 2304). Females: Tantabiddy (AMNH 630455), Point Cloates (WAM 243, AMNH 630454), Carnarvon (HLW 6953), Wannarra Stn. (WAM A 8772), Mahogany Creek (WAM A 4602), Morringup Pass (WAM A 1922), North Perth (WAM A 6958), Moir Pass, Stirling Range (WAM A 1921), near Perth (WAM 10027), Perth (WAM A 1022: type of *rufigaster*), Como (WAM A 4365), Bridgetown (SW, 2 specimens), Albany (WAM 11404, HLW 6956), Chapman River (BM 96.1.12.4), King River (BM 1906.12.20.41), Swan River (RMNH cat. no. 6), Broome Hill (AMNH 630448, 630449), Toobinup (AMNH 630477). Sex uncertain: Glen Florrie (WAM A 2526), Mt. Henry near Perth (WAM 2145), Swan River (BM 1955.6.N.20), Guildford (NMV R 1293). Subsp.: female: Laverton (BM 1906.12.20.44), female: Kurrawang near Kalgoorlie (BM).

10. **Ninox novaeseelandiae boobook** (Latham)

Strix boobook Latham, 1801, Suppl. Indic. Orn., p. xv — Nova Hollandia, restricted to New South Wales by subsequent authors.

Athene marmorata Gould, 1846, Proc. Zool. Soc. Lond. 14, p. 18 — South Australia, restricted to Adelaide by Mees (1961, p. 105).

Spiloglaux boobook tregellasi Mathews, 1913, Aust. Avian Rec. 2, p. 74 — Frankston, Victoria.

Subspecific characters. — A large subspecies which shows some variation in coloration. The darkest extreme, which has been described as *marmorata,* is dark, upper parts only slightly less dark than in *leucopsis* (which race is slightly more chestnut brown); white dots on head and neck, when present, larger, more vaguely defined, than in *leucopsis.* Under surface rather cold brown, more often ocellated than striated. The more typical *boobook* has generally somewhat paler, warmer brown, upper parts, and the under surface in these lighter birds is more often striated than ocellated. The majority of specimens are more or less intermediate between these two extremes, which, moreover, are not as distinct as the description might suggest. Generally speaking this subspecies may be called fairly uniform.

Distribution. — The whole of Victoria and New South Wales, southern Queensland, and eastern South Australia. In South Australia the limit of this race is probably from about the head of Spencer Gulf northwards, but actual records are lacking almost entirely. In Queensland well distributed in

the south and central areas, and, judging from the rather scanty material available, as far north as Innisfail (Geraldton on old labels), where intergradation with *lurida* may occur. Inland, specimens from Birdsville can be assigned to this race.

Discussion. — In my previous revision (Mees, 1961), I included the southern part of the Northern Territory in the range of *boobook*; this however was based on the erroneous assumption that three specimens labelled Teatree Gully, which are thoroughly typical *boobook,* originated from Tea Tree in the Northern Territory. Actually Teatree Gully is a locality near Adelaide. A single specimen from Finke River near the southern boundary of the Northern Territory is somewhat paler than *boobook* and at present there is no evidence that *boobook* extends into the Northern Territory.

A few localities ask for further comment. Of two specimens from Geraldton (Innisfail), one, a female, is a typical *boobook* with a wing of 248 mm. The second specimen, a male, is much paler both above and below, and has many white spots on nape and wings, moreover its wing is only 213 mm. I prefer not to apply a subspecific name to this skin. One of the two females from Roseberth, Birdsville, is a typical *boobook,* wing 245; the other is much paler and somewhat smaller, wing 231, and may be regarded as an intergrade towards *ocellata.*

Material examined. — South Australia. Males: Port Victoria (SAM B 8806), Laura (SAM B 8802), Eudunda (SAM B 22001), Outer Harbour (SAM B 23216), near Adelaide (SAM B 8808), Mt. Barker (SAM B 19965). Females: Laura (SAM B 8801), Nackara (SAM B 22782), south of Eudunda (SAM B 22033), Adelaide (SAM B 6765), Mile End (SAM B 18440), Teatree Gully (SAM B 8803, B 8804, B 8805), Woodville (SAM B 18767). Sex uncertain: Happy Valley, near Adelaide (SAM B 4760), Seton Park (SAM B 17866).

Victoria. Males: Irymple South (NMV B 2597), Rosebery (NMV R 5368), Heytesbury (AMNH 630423), Linton (NMV R 5038), Marong via Bendigo (NMV B 4807), Melton (NMV R 6890), Mt. Moriac, via Geelong (NMV B 4258), Botanical Gardens, Melbourne (NMV R 6980), St. Kilda (NMV B 591), Box Hill (AMNH 630421), Selby (AMNH 630413), Ringwood (AMNH 630414), Myora (AMNH 630418), Mornington (NMV R 11758), Gelantipy (NMV B 5339), Glengyle, Moreland (SAM B 20472). Females: Mildura (NMV B 6125), Kow Plains (HLW 5330), Yanac (NMV W 3191), Portland (NMV B 4259), Orford near Port Fairy (NMV R 4392), Heytesbury (AMNH 630424), Werribee (BM 1910.7.7.60), Mooroolbark (NMV R 4394), Box Hill (CSIRO 135), Selby (AMNH 630411), Wandin (NMV B 149), Frankston (AMNH 630431,

630432, 630433: type of *tregellasi*), Western Port (AMNH 630427), Auburn (AMNH 630417), Raak (NMV R 7637). Sex uncertain: Junction Murray-Darling (NMV R 6898, B 4256), Queenscliff (NMV R 6894), Kew (NMV R 2554), Western Port (NMV B 4354, 4255, R 6891), Alexandra (NMV 6889), Goulburn Valley (NMV R 11403), Victoria (Alexandra?) (NMV R 6888), Victoria (NMV R 6893).

New South Wales. Males: Broken Hill (SAM B 20473), Clare (SAM B 20475), Yanco (AM O. 33169), Narrabri (AMNH 630399), Cobborah Estate, Cobbora (HLW 5335, 7840, 7841), Barton Highway, A.C.T. (CSIRO 229), Goulburn (HLW 5354), Berrima, 2200 ft. (AM 0.27906), Square Rock near Coolong via Yerranderie (AM O. 32253), Blacktown (HLW 5355), Sydney (AMNH 630403), Woollahra, Sydney (HLW 5331), Cook's River (RMNH cat. no. 2), Ourimbah (WAM A 144, A 145), Tubrabucca, Moonan Flat, Upper Hunter River (AM O. 37766), Clarence River (WAM 1683), Richmond River (AMNH 630394, 630395), Wardandian (USNM 278042), Long Bay (WAM A 146, HLW 5333). Females: Clare (SAM B 20476), Parramatta (AMNH 630400, 630401), Sydney (AMNH 266857), Cook's River (RMNH cat. no. 3), Penshurst (AM O. 37041), Gloucester (USNM 278043), Granville (HLW 5334), Manly (WAM A 149), Grafton (WAM 1680, 1681, 1682), Richmond River (AMNH 630397, 630396), Gordon (HLW 5331), Baggabri (AMNH: no number). Sex uncertain: Clare (SAM B 20474), Fairfield (SAM B 8814), New South Wales (NMV R 6895, R 6897).

Queensland. Males: Emu Vale near Warwick (NMV B 2091, AMNH 702906, 702907), Moreton Island (BM 1955.6.N-20.4647), Port Curtis (BM 1955.6N-20.4648), Beverley Group, 21° 31′ S., 149° 55′ E. (AMNH 630391). Females: Roseberth, Birdsville area (AMNH 343645), Mt. Hutton St. (BM 1924.12.18.79), Emu Vale near Warwick (NMV B 2078, AMNH 702908, 702909, 702910, and one without a number), Percy Islands (BM 1955.6.N-20), Geraldton (AMNH 630386). Sex uncertain: Mackay (AMNH 630392), Queensland (WAM A 1534). Subsp.: male: Geraldton (AMNH 630507), female: Roseberth, Birdsville area (AMNH 630646).

11. **Ninox novaeseelandiae lurida** De Vis

Ninox boobook, var. *lurida* De Vis, 1887, Proc. Linn. Soc. N.S.W. (2) 1, (1886), p. 1135 — dark thick scrubs, a few miles from Cardwell.

N[*inox*] *lurida* De Vis, 1889, Rep. Sci. Exp. Bellenden-Ker Range, p. 84 — Herbert Gorge, Bellenden-Ker.

Spiloglaux boweri Mathews, 1913, Aust. Avian Rec. 2, p. 74 — Petersons Pocket, Cairns, North Queensland.

Ninox yorki Cayley, 1929, Emu 28, p. 162 — Cape York Peninsula.

Subspecific characters. — A very dark race; on the upper parts at least as dark as *leucopsis,* but without spots; under surface dark, much colder brown than *leucopsis,* ocellated with white. This is the darkest race of the Australian mainland.

Distribution. — This subspecies has an apparently very restricted range in the forests of northeastern Queensland. Material examined was from: Peterson's Pocket (Cairns), Bartle Frere, Kirrima Range (Cardwell), Murray River (Cardwell). To this can be added the locality Herbert Gorge in the Bellenden-Ker Range (De Vis, 1889).

Discussion. — I have examined the type of *Ninox yorki*; unfortunately its exact provenance is uncertain, both on its label and in the register it reads just Cape York. From Cayley's (1929) notes on how he obtained the collection it belonged to, it is clear that no exact data were ever available. As it is, however, a dark bird (see also Cayley's coloured plate), it seems best to place it provisionally in the synonymy of *lurida,* though it is perhaps not as dark as typical specimens, and is moreover very large (wing 244).

It is curious that all later authors have ignored De Vis's (1887) original description of this form, published in a well-known and accessible journal, in favour of his later publication (De Vis, 1889). Originally, the reason for this was doubtless that in the earlier paper *lurida* was described as a variety, for in the later paper he stated: "In former observations ... I noticed this little owl as probably a variety of *N. boobook.* From the present and other specimens since obtained I am now persuaded that it should take rank as a distinct species, and therefore append the necessary description". According to the International Code (Stoll & al., 1961, art 17 sub. 9), however, the earlier description is valid.

