AUSTRALIAN MUSEUM SCIENTIFIC PUBLICATIONS

Keast, A., 1958. Variation and speciation in the Australian flycatchers (Aves: Muscicapinae). *Records of the Australian Museum* 24(8): 73–108. [29 January 1958].

doi:10.3853/j.0067-1975.24.1958.646

ISSN 0067-1975

Published by the Australian Museum, Sydney

VARIATION AND SPECIATION IN THE AUSTRALIAN FLYCATCHERS

(*Aves: Muscicapinae*)

By ALLEN KEAST

(Figures 1–7)

(Manuscript received 7.6.57.)

SUMMARY

The Australian Muscicapinae, comprising some thirty-four species, is currently divided into seventeen genera. A study of generic characters shows that of these *Carterornis* is a synonym of *Monarcha, Amaurodryas* and *Melanodryas* of *Petroica,* and *Quoyornis* of *Eopsaltria.* The writer follows Mayr (1941b) in separating *Tregellasia* from *Eopsaltria.* Mathews' generic name *Peneoenanthe* is reintroduced for the Mangrove Robin. The writer has been conservative in making generic changes, the view being taken that it is better to retain 'small' genera where relationships are doubtful than, for the sake of reducing the number of genera, to risk linking them with groups to which they may not belong.

A detailed study of infraspecific variation has been made. Nineteen of the species vary geographically within the Australian continent. Most of those that do not are New Guinea or tropical species that have only a 'toehold' in Australia. Distributions and habitats are detailed. The relatively large collections available to the author have permitted a detailed reassessment of named races and about sixty (slightly more than half those currently recognised) are reduced to synonymy.

Speciation is actively occurring in many flycatchers and isolates, forms with the 'potential' of developing into new species, are numerous. Of the fifteen well-differentiated isolates one (*Petroica rodinogaster*) has recently reached species status (as shown by resumption of contact with parental form without interbreeding. Two, the distinctive subspecies *Poecilodryas superciliosa cerviniventris* and *Eopsaltria australis griseogularis* though isolated are approaching that stage of morphological differentiation typical of species. In addition to the isolates referred to above most of the New Guinea species with a 'toehold' in northern Australia have started to differentiate here. The all-important isolating barriers in the flycatchers are extensive gaps in the particular habitat (tracts of arid country and sea).

Clinal variation (gradual change in a character without isolation) is pronounced in several flycatchers. It falls, in the main, into (*a*) tonal differences associated with rainfall (Gloger Effect), and (*b*) size differences according to latitude (Bergmann Effect). A most interesting demonstration of the effects of isolation on the tendency for northern populations of widely-ranging birds to be smaller, is noted in *Seisura inquieta.* Here the isolated northern populations are some 20 per cent. less than the most southern ones compared to the 'average' figure of 11 per cent. for *Rhipidura leucophrys,* in which the variation is in the form of a continuous cline.

INTRODUCTION

The present paper deals with infraspecific variation and speciation in those birds comprising the Family Muscicapidae of the 1926 *Checklist* of the Royal Australasian Ornithologists' Union, which group is regarded as a sub-family in the recent list of Mayr and Amadon (1951). The following genera are currently recognised: *Rhipidura* Vigors and Horsfield (four species), *Seisura* Vigors and Horsfield (one), *Piezorhynchus* Gould (one), *Myiagra* Vigors and Horsfield (three), *Machaerirhynchus* Gould (one), *Arses* Lesson (two), *Monarcha* Vigors and Horsfield (three), *Carterornis* Mathews (one), *Microeca* Gould (four), *Petroica* Swainson (five), *Melanodryas* Gould (one), *Amaurodryas* Gould (one), *Eopsaltria* Gould (one), *Quoyornis* Gould (two), *Heteromyias* Sharpe (one), *Poecilodryas* Gould (one), *Tregellasia* Mathews (two).

Genera and generic limits are assessed and some changes recommended.

Materials and Methods

The work is based on specimens in the American Museum of Natural History, New York, and the Australian Museum, Sydney. In the case of *Seisura inquieta* (Latham), *Monarcha melanopsis* (Vieillot), *Rhipidura fuliginosa* (Sparrman), and *R. leucophrys* (Latham) material in the National Museum of Victoria, Melbourne, was also used, and with *S. inquieta, R. leucophrys,* and *R. rufiventris* (Vieillot), that in the Western Australian Museum, Perth. Specimens in Melbourne, Adelaide and Brisbane, were seen in the case of *Eopsaltria australis* (White), in addition to those recently collected in the Carnarvon Ranges by Dr. K. Stager and now in the Los Angeles County Museum.

Standard taxonomic methods have been used and measurements made as follows: Wing-length, from angle of wing to tip, straightened along the rule; tail-length, from between base of centralmost two feathers to the tip; bill-length, from end of feathers to tip. Wing-length has been taken as the criterion of over-all size (Amadon 1943). In discussions of wing formula the feathers were numbered from the outermost inwards.

Isolate, as used in discussing geographic variation and speciation, means a population separated from the main stocks by some distributional barrier. This is the first step in the speciation process. In the present work attention is concentrated on isolates that have become differentiated morphologically. By clinal variation is meant the gradual and continuous change in a particular character from one part of the geographic range to another. Variation of this type, whilst it may be marked, is of no immediate significance from the viewpoint of speciation in that no isolation is involved.

GENERA AND GENERIC LIMITS

The thirty-four species are placed in fifteen genera in the *Checklist* of the R.A.O.U. and in twenty-nine by Mathews in his 1946 *Working List.* The checklist, which is the work of a committee, represents a somewhat middle course. More recently the subjugation of one or another of the genera has been advocated. Thus Condon (1951) included *Melanodryas* under *Petroica;* Mack (1953) has restored *Carterornis* to *Monarcha,* a position it formerly occupied; Serventy and Whittell (1948) have placed *Quoyornis* (grey robins) in the same genus as the yellow robins, *Eopsaltria,* while Mayr (1941), in his *Checklist of the Birds of New Guinea,* has placed *Piezorhynchus* under *Monarcha.*

The Australian flycatcher fauna is a composite of endemic Australian species without obvious relatives; species whose affinities lie with the Pacific forms and recent immigrants conspecific with New Guinea birds. There is a large number of diverging and evolving lines occupying a variety of ecological niches. The task of assessing relationships and generic limits is complicated by the fact that the Pacific flycatchers are in need of generic revision (Mayr and Amadon 1945).

The Australian Muscicapinae can be separated into the following subdivisions:

(*a*) *Rhipidura*: The members of this genus have rounded wings, long tails that may be carried as fans, prominent rictal bristles, small bills, and weak feet. They feed by sallying forth after flying insects, can hover, twist, and turn rapidly, and have melodious, chattering call-notes. The nests, which are cup-shaped structures placed on a horizonal branch, have cobwebs, fine strands of bark and grass, as the basic material. The eggs of the various species form a closely-matching group. In terms of colour and colour-pattern the four Australian species fall into two groups; *fuliginosa-rufifrons* (Latham)-*rufiventris,* and *leucophrys.* The last-named is a conspicuous black and white species (compared to the grey and rufous colouring of the others), has a long bill, large feet, wing less rounded, lacks the white tip to the tail, and is an inhabitant of dry, more open, country. The tail: wing ratio of the various species is as follows: *R. fuliginosa,* 1.17-1.27; *R. rufifrons,* 1.12-1.24, *R. rufiventris,* 0.88-0.93; *R. leucophrys,* 0.96-1.04. The genus *Rhipidura* extends well beyond Australia but, at least as far as the continent is concerned, forms a neat, self-contained group.

(*b*) *Myiagra, Seisura,* and *Piezorhynchus* represent another self-contained group. *Myiagra* spp. have broad, flat and unkeeled bills, long and square tails, prominent rictal bristles, and long rounded wings. In field habits they stand apart from other flycatchers. The long tail is constantly twitched or oscillated. The birds live in open situations, darting from the branches after flying insects, but also getting them amongst the branches and leaves. The calls are harsh and strident. The nest is characteristic, being cup-shaped and built on an exposed branch typically camouflaged with lichen.

Seisura inquieta differs from *Myiagra* spp. in having a long, narrow bill, and in the sexes being fairly similar. They have, however, the same sort of tail movements, method of catching insects in the air, aggressive behaviour whilst breeding, and closely similar call, nest and eggs. *Seisura inquieta* has developed a novel form of behaviour in obtaining its insect food, that of hovering above the grass and uttering a continuous succession of chattering notes reminiscent of an egg-mixer. Whilst so doing the bird looks vertically downward in the manner of a foraging gull.

The tail of *Seisura inquieta* is somewhat rounded and the wing is distinctly more rounded than in Australian *Myiagra* spp. In *M. cyanoleuca* (Vieillot) and *M. rubecula* (Latham) (both migratory species) the 4th primary is greater than (or equal to) the 5th, which generally exceeds the 3rd, while the 6th is the next longest. In *Seisura,* by contrast, the 5th primary is the longest, the 6th and 4th subequal, and the 3rd and 7th next longest. The tail : wing ratios of the two genera are much the same: *Myiagra cyanoleuca,* 0.85-0.90; *M. rubecula,* 0.80-0.90; *Seisura inquieta,* 0.87-0.90.

There does not appear to be any doubt that the affinities of *Piezorhynchus alecto* (Temminck and Laugier) lie with this group and not with the Monarch flycatchers, where it has been placed (R.A.O.U. *Checklist;* Mayr 1941). It has the same sheeny-black feathering dorsally, similar male and female forms, and same colour range, as *Myiagra* spp. Its bill, though keeled, is not unlike that of *Seisura inquieta* and there are similar rictal bristles. The tail : wing ratio in males is 0.82-0.90. The wing is of the rounded type, as in the equally sedentary *Seisura inquieta.* The wing formula is somewhat different, p. 7 exceeding p. 3 (it is typically the reverse in *Seisura*) and p. 9 exceeding p. 2 (it occasionally does so in *Seisura*). In behaviour there is a definite link. Mr. N. Chaffer, who recently spent some days photographing *Piezorhynchus alecto* in northern Queensland, informed me that the bird has the same habit of erecting the head feathers in the form of a semi-crest as has *Seisura inquieta.* It also swings the tail from side to side. The nest is of the same general type. Study of egg collections reveals that the *Piezorhynchus alecto* egg is spotted with grey and brown, as in *Myiagra* spp. and *Seisura inquieta,* not with pink or red as in *Monarcha* spp.

Piezorhynchus alecto differs somewhat in feeding habits from typical *Myiagra* spp. in that it feeds close to the ground, fluttering amongst the tangled masses of roots in sago swamps, mangroves, and creekside vegetation, to snap up insects disturbed by its movements. The feeding habits of *Seisura inquieta,* however, bridge the gap.

Whether or not species in the genera *Myiagra, Seisura,* and *Piezorhynchus,* should be regarded as belonging to a single genus depends largely on whether a worker wishes to give his genera a wide or a 'moderate' meaning. The segregation is an old one since *Seisura inquieta* obviously developed in Australia under open-country conditions, as did *Rhipidura leucophrys. Piezorhynchus alecto,* which is quite a specialized form, presumably originated in the tropics.

(*c*) *Machaerirhynchus.* This genus is distinctive on account of its enormously broadened and flattened bill.

(*d*) The Monarch flycatchers (*Monarcha, Carterornis*).

Mayr, in his New Guinea checklist (1941a) has accepted a somewhat wide meaning for the genus *Monarcha,* including within it the chestnut-breasted group (*M. melanopsis* and its allies), the golden flycatcher (*M. chrysomela* (Garnot) 1829), shining flycatcher (*M. alecto* (Temminck et Laugier) 1827), pied flycatcher (*M. guttula* (Garnot) 1829), as well as the aberrant long-tailed *M. axillaris* Salvadori 1875. Of these, the chestnut-breasted group, a pied flycatcher (not necessarily closely related to the pied birds of New Guinea), and the shining flycatcher (= *Piezorhynchus alecto*) occur in Australia and need to be discussed here.

Monarcha melanopsis, the type species, is a somewhat heavy-billed flycatcher that obtains its insect food from the branches and leaves. The bill is unflattened, the tail square, and legs and feet are fairly strong. In coloration it is chestnut, grey and black. It lives in rain forest, has loud, melodious call-notes, and constructs a cup-shaped nest in which green moss is the dominant material. *M. trivirgata* (Temminck) is smaller, with different markings, but has the general build, colours, and habits.

The small, pied, *Carterornis leucopsis* (Gould) has similar bill, legs, and feet to *M. melanopsis* and *M. trivirgata.* Its wing formula approaches that of *M. trivirgata,* primaries 4 and 5 being longest and equal and usually longer than 3 which equals 6 (sometimes 3, 4, 5, 6 are subequal in *C. leucopsis*). Thereafter p.7 exceeds p.8 which exceeds p.2.

In *M. melanopsis*, by contrast, 4 and 5 are longest, or sometimes 3, 4, 5, which exceed 6, followed by 7, 2 and 8. The tail:wing ratio for *M. melanopsis* is 0.77-0.81, for *M. trivirgata* 0.87-0.92, and for *C. leucopsis*, 0.89-0.91.

Carterornis leucopsis is a rare bird and few accounts of its behaviour are available. Favaloro (1930), however, has drawn attention to its similarity with *M. trivirgata* both in feeding habits and nesting behaviour. Photographs show that the nests of the two do not differ appreciably and, judging from descriptions, the eggs are similar.

Basically, *Carterornis leucopsis* approximates to flycatchers of the *melanopsis-trivirgata* type, differing mainly in coloration, colour-pattern, and in the protuberant gorget or throat tuft (Favaloro 1930). These differences are however, hardly sufficient to warrant generic differentiation and I agree with Mack (1953) and others that the generic name *Carterornis* is unnecessary.

The Shining Flycatcher, *Piezorhynchus alecto*, placed with the Monarch flycatchers by various workers, is fairly distinctive. It differs in colouring, colour-pattern, and in having marked sexual dimorphism, from species typical of the genus *Monarcha*. The immature male is brown and the tail is rounded and not square. The wing has a beautifully rounded contour, seen also in that of the sedentary *M. trivirgata*. The wing of *Piezorhynchus alecto*, however, is characterised by a short p.2, exceeded by p.9 and frequently some of the outer secondaries. In the majority of specimens p.7 exceeds p.3. The roundness of the wing, accordingly, is due to a relatively short second and third primary. In *M. trivirgata*, as already mentioned, p.3 exceeds p.7 and p.2, with rare exceptions, exceeds p.9.

There is little in common in behaviour between *Piezorhynchus alecto* and Australian representatives of the genus *Monarcha*. The habit of swinging the tail from side to side is lacking in the latter, as is also that of erecting the head feathers. The nest and eggs are also different.