Material examined. — Males: Peterson's Pocket, Cairns (AMNH 630561: type of *boweri,* NMV B 4253), Murray R., Cardwell (HLW 8400), Kirrima Range (HLW 5346). Females: Peterson's Pocket, Cairns (AMNH 630562), Bartle Frere (AMNH 630388), Murray R., Cardwell (HLW 8401), Cardwell (HLW 5348), Kirrima Range, Cardwell (HLW 5347). Sex uncertain: Cape York Peninsula (AM O. 27647: type of *yorki*).

12. **Ninox novaeseelandiae halmaturina** Mathews

Ninox boobook halmaturina Mathews, 1912, Novit. Zool. 18, p. 254 — Kangaroo Island.

Subspecific characters. — Similar to *boobook,* but differs by the coloration of the under parts which are striated to ocellated dark brown, interspaced

not with whitish but with rufous cinnamon, a colour also very distinct on the feathers of the legs.

Distribution. — Kangaroo Island off the coast of South Australia.

Discussion. — More material is needed to properly evaluate this subspecies. Though I have since examined two additional specimens, including the type, I have nothing to add to my earlier remarks (Mees, 1961), and Condon (1962) may well be right in questioning the validity of the characters used by me to distinguish this subspecies; nevertheless, he also accepts it.

Material examined. — Males: Penneshaw (SAM B 6882), Birchmas Lagoon (USNM 278792). Females: Kangaroo Island (SAM B 8807), Middle River (AMNH 630439: type of *halmaturina*).

13. **Ninox novaeseelandiae leucopsis** (Gould)

[*Athene*] *leucopsis* Gould, 1838, Proc. Zool. Soc. Lond. 5, (1837), p. 99 — Van Diemen's Land.

[*Noctua*] *Maculata* Vigors & Horsfield, 1827, Trans. Linn. Soc. Lond. 15, (1826), p. 189 — Australia (no precise locality given). Preoccupied.

Spiloglaux boobook clelandi Mathews, 1913, Aust. Avian Rec. 2, p. 74 — Flinders Island.

Spiloglaux boobook leachi Mathews, 1913, Aust. Avian Rec. 2, p. 74 — Victoria = Melbourne.

Spiloglaux novaeseelandiae tasmanica Mathews, 1917, Aust. Avian Rec. 5, p. 70 — Tasmania.

Subspecific characters. — A well-marked race, characterised by small size, dark upper parts with usually many small white dots on the upper parts, especially on the neck, and with strongly ocellated under surface. Under favourable conditions it should be possible to distinguish this subspecies in the field from *boobook,* so that observers in south-eastern Australia may be able to add something to knowledge of its migration.

Distribution. — Tasmania, Maria Island (Legge, 1888), and probably islands in the Bass Strait. The race is at least partly migratory and has been found in Victoria and New South Wales. Further particulars are given in the discussion.

Discussion. — In a previous revision (Mees, 1961) I placed *leachi* in the synonymy of *boobook* as Mathews claimed the type of *leachi* to be larger in size than the Tasmanian race. Examination of the type revealed that it is a normal specimen of *leucopsis,* that perhaps looks slightly larger than other material because it has been filled out very well. The wing-length of 207 mm is normal for *leucopsis.* In the original description the type locality is given simply as Victoria; later Mathews (1915-1916, p. 326) restricted this to Victoria (East of Melbourne). The type, however, is labelled as having been collected in Melbourne which therefore, of necessity, is the type locality.

Mathews applied the name *leachi* to resident birds of eastern Victoria, but as the type is a migrant, this is incorrect.

Notwithstanding Mathews's (1941) opinion to the contrary, there is nothing indeterminable about the name *leucopsis*; see also Mees (1961).

This subspecies is apparently a regular migrant to the mainland; not uncommon in Victoria, but rare in New South Wales. The only authentic specimen from New South Wales I have seen is a male collected in August 1903 in scrub at Long Reef, Manly, by S. W. Jackson. On its label further appear the notes: "this is the 3rd bird only of this species obtained in New S. Wales (rare bird in N.S.W.)" (written by Bassett-Hull), and "May 1916. This skin was forwarded to Mr. A. F. Bassett-Hull in Sydney, who compared it with skins in the Australian Museum Collection and found it to be *Ninox maculata*" (written by White or Jackson). Ramsay (1890, 1898) listed several other specimens from New South Wales: Sydney, Petersham and off Gabo Island; I have not examined these skins which are presumably still in the Australian Museum collection.

The dates of specimens collected in Victoria are from 18th April to 12th October, which is consistent with their being winter visitors only. A specimen caught at sea 50 miles off the Hunters, in May 1906, on which I have commented earlier (Mees, 1961, p. 105) forms a confirmation of the migratory habits of this race; this specimen had previously been mentioned by Littler (1910). On the other hand at least part (the major part?) of the population seems to stay in Tasmania, as I have examined specimens collected in mid-winter at Railton (June 21 and 28) and Dulverton near Railton (July 17).

Whether or not *leucopsis* is a breeding bird on the islands in the Bass Strait is not certain. The type of *clelandi*, the only skin from Flinders Island I have seen, was collected on November 28, which suggests that it is a breeding bird rather than a late migrant on its way to Tasmania. A skin from King Island is undated, but Campbell (1888a), who visited King Island in November 1887, noted that during his stay: "... a mopoke (*Ninox maculata*) was lured to its doom by the imitative power of two members of the party", which also points to breeding.

Material examined. — Males: Railton, Tasm. (AM O. 29982), Dulverton, 3 miles from Railton, Tasm. (HLW 5328), Flinders Island, Bass Strait (AMNH 630524: type of *clelandi*), Naracoopa, King Island (NMV B 588), Werribee, Vict. (BM 19.7.7.58), University grounds, Melbourne (NMV R 6886), Melbourne (AMNH 630435: type of *leachi*), Olinda, Vict. (AMNH 630416), Selby, Vict. (AMNH 630412), Long Reef, Manly, N.S.W. (HLW 5329). Females: Bushy Park, Tasm. (AMNH 630525: type of *tasmanica*),

Railton, N.W. Tasm. (NMV B 4252), Tasmania (SAM B 8821, BM 1955.6.N.20), caught at sea 50 miles off the Hunters (SAM B 4761), Western Port (AMNH 630428). Sex uncertain: Mt. Barron, Tasm. (SAM B 4762), Tasmania (SAM B 8822, NMV R 6887, BM 74.4.29.10 and 81.5.1.1845), Queenscliff, Vict. (NMV R 6885), Tasmanie (RMNH cat. no. 1 and 2), Van Diemens Land (BM 44.3.20.6 and 9.8.83).

14. **Ninox novaeseelandiae albaria** Ramsay

Ninox albaria Ramsay, 1888, Tab. List Aust. Birds, p. 36 — Lord Howe Island.

Subspecific characters. — Fairly light brown upper surface (rather similar to specimens from Groote Eylandt), but light brown (colour almost as back but slightly warmer in tone) ocellated under surface.

Distribution. — Lord Howe Island.

Material examined. — Males: The Pines (AMNH 630536, 630537), Medds Beach (AMNH 630534, 630535). Females: The Pines (AMNH 630538, 630539), Mt. Sedghird (AMNH 630533).

15. **Ninox novaeseelandiae undulata** (Latham)

Strix undulata Latham, 1801, Suppl. Indic. Orn., p. xvii — Insula Norfolk.
Ninox boobook royana Mathews, 1912, Aust. Avian Rec. 1, p. 120 — Norfolk Island.

Subspecific characters. — A small race; darker, both above and below, than *albaria,* and inclined to have spots on the neck. Rather similar to *leucopsis,* but that race is somewhat darker, warmer chestnut on the back, is coarser ocellated on the under surface, not finely ocellated, and has more white spots on head and neck.

Distribution. — Norfolk Island.

Material examined. — Males: Mt. Pitt (AMNH 630551, 630552, 630553, 630554), Red Road, Mt. Pitt (AMNH 630550), near Cable Station (AMNH 630540, 630541), Norfolk Island (AMNH 212339, 212340). Females: Mt. Pitt (AMNH 630547, 630555, 630556, 630557, 630558, 630559), Red Road, Mt. Pitt (AMNH 630549, 630548: type of *royana*), near Cable Station (AMNH 630542, 630543, 630544, 630545), near Cascades (AMNH 630546), Norfolk Island (AMNH 212341, 212343). Sex uncertain: Norfolk Island (HLW 5345).

16. **Ninox novaeseelandiae novaeseelandiae** (J. F. Gmelin)

[*Strix*] *novae Seelandiae* J. F. Gmelin, 1788, Syst. Nat., 13th ed. I, p. 296 — nova Seelandia.
[*Strix*] *fulva* Latham, 1790, Index Orn. I, p. 65 — nova Zealandia.
Strix novaeseelandiae maculata Kerr, 1792, Anim. Kingdom I, p. 538 — New-zealand.

Noctua zelandica Quoy & Gaimard, 1830, Voy. Astrolabe I, p. 168, pl. 2: fig. 1 — la baie Tasman, dans le détroit de Cook, à la Nouvelle-Zélande.
Noctua venatica Peale, 1848, U.S. Expl. Exp., p. 75 — Bay of Islands, North Island, New Zealand (reference copied).

Subspecific characters. — Very small and dark, even darker than *leucopsis* to which this subspecies is closest.

Distribution. — New Zealand. Common on both main islands, and also occurring on many of the smaller adjacent islands: Taranga or Hen Island and Great Barrier Island (specimens examined), Little Barrier Island (Oliver, 1922a, 1922b), Three Kings Island (Turbott & Buddle, 1948), Kapiti Island (Wilkinson, 1927), Stewart Island (Cockayne, 1909; Oliver, 1926).

Discussion. — Following Mathews (1915-1916), the populations from North Island have been separated from those of South Island, on account of their being less dark, under the name *venatica* (Oliver, 1930; Peters, 1940). Recently, however, Fleming & al. (1953) expressed doubt about the validity of *venatica,* and Oliver (1955, p. 433) commented: "Mathews and Iredale recognised two subspecies in New Zealand, one, *N. n. venatica,* lighter, in the North Island, and the other, *N. n. novaeseelandiae,* darker, in the South Island. But the differences, even if constant, are hardly sufficient to admit subspecies". I have failed to detect any difference either in colour and colour markings or in size between North and South Island birds, and have no hesitation in bringing all the birds of New Zealand under one name.

Material examined. — North Island. Males: Lowray Bay (DM 9341), Stokes Valley (DM 9789, 9438), Lower Hutt (DM 8679), Days Bay, Wellington (DM 505), Rotorua (DM 1773), Kereru (CM Av. 484), Taranga Island = Hen Island (CM Av. 485), Titahi Bay (CM Av. 2161), Opua, Bay of Islands (CM Av. 487). Females: Moko Hinau Island (AMNH 212344), Great Barrier Island (AMNH 212345), Umawera, Kokianga (AMNH 630372), Auckland Domain (AMNH 41349), Taita (DM 9419), Feilding (DM 9227), Lac Marupara (DM 9882), Ohope Beach (DM 9532), Tirongi (DM 8617), Ngaio (DM 9570), Manor Park, Silverstream (DM 9181), Days Bay (DM 9546), Rotorua (DM 9883, 1776), Kanadattat (Khandallal?) (DM 9518), Eastbourne, Days Bay (DM 9517), Te Wairoa (DM 1775), Castlecliff, Wanganui (DM 1770), Gallana Valley, Wellington (DM 1772), Plimmerton (DM 1773).

South Island. Males: Southern Alps (CM Av. 2160), Marlborough (CM Av. 2173). Females: Greymouth, Westland (CM Av. 16486), Coal Creek, Greymouth (DM 501). Sex uncertain: Ahaura, Westland (CM Av. 2163).

Ninox connivens (Latham)

This species is distributed over Australia, New Guinea, and the northern Moluccas. It has been generally assumed that it is Australia-wide in distribution, but there are no records for the centre and mid-west of the continent, and it is also absent from Tasmania, Kangaroo Island and Melville Island. It is an inhabitant of forest and the richer kinds of savannah-woodland.

About the identity of one described form I am in doubt, it is *Ninox* (*Hieracoglaux*) *connivens enigma* Mathews & Neumann (1939) from Pentland, Queensland, which was diagnosed as differing from *N. c. occidentalis* in its much smaller size, wing 246 mm. The comparative measurements given are not, however, those of *occidentalis,* but of *peninsularis.* The general pattern of distribution of the races of *N. connivens* makes it most unlikely that there would be a special race of very small size sandwiched in between *connivens, peninsularis* and *occidentalis.* I have tried to trace the type, but have been unsuccessful. According to Stresemann (1943) the Queensland collection from which *enigma* was described, has come to the Berlin Museum, but Professor Stresemann has told me (pers. comm.) that type material, was excluded from this collection, and suggested that I should try the Museum Julius Riemer, Wittenberg. The reply received from Mrs. Charlotte Riemer, however, is also negative. My suspicion is that the specimen in question is either juvenile or damaged, or is a large individual of *N. novaeseelandiae boobook,* in whose range of variation it comes.

1. **Ninox connivens connivens** (Latham)

Falco connivens Latham, 1801, Suppl. Indic. Orn., p. xii — Nova Hollandia.
Noctua frontata Lesson, 1830, Traité d'Orn., p. 106 — Patrie ignorée.
Athene? fortis Gould, 1838, Syn. Birds Aust., pt. III, descr. and pl. — New South Wales.
Ninox connivens addenda Mathews, 1912, Aust. Avian Rec. 1, p. 120 — South-west Australia.

Subspecific characters. — The largest and darkest race, greyish brown above; and with dark greyish brown striation below.

Distribution. — Western Australia, South Australia, Victoria, New South Wales, and Queensland. In Western Australia confined to the extreme south-west, where apparently uncommon. Rare in South Australia where only recorded from the eastern part of the state, east of a line connecting Innamincka and Spencer Gulf; apparently not uncommon towards the Victorian border (Attiwill, 1949). Field observations from Cooper's Creek (White, 1917) and Orroroo (Gray, 1932), though accepted by later workers, were given in too casual a way to be considered here. In Victoria widely distributed over the whole state, and apparently not uncommon. In New South

Map 5. — The distribution of *Ninox connivens* in Australia: 1, Herdsman's Lake. 2, Boyup Brook. 3, Lake Muir. 4, Katanning. 5, Stirling Range. 6, Chillinup. 7, Innamincka (S. Aust. Mus.). 8, Adelaide (S. Aust. Mus.). 9, Naracoorte (Attiwill, 1949). 10, Mildura. 11, Loddon Valley Highway. 12, Parwan. 13, Kerrisdale. 14, Culcairn. 15, Canberra. 16, Grenfell. 17, Forbes. 18, Perthville. 19, Tarana. 20, Liverpool. 21, Long Bay. 22, Belltrees. 23, Port Macquarie. 24, Breeza. 25, Thomby. 26, Brisbane River. 27, Coomooboolaroo. 28, Lake Elphinstone. 29, Bowen. 30, Inkerman. 31, Mt. Sapphire, Cairns. 32, Cape York. 33, Thursday Island. 34, Banks Island. 35, Ashburton River. 36, De Grey River. 37, Broome. 38, Yeeda Creek. 39, Derby. 40, Fitzroy River. 41, Margaret River. 42, Napier Broome Bay Mission. 43, Pentecost River. 44, Parry's Creek. 45, Ord River. 46, Port Keats. 47, Daly River. 48, Katherine River. 49, Mary River. 50, South Alligator River. 51, East Alligator River and Oenpelli. 52, King River. 53, Chambers River. 54, Cape Barrow. 55, Borroloola. 56, Leichhardt River. 57, Karumba. 58. Sedan. The cross indicates Pentland, type locality of *enigma*.

Wales probably occurring over the whole state, but records from the north-west are lacking. McGill's (1960) statement that the species is more common inland than in the eastern part of the state seems questionable. In Queensland widely distributed in the south-eastern half of the state and occurring as far north as Cairns. Birds from western Queensland are intermediate between this race and *occidentalis*.

Discussion. — From a remark by Mathews (1915-1916, p. 345) I understand that the name *addenda* was based on a single specimen only, and this is confirmed by the fact that in the American Museum of Natural History, which has the Mathews collection, the type of *addenda* is the only skin present from south-western Australia. Mathews diagnosed *addenda* as differing from the nominate race: "in its larger size", but he failed to give measurements. I have measured six specimens, probably all skins existing in collections, and from my figures it is evident that there is no difference in size between birds from New South Wales and from Western Australia, and as there is no difference in colour or pattern either (I cannot confirm Gould's, 1848, assertion that specimens from Swan River are lighter in colour), *addenda*, a name that was given the benefit of the doubt by Peters (1940), enters the synonymy of the nominate race.

Material examined. — Western Australia. Males: Lake Muir (HLW 6957), Stirling Ranges (HLW 5307). Females: Herdsman's Lake (WAM 4888), Katanning (WAM 479). Sex uncertain: Swan River (BM 1955.6N-20.4688), Boyup Brook (wing only, WAM A 8783), Chillinup near Borden (WAM A 2944):

South Australia. No material examined.

Victoria. Males: None examined. Females: Mildura (NMV B 1509), 62½ miles north of Bendigo on Loddon Valley Highway (NMV, no number), Parwan (AMNH 630283), Kerrisdale (AMNH 630284).

New South Wales. Males: Forbes (AMNH 630278), Perthville (AM O. 36846), Tarana (AMNH 630280). Females: Culcairn (AMNH 630281), Gungahlin, Canberra (CSIRO 223), Grenfell (HLW 5304), Liverpool (HLW 5305), Long Bay (AMNH 630279), Belltrees, Scone (HLW 5303), Rivière Hasting, Port Macquarie (RMNH cat. no. 4), Breeza near Tamworth (AM O. 38812).

Queensland. Males: Thomby (BM 1925.11.1.598), Brisbane River (BM 86.2.1), Coomooboolaroo, Dawson River (AMNH 630303), Mt. Sapphire, Cairns (AMNH 630306). Females: Kirrima Station (HLW 8402), Inkerman (AMNH 630302), Coomooboolaroo, Dawson River (AMNH 630304, 630305). Sex uncertain: Bowen (RMNH cat. no. 5), Lake Elphinstone (RMNH cat. no. 6).

2. **Ninox connivens peninsularis** Salvadori

Ninox peninsularis Salvadori, 1876, Ann. Mus. Civ. Genova 7, (1875), p. 992 — Caput York, presso Somerset.

Subspecific characters. — Similar to the nominate race, but smaller; upper surface slightly darker; stripes on the under surface slightly browner, less greyish.

Distribution. — Cape York Peninsula, Queensland, also Thursday Island and Banks or Moa Island in the Torres Strait. The boundary between the ranges of *peninsularis* and *connivens* is not known, but it seems that *peninsularis* is confined to the Peninsula proper and does not range far down into Queensland.

Material examined. — Males: Cape York (BM 50-7.20-193, 80.11.18.389), Banks (Moa) Island (HLW 6435), Utingu, Cape York (AMNH 630292, 630293, 630294, 630295), Cable Station, Cape York (AMNH 630296), Piara, Cape York (AMNH 630299), mainland, hinterland of Red Island, Cape York (AMNH 630300). Females: Thursday Island (BM 82.2.18.4), Banks (Moa) Island (HLW 6383), Utingu, Cape York (AMNH 630285, 630286, 630287, 630288, 630289, 630290, 630291), Cable Station, Cape York (AMNH 630397), Patison Creek, Cape York (AMNH 630298).

3. **Ninox connivens occidentalis** Ramsay

Ninox connivens-occidentalis Ramsay, 1887, Proc. Linn. Soc. N. S. W. (2) 1, (1886), p. 1086 — Derby.

Ninox connivens suboccidentalis Mathews, 1912, Novit. Zool. 18, p. 255 — Northern Territory = Port Keats.

Subspecific characters. — Typically differs very distinctly from *connivens* and *peninsularis* by being browner, less greyish, above, and by having the stripes on the under surface much browner; size perhaps slightly smaller than *connivens,* but larger than *peninsularis.* But see discussion.

Distribution. — Western Australia, Northern Territory and north-west Queensland. In Western Australia in the Pilbara District, where apparently rare, for I have found only two specimens in collections and there are no published records of observations either, and in the Kimberley Division, where widely distributed and, judging from the number of skins in collections, not uncommon. In the Northern Territory only in the northern part, I know of no records south of 17° S. In Queensland known from scattered localities south of the Gulf of Carpentaria.