(*e*) *Arses*. This small genus of black and white birds (with brown females in New Guinea) comprises species which are undoubtedly closely related to the Monarch flycatchers but are generically distinct. The bill is like that of *Monarcha* spp. The wing is long and rounded (p.4 and p.5, or occasionally 4, 5, 6, are longest, followed by 3, then 7, then 8 and 2). The tail is fairly square and is long (tail:wing ratio, 0.85-0.94). The distinctive features of the genus are colour-pattern, long neck feathers that are frequently elevated to form a frill, and blue fleshy eye-rim. One Australian species (*A. kaupi* Gould) has an unusually long hind toe, apparently associated with its habit of moving over the trunks and branches in search of food in the manner of a tree-creeper. This species is also said to spread its tail when fluttering about the branches (North 1903).

The habits and song of *Arses* spp. are somewhat different from those of the Monarch flycatchers. The nest is distinctive, resembling a miniature basket and frequently placed on a hanging vine. The eggs are fairly distinctive.

(*f*) *Microeca*. I agree with Mayr (1941b) and Vaurie (1953) in recognising this as a well-defined small genus which stands apart on morphological grounds (broad bill, pronounced rictal bristles, long wing, weak tarsus), and in behaviour, habits, nest and eggs. Its method of hunting is to sit on an exposed branch and sally forth after passing insects. It is thus an aerial feeder and this is reflected in its morphological characteristics.

(*g*) The Australian Robin-like Birds (*Petroica, Melanodryas, Amaurodryas, Quoyornis, Heteromyias, Poecilodryas, Eopsaltria, Tregellasia*): In this group are comprised somewhat generalized flycatchers that take their food from the branches or ground and are typically robin-like. Their appearance reflects the general similarity in habits and they differ in little more than colour and colour-pattern. The sixteen species are currently broken up into eight or more genera. In terms of dominant colour these are: *Petroica* spp., males with much red (replaced by black in New Guinea and New Zealand species), females brown; *Melanodryas cucullata* (Latham), pied male and brown female; *Amaurodryas vittata* (Quoy and Gaymard), brown, sexes alike; *Quoyornis* spp., grey, sexes alike; *Eopsaltria australis* (White) and *Tregellasia* spp. (the latter the large-headed robins), yellow-breasted and sexes alike; *Heteromyias cinereifrons* (Ramsay) and *Poecilodryas superciliosa* (Gould), somewhat complicated colour-pattern involving brown, greys, black and white, with the sexes alike.

In their morphological characters these genera compare as follows:

Bill: This is of a generalized type in most species. It is, however, long in *Quoyornis leucurus* (Gould), relatively small in *Petroica* spp., broad and shallow in *Tregellasia* spp., wide in *Poecilodryas superciliosa*, and large, high and narrow in *Heteromyias cinereifrons*.

Rictal Bristles: These are prominent in species in the genus *Tregellasia,* and in *Poecilodryas superciliosa* and *Quoyornis leucurus,* but small in species in other genera.

Tail Shape: The tail is square in all species with the exception of *Quoyornis leucurus,* in which it is rounded.

Legs: These are relatively strong in the whole group though, as would be expected, somewhat weaker in those species of *Petroica* that are arboreal. Scutellation varies somewhat between species but as it is influenced by age I do not consider it a reliable generic character. In *Heteromyias cinereifrons,* however, scutes are virtually absent and the legs are smooth.

Wings: Primaries 4 and 5 are invariably the longest in the Australian robins. Individuals with nos. 3, 4, 5 subequal (and 3 exceeds 6) frequently occur in *Eopsaltria australis, Amaurodryas vittata,* and *Melanodryas cucullata.* Primary 6 typically exceeds p.3 in *Eopsaltria australis, Quoyornis leucurus,* and *Q. georgianus* (Quoy and Gaimard), *Tregellasia* spp., *Poecilodryas superciliosa, Heteromyias cinereifrons,* but commonly equals it in *Petroica* spp., which inclines more to the previous type. Primary 2 typically exceeds p.7 in *Melanodryas cucullata* and generally in *Petroica* spp. In *Amaurodryas vittata* p. 7 mostly exceeds p. 2, but they may be of the same length. In all the other genera p.7 exceeds p.2.

It is difficult to say what importance should be given to wing formula in assessing generic limits. If one were to claim it as positive evidence of close relationship in the case of *Melanodryas cucullata* and *Petroica* spp. the same could be said for *Quoyornis* spp., *Tregellasia* spp., and *Poecilodryas superciliosa,* although these genera are quite dissimilar in other features.

Tail:wing ratios for various robins range as follows: *Eopsaltria australis,* 0.72-0.77; *Quoyornis georgianus,* 0.78-0.83; *Quoyornis leucurus,* 0.76-0.78; *Amaurodryas vittata,* 0.69-0.74; *Melanodryas cucullata,* 0.67-0.72; *Petroica phoenicia* Gould, 0.68-0.71; *Petroica rosea* Gould, 0.77-0.81; *Tregellasia capito* (Gould), 0.67-0.69; *Poecilodryas superciliosa,* 0.76-0.78; *Heteromyias cinereifrons,* 0.65-0.67; with New Guinea *H. albispecularis* (Salvadori) about 0.63. These ratios indicate that *Heteromyias cinereifrons* and *Tregellasia* spp. have relatively short tails, whereas the tail is relatively long in *Quoyornis* spp., *Poecilodryas superciliosa* and *Petroica rosea.*

It would appear that tail:wing ratios can be of little assistance in assessing robin relationships.

Distinctive Colour Markings: A wing-bar occurs in most species and is typically prominent. It is, however, faint in *Eopsaltria australis* and *Tregellasia* spp. In *Quoyornis leucurus* alone it is absent. There is a distinctive white band at the base of the tail in only two species, *Quoyornis leucurus* and *Melanodryas cucullata.* It is faintly visible in *Amaurodryas vittata.*

Egg Colouring: The eggs of Australian robins are of three types:

(*a*) Blue or greenish-blue eggs spotted with reddish-brown (*Eopsaltria australis, Tregellasia* spp., *Poecilodryas superciliosa, Quoyornis georgianus*).

(*b*) Brownish-blue or greenish-blue eggs without spotting (*Melanodryas cucullata, Amaurodryas vittata, Quoyornis leucurus*).

(*c*) Ground-colouring of egg grey to white, spotting grey or greyish-brown not red (*Petroica* spp.). The eggs of most species are readily distinguishable. *P. goodenovii* differs in having a bluish ground-colour thus, in a measure, connecting this group with (*a*). The egg of the large *Heteromyias cinereifrons* has a grey to buff ground-colour and brownish markings. Whilst this egg can be grouped under category (*c*) it stands somewhat apart.

Egg-colouring could be said to confirm that *Amaurodryas vittata* is closely-related to *Melanodryas cucullata* and *Quoyornis georgianus* to *Eopsaltria australis.* Interestingly enough it does not support the presumed close relationship of *Melanodryas cucullata* to the genus *Petroica.*

Nest Structure: All species have a generalized cup-shaped nest on a branch. Strips of bark and lichen serve as camouflage. Those of the various genera are recognizable on materials used and size. It is doubtful, however, if fundamental differences are involved so much as: (*a*) availability of the different materials and (*b*) a compromise between the conflicting needs of a small nest that is difficult to see and a bulky one that is warm. In the latter respect it might be noted that *Petroica goodenovii,* living in the interior where cover is sparse, has a small nest, and *P. rodinogaster* of the cold, dense, Tasmanian forests,

a large and bulky one. The nest of the mangrove dweller *Quoyornis leucurus* is a small version of the generalized *Eopsaltria-Melanodryas* type. That of the large *Heteromyias cinereifrons*, however, is a loose structure of roots, leaf skeletons, fibre and moss, and bears little resemblance to the nest of any of the other robins.

The Nestling Bird: A complete series of nestlings is not available for study. A brown, mottled immature is the rule in robins (Mathews 1921-22). New collections will have to be made, however, before juvenile colouring can be properly assessed as a generic character.

General Behaviour: Robins, with few exceptions, feed both in the branches and on the ground. Movements, except when attacking prey, tend to be slow and sedate. All escape observation by remaining still. The call tends to take the form of a piping succession of notes but some species (*e.g.*, a few members of the genus *Petroica*) are relatively silent. Some genera share odd characteristics of behaviour (which may not indicate close relationship). Thus *Eopsaltria australis, Tregellasia* spp., and *Heteromyias cinereifrons*, have the habit of clinging vertically to tree-trunks. and from that position surveying the surroundings. A vertical flicking of the tail is to be seen in *Eopsaltria australis* and *Petroica* spp.

Generic Relationships—Summary: The Australian robin-like birds fall into a number of divisions in terms of colour and colour-pattern and, on the basis of these, genera have been created. When, however, an attempt is made to confirm the genera by morphological criteria and in terms of behaviour it is found that the differences are less clear-cut. Nor does it seem possible, save at the risk of combining elements that are not closely related, to substantially reduce the number of genera.

The position may be rationalized to some extent as follows:

(1) *Quoyornis* Gould. This genus, as at present used, is composed of two essentially unrelated species. One of them, *Q. georgianus* really belongs to *Eopsaltria*. The other, the mangrove robin, *Q. leucurus*, is so distinct that it should be placed in a monotypic genus (*Peneoenanthe* Mathews).

The evidence for placing *Quoyornis georgianus* under the genus *Eopsaltria* rather than associating it with *Melanodryas* is as follows: (*a*) There is no transverse bar at the base of the tail; (*b*) wing formula; (*c*) eggs; (*d*) behaviour, *vide* the following remarks of Serventy and Whittell (1948):

> In general habits the species is very similar to the Western Yellow Robin and has the same mannerisms of clinging to the side of a tree and remaining motionless, and of jerking its tail and wings.

Accordingly, I follow Serventy and Whittell in placing this species in the genus *Eopsaltria*.

Quoyornis leucurus (R.A.O.U. *Checklist*) (*Poecilodryas pulverulenta* (of Mayr 1941)).[1] The Mangrove Robin of the north has only a superficial colour resemblance to the grey robin of the south-west, despite its having been placed with it by many workers. In fact, its characteristics of a long, strong, bill and prominent rictal bristles, rounded tail, and absence of wing-bar, are such that it is surprising its distinctiveness from *Quoyornis* has not been more widely stressed.

Mayr (1941b) placed it in the genus *Poecilodryas*, but only with certain misgivings, writing: "We now come to three species which might be included in *Poecilodryas*, partly because their plumages are not completely known and partly to avoid putting them in monotypic genera". He then proceeds to comment on the unusual "*Pachycephala*-like compressed" bill (there would appear to be a typographical error here for the bill is referred to as "small" and the rictal bristles as "weakly-developed" whereas, compared to typical robins, the reverse is the case.)

The Mangrove Robin is without close relatives and is as distinct from *Poecilodryas superciliosa* and *Eopsaltria georgiana* as any of the other robin genera are from each other. There is no alternative, from the viewpoint of consistency, but to place it in a monotypic genus (it will take the name *Peneoenanthe* Mathews 1920).

---

[1] Iredale (1956) has rejected the specific name *pulverulenta* and uses the name *leucurus* Gould 1869. Admittedly the description by Bonaparte (1850) of the bird collected and labelled by Muller is a poor one: "*Myiolestes pulverulentus.* Grisea: subtus alba." The name, however, has clear priority and should stand.

(2) *Amaurodryas* and *Melanodryas*. The former is but a "henny-plumaged" insular derivative of *Melanodryas cucullata*. Its relationship here, rather than to the genus *Eopsaltria*, is seen from: (*a*) There is a trace of a transverse bar at the base of the tail; (*b*) egg colouring; (*c*) general behaviour. Field observers liken it to *Melanodryas* on general appearance and nest, the fact that clinging vertically to trunks is not a basic habit, and because it has not the piping call-note of *Eopsaltria*.

The preceding survey has indicated a close similarity of *Melanodryas cucullata* to members of the genus *Petroica*. Condon (1951) has already advocated that it should be placed under this genus. The ways in which *M. cucullata* resembles a typical *Petroica* such as *P. multicolor* are as follows: (*a*) The colour patterns are remarkably similar, even to the extent of distribution of white on the wings; (*b*) in both groups the females are brown; (*c*) the wing formula is similar, especially in primary 2 typically exceeding p.7; (*d*) taking size differences into account bills, legs and feet, are similar, as are the rictal bristles; (*e*) the two have certain similarities in habits, notably that of perching on a stump or post in clearings and fields and from there flying down to take food on the ground. The two differ in (*a*) general size; (*b*) egg colour and patterning; (*c*) the fact that red is absent in the male of *Melanodryas*. New Guinea and New Zealand members of the genus *Petroica*, however, are black and white, lacking red, so that this objection is removed. Hence it would appear that, subject to a comparison of nestlings at a future date, the only real differences between *Melanodryas* and *Petroica* lie in the eggs and in general size. Hence the former name should be reduced to synonymy.

(3) Genus *Tregellasia*. Mayr (1941) has restored this genus of Mathews and I agree with his action. These birds (*T. capito* and *T. leucops*) have conspicuously large heads, flattened bills, and prominent rictal bristles. Their relationship to the genus *Eopsaltria*, with which they share similar colouring, eggs, wing formulae, and the habit of clinging to the vertical sides of trees is, accordingly, not particularly close. They should be separated generically.

INFRASPECIFIC VARIATION

Rhipidura fuliginosa (Sparrman) 1787. (Grey Fantail)

(Figure 1.)

This species extends widely through the sclerophyll forests, rain forests, savannah, and mangroves of the periphery of the continent. There is an isolated stock in the mountains of central Australia. *R. fuliginosa* requires scrubby thickets, leaving the more open places to *R. leucophrys*. This applies even in the forests of the south-east and south-west, where it reaches it greatest concentrations.

The species is absent from great areas of the inland. For example, on a traverse of the continent during the winter of 1952 from Port Augusta to the Macdonnells and thence to Wyndham, Port Keats, the Barkley Tableland, Mount Isa, and Cairns, the writer saw the species only at Port Augusta, Port Keats (in mangroves), Normanton (monsoon forest), and Cairns. The evidence suggests that it is a very rare bird in the desert centre of the continent (in addition to North's specimens from Stoke's Pass in the Macdonnells there are records from Marree, Lake Frome, and Cooper's Creek (Terrill and Rix 1950). The species is apparently 'thinly spread' and much broken up distributionally in the north-west (*e.g.*, Kimberleys) where it occurs only in mangrove thickets.

Rhipidura fuliginosa is sedentary, though some local movements occur (Lamm and Calaby 1950; Serventy and Whittell 1948).

Specimens: Tasmania (series); King Island (1); Flinders Island (2); Melbourne, Sydney, Adelaide (all series); Kangaroo Island (3); Richmond River (1); Bunya Mountains (2); Rockhampton area (1); Burnett River (1); Cairns (series); Utingu, on Cape York (series); Normanton (4); Burketown (1); Leichhardt River (2); Alexandria, N.T. (1); Melville Island (series); Point Torment and Derby (series); Carnarvon and Boolathanna (series); Point Cloates (3); south-western Australia (series); Stoke's Pass in central Australia (2); Hall Sound, New Guinea (3).

Geographic Variation: *R. fuliginosa* is a highly plastic species. Whilst most populations are variable the following geographic colour types occur, distributed as in Figure 1.

(1) Tasmania and the Bass Strait Islands (*albiscapa* Gould 1840). The large area of sooty-grey on the breast readily distinguishes this form from that of south-eastern Australia. The underparts are more richly coloured and the back duskier. There is less white on the tail feathers. The throat is greyish-white. Condon (1951) comments on the distinctiveness of this form.

(2) South-eastern Australia from Eyre's Peninsula and Lake Gardner, through Victoria and New South Wales, to at least Rockhampton, Queensland. This form takes the name *R. fuliginosa alisteri* Mathews 1911. It is a generalized type and there is obviously gene flow throughout. A few individuals from the Melbourne area, one from Myponga, South Australia, and two from Kangaroo Island, are of the Tasmanian type. A few Sydney birds could also fit into that series.

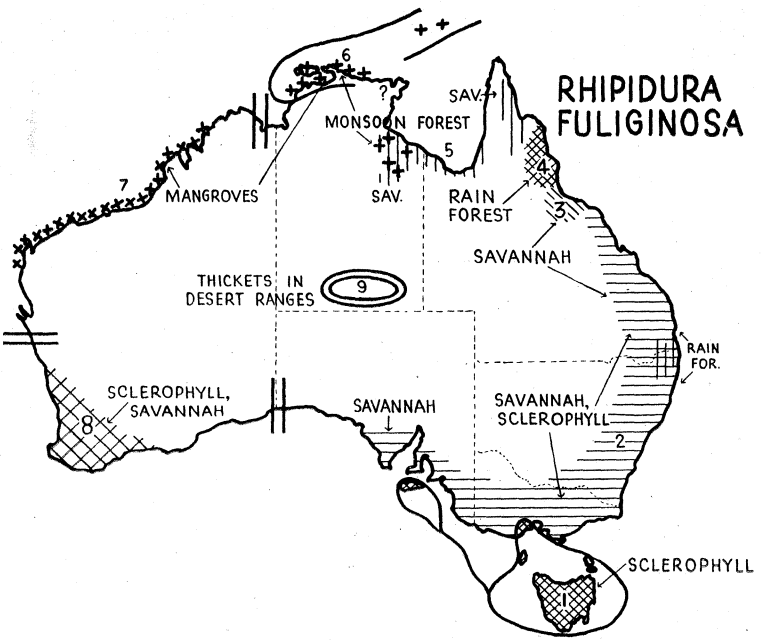

Fig. 1.—Colour forms and isolation in the Grey Fantail (*Rhipidura fuliginosa*). This grey-brown flycatcher varies in colour with rainfall and type of forest occupied (variation of this nature in birds is genotypic, not phenotypic). Thus, though the Tasmanian and Atherton populations (1 and 4) are alike, direct relationship is not involved; it is the environmental influences that are similar.

Distributional barriers are indicated by parallel lines. The population isolated in the mountains of central Australia (9) is the most distinctive. 1. *albiscapa*. 2. *alisteri*. 3. *harterti*. 4. *frerei*. 5. *phasiana*. 6. *buchanani*. 7. *subphasiana*. 8. *preissi*. 9. *albicauda*.

(3) I have not seen any birds from Inkerman (Mathew's *'harterti'* 1912, the type of which is not in the American Museum of Natural History). The area corresponds to the 'tongue' of dry country that extends through to the coast from the interior. This form is described as differing from *alisteri* in "its lighter grey coloration above, less marked band on the breast and more uniform paler abdomen coloration", a description that could well apply to various north-western populations. A female in the Australian Museum collection from Gayndah (Burnett River) could fit into the Sydney series.

(4) Cairns-Atherton area (*frerei* Mathews 1912). This rain forest form is so close to the Tasmanian one that many individuals are indistinguishable. However, the throat tends towards white, instead of being greyish-white, and the area of sooty-grey on the breast tends to be smaller.

(5) Cape York and Gulf of Carpentaria (*phasiana* De Vis 1884). These birds are paler, approaching closely to the south-eastern type. A series of six birds from Utingu and one from Jardine River (Cape York), four from Normanton, one from Burketown, two from Leichhardt River, are similar, whilst a single worn individual from Alexandria is more drab ventrally but obviously also belongs here.

(6) Melville Island and, presumably, coastal Northern Territory. Southern New Guinea, (*buchanani* Mathews 1912). This is a very drab form and is lacking in dark markings. The back is drab greyish-brown instead of dark grey. There is a mere smudge of greyish-brown on the breast (instead of sooty or mid-grey), so that the pigmented area does not stand out from the pale buff-coloured breast. Two females from Hall Sound, Papua, fit this series.

(7) Napier Broome Bay, Point Torment and Derby, Point Cloates, etc. (*subphasiana* Mathews 1912). The six individuals from the Derby area have a distinctly richer (more ochraceous) under-surface than the Melville Island birds. A bird from Napier Broome Bay, three from Point Cloates, one from North-west Cape (and for that matter some of the individuals from the Gulf of Carpentaria) are similar to them. Although the pectoral band, as noted by Mathews, is lacking in Northern Territory, Kimberley, and mid-western birds it is pronounced in two (?) immature birds from Derby and in a female from the Fortescue River.

(7*a*) Boolathanna and Carnarvon area (unnamed). Birds from here have the paler breasts of the Melville Island birds.

(8) South-western Australia (*preissi* Cabanis 1851). This form has the general appearance of a pallid version of the Tasmanian form. The breast smudge, whilst generally extensive is grey instead of sooty black and the back is paler than in Tasmanian birds (and for that matter those from New South Wales).

(9) Central Australia (*albicauda* North 1895). As noted by North (1895) this form stands apart in having "all but the two central tail feathers pure white, ..." There are two birds in the Australian Museum (one the type) and in both the tail is conspicuously whiter than in any other specimens. Otherwise their general appearance is much like that of coastal birds from the south-west.

Measurements: Wing-lengths of males (mm): Tasmania (9), 70-77 (73); King Island (1), 74; Flinders Island (2), each 74; Melbourne (8), 71-79 (75); Adelaide (3), 73-78 (75); Sydney (16), 73-79 (76); Kangaroo Island (1), 75; Bunya Mountains (2), 76 and 78 (77); Gracemere (1), 76; Cairns (5), 75-80 (78); Normanton-Burketown (2), 78; Melville Island (3), 69-71 (70); Port Torment-Derby (6), 68-76 (71); Point Cloates (2), 68 and 71 (70); Carnarvon and Boolathanna (8), 65-71 (68); south-western Australia (13), 70-77 (75); Stoke's Pass, central Australia (1), 72.

The above measurements indicate that whilst eastern and southern birds are of the same general size those from the less hospitable north-west of the continent (Melville Island to Carnarvon) are distinctly smaller. Two birds from the Gulf of Carpentaria would appear to belong to the eastern group.

Tasmanian males have tails ranging from 82-89 mm in length (mean of 9, 85); Sydney (16), 79-87 (83); south-western Australia (13), 82-87 (83); Derby (3), 76-87 (81); Carnarvon (8), 75-85 (80). The inference is that Tasmanian birds tend to have slightly longer tails than the typical, and north-western birds slightly shorter ones.

On the basis of their characteristics, and knowledge of distribution, the following Australian populations would appear to be isolated from the main stocks: Tasmania, south-western Australia, Macdonnell Range in central Australia and, possibly, those of the north-west.

North-western birds as a whole (Northern Territory to the Hamersley region) are so different from those of the east and south (pallid, reduced breast 'band', small size), as to constitute a distinct group. Variation in *R. fuliginosa* is doubtless closely bound up with rainfall and humidity. The two darkest forms are in Tasmania and the Cairns rain forests, areas of highest rainfall. The palest forms are from the dry north-west and mid-west of the continent. Melville Island birds are also very pale. Although this is an area of moderately high rainfall it is restricted to the hot summer so that its effectiveness is limited.

Nomenclature: The variation in this species, a succession of colour forms around the periphery of the continent, several of which resemble others, is most difficult to treat trinomially. Thus, the Tasmanian form (insular) of the far south-east is relatively similar to that of the Cairns rain forests (north-east Queensland), although the two are separated by a paler form and some 1,500 miles. The south-eastern and Cape York forms are not unlike each other but the dark Cairns form is interposed between them. Since the darkly pigmented Cairns type could be thought of as a 'saturated' representative of the other

eastern birds and the populations to the north and south are similar, the question arises as to whether all should not be included under the one name? Again, the two populations of dark birds (Tasmania and Cairns) could be grouped and the 'mid-grey' populations (south-eastern Australia and Cape York) receive a second name. A further course is that each of the four be given names. These difficulties, plus the varying degree of difference between successive colour forms, indicate that little importance can be attached to 'races' in species where climate affects plumage.

The following trinomial arrangement would appear to be the most satisfactory:

(1) *Rhipidura fuliginosa albiscapa* Gould 1840. Tasmania, King and Flinders Islands.

(2) *Rhipidura f. alisteri* Mathews 1911. South-eastern and eastern Australia from Lake Gardner and Eyre's Peninsula eastwards through Victoria and New South Wales, at least as far north as Rockhampton, Queensland.

(3) *R. f. harterti* Mathews 1912. Dry area around Inkerman, coastal north Queensland.

(4) *R. f. frerei* Mathews 1912. Cairns-Atherton rain forests.

(5) *R. f. phasiana* De Vis 1884. Cape York, Gulf of Carpentaria, westwards at least to Alexandria.

(6) *R. f. buchanani* Mathews 1912. Melville Island and adjacent Northern Territory. Hall Sound area of New Guinea.

(7) *R. f. subphasiana* Mathews 1912. Derby area to (?) Point Cloates. The Carnarvon birds could be included here to save introducing another name.

(8) *R. f. preissi* Cabanis 1851. South-western Australia.

(9) *R. f. albicauda* North 1895. Central Australia (Macdonnells).

The names *victoriae* Mathews 1912 (Victoria) and *whitei* Mathews 1912 (Grange, South Australia) are synonyms of the race *alisteri*.

Rhipidura rufifrons (Latham) 1801 (Rufous Fantail)
(Figure 2A.)

Range: Northern Australia from Napier Broome Bay in the north-west to Cape York, thence down the east coast to Victoria. The habitat is monsoon forest in the north and rain forest in the east.

Details of the winter dispersal of the south-eastern populations of this species are not known but they must intermix with those of Queensland at this time. Hence only material collected during spring and early summer can be used in taxonomic work.

Evolution in the *Rhipidura rufifrons* group in the Pacific has been treated by Mayr and Moynihan (1946).

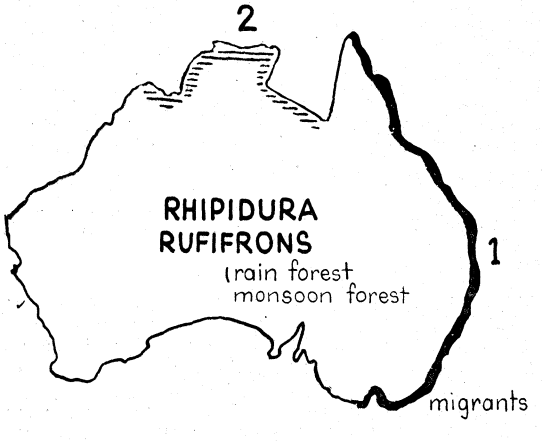

Fig. 2. — *Rhipidura rufifrons*, a rain-forest inhabitant in the east, and a riverside monsoon-forest form in the west, is broken up into two distinctive forms by the dry country at the head of the Gulf of Carpentaria. The elements probably represent twin invasions of the continent from the north. 1. *rufifrons rufifrons*. 2. *rufifrons dryas*.

Specimens: Melbourne area, Sydney, Gosford, Tweed River, Blackall Range and Bunya Mountains (all spring series); Inkerman (1—September); Wide Bay-Cairns (good series, mostly winter); Cape York (Utingu and Cable Station—good breeding season and good winter series). Small series were seen from the Gulf of Carpentaria, including a July male from Burketown, female from the Gregory River (July), an undated male from Georgetown, and various individuals from Normanton (January male, February female, October female, etc.). Northern Territory specimens: Van Diemen Gulf, Anson Bay (both series); Alligator River (1); Melville Island (1); Darwin (1); Parry's Creek (1—Mathews female 'type' of *parryi*).

Geographic Variation: Birds fall into two main series: eastern and north-western. Northern Territory birds have a prominent white (instead of barely discernible grey) tipping to the tail feathers, a general reduction in scale-like breast markings (although this is variable), and tendency towards paler breasts (reduction in buff colouring). The tail is the main character separating the two groups. In eastern birds the terminal paleness of the feathers (with the exception of the centralmost two, where it may not be developed at all) is some 5-10 mm in width. In Northern Territory birds the centralmost two feathers are finely tipped with white (3-5 mm) but it is extensive on the other feathers (15-25 mm). The two forms thus differ both in the tone and extent of the terminal markings.

The Gulf birds are of the north-western type but have intermediate tendencies, *e.g.*, the breast pattern approaches that of the eastern specimens; the white tipping to the tail is frequently as extensive as in Northern Territory birds but may be narrower (*e.g.*, 15 mm instead of 25 mm). The single male from Watson River, near the tip of Cape York, but on its western side, is of this type.

The range of the two colour-types is shown on Figure 2.

Measurements of adult males are as follows:

	Wing	Bill	Tail
	mm	mm	mm
Melbourne (6)	71–76 (74)	8.0–8.6 (8.2)	80–86 (82)
Sydney (4)	72–78 (75)	7.8–8.7 (8.3)	81–86 (84)
Cairns (6)	71–77 (74)	8.2–8.8 (8.5)	80–88 (86)
Cape York (4)	73–75 (74)	8.2–8.5 (8.3)	82–85 (83)
Gulf of Carpentaria (6)	70–72 (71)	8.6–9.2 (9.0)	87–93 (90)
Northern Territory (6) (Van Diemen Gulf, etc.)	68–75 (72)	8.7–9.2 (8.9)	88–94 (92)

The inference to be drawn from these figures is that the populations frequenting the north-west of the continent and the Gulf of Carpentaria have longer bills, longer tails, and slighter shorter wings, than those of the east and north-east.