Discussion. — Topotypical birds (from the Derby area) differ very conspicuously from the much darker and greyer nominate race, but going east there occurs an, over short distances almost imperceptible, darkening

and greying of the plumage, and specimens from north-central Queensland are more or less intermediate between *occidentalis* and *connivens*. The change from one into the other is so gradual that it is impossible to draw a boundary line between the two races, though specimens from the Gulf of Carpentaria seem still closer to *occidentalis* than to *connivens*, so that I include them with the first-mentioned race.

Mathews's *suboccidentalis* was described as coming from the Northern Territory, but this can be restricted, as the type is from Port Keats (not Point Keats as Mathews, 1931, wrote). Mathews correctly described his new race as differing" ..... from *N. c. connivens* in its paler coloration, but not as pale as *N. c. occidentalis*, which it most resembles". Mathews (1927, 1931) himself later synonymised the name with *occidentalis*. Actually Mathews's diagnosis describes the bird from Port Keats very well, it is very slightly darker than topotypical *occidentalis*, but as it represents only a minor step on the gradient running all across the northern portion of Australia, I agree that the name should be synonymised. The two skins from Pilbara are typical *occidentalis*, very different from *connivens* inhabiting southwestern Australia.

Material examined. — Western Australia. Males: De Grey River, 10 miles from the coast (AMNH 701947), Broome (AMNH 630316, 630317, HLW 5308, WAM 68), Yeeda Creek (AMNH 630321), Fitzroy River (AMNH 630319, HLW 8303, WAM 67), Fitzroy River, 200 miles up (WAM 69), Margaret Crossing, Hall's Creek Road (AMNH 630323), Napier Broome Bay Mission Station (HLW 5313), Pentecost River (AMNH 630336), Parry's Creek (AMNH 630328, 630329, 630330, 630331), Ord River (WAM 6159). Females: Ashburton River (HLW 5309), Broome (AMNH 630318), Derby (NMV R 5345), Yeeda Creek (AMNH 630322), Fitzroy River (HLW 8304), Pentecost River (AMNH 630335), Parry's Creek (AMNH 630324, 630325, 630326, 630327), Ord River (WAM 6160), Obogama [7]) (AMNH 630337). Sex uncertain: Derby (AM O. 329, O. 328: type of *occidentalis*).

Northern Territory. Males: Daly River (AMNH 630339), Mary River (AMNH 630341), Alligator River (BM 1905.1.240.36, WAM 7886, 7888), South Alligator River (AMNH 630345, WAM 7887), East Alligator River (NMV R 6359), Oenpelli (USNM 405812, 405813, 405814, 405815), King River (AMNH 630332), Chambers River (BM 1925.11.1.600), Wentworth River, N.T., long. 137° (BM 57.9.18.41). Females: Port Keats (AMNH

7) Obogama, N.W.A., locality not traced, presumably in Western Australia. No collector's name, which might give a clue, appears on the label.

630338: type of *suboccidentalis*), Katherine River (AMNH 630343), South Alligator River (AMNH 630344), Oenpelli (NMV R 6787, USNM 405811), King River (AMNH 630333), Cape Barrow (HLW 5312), Borroloola, McArthur River (AMNH 630346, HLW 5306). Sex uncertain: Alligator River (WAM 7902).

Queensland. Males: Leichhardt River (AMNH 630347), Karumba, Norman River (AMNH 630310), Sedan, Cloncurry River (AMNH 630307). Females: Karumba, Norman River (AMNH 630311), Sedan, Cloncurry River (AMNH 630308, 630309).

4. **Ninox connivens assimilis** Salvadori & D'Albertis

Ninox assimilis Salvadori & D'Albertis, 1875, Ann. Mus. Civ. Genova 7, p. 802 (nom. nud.), 809 — Monte Epa.

Ninox albomaculata Ramsay, 1879, Proc. Linn. Soc. N.S.W. 3, p. 249 — Laloki River.

Subspecific characters. — Very small, smaller than any other race; browner, less grey-brown than *connivens* and *peninsularis*, especially on the under surface, but not as pale as *occidentalis*.

Distribution. — Eastern New Guinea, on the south coast as far west as Merauke; on the north coast to the Ramoe River; also Vulcan and Dampier Islands.

Material examined. — Males: Daru (AMNH 425952), Giriwu River (AMNH 630352), Daviumbu (AMNH 425949), Vulcan Island (AMNH 630349), south-east New Guinea (BM 1955.6N-20.4691). Females: Kokoda, Mambare River (BM 1906.12.22.1), Daru (AMNH 425954, 425955), Veimauri, Galley Reach, C.D. (AMNH 295414), Giriwu River (AMNH 630353), Vulcan Island (AMNH 630350), Dampier Island (AMNH 630351). Sex uncertain: Merauke (RMNH cat. no. 1), Choquerie District, Astrolabe Mountains (BM 82.3.8.3, BM 1955.6N-20.4690).

5. **Ninox connivens rufostrigata** (G. R. Gray)

Athene rufostrigata G. R. Gray, 1860, Proc. Zool. Soc. Lond. (1860), p. 344 — East Gilolo.

Subspecific characters. — Not so small as *assimilis*; clearly browner, less grey-brown, than the nominate race, especially where the stripes on the under surface are concerned, but not as brown as *assimilis*. Slightly darker (but not greyer) brown on under surface than *occidentalis*, and brown striae apparently somewhat broader.

Distribution. — North Moluccas: Obi, Batjan, Halmahera, Morotai.

Material examined. — Males: Bartaka, Halmahera (AMNH 467593), Halmahera (RMNH cat. no. 1), Batjan (AMNH 630357), Obi (AMNH

630359). Female: Halmahera (RMNH cat. no. 2). Sex uncertain: Morty Island [= Morotai] (AMNH 630355, 630356), Dodinga, Halmahera (RMNH cat. no. 4), Halmahera (RMNH cat. no. 3).

Family Tytonidae

Genus **Tyto** Billberg

Tyto Billberg, 1828, Syn. Faun. Scand. 1, pt. 2, tab. A — type by monotypy, *Strix alba* Scopoli (reference copied from Mathews & Iredale, 1913).

For the complicated generic synonymy I refer to Mathews (1915-1916, 1931). It seems best to place all four Australian Tytonidae in the genus *Tyto*. Of these four species, *T. alba* and *T. novaehollandiae* seem to be closely related; *T. capensis* is more distinct especially because of its long legs; *T. tenebricosa* stands apart in colour, though there are no structural peculiarities, and therefore I do not recognise the genus *Megastrix* Kaup for it. The family Tytonidae contains but two genera, *Tyto,* practically world-wide in distribution but with most species in the Australian region, and *Phodilus* with but two species, one in central Africa, the second in south-east Asia.

Tyto alba (Scopoli)

Virtually world-wide in distribution. I have not made a careful study of the large Australian material available in collections, but what I have seen leads me to agree with authors (Hartert, 1929; Mathews, 1931; Peters, 1940) who recognized only one race for the whole of Australia.

Tyto alba delicatula (Gould)

Strix delicatulus Gould, 1837, Proc. Zool. Soc. Lond. 4, (1836), p. 140 — In Novâ Cambriâ Australi.

Tyto alba alexandrae Mathews, 1912, Novit. Zool. 18, p. 256 — Northern Territory (Alexandra).

Tyto alba kuehni Hartert, 1929, Novit. Zool. 35, p. 99 — Kisser.

Tyto alba everetti Hartert, 1929, Novit. Zool. 35, p. 99 — Savu.

Distribution. —The whole of Australia, including Tasmania; also Timor and neighbouring islands (Mayr, 1944a), and apparently some of the Solomon Islands, though the subspecific status of the birds from that area is not yet clear (Mayr, 1936; Galbraith & Galbraith, 1962). Has been recorded from New Zealand as a straggler (Falla, 1948; Falla & Riney, 1958).

Though the species can rightly be regarded as distributed over the whole of Australia, it seems less common in the heavily wooded areas (Dickison,

1941; Mees, 1963). In Western Australia, it is apparently not common in the south-west, as previously noted by Whittell & Serventy (1948) and Mees (1963).

In Tasmania the species was first recorded as recently as 1910 (Hall, 1910), and is still a rare and little known bird (Sharland, 1958), much rarer than *T. novaehollandiae castanops*. It is likely that the colonization of Tasmania came about as a result of the extensive clearing of woodland carried out by man, and the same may account for the present day occurrence in the south-west of Western Australia and in other previously wooded regions. That *T. alba* does wander even across the sea, and therefore must be a good colonizer is shown not only by its almost world-wide distribution, but also, as far as the race *delicatula* is concerned, by the records from New Zealand, and the temporary colonization of Dorre Island, Shark Bay (Mees, 1962). Skins from Leonora and Well 48 on the Canning Stock Route (WAM A 6658, A 5964) prove that the species ranges right through the most arid parts of Australia. These inland birds differ in no way from specimens collected near Perth.

No published records of the occurrence of Barn Owls on Kangaroo Island seem to exist, and the species was not mentioned by Wheeler (1960) in the latest list of birds of the island. Condon (1962), however, included Kangaroo Island in its range. To my request for further particulars, Mr. Condon (in litt., 6.II.1963) replied: "I have a manuscript note that it was observed by "W. Johnston" at Penneshaw, on August 5, 1926. This is the only record for the island. For many years I have maintained a MS. list of all birds seen or taken on the Island, together with references to publications, and it is surprising, from time to time, to get new records of quite common species (on the mainland), which have never been seen there before ... The fact that the Barn Owl had only been recorded once did not make me think there was anything unusual in this. "W. Johnston" is probably the late W. C. Johnston, who more recently was active in the Bird-Banding Scheme, and died a year or two ago". Whether or not the Barn Owl is more than a rare straggler on Kangaroo Island remains to be ascertained.

As regards other islands off the Australian coast, there do not seem to be records for Dirk Hartog Island, Melville Island, and Groote Eylandt.

The lack of geographical variation throughout Australia may be due to the wandering habits of the species, but it also suggests, particularly in view of the identity of Timor birds with those of Australia, that the Barn Owl is a fairly recent immigrant in Australia, as has previously been noted by Mayr (1944b). The recent colonization of Tasmania, Kangaroo Island(?), south-western Australia, and perhaps south-eastern Australia, however, prob-

ably cannot be used as an argument for this because, as noted above, it is more likely the result of man-made changes in habitat.

Tyto novaehollandiae (Stephens)

This large owl is distributed over the whole of Australia with the exception of the most arid parts, and Tasmania. Also southern New Guinea [8]), the island of Manus, Tenimber Islands and Boeroe.

Inhabits forest and savannah woodland.

The geographical variation is complicated and the available material was insufficient so that no final classification could be arrived at. It seems possible to recognise the following races in Australia and Tasmania.

1. **Tyto novaehollandiae castanops** (Gould)

Strix castanops Gould, 1837, Proc. Zool. Soc. Lond. 4, (1836), p. 140 — In Terra Van Diemen.

Subspecific characters. — Distinctly larger than all other races; practically always strongly tinged with cinnamon below; colour pattern on upper surface coarser than in other races.

Distribution. — Tasmania, where, according to published accounts (Sharland, 1947, 1958; Green, 1959), and judging from the fairly large material extant in museums, widely distributed and not uncommon. Also Maria Island (Legge, 1888).

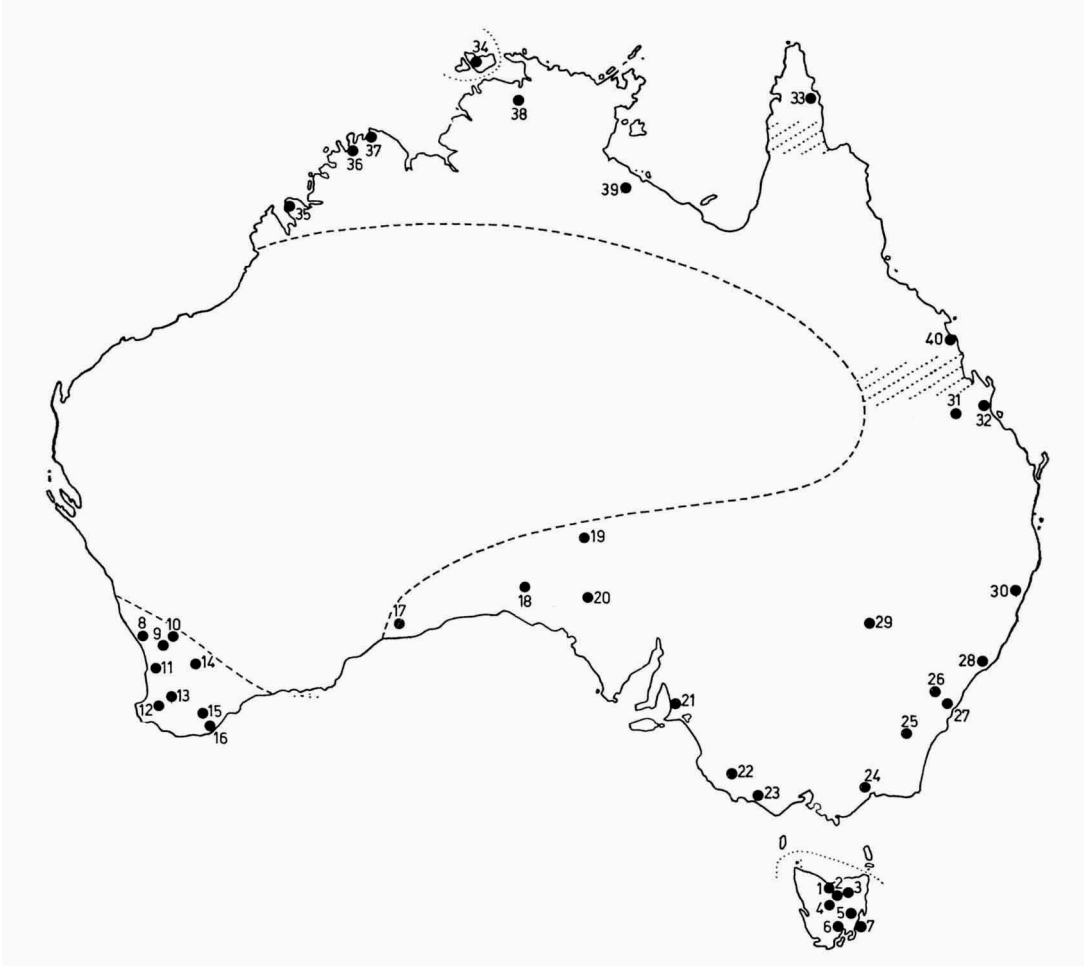
Discussion. — There is no evidence that this subspecies migrates to the mainland; occasional records for Victoria were probably caused by insufficient appreciation of individual variation in the nominate race, and at least one of these records was subsequently withdrawn (Wakefield, 1958).

According to Sharland (1958), a percentage of birds in the south and central parts of Tasmania are white breasted, while in the north they would be cinnamon tinged on these parts. I have not examined any truly white breasted birds of this race, but it would be interesting to have the existence of this kind of geographic variation on a small island like Tasmania confirmed.

On a previous page I have made some bitter remarks about sexing. The present case illustrates this well: when looking at the table of measurements, there is a huge variation without much difference between the sexes, a variation far exceeding the variation of about 10% normally found in homo-

8) The five specimens in the Leiden Museum and the one in the American Museum of Natural History are very close to, if not identical with, the nominate race, and very different from *galei*, to which they were tentatively assigned by Mayr (1941). In the near future I intend to study the Leiden material more carefully.

geneous bird populations. When we ignore sexing on the labels and group the specimens according to size, we get the following:



Map 6. — The distribution of *Tyto novaehollandiae* in Australia: 1, Railton. 2, Westbury District. 3, Evandale. 4, Great Lake. 5, Oatlands. 6, Hobart. 7, Maria Island (Legge, 1888). 8, Perth (Herdsman's Lake, Monger's Lake, and Victoria Park). 9, Beverley. 10, East Beverley. 11, Pinjarra. 12, Bridgetown. 13, Boyup Brook. 14, Yealering. 15, Tingellup. 16, Albany. 17, Cocklebiddy. 18, Ooldea. 19, Coober Pedy (Terrill & Rix, 1950). 20, Tarcoola (Terrill & Rix, 1950). 21, Adelaide. 22, Casterton. 23, Warrnambool. 24, Bumberrah. 25, Canberra. 26, Lithgow. 27, Wallacia. 28, Newcastle. 29, Nyngan. 30, South Grafton. 31, Coomooboolaroo. 32, Gracemere. 33, Pascoe River. 34, Apsley Straits. 35, Wotjulum. 36, Admiralty Gulf. 37, Napier Broome Bay. 38, South Alligator River. 39, McArthur River. 40, Mackay.

wing (mm)	319-329	330-39	340-49	350-59	360-69	370-79	380-89
number of specimens	3	3	2	–	2	4	2

Even from this small sample, it is quite clear that two size groups are involved, and it seems reasonable to assume that the smaller birds (wing 319-343) are males, the larger birds (wing 360-387) females. Fleay (1949) has also noted the great difference in size between the sexes.

Material examined. Males: Evandale (AMNH 629465), Hobart (AMNH 629463), Great Lake (AMNH 629464), Railton (AM O. 29990), Oatlands (WAM 0146), Tasmania (AMNH 629461). Females: Hobart (AMNH 629462, NMV B 192), Westbury District (AMNH 629460), Railton (AM O. 29992, O. 29993). Sex uncertain: Tasmania (AMNH 629469, 629470, WAM 0147).

2. **Tyto novaehollandiae novaehollandiae** (Stephens)

Strix (?) *Novae Hollandiae* Stephens, 1826, in Shaw's Gen. Zool. XIII, pt. 2, p. 61 — New Holland.

Strix personatus Vigors, 1831, Proc. Zool. Soc. Lond. 1, p. 60 — Australia. Preoccupied.

Strix Cyclops Gould, 1837, Proc. Zool. Soc. Lond. 4, (1836), p. 140 — In Novâ Cambriâ Australi.

Tyto novaehollandiae perplexa Mathews, 1912 (Jan.), Novit. Zool. 18, p. 259 — West Australia (East Beverley).

Tyto novae-hollandiae whitei Mathews, 1912 (2 April), Aust. Avian Rec. 1, p. 34 — Adelaide, South Australia.

Tyto novae-hollandiae riordani Mathews, 1912 (2 April), Aust. Avian Rec. 1, p. 35 — Victoria (Warnambool) [recte: Warrnambool].

Tyto longimembris dombraini Mathews, 1914, Aust. Avian Rec. 2, p. 91 — Victoria.

Tyto novae-hollandiae troughtoni Cayley, 1931, What Bird is That?, p. 32, pl. 5 fig. 4 — Ooldea, South Australia.

Subspecific characters. — Medium sized; colour pattern on the back rich and dark; underparts variable, usually white, but sometimes rather dark cinnamon, always more or less spotted.

Distribution. — Victoria, New South Wales, Queensland, South Australia, Western Australia. In Victoria known from a number of localities, and probably widely distributed. The same pertains to New South Wales where according to McGill (1960) it is confined to the forested parts east of the Divide, but I have examined a skin from Nyngan, and south Queensland. At present rare in South Australia; there is no material in the South Australian Museum, but specimens exist from Adelaide and Ooldea. Terrill & Rix (1950) mention some additional localities, from which it would seem that the species is rare, but widely distributed. In contradistinction to the scantness of recent records, Gould (1848) wrote: "During my visit to the

interior of South Australia, numerous individuals fell to my gun". I note, however that Condon (1962) describes the species as not uncommon, but rare in forest country: another problem that would merit investigation, as in Western Australia *Tyto novaehollandiae* is more or less confined to forest country, and the general distribution indicates a species inhabiting woodland and savannah-woodland and avoiding the arid parts of the continent. In Western Australia known from the Nullarbor Plain, and the south-west, from the area west of the line Perth-Yealering-Albany, with a single exception: Yandil Station near Wiluna.

The bird from Yandil Station (WAM no. A 2699) is undated, but it was registered in August 1924; while normally I would not query its provenance, in the Western Australian Museum formerly sometimes the address of the donor of a specimen was entered in the register rather than its locality so that this record is not above suspicion (cf. Mees, 1963). On the other hand, as the species has also been recorded from the Nullarbor Plain, it is quite possible that it ranges right through the more arid country and that the lack of records is purely due to its scarcity.