The following are synonyms of *rufifrons*: *inexpectata* Mathews 1912 (Dandenongs); *intermedia* North 1902 (Bellenden Ker); *kempi* Mathews 1912 (Cape York); and *parryi* Mathews 1912 (Parry's Creek) is a synonym of *dryas*.

Speciation and Isolating Barriers: The two Australian forms of *Rhipidura rufifrons* probably represent twin invasions from New Guinea. Within Australia the two occupy relatively different habitats, the north-western one being adapted to dry conditions. It has obviously secondarily spread eastwards around the shores of the Gulf, possibly as far as the Watson River.

Nomenclature: *Rhipidura rufifrons rufifrons* (Latham) 1801: East coast from Victoria to Cape York.

Rhipidura rufifrons dryas Gould 1842: Napier Broome Bay to Gulf of Carpentaria and western Cape York.

Rhipidura rufiventris isura Gould 1840 (Northern Fantail)

The Australian range of *Rhipidura rufiventris* extends from Broome in the north-west, along the north coast to about the Burnett River (Gayndah) Queensland. The habitat is monsoon forest, mangrove, and rain forest. It is not known whether or not the range is continuous across the head of the Gulf of Carpentaria but the species has been collected on the Leichhardt River.

Specimens: Broome (one young bird); Derby (series); Parry's Creek (3); Ord River (1); coastal Northern Territory, including Katherine River, King River, Daly River, Brocks Creek, Alligator River (series); Melville Island (series); Leichhardt River (1); Claudie River on Cape York (1); Cairns, Rockingham Bay, and Mount Elliott (series); Gayndah, Burnett River (1).

Geographic Variation: The material does not reveal any consistent geographic differences. In the west and east, Melville Island and Cairns birds are similar, though some of the former are paler dorsally and ventrally.

Measurements of series of adult males from various localities fail to indicate any geographic size differences:

	Wing Length mm	Tail Length mm
Derby-Wotjulum, *i.e.*, 60 miles north of Derby (6)	84–92 (86)	78–82 (81)
Parry's Creek (3)	81–87 (85)	80–86 (83)
Melville Island (4)	85–91 (87)	76–82 (80)
South Alligator River (2)	82, 86	79, 80
Cape York (1)	88	83
Cairns-Rockingham Bay (7)	80–89 (85)	79–86 (82)

Nomenclature: The type specimen of Mathews' '*tormenti*', 1912 (Point Torment) has not a "longer tail" as stated, but has a very long bill. At any event the other material from this locality is typical. Mathews' '*macgillivrayi*' 1916 from the Leichhardt River is similar to Rockingham Bay birds (Ramsay's '*superciliosa*' 1875). Variation in bill width, given as a race character by Mathews, does occur, but it is not consistent from place to place and does not lend itself to accurate measurement.

Only one race of *Rhipidura rufiventris* can be recognised in Australia.

Rhipidura leucophrys (Latham) 1801 (Willie Wagtail)

(Figure 3.)

This species ranges widely over Australia, occupying most forest habitats with the exception of the denser jungles and mulga desert. In the interior it is found mostly along the watercourses. The species is a casual visitor to Tasmania.

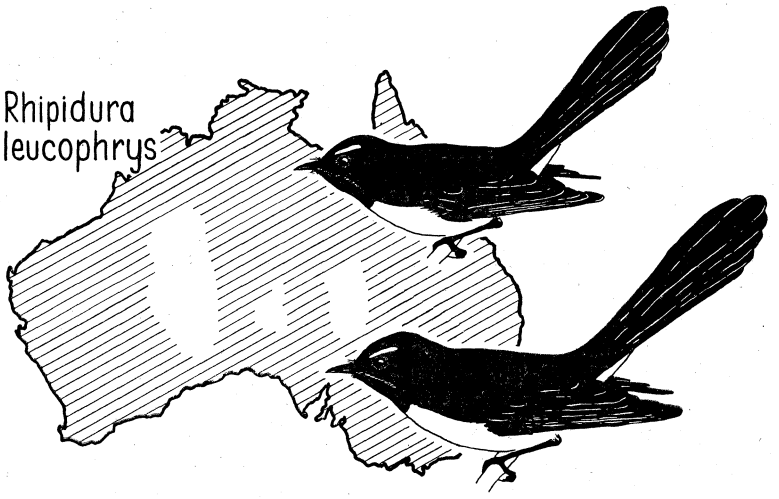

Fig. 3.—Black and white Fantail (*Rhipidura leucophrys*), to show south-north size cline (Bergmann Effect). Southernmost and northernmost populations differ in size by 11 per cent.

Specimens: Melbourne (series); Sydney (series); odd specimens from coastal Queensland; Cape York (3); Normanton (series); coastal Northern Territory, including Alligator River, Van Dieman Gulf, Eureka—series; Parry's Creek (series); Napier Broome Bay (1); Forrest River (2); Canning Stock Route, Wells 34 and 7—one each; Derby (series); Point Cloates (3); mid-western Australia, mostly Yalbalgo and Boologorroo—2; south-western Australia, Broome Hill, etc.—series; central Australia (2); Birdsville (1); Alexandria (3).

Geographic Variation: This species does not vary in colour geographically.

Northern populations of *Rhipidura leucophrys* are distinctly smaller than southern ones (judged by changes in wing-length), as will be seen from the following series of adult males:

	Wing mm	Tail mm
Eastern:		
Melbourne area (5)	97–104 (101)	97–106 (101)
Sydney area (12)	96–104 (99)	97–105 (100)
Bourke (3)	95– 99 (97)	97–102 (99)
Normanton (4)	90– 95 (92)	92– 97 (94)
Cape York (3)	91– 96 (93)	95– 98 (97)
Western:		
South-western Australia (8) (Albany, Broome Hill)	92–101 (98)	94–102 (97)
Mid-western Australia (3) (Yalbalgo and Boologorroo)	93–101 (97)	97–102 (98)
Point Cloates (2)	96, 99 (96)	96, 99 (98)
Derby (3)	93– 98 (96)	96–100 (98)
Parry's Creek (3)	94– 96 (95)	96– 99 (98)
Forrest River (1)	97	98
Coastal Northern Territory (6) (Alligator River, Van Diemen Gulf)	91– 96 (94)	91– 99 (93)
Birdsville (1)	103	99
Alexandria (1)	96	96

As there are no breaks in the distribution of *R. leucophrys* it would seem certain that size variation is clinal. (Fig. 3.)

Nomenclature: I can see no basis for Mathews' '*utingu*' 1912 (Cape York) and '*carteri*' 1912 (South-western Australia) both named on size grounds. The best procedure would be simply to name northern and southern ends of the cline, *viz*:

Rhipidura leucophrys leucophrys (Latham) 1801: Southern Australia.

Rhipidura leucophrys picata Gould 1848: Northern Australia.

Seisura inquieta (Latham) 1801 (Restless Flycatcher)
(Figure 4.)

This species extends throughout the continent where there is forest of the open type. The habitat is savannah woodland (with intrusions into savannah grassland) and dry sclerophyll forest. It avoids desert and semi-desert areas (Serventy and Whittell 1948; Terrill and Rix (1950)) and is absent from the mountain ranges of central Australia where many forest species have isolated populations—note absence from field lists of Whitlock (1924), Jarman (1953), and those of the writer. In fact, *S. inquieta* is absent from the broad belt of country extending across the 'waist' of the continent from the Sharks Bay—Hamersley region of the west (Carter 1921-22 in Mathews 9:66) through to western Queensland. This has the effect of dividing the species into a southern stock and one living in the savannah of the north (recorded as "rare" as far south as Banka Banka, 60 miles north of Tennant Creek (Jarman, 1944)). The two stocks may be in contact in the east of the continent but certainly are not in either the centre or west.

Specimens: Melbourne (series); Victorian mallee (series); Sydney area (series); Kangaroo Island (4); coastal South Australia (3); Bourke (2); Charleville (1); Emu Vale (2); Gracemere (2); Mackay (2); Alexandria (1); Borroloola (1); Normanton (series); south-western Australia (series); Broome (2); Derby (series); Parry's Creek (series); Napier Broome Bay-Forrest River (5); coastal Northern Territory-Van Diemen Gulf, Alligator and Daly Rivers (series).

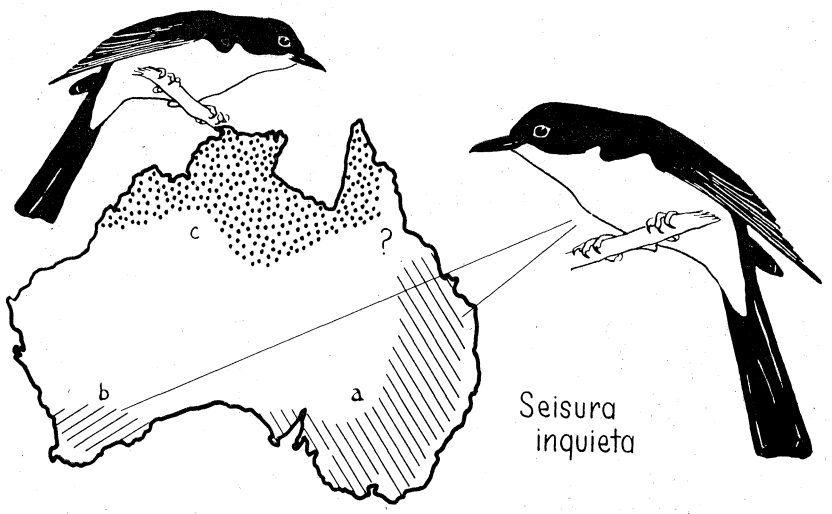

Fig. 4. South-north size variation in the Restless Flycatcher (*Seisura inquieta*). Southern and northern populations are isolated. Size trends are the same as in *R. leucophrys* but they are so much greater (20 per cent.). a. *inquieta*. b. *westralensis*. c. *nana*.

Geographic Variation: This species does not vary geographically in colour.

Wing, bill, and tail lengths vary strikingly from south to north, as will be seen from the following series of adult males:

East (*south to north*) :	Wing (mm)	Tail (mm)	Bill (mm)
Melbourne area (4)	101–108 (104)	92–96 (94)	15.2–15.5 (15.3)
Victorian Mallee (4)	101–108 (104)	93–96 (95)	15.1–15.8 (15.5)
Sydney area (9)	102–108 (106)	92–97 (95)	14.3–15.5 (14.9)
Bourke (1)	107	93	15.5
Emu Vale (1)	105	93	15.5
Gracemere (1)	103	90	15.2
Mackay (1)	101	88	14.8
Charleville (inland) (1)	101	87	14.6
Normanton (5)	83–90 (86)	75–79 (78)	13.0–13.3 (13.1)
Booroloola (1)	89	80	12.7
Alexandria (1)	about 100	92	14.0
West (*southern*) :			
Kangaroo Island (3)	106–110 (108)	92–94 (92)	15.1–16.0 (15.5)
Coastal South Australia (2)	103, 110	92, 92	15.2, 15.4
South-western Australia (11)	107–113 (110)	93–103 (99)	15.4–16.4 (16.0)
(*northern*) :			
Broome (2)	88, 89	77, 86	12.0, 12.2
Derby (5)	84–93 (89)	77–82 (80)	12.0–13.0 (12.6)
Parry's Creek (3)	83–88 (86)	76–85 (80)	12.3–12.8 (12.7)
Napier Broome Bay and Forrest River (3)	90–94 (92)	80–85 (84)	12.2–13.1 (12.8)
Coastal Northern Territory (6)	83–90 (88)	74–82 (78)	12.8–13.5 (13.1)

It will be seen that the northern populations of *S. inquieta* are strikingly smaller than those from the south, in all dimensions (Fig. 4). Within the latter the south-western stock is larger than the south-eastern one and confirms the racial status of these birds (Mathews' *westralensis* 1912). The series does not, however, support the existence of a distinct form in the Derby area (Mathews' '*rogersi*' 1912, said to be smaller than *nana* and constituting the smallest 'race'). Mathews' '*nea*' 1912 from the Dawson River, "intermediate in size" between

the southern and northern forms, is not justified for birds from central Queensland are of the southern type. It is permissible only to name end forms so that *rogersi* is a synonym of *nana* and *nea* of *inquieta*.

Nomenclature: The following races occur in *S. inquieta*:

Seisura inquieta inquieta (Latham) 1801: Eastern section of continent from South Australia to central Queensland.

S. inquieta westralensis Mathews 1912: South-western Australia (an isolate).

S. inquieta nana Gould 1870: Northern Australia (Kimberleys to north Queensland).

Isolation and Speciation: The chief interest of *S. inquieta* lies in the isolation of its components and the effect of this on geographic variation. The large south-western form ("b" Fig. 4) is isolated from the birds in south-eastern Australia ("a", Fig. 4) by the arid Nullarbor Plain (gap in range perhaps 1,000 miles) and from the small form in the Kimberleys ("c", Fig. 4) by the desert tracts extending to the sea south of Sharks Bay and in the Ninety Mile Beach region (range gap of perhaps 1,200 miles). It is interesting to note that in *S. inquieta* the northern form has not got southwards across the latter barrier to occupy the savannahs of the Hamersley region, which is the case with many species.

The gap in the range of the 'Scissors-Grinder' through the centre of the continent (southern Flinders Range to Banka Banka) is in the region of 1,200 to 1,300 miles. Since the vegetation maps (Prescott 1931) indicate that savannah woodland extends continuously up the east of the continent it is to be expected, in this section of the continent, that large southern and small northern forms will be in contact with each other. There is no information on this. It will be noted, however, that as far north as Mackay the birds are relatively large but that at Normanton (some 600 miles to the north-west) they are very small. This is the critical area for investigation but, not only have we no specimens from there but there is no evidence as to whether or not the range is continuous between these points. It might, however, be borne in mind that the treecreeper (*Climacteris picumnus*) has distinctive southern and northern forms with similar distributions to those of *S. inquieta*. The former extends north at least to Rockhampton and the latter inhabits the Normanton-Cape York-Cardwell triangle. There can be no doubt that isolation has been involved in the production of these (Keast 1957). Likewise *inquieta* and *nana* must have developed in isolation. As in *Climacteris* the barrier is possibly the tract of arid country that extends from inland to the coast in the vicinity of Townsville-Inkerman.

It is common for sedentary Australian birds with an extensive range to be smaller in the warmer north. Mostly the differences are not great (*e.g.*, 11 per cent. in *Rhipidura leucophrys*) and there is a cline connecting them; that is, it is simply an expression of Bergmann's Rule. It is worthy of note that in *S. inquieta*, where the northern and southern populations are isolated, the differences are greater (20 per cent.).