Some earlier references to the occurrence in the north-west of Western Australia are doubtless erroneous. Campbell (1900) for example mentions that Carter caught an individual near Point Cloates in 1892. Carter himself, however, in his comprehensive paper on the avifauna of that area (Carter, 1903) does not mention the species. He only lists *Ninox novaeseelandiae* and *Tyto alba* (nomenclature modernised), and adds that on rare occasions he has heard: "... an extremely harsh, loud, screaming note, which probably emanated from one of the larger owls". This would certainly not pertain to *Tyto novaehollandiae,* it may possibly have been the "screaming woman" call of *Ninox connivens.*

Alexander (1921) stated that *T. alba* and *T. novaehollandiae* are about equally common near Perth, and according to Carter (1923), *T. novaehollandiae* would be plentiful in the extreme south-west of Western Australia, while *T. alba* would be very rare. Though Carter was a good ornithologist, his notes on individuals seen from a motor coach seem rather casual, and I query that certain identification would be possible under such conditions. Serventy (1948) was not able to give any additional records for the Perth area, and Serventy & Whittell (1948, 1962), believing both *T. alba* and *T. novaehollandiae* to be distributed over the whole of Western Australia noted of the former: "According to specimens received at the Western Australian Museum since 1920, this species outnumbers the Masked Owl by ten to one". Examination of material in the collection revealed, however, that when we only consider the forested south-west of the state, roughly

west of the line Perth-Albany, there are more specimens of *T. novaehollandiae* than of *T. alba* (cf. Mees, 1963). Especially in the heavily forested areas, *T. novaehollandiae* is still the commoner of the two. Mr. A. Jones of Manjimup, for example, has given me the information that over the years he has caught in his rabbit traps a number of owls, and that they all were *T. novaehollandiae*. The fact that Serventy (1948) was unable to give any new records from the Perth area appears also in a new light; it does not necessarily mean that Alexander's earlier estimate of the relative abundance of the two species was erroneous, but might reflect a change in status as a result of clearing and extension of the city, with the accompanying reduction of forest and increase of open contry. For the extreme south of Western Australia, however, it seems that Carter's assessment of the situation still holds true.

It is almost certain that the deposits of mammal bones in caves on the Nullarbor Plain described by Lundelius (1963) and others are the work of *Tyto novaehollandiae,* and the same has been suggested for Victoria (Wakefield, 1960a, 1960b; McKean, 1963).

Discussion. — The birds can be divided in size groups in the same way as has been done for *castanops*.

wing (mm)	290-99	300-09	310-19	320-29	330-39	340-49	350-59
number of specimens	2	6	2	4	7	4	4

Here also, there is a definite indication of two different size groups, with males ranging in size from 298-322, females from 326-358 mm (see also Serventy & Whittell, 1962). Unfortunately, it is never possible to prove that a bird has been sexed incorrectly, but my argument gains value from the fact that skins prepared by reputable ornithologists (like Major Whittell: two birds sexed as females, wing length 348 and 358 mm) and not by professional collectors and preparators, support it. See also my remarks on *Meliphaga virescens* in a previous paper (Mees, 1961, p. 122).

Material examined. — Western Australia. Male: Herdsman's Lake (WAM 6801). Females: Monger's Lake (WAM 247), Victoria Park (WAM A 1478), Beverley (WAM 1125), East Beverley (AMNH 629440: type of *perplexa*), Yealering (WAM A 3906), Bridgetown (SW, two specimens), Tingellup, Mt. Barker (WAM A 4496), Albany (WAM A 7406). Sex uncertain: Pinjarra (WAM 4855), Boyup Brook (WAM A 8777), Yandil Station, Wiluna (WAM A 2699), Cocklebiddy (skeleton, WAM).

South Australia. Female: Ooldea (AM O. 2656: type of *troughtoni*). Sex uncertain: Adelaide (AMNH 629456: type of *whitei*).

Victoria. Females: Casterton (AMNH 629455), Warrigal (NMV R 11970), Bumberrah (NMV R 11817). Female?: near Warrnambool (AMNH 629453). Sex uncertain: Casterton (AMNH 629454), Warrnambool (AMNH 629472, 629473).

New South Wales. Males: Nyngan (HLW 5314), Newcastle (NMV B 4262), Orara River, S. Grafton (HLW 5310). Females: Canberra (CSIRO 285), Lithgow (AM O. 29988), Wallacia (AM O. 29989).

Queensland. — Male: Coomooboolaroo, Rockhampton (AMNH 629450), Gracemere (AMNH 629452).

3. **Tyto novaehollandiae galei** Mathews

Tyto galei Mathews, 1914, S. Aust. Orn. 1, pt. 2, p. 12 — Pascoe River, North Queensland.

Subspecific characters. — Very small, upperparts dark grey and white; under surface white with a few small grey spots; mask white with a white collar. No trace of brownish or cinnamon in the plumage.

Distribution. — Cape York Peninsula.

Discussion. — These small, pure white and dark grey birds, are very different from nominate *novaehollandiae*. On the other hand, as only two specimens were available, it is possible that they are just extreme variants of a population in which more normal-coloured individuals also occur — the race *kimberli* shows a similar kind of variation.

Material examined. — Males: Pascoe River (AMNH 629449: type of *galei*), Cape York (AMNH 629448).

4. **Tyto novaehollandiae melvillensis** Mathews

Tyto novae-hollandiae melvillensis Mathews, 1912, Aust. Avian Rec. 1, p. 35 — Melville Island, Northern Territory.

Subspecific characters. — More or less cinnamon on under surface with /\ — shaped spots; mask vinaceous; dorsal surface dark. If the two specimens examined were correctly sexed as females, the race is small.

Distribution. — Melville Island.

Discussion. — Only two specimens from Melville Island were available, but on the basis of these it seems likely that *melvillensis* is a valid race. See also the remarks made by Rothschild & Hartert (1913).

Material examined. — Females: Coopers Camp, Apsley Straits (AMNH 629444: type of *melvillensis*), 10 miles east of Gordon Point (AMNH 629445).

5. **Tyto novaehollandiae kimberli** Mathews

Tyto novaehollandiae kimberli Mathews, 1912 (Jan.), Novit. Zool. 18, p. 257 — East Kimberley, West Australia.

Tyto novae-hollandiae mackayi Mathews, 1912 (2 April), Aust. Avian Rec. 1, p. 34 — Mackay, Queensland.

Subspecific characters. — An average-sized race, often very pale in colour, but extremely variable; underparts always white, more or less spotted; mask white.

Distribution. — Western Australia, the Northern Territory and North Queensland (excluding Cape York). In Western Australia apparently confined to the Kimberley Division; in the Northern Territory known from the northern part only. Distribution in Queensland not sufficiently known, but the type of *mackayi* seems to fit in here, though it is perhaps slightly darker.

Material examined. — Western Australia. Males: Wotjulum (WAM A 7729), Napier Broome Bay (AMNH 629442, HLW 5315). Females: South-eastern corner of Admiralty Gulf (AMNH 629441), East Kimberley (AMNH 629443: type of *kimberli*).

Northern Territory. Male: South Alligator River (AMNH 629447). Females: South Alligator River (AMNH 629446), MacArthur River (HLW 5316) [9]).

Queensland. Sex uncertain: Mackay (AMNH 629451: type of *mackayi*).

Tyto longimembris (Jerdon)

The Grass-Owl ranges over the southern half of Africa, south and east Asia, the whole Indo-Australian Archipelago (where, however, it is very spotty in distribution and absent from many islands), and Australia. Over most of its range it is a rare species and its geographic variation has not been worked out satisfactorily owing to lack of material. As since Hartert (1929) the species has been revised twice, by Amadon & Jewett (1946) and Amadon (1959), I have not tried to cover the same ground again and will confine myself to some remarks on additional material not examined by Amadon. Amadon has united the *Tyto longimembris* group with the African grass owls, using the name *T. capensis* for the species as thus expanded. However, as Roberts (1936) has shown, the name *Strix capensis* A. Smith cannot be used as it is preoccupied by *Strix capensis* Daudin.

9) In the Australian Museum I examined a female (AM O.12581), received in 1902, which bears on its label the notes: "caught 100 miles inland from Port Darwin, alive, pres. Dr. Campbell, received A. J. N.[orth]." The wings are 384 mm, very large for any but Tasmanian birds, and as the bird was received alive, ample opportunity must have existed for a mix-up. Therefore I have not further considered this specimen.

At the time Daudin's work was not available to me, but in order to check on the correctness of Roberts's remarks, I asked my friend Dr. L. B. Holthuis to consult Daudin (1800) for me, and he replied as follows: As was to be expected there is an (albeit small) error in the citation given by Roberts. On p. 200 of Daudin's work nothing of interest appears, but what Roberts apparently meant to refer to is p. 209, where under *Strix Bubo,* which is dealt with on p. 208, a number of varieties are given, one of which is var. B. "Grand Duc d'Afrique. *Bubo capensis*". *Bubo* in this combination is a specific name, not a generic name, as is clear from the fact that these varieties are not numbered (but lettered), and that all come under no. 33, *Strix Bubo,* while on p. 210 the next species, no. 34, *Strix virginiana* is listed. Everything is placed in Genre V, *Strix*. Daudin is not consistent in his method of citing varieties, for example on p. 205 the "Variété Chevechette de Tengmalm" (a variety of the Chouette Chevechette *Strix pusilla*) is listed as "*Strix tengmalmi*", but all varieties of *Strix otus* are referred to as "*Otus ...*": Anyway, the name *capensis* is used here in the genus *Strix,* and *Strix bubo capensis* Daudin, 1800, is therefore an older primary homonym of *Strix capensis* Smith, 1834.

According to Roberts and recent African literature the next available name is *Tyto punctata* Lichtenstein, 1854. This has for workers in the Oriental and Australian regions the pleasant consequence that the name *longimembris* becomes once more the oldest valid name for the species, even if the African and Indo-Australian grass-owls are united to one species. It also relieves me of the necessity to decide whether or not to regard the two groups as conspecific.

Tyto longimembris longimembris (Jerdon)

Strix longimembris Jerdon, 1839, Madras J. Lit. Sci. 10, p. 86 — Neilgherries.

Strix candida Tickell, 1833, J. Asiat. Soc. Beng. 2, p. 572 — Borabhum. Preoccupied by *Strix candida* Latham, 1801, Suppl. Indic. Orn., p. xiv.

Strix walleri Diggles, 1866, Orn. Aust. I, pl. 14 — Brisbane.