Piezorhynchus alecto (Temminck et Laugier) 1827. (Shining Flycatcher)

This species ranges along the coastline of northern Australia from Derby to about Hinchinbrook Island. It is an inhabitant of the undergrowth and brushes in the vicinity of creeks and rivers and of the dense mangrove forests.

Specimens: Point Torment (series); Napier Broome Bay (3); Melville Island (series); coastal Northern Territory, including Post Essington and the Mary, Margaret, King and Alligator Rivers (series); Groote Eylandt (1); Cape York-Cable Station, Peak Point, Piara, Patterson Creek, Somerset (series); Cooktown (1); Cairns and Cardwell (series); Hinchinbrook Island (1); Torres Strait (2).

Geographic Variation: Three distinctive colour-types occur:

(1) Point Torment area (*tormenti* (Mathews) 1912).

The bill is long and narrow and the abdomen is sooty black in the male. The females are striking: dark-grey brown on the top of the head with only the faintest sheen, instead of the sheeny-black of those from elsewhere. This possibly represents the continuance of the immature plumage into the adult.

(2) Napier Broome Bay-Melville Island and (probably) Groote Eylandt (*nitida* Gould) 1840). In the males the bill form and colour of the abdomen are intermediate between *tormenti* and *wardelli*. Melville Island females tend to be slightly darker brown on the back than Cape York birds but some Cape York individuals resemble them.

(3) Torres Strait, Cape York, south to Hinchinbrook Island, Queensland (*wardelli* Mathews 1911). This is a short-billed form, although occasional longer-billed individuals do occur (one male had a bill 14.1 mm in length). In males the black of the abdomen has a sheen to it, lacking in *tormenti*.

Wing and bill measurements of males from the several localities are as follows:

	Wing (mm)		Bill (mm)	
Point Torment (3)	85-87	(86)	15.2-15.8	(15.6)
Napier Broome Bay (3)	87-92	(89)	14.7-14.8	(14.8)
Northern Territory coastal (4)	87-91	(89)	13.6-14.4	(14.1)
Melville Island (3)	84-89	(87)	13.5-14.5	(14.0)
Groote Eylandt (1)	87		13.9	
Cape York (7)	84-91	(88)	13.2-13.9	(13.6)
Cairns (7)	86-90	(88)	12.7-13.4	(13.0)
Hinchinbrook Island (1)	89		13.1	
Banks Island, Torres Strait (2)	90, 93		13.8, 14.2	

There is apparently no significant geographic variation in wing length (and tail length). Bills vary strikingly, maximum size being reached in the Point Torment form and minimum in the birds from Queensland, that is at the two extremes of range. The occurrence of distinct colour forms in the north-west and east is indicative of isolation of these two stocks. The case is a parallel to that of *Pachycephala simplex* and infers that there is a gap in the richer mangrove forests in the Gulf of Carpentaria.

Nomenclature: The races *tormenti, nitida, wardelli,* warrant recognition. Mathews' '*melvillensis*' 1912 ("much wider, heavier bill") and '*campbelli*' 1912 from Cape York, said to have a "much narrower bill" and to be smaller, are direct synonyms of *nitida* and *wardelli* respectively. These populations certainly do not merit names.

Piezorhynchus alecto tormenti (Mathews) 1912: Point Torment area of Kimberleys.

P. alecto nitida Gould 1840: Napier Broome Bay to Melville Island and (probably) Groote Eylandt.

P. alecto wardelli Mathews 1911: Islands of Torres Strait, Cape York, south to Hinchinbrook Island.

Myiagra rubecula (Latham) 1801. (Leaden Flycatcher)

(Figure 5.)

The Australian range of this species extends from west of Melbourne, northwards along the coast to Cape York, thence west to about Derby in the Kimberleys. It is a species of the coastal forests. Eastern and western stocks are probably isolated. The south-eastern populations are migrants.

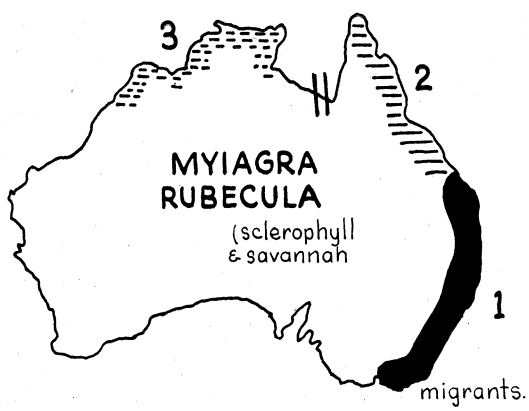

Fig. 5. — *Myiagra rubecula*, a sclerophyll-savannah species, in addition to having an isolated form in the north-west, has undergone minor differentiation in the east. Like *R. rufifrons* the south-eastern population is migratory. 1. *rubecula rubecula*. 2. *rubecula yorki*. 3. *rubecula concinna*.

Specimens: Melbourne (series); Sydney (series, including two wintering males); odd birds collected at various times of the year from a variety of Queensland localities, including Fraser Island, Burnett River, Mackay, Inkerman, Hinchinbrook Island, Cardwell, Bartle Frere (Cairns), Cooktown, and Cape York. In the north-west specimens have been seen from Napier Broome Bay (3); Parry's Creek (series); Melville Island (series).

Geographical Variation: Birds collected in late spring and summer (*i.e.* in breeding season) may readily be divided into three series:

(1) South-eastern breeding populations (*rubecula* (Latham) 1801) in which the males are characterized by pale lores. The bill is large and wide (length in Sydney birds, 11.3-11.8 mm (mean of eight, 11.6). The northern limits of this form cannot be stated, but it presumably grades into *yorki*.

(2) North-eastern populations, Cape York to about Fraser Island (*yorki* Mathews 1912), with black lores and a bill like *rubecula*. There are black-lored males from Cape York (various times of the year); Bartle Frere, Cardwell, Inkerman, Hinchinbrook Island, Burnett River and Fraser Island (spring and summer).

(3) Kimberleys and Northern Territory (*concinna* Gould 1847) with black lores and a small, narrower bill (length in Northern Territory-Melville Island birds, 10.2-10.8 mm the mean of six being 10.7).

Wing-length measurements for adult males (mm) from various parts of the range in late spring and summer are as follows:—Melbourne (4), 80-84 (82); Sydney (10), 77-83 (80); Fraser Island and Burnett River (2), each 79; Rockingham Bay (1), 80; Cape York (4), 77-80 (78); Darwin (2), 73 and 74; Melville Island (3), 74-79 (76); Parry's Creek (3), 73-75 (74); Derby (1), 76. These figures indicate that, though there is probably a minor south-north cline of decreasing size in the breeding populations of *M. rubecula* in the east the north-western stocks are distinctly smaller; that is to say the changes in size reflect those in bill length.

The fact that the migratory south-eastern race of *M. rubecula* is distinguishable from that inhabiting the north-east means that it should be possible to accurately plot the winter range of this form. Males with pale lores (American Museum of Natural History Collection) have been seen as follows: Cape York (April, May, June, September, October), Cooktown (October), and Mackay (September). It will be noted that Mayr (1941) records *M. rubecula rubecula* as extending to the Daru-Fly River area of New Guinea on migration.

Nomenclature: The forms *rubecula, yorki,* and *concinna* merit recognition, with *yorki* the least differentiated of the three. I have seen the type specimens and agree with the action of Mathews in placing his *ringwoodi* 1912 under *rubecula,* and *melvillensis* 1912, and *broomei* 1912, under *concinna.*

Myiagra rubecula rubecula (Latham) 1801: Coastal forests of eastern Victoria, New South Wales, presumably grading into

M. rubecula yorki Mathews 1912: Fraser Island to Cape York (breeding).

M. rubecula concinna Gould 1847: Kimberleys and Northern Territory.

Myiagra cyanoleuca (Vieillot) 1818. (Satin Flycatcher)

This species extends through the coastal mountain forests of the east from Tasmania to Cape York. It is a migrant and winter visitor to New Guinea, New Britain, and adjacent islands (Mayr 1941).

Specimens: Tasmania (4), Melbourne (series), Sydney and central coastal New South Wales (series), Cairns (series), Cape York (series).

Geographic Variation: There is no indication of geographic colour variation in this species. Wing-length measurements of adult males (mm) from various parts of the range are as follows: Tasmania (2), 89 and 94; Melbourne area (4), 89-92 (90); Sydney and central New South Wales (5), 87-92 (90); Cairns (4), 86-90 (88); Cape York (4), 85-92 (88). I do not agree that Mathews' '*robinsoni*' 1912 (Cooktown, north Queensland) is duller (less glossy) in coloration.

No races can be recognised in *M. cyanoleuca.*

Myiagra ruficollis (Vieillot) 1818. (Broad-billed Flycatcher)

This species extends through the coastal regions of tropical northern Australia from Point Torment to Cape York. The habitat is mangroves. Beyond Australia the species extends to southern New Guinea and Timor.

Specimens: Point Torment (series); Melville Island (4); Normanton (series), Cape York (2).

Geographic Variation: This species does not vary geographically within Australia. Various races have been described by Mathews: *kempi* 1912, Cape York ("narrower and more pointed bill"); *cooperi* 1912, Melville Island ("darker coloration and broader bill"); *tormenti* 1912, Point Torment ("lighter above and narrower bill"). Series fail to support such descriptions and these names must be reduced to synonymy. Mayr (1941) and H. G. Deignan (*Results, Arnhem Land Expedition;* unpub.) correctly place Australian birds under the race *mimikae* Ogilvie-Grant 1911, of New Guinea.

Machaerirhynchus flaviventer Gould 1851. (Boat-billed Flycatcher)

The Australian range of this species extends from Cape York to Cardwell. It is strictly an inhabitant of the rain forest and hence the range is broken by the 150 mile-wide front of dry country in southern Cape York.

Specimens: Series from Cape York and Cairns.

Geographic Variation: Birds from the two areas are distinctive. Males from Cairns (*secundus* Mathews 1912) have the back heavily blotched with black instead of being dark olive above like those from Cape York (*flaviventer* Gould 1851). Females from the former area tend to be deeper green dorsally. Wing-length measurements of adult males (mm) are as follows: Cape York (4), 56-60 (59); Cairns-Cardwell (7), 58-61 (60). The distribution of these forms corresponds to the isolated tracts of rain forest in northern Cape York and Atherton areas respectively.

As would be expected the Cape York stock approaches the colouring of *xanthogenys* Gray 1858, from southern New Guinea, in which form there is, however, some development of black on the back.

Nomenclature: *Machaerirhynchus flaviventer secundus* Mathews 1912: Cairns-Atherton area.

M. flaviventer flaviventer Gould 1851: Cape York.

Arses kaupi Gould 1851. (Pied Flycatcher)

This species is confined to the Cairns-Cardwell rain forest area.

Specimens: Approximately a dozen from the general Cairns area.

Geographic Variation: It does not vary geographically. Adult males vary in wing-length from 80 to 83 mm (mean of 6, 82).

Mack (1931) has discussed the relationship of this species with *A. telescophthalmus lorealis*.

Arses telescophthalmus lorealis De Vis 1895. (Frill-necked Flycatcher)

The distinctive Australian population of this widely-ranging New Guinea species is confined to the rain forest north of Coen, Cape York.

Geographic Variation: This form does not vary within Australia. Its relationships with the New Guinea stock has been dealt with by Mack (1931 and 1953) who draws attention to the closeness of *lorealis* to *aruensis* from the Aru Islands. It is important, however, to note the persistence of the brown female form in the latter (coloured plate in Gould, 1875-1888).

Monarcha melanopsis (Vieillot) 1818. (Black-faced Flycatcher)

The Australian range of this species is from Victoria (where it is rare) to Cape York. The habitat is rain forest. The southern birds are migrants, the species having a wintering area from south-eastern New Guinea to Fergusson, Goodenough, and the Trobriand Islands (Mayr 1941).

Specimens: Cunningham, Victoria (1); Sydney area (series, breeding season); odd birds from Richmond River, Tweed River, Macpherson Range, Bunya Mountains (breeding season); Cairns and Cardwell (series, September, December, January, February); Cape York (4 in February, one without date).

Geographic Variation: There are no consistent colour differences as between birds collected in spring-summer at the southern and northern extremities of range.

Wing-length measurements for adult males (mm) from various parts of the range are as follows: Victoria (1), 89; Sydney area (9), 90-97 (94); northern New South Wales (3), 93-97 (95); Cardwell-Cairns (7) 87-91 and one December bird 95 (90); Cape York (3), 85, 86, and 93, respectively. The Cape York birds were collected in February and should be breeding stock. Hence a minor south-north size cline is indicated. An undated male has a wing measuring 96 mm and is obviously a migrant from the south. There would not appear to be geographic variation either in bill- or tail-length in *M. melanopsis*.

The smaller size (as judged by wing-length) of the northern populations of *M. melanopsis* can be recognized by accepting the name *pallida* Mathews 1916. Since *M. melanopsis* breeds only in rain forest there is probably a degree of genetic isolation between birds inhabiting the two large sections of this vegetation association, the one in Cape York and Cairns, the other in southern Queensland and New South Wales.

Nomenclature: *Monarcha melanopsis melanopsis* (Vieillot) 1818: Victoria to southern Queensland.

Monarcha melanopsis pallida Mathews 1916: Cardwell to Cape York.

Monarcha frater Sclater 1874. (Black-chinned Flycatcher)

This is another New Guinea species with a 'toe-hold' in the Claudie River district of northern Cape York. It has long held the name '*Monarcha canescens*' in Australian literature and been the subject of debate as to whether it is a good form or only an aberration.

The difference between *Monarcha frater* and *M. melanopsis* is not great. As far as I can determine *M. melanopsis* has not been recorded breeding in New Guinea. As, however, an endemic race is listed in the south (Merauke to the Oriomo River (Mayr 1941) the specific status of *M. frater* would appear to be assured.

Geographic Variation: Only a couple of Australian specimens of *M. frater* have been collected. There are single specimens (labelled '*canescens*') in the American Museum of Natural History from 'Cape York' (a female collected on 27 February), Claudie River (male, 16 February, the type of Mathews' '*claudia*') and a male labelled 'Cape York' (17 March, the type of Mathews' '*kurandi*').

Much more material is needed before an adequate comparison of Australian and eastern New Guinea populations of *M. frater* can be made. The two would appear similar, however.

Monarcha trivirgata (Temminck) 1829. (Spectacled Flycatcher)

The Australian range of this species extends from Cape York to northern New South Wales (occasionally breeding as far south as Gosford). The habitat is rain forest, but in places the bird frequents mangroves. The southern populations are migratory.

Specimens: Richmond River (2); Tweed River (2); Gracemere (2); Port Denison near Bowen (2); Inkerman (1); Cairns (series); Cooktown (1); Cape York, including Piara, Cable Station, Somerset, Utingu, Pinkenya (total of about 15); Banks Islands, Torres Strait (3).

Geographic Variation: There are two colour-types in Australia. The southern one (*gouldi* Gray 1860) ranges from New South Wales to the base of Cape York. In it the rufous of the breast extends down over the flanks. The northern form (*albiventris* Gould 1866) has a white abdomen, the rufous ending abruptly on the breast. In the American Museum of Natural History there are white-breasted birds from Torres Strait, Piara, Cable Station, and Somerset. Birds from Utingu and Pinkenya (Cape York) could fit into the southern type, having coloured flanks but with the white extending well on to the rufous area. Possibly these are migrants. Cooktown birds are like those from the south. Mack (1953) lists *albiventris* from Portland Road, Claudie River, Iron Range, Tozer Gap, Peach River, Upper Nesbit River, and Rocky Scrub, and *gouldi* from Shipton's Flat and Mount Finnegan in the Cooktown area.

Wing-length measurements (mm) of adult males of *Monarcha trivirgata* are as follows:

Northern New South Wales (3), 76-79 (77); Gracemere (1) 80; Port Denison (2), each 78; Cairns (11), 75-82; Cape York—*albiventris* (5), 73-76 (75); Torres Strait (2), 72 and 75. A south-north cline of decreasing size is indicated

Mathews' *'stalkeri'*, 1916 from Inkerman has already been reduced to synonymy by the author. It is not significantly "pale" as stated in the description.

M. trivirgata albiventris represents a second invasion of the continent from the north. It is presumably isolated as a breeding unit from the southern stock by the dry tract (some 150 miles wide) as the base of Cape York. This, a barrier to many species, is discussed by Mack (1953).

Nomenclature: *Monarcha trivirgata gouldi* Gray 1860: Central coastal New South Wales to southern Cape York.

M. trivirgata albiventris Gould 1866: Northern Cape York.

Monarcha leucotis Gould 1850 (White-eared Flycatcher)

This species extends through the coastal forests of Queensland from Cape York to about Brisbane, being rare at the extremities. Its rarity on Cape York is stressed by Macgillivray (1921-22 in Mathews 9: 91) and Mack (1953).

Specimens: Brisbane (1); Fraser Island (1); Gracemere (2); Port Denison (2); Cairns (6).

Geographic Variation: This species does not vary geographically in colour and I disagree with Mathews that the birds from Gracemere (*'gracemeri'*) have a darker coloration. Wing-length measurements (mm) of adult males are as follows: Brisbane (1), 71; Port Denison (2), 72, 73; Cairns (4), 71-74 mm (72). Mack (1953), who has examined a Cape York specimen, does not admit any races in *M. leucotis* and I am in agreement with him.

Microeca leucophaea (Latham) 1801 (Brown Flycatcher)

This flycatcher has a wide range through continental Australia and has an outlying population in southern New Guinea. Sclerophyll forest and savannah woodland are the main habitats. Rain forest, at the one extreme, and desert mulga on the other, limit distribution. Even so, *M. leucophaea* extends well out into the drier areas, *vide* Kalgoorlie and Balladonia in the south-west (skins), east to Ooldea and north to Donald's Plains, Innamincka and Mount Ive in South Australia (Terrill and Rix 1950); and south to Alexandria (skins) and Banka Banka, near Newcastle Waters, in the Northern Territory (Jarman 1944). It is absent from a vast tract of country 600 to 800 miles wide extending from the west coast, through central Australia, to western Queensland. The species can best be thought of as being composed of a series of southern and a series of northern populations connected by way of Queensland. The south-western stock is apparently isolated to-day (Serventy and Whittell 1948).

Specimens: Melbourne area (series); Victorian mallee (series); south-eastern South Australia (series); south-west corner (series); Lake Dundas (1); Kalgoorlie (1); Balladonia (1); Innamincka, central Australia (1); Bourke (2); Dubbo (1); Emu Vale (2); Gracemere (2); Dawson River (1); Bowen (1); Walsh River (1); Cairns (2); Normanton (series); Alexandria (2); Alligator River (3); Forrest River (1); Parry's Creek (4); Maple Downs Station (1); Derby (series).

Geographic Variation: This occurs in overall coloration (back paler, ventral surfaces "whiter" in drier areas) and in the extent of white on the tail. In general coloration birds from the better-watered areas of the south-east and east (Sydney, Melbourne and Adelaide, south-eastern Queensland, north to Cairns) are similar. South-western birds are of the same general tone but frequently have a brownish tinge on the ventral surface. Interior and northern birds are distinctly paler (browner) dorsally, and whitish below (lack greyish suffusion). In New South Wales birds from Dubbo are only slightly paler than those from Sydney but the Bourke specimens are distinctly so. The specimen from Innamincka, central Australia, is very pale. Kimberley, Northern Territory, and Normanton birds are pale on the back, but within the Kimberleys a minor clinal change is evident (*e.g.*, Forrest River birds are slightly darker above than those from Maple Downs inland and Derby-Broome to the south). The Normanton birds tend to have a whiter underside than those from the Kimberleys, lacking the buff-coloured wash on the chest.

In respect to tail coloration, birds from the south-east (Adelaide, Melbourne, Sydney, Bourke, Innamincka, south Queensland) have a 'moderate degree' of white. It is markedly reduced in birds from the south-west of the continent, Eyre Peninsula (Condon 1950), and the Victorian mallee. The difference is described by Condon:

> . . . .the two outer shafts of the tail are not pure white; the outermost rectrix is white on the outer vane while the basal half of the inner vane is very dark grey, the second rectrix is dark grey except for a white tip.

Increased white is manifest in northern birds (Kimberleys, Northern Territory, Normanton, and Cairns), birds from central Queensland being transitional to the south-eastern type.

Typical Sydney birds have the outermost rectrix pure white, the second pure white or dark only on the basal section of the inner vane, and the third with a minor to moderate broad tipping of white. In northern birds the third rectrix varies from having a moderately-broad tipping of white to being almost pure white.

Specimens of the New Guinea form of *M. leucophaea* (*zimmeri*) are distinctive, having a cream-yellow wash ventrally, a yellowish wash dorsally (visible in some Normanton birds), and a broad bill.

Wing-length measurements (mm) of adult males are as follows: Melbourne area (4), 89-92 (90); Victorian mallee (3), 89-92 (90); Sydney area (10), 89-94 (91); Dubbo (1), 87; Bourke (2), 88 and 90; Innamincka, central Australia (1), 89; Emu Vale (1), 89; Gracemere (1), 88; Cairns (2), 83 and 85; Normanton (7), 80-84 (82); Alligator River (2), 77 and 79, Maple Downs (1), 84; Forrest River (1), 76; Parry's Creek (3), 78-80 (79); Derby (6), 76-82 (78); south-west corner (4) 87-91 (88). The smaller size of the northern populations is apparent.

The bill, because of its small size, is a difficult character to measure in *M. leucophaea*. There is little doubt, however, that birds from the north also have small bills; Sydney males (10), 8.6-9.2 mm (8.9); Cairns (2), 8.4 and 8.5 mm; Derby (6), 8.2-8.7 mm (8.4).

Nomenclature: Seven Australian races are given for *Microeca leucophaea* in the latest list of Mathews (1946). These are as follows: *leucophaea* (Latham) 1801—south Queensland and New South Wales; *assimilis* Gould 1841—south-western Australia; *pallida* De Vis 1884—Northern Territory and north Queensland; *victoriae* Mathews 1912—Victoria, South Australia and Tasmania; *subpallida* Mathews 1912—north-western Australia; *howei* Mathews 1913—Victoria (mallee); *barcoo* White 1917—central Australia. In his recent work on the birds of South Australia Condon (1951) has synonymized *victoriae* and accepted *assimilis* and *barcoo*. Eyre Peninsula birds are included in the south-western race but the Victorian mallee birds are grouped with *leucophaea*.

The most satisfactory arrangement for *M. leucophaea* would appear to be as follows:

Microeca leucophaea leucophaea (Latham) 1801: South-eastern Australia (coastal) from Adelaide to central Queensland. Synonym: *victoriae*.

M. leucophaea barcoo White 1917: Drier areas of southern Australia from Cooper's Creek to western New South Wales.

M. leucophaea assimilis Gould 1840: South-western Australia, Eyre Peninsula and Victorian mallee. Synonym: *howei*. This form could be secondarily connected with *leucophaea* in south-eastern South Australia (and possibly Victoria).

M. leucophaea pallida De Vis 1884: Northern Australia. Synonym: *subpallida*. This name applies to the small birds of the north, the tails of which show a large amount of white. The birds of north-eastern Queensland (*vide* Cairns) are a problem since, unlike the

Gulf, Northern Territory and Kimberley birds, they are not pale but resemble the south-eastern stock in degree of pigmentation. The best course would appear to be not to grant them a special name but include them in *pallida* along with the other northern birds.

M. leucophaea zimmeri Mayr and Rand 1935: Port Moresby region of New Guinea.

Isolation and Speciation: The south-western stock, though it does extend into the drier areas, is isolated to-day (Serventy and Whittell 1948). Its similarity to the Eyre Peninsula and Victorian mallee stock indicates a common origin of the three. The eastern mallee stock is unlike that inhabiting the adjacent coast and western New South Wales hence, like the mallee populations of *Psophodes nigrogularis, Podargus* and others, it would appear to have derived from the west.

The similarity of the nominate race over large areas of the east and *pallida* along the north coast suggests that there is no isolation. It is more than likely, however, that some populations of *barcoo* are virtually cut off. In any event one population of *Microeca leucophaea*, the New Guinea form *zimmeri*, is certainly isolated, has differentiated, and could be said to be on the way to developing into a new species.

Microeca flavigaster Gould 1843 (Lemon-breasted Flycatcher)

This species ranges along the northern coastline of the continent from south of Bowen in the east to about the Daly River in the west. The habitat is said to be "savannah woodland and forest country" on Cape York (Thomson 1935), "open forest" at Mackay (Harvey and Harvey, in Mathews 1919-20, 8: 76) and "more numerous in the mangroves than elsewhere" on Melville Island (Rogers, in Mathews 1919-20, 8: 76). At Port Keats the writer found them mostly in the damper savannahs.

Specimens: Bowen (3); Inkerman (3); Cardwell, Rockingham Bay, Herbert River, Cairns, etc. (series); Cape York (series); Melville Island (6); Daly River and Port Keats (4).

Geographic Variation: Australian populations fall into two series, a north-western one (*flavigaster* Gould 1843) and an eastern one (*terraereginae* Mathews 1912), as Mack (1953) has noted. The former differs in having a clear white throat (instead of a drab one tinged with olive) and in the clearer, brighter, yellow breast.

M. flavigaster is, however, a plastic species as will be seen from differences in series from along the Queensland coast. In specimens from Cape York the throat feathers have a distinct yellowish suffusion so that the throat is like the breast or only slightly paler. The top of the head and back are uniformly deep olive. Only some Barron River birds (including the type of *terraereginae* are as bright as this; in the others the throat is greyer (less yellow). This is presumably the type named '*laetissima*' by Rothschild in 1916. A female and two unsexed birds from Inkerman are drab ventrally ("fawn yellow") whilst three from Bowen are similar but with some increase in the ventral colouring (increase in olive-yellow component).

Within the north-western form the series from Melville Island inclines towards the Cairns type, that is, there is a suggestion of olive through the throat. Mathews named these birds *melvillensis* in 1912, stating that they are a lighter yellow below and less green on the back. His type, however, is a very worn bird.

Wing-length measurements (mm) of adult males from various parts of the Australian range are as follows: Cairns area (8), 74–79 with one 83 (77); Cape York (6) 73–77 (76); Port Keats-Daly River (2), 73 and 76; Melville Island (4), 73-78 (75). There would not appear to be any difference in bill-length as between eastern and western populations, each falling within the general range of 8.1–8.8 mm.

Nomenclature: The coloration in this species is influenced somewhat by climate and the most satisfactory course is to recognise only a north-western and a north-eastern race, as follows:

Microeca flavigaster flavigaster Gould 1843. Synonym: *melvillensis*. Coastal Northern Territory from Port Keats to Melville Island (? and further east).

M. flavigaster terraereginae Mathews 1912. Synonym: *laetissima*. Cape York to Bowen, Queensland.

Microeca brunneicauda Campbell 1902 (Brown-tailed Flycatcher)

This species is stated to occur along the north coast from Point Torment to Darwin. The habitat is mangroves.

Vaurie (1953) has discussed the status of this somewhat puzzling species and points out its close relationships with *M. flavigaster*. On the basis of a supposed area of overlap in the Northern Territory, *M. brunneicauda* has been retained as a good species. Presumably *M. brunneicauda* originated in the Kimberleys.

Specimens: Point Torment (series) and Napier Broome Bay (2).

Geographic Variation: Mathews has separated the Kimberley stock racially (*tormenti* 1916) from the Darwin bird as "lacking the buff on the throat and having the inner web of the three outer tail feathers with a large whitish spot." I have been unable to locate any Northern Territory specimens of *M. brunneicauda* and until these are available not only can geographic variation not be discussed but the status of *M. brunneicauda* itself must remain suspect.

Wing-length measurements (mm) for adult males of *M. brunneicauda* from Point Torment are: 73-77 (mean of five, 75). The bills range from 9.6 to 9.8 mm.

Nomenclature: *Microeca brunneicauda brunneicauda* Campbell 1902: Darwin area of Northern Territory.

? ? *M. brunneicauda tormenti* Mathews 1916: Requires investigation.

Microeca griseoceps De Vis 1894 (Yellow Flycatcher)

I have not seen Australian material of this species but Mack (1953) lists a specimen from Claudie River, Cape York, in the H. L. White Collection and one from Tozer Gap nearby in the Queensland Museum Collection. The habitat of Mathews' '*Kempiella kempi*' is said to be "edge of rain forest".

Mack was unable to distinguish Australian birds from the nominate *M. griseoceps griseoceps* of southern New Guinea. It is probably quite a recent immigrant to Australia.

Petroica multicolor (Gmelin) 1789 (Scarlet Robin)

In Australia this species extends through the sclerophyll forests of the east from south Queensland to Kangaroo Island. There are isolated stocks in the south-west corner of the continent and in Tasmania. *P. multicolor* occurs as a complex of forms in the Pacific (Mayr 1934). Similar examples of island speciation in the genus *Petroica*, this time in New Zealand and the subAntarctic islands, are demonstrated by Fleming 1950.

Specimens: Emu Vale, south Queensland (2); Blue Mountains, mainly Lithgow area (large series); Melbourne area (series); Flinders Island (2); Tasmania (series); coastal South Australia (series); Kangaroo Island (2); south-western Australia (series). Included in these were the types of Mathews' '*samueli*' and '*frontalis*'.