Strix oustaleti Hartlaub, 1879, Proc. Zool. Soc. Lond., (1879), p. 295 — the banks of Wai-manu, a confluent of the Rewa river, in the island of Viti Levu.

Tyto longimembris georgiae Mathews, 1912, Aust. Avian Rec. 1, p. 75 — Northern Territory = Victoria River.

Tyto longimembris maculosa Glauert, 1945, Emu 44, p. 229 — Cranbrook.

Distribution. — A rare bird in Australia, as, indeed, it is over most of its range. Has been recorded from Queensland, the Northern Territory, Victoria, Western Australia, and apparently also New South Wales. None of the Australian records is from more than a hundred miles inland.

Victoria. Gray's (1933) find of some decomposed remains at Werribee seems to be the only recent record based on material. The size of the tarsus

as given, 3¼", shows, that the bird was correctly identified. Previously recorded by Campbell (1888b, 1900): "The first specimen brought under my notice was by Mr. A. Coles, taxidermist, Elizabeth Street, Melbourne. The rare specimen was promptly secured by the National Museum. Another example is in the Geelong Museum, taken at Point Henry, 1884". Howe (1916) mentioned the presence of two specimens, obtained in Victoria (but without exact locality), in April 1890. Keartland (in North, 1912)

Map 7. — Localities from where *Tyto longimembris* has been recorded in Australia. The localities are so scattered and the bird is so rare, that no range can be given: 1, Cranbrook. 2, Victoria River. 3, Werribee (Gray, 1933). 4, Sydney (Ramsay, 1875). 5, Richmond River (Ramsay, 1898). 6, Brisbane (type locality of *walleri*). 7, Bowen. 8, Palm Islands. 9, Cooktown. 10, Banks Island.

noted the species near Beveridge and in the Wallam District, but apparently no specimens were obtained, and I feel that some of these old records are questionable.

New South Wales is traditionally included in the range, and specimens from Sydney and the Richmond River were listed by Ramsay (1875, 1890, 1898). I have not seen authentic specimens and do not know of any records in this century.

In Queensland apparently fairly widely distributed, though all records are from the east coast and the offshore islands.

In the Northern Territory only known from specimens collected by Dahl on the Victoria River.

In Western Australia known from a single specimen, the type of *maculosa.*

Outside Australia this subspecies has a wide distribution; specimens from New Caledonia and Viti Levu belong to it (Amadon, 1942), further those from India, Burma, Indo-China, Celebes and the Toekang Besi Islands.

Discussion. — Amadon (1959) has pointed out that Australian birds, which have been known as *walleri,* are scarcely separable from the nominate race. The only reason for Amadon to maintain *walleri* tentatively was the geographical distance separating the populations. When one is prepared to group specimens from localities as far apart as Celebes, north-east Australia and Fiji under one name, I do not think that the geographical argument against uniting *walleri* with *longimembris* is so cogent that it should overrule the morphological evidence.

As Amadon & Jewett (1946) and Amadon (1959) omitted mention of *maculosa* from Western Australia, some notes on the type (and only known specimen) may be in place. When Glauert (1945) described *maculosa,* a female, he had for comparison only a single unsexed skin of *"walleri"*, collected in 1889. The points of difference noted by Glauert are slight, and as the individual variation is always rather great in Tytonidae, and comparison was made with but a single bird, collected 55 years earlier, it seems justified to relegate *maculosa* to the synonymy of *"walleri"*, as was previously done by Whittell & Serventy (1948). As yet there is no proof that there is a resident population of *longimembris* in Western Australia; it may be no more than a rare vagrant. In the Leiden Museum I examined the specimen from Celebes first recorded by Büttikofer (1894), and subsequently mentioned by Hartert (1929), Stresemann (1940) and Amadon & Jewett (1946); as it did not seem to differ in any way from a skin from Bowen, Queensland, present in the same collection, I agree with Amadon (1959) that it should be placed with *walleri,* which itself is a synonym of *longimembris.*

Amadon (1959) mistakenly listed the synonym *georgiae* as having been described from Victoria, instead of Victoria River (Northern Territory), a slip that could easily lead to confusion, reason why I mention it here.

It is curious that *Tyto longimembris* should have developed a well-marked endemic subspecies in New Guinea (*Tyto longimembris papuensis* Hartert), and other subspecies in the Philippines and Formosa, while birds from India and Australia are identical or practically so. This throws doubt on the correctness of Stresemann's (1939, fig. 11) hypothesis of its dispersal and distribution, and, as Amadon has suggested, the Indian and Australian populations may still be found to be in contact through the Malay Peninsula and Sumatra, or may have been so in the not-so-remote past, This possibility is strengthened by the recent discovery of the species on Flores (Paynter, 1963).

Material examined. Males: Palm Islands, Queensland (AMNH 629425), Banks (Moa) Island, Torres Strait (HLW 6386). Females: Cranbrook (WAM A 5792: type of *maculosa*), Cooktown (AMNH 629429), Victoria River (AMNH 629422, 629423: type of *georgiae*), Banks (Moa) Island, Torres Strait (HLW 6401), Kalidupa Island (AMNH 629421). Sex uncertain: Bowen (AMNH 629426, RMNH cat. no. 3), Loewoe, Celebes (RMNH cat. no. 2).

Tyto tenebricosa (Gould)

The range of this species includes eastern Australia: Victoria, New South Wales and Queensland, and New Guinea, including Japen. It inhabits heavy forest. There are three well-marked races.

In the descriptions the word vermiculation is used for the wavery fine cross-bars.

1. **Tyto tenebricosa tenebricosa** (Gould)

Strix tenebricosus Gould, 1845, Proc. Zool. Soc. Lond. 13, p. 80 — the brushes of the river Clarence, in New South Wales.

Tyto tenebricosa magna Mathews, 1912, Novit. Zool. 18, p. 258 — Victoria.

Subspecific characters. — A large race; upper surface dark sooty brown, with small white spots, fairly smooth with hardly any vermiculation; under surface brownish, vermiculated.

Distribution. — Victoria, New South Wales and south-eastern Queensland; accidental on Flinders Island, State of Tasmania. In Victoria mainly occurring east of Melbourne in the Dandenong Ranges (Campbell, 1900; Howe, 1928, 1935), and apparently also in Gippsland, where Campbell (1900)

says to have collected a specimen at Lake King. The only record from west of Melbourne I have been able to trace is the skin from Armstrong; this specimen is undated, collector R. B. Chandler, a name not familiar to me; therefore I have accepted it at face value, but confirmation of the occurrence of *Tyto tenebricosa* west of Melbourne would be welcome. I do not know on what evidence Peters (1940) included South Australia in the range of the species.

Map 8. — The distribution of *Tyto tenebricosa* in Australia: 1, Armstrong. 2, Western Port. 3, Dandenong Ranges (Howe, 1928, 1935). 4, Gosford. 5, Barrington (Hyem, 1936). 6, upper reaches of the Macleay River (De Warren, 1928). 7, Lionsville. 8, Emu Vale. 9, Allora (Nielsen, 1961). 10, Pimpana (Campbell, 1889). 11, Cedar Bay. 12, Cairns. 13, Atherton Tableland. 14, Ravenshoe. 15, Johnstone River. 16, Cardwell (Broadbent, 1910).

Records for New South Wales are confined to the coastal zone from Gosford to the Queensland border.

In Queensland only in the extreme south-east: Allora (Nielsen, 1961), Warwich, and Pimpana near Brisbane.

Lord (1927) and apparently also Mathews (1920) and Leach & al. (1926), mentioned *Tyto tenebricosa* from islands in the Bass Strait, and Sharland (1958) from Flinders Island, but I do not know on whose authority, and it is unlikely to be more than an accidental visitor.

Material examined. — Males: Clarence River (RMNH cat. no. 1), Gosford (AMNH 629492). Females: Emu Vale near Warwick (NMV B 2090), Victoria (AM O. 23636, AMNH 629494: type of *magna*). Sex uncertain: Lionsville, Clarence River (HLW 6543), Armstrong, Vict. (AMNH 629493), Western Port (NMV B 4265), Melbourne (RMNH cat. no. 5).

2. **Tyto tenebricosa multipunctata** Mathews

Tyto tenebricosa multipunctata Mathews, 1912, Novit. Zool. 18, p. 257 — Johnston River, North Queensland [recte: Johnstone River].

Subspecific characters. — Much smaller than the nominate race; upper surface with large white spots, and strongly vermiculated, under surface paler, abdomen usually whitish. A very distinct race.

Distribution. — North-eastern Queensland, from Cooktown to Ravenshoe (Atherton Tablelands), and Cardwell.

Discussion. — Rothschild & Hartert (1913), in a paper in which they rejected practically all new forms of *Tyto* that had been named by Mathews the year before, accepted *multipunctata* as "an excellent new form", and it is curious that the validity of this well-marked race should have been denied by later workers, beginning with Mathews (1915-1916) himself. Though Mathews (1912) had correctly described *multipunctata* as differing from the nominate race in its smaller size, in his criticism of Rothschild & Hartert's publication he stated that these authors: "... admit the form *multipunctata*, but did not recognise that the whole of the three specimens were more or less immature. This would account for the small wing length ...". In his eagerness to point out a supposed error made by Rothschild & Hartert, Mathews was apparently prepared to admit that he had based a new subspecies of alleged small size on an immature bird. Notwithstanding this belated admission, there is no doubt that *multipunctata* is a very small race.

Material examined. — Males: Cedar Bay (AMNH 629488), Riverston, Cairns (HLW 5311), Atherton Tableland (AMNH 200370). Females: Cedar Bay (AMNH 629489), Barron River, Cairns (AMNH 629491), Dennna Creek, Ravenshoe (HLW 4505). Male?; Johnstone River (AMNH 629490: type of *multipunctata*).

3. **Tyto tenebricosa arfaki** (Schlegel)

Strix tenebricosa Arfaki Schlegel, 1879, Notes Leyden Mus. 1, p. 101 — near Hattam.
Megastrix tenebricosa perconfusa Mathews, 1916, Birds Aust. V, p. 408 — British New Guinea (Aroa River).

Subspecific characters. — In size similar to *multipunctata,* or perhaps slightly larger; upper surface somewhat variable, little to moderately vermiculated; white spots smaller than in *multipunctata*; dorsal surface of most specimens not very different from that of the nominate race; under surface on an average darker than in the other races.