Geographic Variation: Only in the females can any geographic colour variation be seen. Those from the south-west have darker (sooty) throats, and are darker dorsally than those from the east; it is only the odd bird that could be confused with them. Tasmanian females may tend to have 'browner' throats than those from the mainland but the difference is not significant.

As has been noted by Condon (1951) the 'characters' in males that have been used in the separating of races (size of white cap, amount of white on the outer tail feathers, intensity of scarlet on the breast) are of no significance. The males certainly do not vary geographically in colour.

Wing-length measurements (mm) of adult males from various parts of the geographic range are as follows: Emu Vale, Queensland (2), both 73; Blue Mountains, New South Wales (26), 75-80 (77); Dandenongs (5), 73-78 (75); Tasmania (9), 75-78 (76); Kangaroo Island (2), 78 and 76; south-eastern South Australia (4), 75-78 (77); south-western Australia (7), 73-77 (75).

It is obvious from the above that *Petroica multicolor* does not vary in size geographically.

The study of variation shows that the south-western isolate of *P. multicolor* has started to differentiate but the Tasmanian one has not.

Nomenclature: The following names should be reduced to synonymy of *boodang*: *leggii* Sharpe 1879 (Tasmania); *halmaturina* Campbell 1906 (Kangaroo Island); *frontalis* Mathews 1912 (Parwan, Victoria). This leaves the races:

Petroica multicolor boodang (Lesson) 1837: Eastern Australia and Tasmania.

P. multicolor campbelli Sharpe 1898: South-western Australia.

Petroica goodenovii (Vigors and Horsfield) 1827 (Red-capped Robin)

This species extends through the savannah and mulga areas of the continent. It avoids the sclerophyll and rain forest areas, which are occupied by the related species *P. multicolor*, *P. phoenicea*, and *P. rosea*.

In addition to the birds listed below two worn adult males from Alexandria were seen.

Geographical Variation: With the exception of slight paling in females from the drier areas there is no geographical colour variation in this species.

Wing-length measurements (mm) of adult males from various parts of the range of *Petroica goodenovii* are as follows: south-western Australia—Broome Hill (5), 64-67 (65); South Australia—Lyndhurst, Eyre's Peninsula (7), 62-66 (64); Victorian mallee (4), 63-64 (64); eastern New South Wales—Nepean River, Tarana, Bathurst (7), 64-67 (65); western New South Wales—Narromine, Lachlan River, Buckinguy (8), 64-66 (65); Cooper's Creek-Birdsville (2), 63 and 64; central Australia—Macdonnells and Ayer's Rock (7), 61-66 (64); Carnarvon (3), 63-64 (64); Mungi in Kimberleys (3), 61-67 (64); Darwin (1), 62; 'north Queensland' (3), 63-64 (64).

It is apparent that there is no size variation in *Petroica goodenovii*.

Nomenclature: Mathews has created a number of races on such characters as "large size", "brighter coloration above and more extensive below", "deeper red coloration on the forehead and breast", "longer bill", "paler coloration". None of these are, however, justified. Accordingly, the following names fall into synonymy: *ramsayi* Sharpe 1879; *quoyi* Mathews 1912; *ruficapilla* Mathews 1912; *alexandrae* Mathews 1912.

Petroica goodenovii is not divisible into races.

Petroica phoenicea Gould 1837 (Flame Robin)

Range: *P. phoenicea* extends through the coastal sclerophyll forests of eastern Australia from northern New South Wales (most northerly specimen is from Clarence River) to the Dandenongs, Adelaide, Bass Strait Islands, and Tasmania. It is an inhabitant of the highlands in the more northern parts of its range.

P. phoenicea is a winter migrant to South Australia, arriving in April and departing in July-August (Terrill and Rix 1950). These birds presumably come from Tasmania. The species sparingly visits the lowlands about Sydney in winter but whether these individuals are from the adjoining highlands (the generally-accepted theory) or the south is not known. It might be noted that Campbell (1909) considers that there is no migration between Tasmania and the mainland in *P. phoenicea*.

Specimens: Clarence River (2); Dungog (1); Blue Mountains-Cox's River and Lithgow (large series); Buckingbah (3); Murray River (1); Marrangaroo (2); Dandenongs (series); King Island (3); Cape Barren Island (2); Tasmania—Arve River, Railton, Launceston (series); Adelaide (series).

Geographic Variation: There is no geographic colour variation in this species, either in the males or in the females.

Wing-length measurements (mm) for adult males from various parts of the range are as follows: Clarence River (2), each 80; Blue Mountains (32), 78-83 (81); Melbourne (5), 80-83 (81); Adelaide (3), 81-82 (81); Tasmania (15), 79-81 (80). Most of the New South Wales specimens were collected during the autumn and winter, hence, theoretically, might be migrants from the south. Wing-lengths of a November male (79 mm) and three taken in August (79, 80, 83), plus similarity of the means of the northern and southern series demonstrate, however, that there is no geographic size variation in *P. phoenicea.*

Nomenclature: Variation in the amount of white on the forehead, introduced by Mathews as a race character, is of no geographic significance. There are no races in *P. phoenicea.*

Synonyms: *addenda* Mathews 1912; *albicans* Mathews 1912; *tasmanica* Mathews 1922.

Petroica rosea Gould 1839. (Rose Robin)

P. rosea ranges through the rain forests of the east coast from north of the Bunya Mountains to west of Melbourne.

Specimens: These have been seen from the Bunya Mountains, Tweed River, Sydney and Melbourne areas.

Geographic Variation: There is no geographic variation in colour.

Wing-length measurements (mm) for adult males from various parts of the range are as follows: Bunya Mountains (2), 63, 66; Tweed River (2), 65, 66; Sydney (12), 63-69 (66); Dandenongs (3), 67-68 (68). No geographic variation in size is indicated.

Nomenclature: Mathews has described a race (*queenslandica* 1916) from 'North Queensland' as paler than the nominate form. The type specimen of this form is not in the American Museum of Natural History and hence I am unable to report on it. As far as can be determined, however, *P. rosea* does not extend to north Queensland. Various lists (*e.g.*, Bourke and Austin 1947; White 1946) do not include it, nor have more recent observers (*vide* N. Chaffer, pers. com.) seen it.

In view of the general homogeneity of *P. rosea* it would appear best to drop '*queenslandica.*'

Petroica rodinogaster (Drapiez) 1819. (Pink Robin)

This is the Tasmanian breeding representative of *P. rosea* and is no more than a well-differentiated race of that form. A substantial number of these birds winter in Victoria. Some Victorians believe that *P. rodinogaster* occasionally breeds in that State (R. P. Cooper, pers. com.). Demonstration of this (no hybrids between *P. rosea* and *P. rodinogaster* are known) would, of course, indicate specific distinctness. I leave *rodinogaster* as a species until this matter is clarified.

Specimens: Tasmania (series); southern Victoria—winter migrants, collected April-June (series).

Geographic Variation: *P. rodinogaster* differs from the mainland *rosea* in its pale pink (instead of rose pink) ventral surface, and in the extension of the coloration right over the under-surface instead of being restricted to the breast and upper abdomen. Also, the back and throat are sooty-black in *rodinogaster,* not deep grey.

There is no difference in colour between Tasmanian birds, those from King Island, and winter individuals from Victoria.

Wing-length measurements for adult males (mm) are as follows:

Tasmania (12), 64-71 (68); Dandenongs (4), 65-70 (68).

Nomenclature: Mathews states that Victorian birds are "smaller and darker above" than those from Tasmania. His type of '*inexpectata*' 1912, is, however, an unusually small bird (wing-length of 65 mm, as against 68-71 in Tasmania) and hence exceptional. The colour difference stated does not hold.

Petroica cucullata (Latham) 1801. (Hooded Robin)

This sedentary robin ranges throughout the dry savannah and mulga areas of the interior of the continent, avoiding the more heavily timbered eastern and south-western zones. The range is apparently continuous around the periphery of the continent.

Specimens: Melbourne area (series); eastern New South Wales—Mulgoa and Blue Mountains (series); Kempsey (2); Adelaide area (5); Port Lincoln (2); Ooldea (1); western New South Wales—Moolah (4); Ayer's Rock (2); Macdonnell Ranges (5); Charleville and Cloncurry (2 each); Normanton (3); McArthur River (1); Alexandria (4); Goyder River (1); south-western corner (series); East Murchison (3); Dirk Hartog Island (2); Hamersley region (4); Derby (3); Mungi (1); Marngle Creek (5); Napier Broome Bay (2); coastal Northern Territory—Mary and Alligator Rivers, Glencoe (series); Melville Island (5).

Geographic Variation: The only geographic colour variation to be seen in *P. cucullata* is that the males from the north-west tend to have a little more white on the tail and the females would appear to be a little lighter on the dorsal surface than those from elsewhere.

The northern populations of *P. cucullata* are distinctly smaller than southern ones, the changeover apparently being clinal. Wing-length measurements (mm) of adult males are as follows:

East:—Melbourne Area (5), 98-101 (99); Sydney Area (10), 96-103 (99); Western New South Wales (2), each 99; Charleville (1), 92; Cloncurry (1), 93; Normanton (2), 90, 92; McArthur River (1), 91;

Central:—Adelaide Area (4), 94-100 (98); Port Lincoln (1), 96; Ooldea (1), 93; Ayer's Rock (1), 97; Macdonnell Ranges (3), 93-95 (94); Alexandria (2), 92, 95; Goyder River (1), 87.

Western:—South-west corner (8), 92-97 (95); East Murchison (3), 93-97 (94); Dirk Hartog Island (2), 95, 94; Hamersley region (1), 92; Derby (2), 88, 89; Mungi (1), 93; Marngle Creek (4), 89-94 (91); Napier Broome Bay (1), 94; Coastal Northern Territory (6), 87-94 (91); Melville Island (3), 86-90 (88).

Nomenclature: Names have been given to populations of *P. cucullata* as follows: *vigorsi* (Mathews) 1912 ("smaller wing"), *westralensis* (Mathews) 1912 ("again smaller . . . . . and with less white on the greater wing-coverts and outer edge of the secondaries"); *picata* Gould 1865 ("much smaller" than *cucullata*); *melvillensis* (Zietz) 1914 ("smaller than *subpicata*"); *subpicata* (Mathews) 1912 ("larger than *picata* and duller than *cucullata*"). It is clear that most of these 'races' merely represent scattered samples from different parts of the transition area from southern to northern type. There is no point in recognising other than:—

Petroica cucullata cucullata (Latham) 1801: Southern Australia.

Synonyms: *vigorsi, westralensis.*

P. cucullata picata (Gould) 1865: Northern Australia.

Synonyms: *subpicata, melvillensis.*

Petroica vittata (Quoy and Gaimard) 1830. (Dusky Robin)

This species, one of the more distinctive endemics of Tasmania, is an inhabitant of the scrubs and forests of the main island and Flinders and King Islands in Bass Strait.

Specimens: Large series from Tasmania, many specimens without precise locality; two skins from Flinders Island.

Geographic Variations: With the possible exception of the King Island population, which I have not seen, this species does not vary geographically. Flinders Island birds, stated by Mellor and White to be "much darker throughout" do not differ consistently in this way. Cape Barren Island, from which Mathews has described his race *'bassi'* (1914), lies close to Flinders Island which is included by him in the range of this form. The name can be reduced to synonymy. The King Island form (*'kingi'* 1914), described by Mathews as having a "buff breast instead of a grey one", could be distinct as the populations of several species are differentiated on this island. I have not, however, seen any material.

Measurements (mm) of adult male *P. vittata* from the mainland of Tasmania are as follows: Bill-length 11.4.12.7 (mean of 9, 11.7); wing-length, 86-93 (89); tail-length, 60-67 (62).

Nomenclature: *Petroica vittata vittata* (Quoy and Gaimard), 1830: Tasmania, Flinders, and Cape Barren Islands.

P. vittata kingi (Mathews) 1914: King Island (subject to confirmation).

Eopsaltria australis (White) 1790. (Yellow Robin).

(Figure 6.)

This species is basically an inhabitant of the coastal sclerophyll and rain forests. It extends from Cooktown (Mack 1953) to Millicent (Terrill and Rix 1951) in the east. In the western section there is an isolated population on Eyre Peninsula and another one ranging from the Murchison to Norseman (Serventy and Whittell 1948).

Inland range limits in the east correspond to 'outlyers' of forest and are now known fairly precisely. They are: Atherton Tablelands, Duaringa (Barnard and Barnard 1925), Carnarvon Range (skins), Toowoomba (E. Langton, pers. com.), Murphy's Creek (E. A. R. Lord, pers. com.), Moonie River near Mungindi (Elliott 1938), Moree (Sullivan 1931), Gilgandra (P. A. Bourke, pers. com.), Nyngan (A. R. McGill, pers. com.), Manilla and Cobborah (skins), Leeton (skins), Inglewood north of Bendigo (Favaloro 1953). Hence, though the main habitat of *E. australis* is in the better watered regions, in places it extends well out into the inland savannahs (on Eyre Peninsula into the 15-inch rainfall zone).

From the distributional point of view the absence of *E. australis* from the Mount Lofty ranges in South Australia (Ninety Mile Desert being a distributional barrier) and its occurrence on the eastern side of the Nullarbor Plain (that it must have crossed in former times) will be noted.

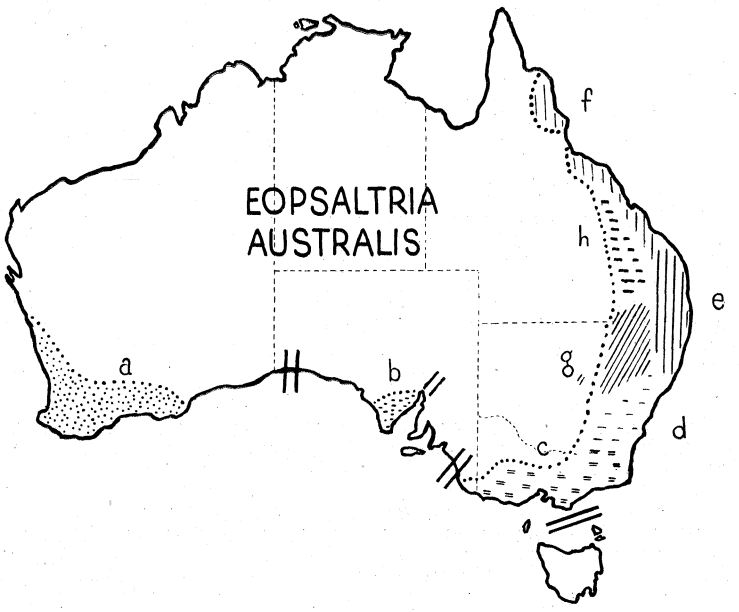

Fig. 6.—Isolation and variation in the Yellow Robin (*Eopsaltria australis*). The grey-breasted type obviously arose in the south-west of the continent and has secondarily recrossed the Nullarbor Plain to leave an isolate on Eyre Peninsula (b). Parallel lines indicate distributional barriers. a. *griseogularis*. b. *rosinae*. c. *viridior*. d. *australis*. e. *chrysorrhoa*. f. *magnirostris*. g. *austina*. h. *coomooboolaroo*.