Distribution. — New Guinea, where recorded from all parts of the mainland and from Japen.

Discussion. — As mentioned above, there is some variation in the upper surface; one specimen (AMNH 629509) is even more vermiculated than the type of *multipunctata,* but the under surface is darker. An old specimen (AMNH 629495) collected by van Duivenbode is rather similar to *multipunctata* on the upper parts, and has also fairly large white dots, but the under surface is darker. Sex and locality are doubtful; the locality reads: "Arfak Peninsula according to prep. v. Duivenbode". The colour of the mask (pale or dark) is variable in all three races.

Rothschild (1917), thought that Schlegel (1879) erred when he described the race *arfaki* as smaller than *tenebricosa.* The explanation is that Schlegel's material, as he correctly stated, came from south-eastern Australia, hence belonged to the large nominate race, while most of the Australian skins available to Rothschild were of the small race *multipunctata.* The wing of the type of *arfaki* is not as small as Rothschild surmised. Schlegel described it as measuring 9 inches, one line (French measure), and Rothschild wrote: "The wing of the type-specimen is said to measure 243 mm". I found for the left wing a length of 248, for the right wing, which is less worn, one of 256 mm.

Material examined. — Males: Hattam (RMNH: type of *arfaki*), Ogwarra, Angabunga River (AMNH 629499), Ogwarra (AMNH 629500), low country near Port Moresby (AMNH 629506), Deva-Deva, 65 miles north-east of Yule Island 4000-5000 ft. (AMNH, no number), Mafulu 1250 m (AMNH 419707), Mafulu (AMNH 419706). Females: Kloofbivak (RMNH cat. no. 2), Avera, Aroa River (AMNH 629505), head Aroa River 6000 ft. (AMNH 629502), Collingwood Bay (AMNH 629509), head of Aroa River 6000 ft. (AMNH 629504), Sattelberg (AMNH 629497), Sattelberg (AMNH 629498), Kampong Baroe, Japen (AMNH 301524), Manoepi near Wasior, Wandammen (AMNH 303058).

Wing-measurements of Material examined

Ninox rufa

Ninox rufa rufa

♂: 374, 375, 376, 380, 383
♀: 347, 350, 355, 356, 357
?: 364

Ninox rufa marginata

♂: 313, 328, 337, 337, 349
♀: 306, 312, 336, 352

Ninox rufa queenslandica

♂: 348

Ninox rufa humeralis

♂: 327, 335
♀: 307, 310, 312, 314, 330, 330
?: 310, 323, 328, 333, 338, 347

Ninox rufa aruensis

♀: 260

Ninox strenua

♂: 398[10]), 402, 403, 408, 409, 411, 412, 417, 420
♀: 381, 392, 393[10]), 400, 410
?: 405, 412, 437

Ninox novaeseelandiae

Ninox novaeseelandiae plesseni

♀: 211

Ninox novaeseelandiae moae

♂: 208, 212, 212, 213, 213, 221
♀: 215, 217, 228

Ninox novaeseelandiae cinnamomina

♂: 210, 211, 212, 215
♀: 212, 215

Ninox novaeseelandiae pusilla

♂: 193, 195, 200
♀: 194, 196

10) plumage very worn.

Ninox novaeseelandiae melvillensis

♂: 203, 211, 213

♀: 199, 210

Ninox novaeseelandiae ocellata

Sawoe ♂: 205, 209, 210

♀: 203, 211, 224, 227

W.A. ♂: 208, 214, 218, 218, 220, 223, 225, 227, 227, 230, 230, 235, 239

♂?: 222, 231

♀: 216, 218, 221, 228, 228, 228, 229, 232, 232, 235, 236, 240

?: 223, 226, 231

N.T.(N) ♂: 213, 214, 217, 219, 220, 224

♀: 218, 220, 224, 225, 225, 227, 227, 227, 230, 237

?: 205, 217

Groote Eylandt ♂: 204, 206

♀: 212, 218, 220

?: 205

N.T.(S) ♂: 233, 237

♀: 233

?: 233

S.A. ♂: 238

♀: 228

Qld. ♂: 218, 221, 222, 227, 232

♀: 220, 222, 227, 231, 233, 234

Ninox novaeseelandiae rufigaster

♂: 215, 215, 219, 224, 225, 226, 227, 228, 229, 232, 233, 233, 234

♀: 226, 226, 226, 228, 228, 229, 229, 230, 230, 230, 231, 231, 231, 231, 234, 236, 236, 237, 237, 241, 243, 246

?: 227, 230, 231, 240

Laverton ♀: 233. Kurrawang ♀: 236

Ninox novaeseelandiae boobook

S.A. ♂: 230, 234, 235, 240, 241, 243, 247

♀: 227, 231, 234, 236, 240, 241, 242, 246, 249

?: 249, 252

Vict. ♂: 231, 232, 233, 233, 233, 234, 236, 238, 238, 239, 240, 241, 241, 244, 245, 248

♀: 229, 232, 232, 234, 235, 235, 237, 238, 238, 238, 240, 242, 245, 245, 246, 246, 247

?: 223, 236, 237, 237, 237, 238, 240, 241, 245, 246, 246, 251, 253

N.S.W. ♂: 237, 238, 239, 239, 239, 240, 242, 242, 242, 242, 243, 244, 244, 245, 245, 245, 245, 246, 247, 248, 248, 248, 250, 251, 255

♀: 228, 237, 243, 243, 244, 246, 250, 251, 252, 252, 256, 257, 257, 258, 259, 261, 261

?: 235, 240, 245, 245, 252

Qld. ♂: 233, 241, 241, 243, 248, 254

♀: 244, 245, 247, 247, 249, 250, 251, 251, 257

?: 238, 250

Ninox novaeseelandiae lurida

♂: 210, 214, 219, 220

♀: 207, 211, 217, 217, 221

?: 244 (type of *yorki*)

Ninox novaeseelandiae halmaturina

♂: 215, 226

♀: 236, 245

Ninox novaeseelandiae leucopsis

♂: 198, 201, 205, 206, 206, 207, 212, 213, 219, 222

♀: 203, 206, 206, 207, 210, 220

?: 193, 200, 202, 203, 204, 211, 211, 211, 212, 217

Ninox novaeseelandiae albaria

♂: 209, 214, 214, 215

♀: 218, 220, 222

Ninox novaeseelandiae undulata

♂: 196, 197, 197, 198, 199, 199, 200, 201, 205

♀: 199, 200, 200, 201, 201, 202, 203, 203, 203, 203, 205, 206, 206, 207, 208

?: 208

Ninox novaeseelandiae novaeseelandiae

North Island ♂: 186, 187, 190, 191, 193, 193, 193, 194, 197, 199

♀: 183, 184, 185, 187, 188, 189, 189, 190, 190, 192, 192, 194, 196, 197, 197, 198, 199, 199, 202, 202

South Island ♂: 195, 203

♀: 187

?: 186

Ninox connivens

Ninox connivens connivens

S.W.A. ♂: 301, 322
♀: 296, 300
?: 291, 308

Vict. ♀: 293, 296, 314, 317

N.S.W. ♂: 303, 312, 325
♀: 295, 298, 298, 299, 304, 308, 313, 317

S.Qld. ♂: 308, 313, 314, 316
♀: 282, 283, 305
?: 308, 322

Ninox connivens occidentalis

N.W.A. ♂: 280, 287, 288, 288, 289, 292, 292, 292, 292, 294, 295, 298, 301, 304
♀: 272, 280, 280, 281, 282, 285, 285, 286, 288, 294
?: 287, 306

N.T. ♂: 272, 282, 285, 285, 285, 285, 288, 288, 290, 296, 297,
♀: 273, 275, 276, 278, 281, 281, 286, 289, 294, 305

N.W.Qld. ♂: 294, 300, 306
♀: 280, 284, 287, 288, 310

Ninox connivens peninsularis

N.Qld. ♂: 272, 274, 278, 279, 280, 280, 285, 288
♀: 257, 260, 262, 267, 267, 268, 270, 271, 272, 275, 280

Ninox connivens assimilis

N.G. ♂: 258, 261, 262, 263, 266, 277
♀: 255, 255, 255, 256, 257, 259, 261, 270
?: 260, 264, 272

Ninox connivens rufostrigata

Moluccas ♂: 258, 272, 277, 290
♀: 290
?: 283, 283, 287, 291

Tyto novaehollandiae

Tyto novaehollandiae castanops

Tasm. ♂: 319, 328, 331, 334, 370, 381, 387
♀: 333, 343, 360, 363, 375, 378
?: 327, 345, 371

Tyto novaehollandiae novaehollandiae

S.W.A. ♂: 310
♀: 318, 328, 337, 338, 342, 348, 352, 358

?: 303, 305, 358
S.A. ♀: 327
?: 302
Vict. ♀: 326, 338, 348
♀?: 350
?: 291 [11]), 308, 334
N.S.W. ♂: 298, 322, 333
♀: 337, 339, 343
S.Qld. ♂: 302, 308

Tyto novaehollandiae galei

♂: 280, 283

Tyto novaehollandiae melvillensis

♀: 302, 308

Tyto novaehollandiae kimberli

W.A. ♂: 303, 305, 318, 320
♀: 300 [12]), 330, 332
N.T. ♀: 302
Qld. ?: 312

Tyto longimembris

Tyto longimembris longimembris

♂: 303, 322
♀: 321, 324, 329, 331, 333, 342
?: 314, 321, 324

Tyto tenebricosa

Tyto tenebricosa tenebricosa

♂: 295, 300
♂?: 285
♀: 327, 328, 342
?: 285, 290, 291

Tyto tenebricosa multipunctata

♂: 237, 243, 253
♂?: 266 [13])
♀: 243, 260, 263

Tyto tenebricosa arfaki

♂: 253, 255, 255, 256, 257, 257
♀: 260, 268, 271, 280, 282, 287, 288, 290, 300

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11) juvenile.
12) Type of *kimberli*. Judging from its small size the bird is more likely to be a male.
13) Type of *multipunctata*; the size suggests that it is a female.

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Plate 1. — Extremes in individual variation of *Ninox novaeseelandiae ocellata* (Bonaparte). Left, a bird of uncertain sex from Tambrey, 4 August 1958 (WAM A 8362); right, a female from Tambrey, 31 July 1958 (WAM A 8361), 2/3 × nat. size.