Range limits are of necessity approximate. Distribution inland is discontinuous and ' spotty '.

Specimens: South-west corner of continent (series); Eyre Peninsula (5); south-eastern South Australia (4); Glenelg River (2); various localities in Victoria, mostly near Melbourne—Bayswater, Selby, Rosedale, Port Fairey, Mount Macedon, Black Spur (series); Yanco (2); Berrima (1); Narooma (1); Ulladulla (1); Lithgow (series); Sydney area (series); Cobborah (2); Dorrigo (series); Bellingen River, Nymboida, Port Macquarie, Armidale, Manilla (1 each); Richmond River (series); Tenterfield (1); Macpherson Range (2); Moreton Bay, Brisbane River and Stradbroke Island (series); Bunya Mountains (series); Gympie (2); Blackall Range (2); Mary River (1); Carnarvon Ranges (3); Duaringa area (3); Proserpine (1); Mackay (1); Bowen (2); Cardwell (3); Cairns area (series).

Geographic Variation: This species falls into three main colour types: Grey-breasted western birds (*griseogularis*), yellow-breasted south-eastern birds with olive-green rump (*australis*), and central- and north-eastern yellow-rumped birds (*chrysorrhoa*). Much controversy has surrounded the status of the last two forms.

The following races may be recognised in *E. australis*:

(*a*) Murchison to Norseman, south-western Australia; (*griseogularis* Gould 1838). The breast is grey, the abdomen yellow.

(*b*) Eyre Peninsula to Lake Dundas, South Australia: (*rosinae* (Mathews) 1912). Like *griseogularis* but the rump is olive-green instead of yellowish-olive as Condon (1951) has remarked.

(*c*) Millicent, south-eastern South Australia, to Victoria: (*viridior* (Mathews) 1912). These are greener on the dorsal and ventral surfaces than *australis* from Sydney.

Three specimens in the South Australian Museum Collection labelled 'Mildura' (coll. Cockerell) are most interesting. They have bright yellowish-olive rumps and the olive tones are much reduced dorsally. However, the species does not occur near Mildura (N. J. Favaloro, pers. com.), hence their origin is something of a mystery. They could represent an undescribed race.

(*d*) South- and central-eastern New South Wales (Yanco, Narooma, Ulladulla, Berrima, Lithgow, Sydney, Newcastle). This is *australis* (White) 1790.

(*e*) Northern New South Wales to central Queensland, coastal section east of Great Dividing Range: (*chrysorrhoa* Gould 1869).

This form is characterized by a bright yellow rump that renders it most conspicuous in the field. The breast is also brighter. Typical specimens have been seen from: Dorrigo, Port Macquarie, Bellingen, Richmond River, Armidale, Tenterfield, Macpherson Range, Moreton Bay, Stradbroke Island, Bunya Mountains, Blackall Range, Proserpine, Mackay, Bowen. The occurrence of 'duller' birds that approach the colouring of the brighter *australis* from Sydney will be noted in places. This applies to a couple of the Dorrigo series, a Nymboida bird, and one or two in the south-eastern corner of Queensland (*vide* a male from Pine Mountain in the Australian Museum). Such birds undoubtedly account for field records of '*E. australis*' in north-eastern New South Wales and southern Queensland (see discussion later).

(*f*) North-eastern Queensland (Atherton, Cairns, and Cooktown): (*magnirostris* Gould 1869). The colouring is like that of *chrysorrhoa* but bills and wings average slightly larger. I consider this a poorly-defined form. (See also remarks of North 1903).

(*g*) Central and northern New South Wales (inland): This is Mathews' *austina* 1915, described as differing from *australis* "in having the head and back grey, the latter altogether lacking the greenish tinge; the under-surface very much paler". The population actually also has a pale yellow rump, as was intimated by Mathews when he subsequently placed it in the synonymy of *chrysorrhoa*. Typical birds are from Cobborah and specimens from Tamworth and Manilla fit quite well.

(*h*) South-central Queensland inland—Carnarvon Range and Duaringa (inland from Rockhampton): This is *E. australis coomooboolaroo* Campbell 1913. It resembles the dry-country birds to the south in reduction of olive tones dorsally. The rump, however, approaches that of typical Sydney coastal birds. Campbell describes it as "wax yellow". I would call it "yellowish olive". Specimens in the Los Angeles County Museum from the Carnarvon Range (200 miles from the sea) are grey above and have an olive-green rump (two males and one female). Actually *coomooboolaroo* is not smaller than *chrysorrhoa*, as stated by Campbell. Its coloration obviously reflects the environment (dry scrub) in which it lives, although possibly some isolation is involved.

Size Variation: Wing-length measurements of adult males (mm) of *E. australis* from various parts of the range are as follows: South-western Australia (8), 84-90 (87); Eyre Peninsula (2) 90 and 95 (92); Glenelg River (1), 87; Melbourne area (6), 86-92 (87); Yanco (1), 86; Sydney (14) 86-91 (88); Lithgow (3), 88-92 (90); Dorrigo (5), 85-94 (90); Manilla (1), 91; Richmond River (4) 89-94 and one 97 (93); Bunya Mountains (5), 89-93 and one 96 (92); Carnarvon Range (2), 90 and 94; Coomooboolaroo (1), 91; Mackay (1), 89; Bowen (1), 91; Cairns (11), 88-93 and one 96 (91).

Wing-length measurements (mm) of adult females are as follows: South-western Australia, 83 and 85; Eyre Peninsula (3), 81-88 (84); Melbourne area (2), 78 and 82; Sydney area (6), 80-90 (84); Lithgow (3), 79-83 (81); Dorrigo (2), 82 and 87; Bunya Mountains (3), 82-87 (84); Coomooboolaroo (1), 83; Bowen (1), 80; Cairns (6), 82-87 (85).

Bill-length measurements have been made independently by the writer on specimens in the Australian Museum (measuring from the end of feathering to the tip) and by Dr. Ernst Mayr on the collection in the American Museum of Natural History (from depression at the base of the skull to the tip).

Bill (Males)

Writer's measurements (mm): South-western Australia (7), 10.5-12.0 (11.3); Port Lincoln (2), 12.2 and 12.4; Sydney (9), 11.0-12.0 (11.5); Dorrigo (5), 11.0-11.8 and one 12.5 (11.6); Manilla (1), 11.7; Cairns (6), 11.4-12.4 but one 10.9 (really a male?) and one from Kuranda 12.8 (12.0).

Dr. Mayr's measurements (mm): Sydney (6), 17.1-17.9 and one 18.7 (17.6); Lithgow (5), 17.8-18.3 and one 18.9 (18.2); Coomooboolaroo near Duaringa (1), 19.0; Mackay (1), (2), 17.4 and 18.9; Richmond River (3) 17.3, 18.9, and 20.6 respectively; Bunya Mountains 19.1; Bowen (1), 18.4; Cairns (7), 17.9-18.9 and one 19.5 (18.6).

Bill (Females)

The writer's measurements (mm): Sydney (6), 10.6-11.8 (11.0); Dorrigo (2), 11.4 and 11.5; Cairns (1) 10.7. Mayr's measurements: Lithgow (3) 14.9-16.3 (15.4) Sydney—two sub-adult, 17.0 and 17.1; Bunya Mountains (3), 15.8, 16.3, 17.1 (16.4); Coomooboolaroo (1), 15.9; Bowen (1), 16.0; Cairns (6), 15.5-16.5 (16.0).

The measurements indicate that in *Eopsaltria australis*, in contrast with most bird species, the northern populations are slightly larger than the southern ones (using wing-length as the criterion of over-all size). Bill-length measurements indicate that, although the north Queensland birds do tend to average larger in this character than those from further south, odd birds with large bills do occur in northern New South Wales. The status of the form *magnirostris* is accordingly doubtful.

Variation in E. australis *and the Environment*

(*a*) *Yellow rump in eastern Australia.*—Following reports that the olive-rumped and yellow-rumped 'species' of *Eopsaltria* coexisted in northern New South Wales and that the former occupied open forest and the latter rain forest, the writer circularized various field ornithologists during 1942-1943. There proved to be disagreement on the question. It was the opinion of L. J. Rhodes (letter of 14 March 1943) that, over a wide area of the north-east, one occurred in one habitat and the other in the second. H. E. Brenton (letter of 18 February 1943) and F. M. Irby (5 November 1942) agreed but stated that the two coexisted in the same forests. A. J. Elliott and M. Goddard, however, maintained that the two colour-types were nothing more than extremes of the same bird. Subsequently a fine series of specimens, forwarded by M. Goddard to the Australian Museum, amounted to proof positive that there was complete intergrading in the Dorrigo area.

Once adequate taxonomic material was assembled it was apparent that the Elliott-Goddard view was, in fact the correct one, there being intermediate individuals from other areas also, *vide* south Queensland. It was apparent, moreover, that northwards from Dorrigo the 'olive-rumped' birds amounted to no more than odd individuals in any population (see previously).

Subsequently, the writer sought to check the supposed link between forest type and rump-colour in the field. No such pattern presented itself. The field trip did, however, confirm the complete dominance of the yellow-rumped bird to the north of Port Macquarie

where, apart from rain forests, the sclerophylls proved to be of a denser, wetter, type than those further south. Inland in the north in the Armidale region, where forests did tend to be somewhat dry, the birds, though paler, nevertheless had yellow rumps, suggesting the influence of stock from the rain forests to the east.

The distribution of yellow-rumped robins corresponds fairly well with the southern limits of extensive tracts of tropical rain forest. It would seem that since they do not occur far south of Dorrigo and are replaced by olive-rumped birds under savannah conditions in central Queensland, that the character is in some way related to the warmer jungle habitat. *Eopsaltria* has the habit of clinging vertically to the sides of trees, in which position the coloured breast is obscured but the rump is visible. A bright rump would certainly render the owner conspicuous under open forest conditions. In jungle, however, camouflage is unnecessary and the coloured rump appears to fulfil the function of a recognition marking. In a letter to me, A. H. Chisholm has described the yellow rump as glowing like a piece of luminescent fungus in the dark jungle. As it is difficult to conceive of a past distributional barrier between *chrysorrhoa* and *australis* it would appear that the case is one of the environment controlling the development and maintenance of a character.

(*b*) *Grey breast in Western Australia.*—It is possible that this represents an expression of a need for more effective camouflage in this section for, next to the rump, the breast is the most conspicuous part of the bird. These populations are, however, isolated so that other factors may well be involved.

(*c*) *Loss of olive colouring and general drabness in dry areas.*—These trends seen in the inland populations, are simply expression of the Gloger Effect.

(*d*) *Size differences between southern and northern populations.*—Northern populations of *E. australis* would appear to average slightly larger than southern ones. The reason however, is obscure.

Nomenclature: *Eopsaltria australis griseogularis* Gould 1838: South-western Australia. *E. australis rosinae* (Mathews) 1912: Eyre Peninsula to Lake Dundas. *E. australis viridior* (Mathews) 1912: South-eastern South Australia to Victoria. *E. australis australis* (White) 1790: South and central eastern New South Wales. *E. australis chrysorrhoa* Gould 1869: Coastal northern New South Wales to central Queensland. *E. australis magnirostris* Gould 1869: Coastal north Queensland. *E. australis austina* Mathews 1915: Central and northern New South Wales (inland). *E. australis coomooboolaroo* Campbell 1913: Central Queensland (inland).

Mathews' races '*wongani*' and '*quoyi*' 1920 are synonyms of *griseogularis*.

Eopsaltria georgiana (Quoy and Gaimard) 1830 (White-breasted Robin)

This species is confined to the south-west corner of the continent, being most plentiful from Cape Naturaliste to Albany but occurring in gullies in the Darling Range north to above the level of Pinjarra (Serventy and Whittell 1948). It inhabits dense thickets fringing brooks and swampy areas.

E. georgiana is particularly interesting in that it is one of the only two birds species restricted to the south-west corner of the continent. Its origin is obscure.

Specimens: Series from King George's Sound, Wilson's Inlet, and Warren River.

Geographic Variation: This species does not vary geographically and I agree with Mathews in reducing his '*warreni*' 1916 to synonymy. Twelve males vary in wing-length from 74-82 mm (mean, 78). Bills vary from 10.9-11.7 mm (11.4).

Peneoenanthe pulverulenta (Bonaparte) 1851 (Mangrove Robin)

This species ranges along the northern coastline of the continent from Exmouth Gulf in the west to Cardwell in the east. The habitat is mangroves.

Specimens: Hampton Harbour, mid-west Australia 1—the type of *cinereiceps* Hartert); Derby (5); Napier Broome Bay (2); Alligator River (2); Melville Island (5); Normanton (3); Cape York (4); Rockingham Bay (2).

Geographic Variation: This is mainly in the dorsal coloration. The specimen from the 'mid-west', those from Derby and the two females from Napier Broome Bay, are distinctly paler (lighter grey) above than the typical. Melville Island and Alligator River birds are a stage darker towards the Cape York-east Queensland type. Birds from the intermediate dry area at Normanton are relatively pale above. The Normanton birds lack the greyish breast marking but so do many of the Melville Island birds.

Wing-length measurements of adult males (mm) are as follows: mid-western Australia (1), 87; Derby (3), 81-84 (83); Melville Island (3), 83-88 (85); Normanton (3), 82-85 (84); Cape York (4), 82-88 (86); Rockingham Bay (1), 87. No geographic size variation is indicated by these small series. Bill length (13.4-14.0 mm) does not vary geographically.

Nomenclature: Mathews described several races in *P. pulverulenta* on such characters as size, dorsal coloration, colour of head and lores. Subsequently Mathews reduced his Norman River, Napier Broome Bay, and Melville Island races to synonymy, leaving three as follows: *leucurus* (Gould) 1869—Cape York; *cinereiceps* Hartert 1905—mid-western Australia; *alligator* (Mathews) 1912—Northern Territory.

The best procedure, nomenclatorially, would appear to be to follow Mathews subdivision, but to include birds from the southern Kimberleys with *cinereiceps,* group the Northern Territory birds and the paler individuals from Normanton under *alligator,* and include the birds from eastern Queensland under the Cape York *leucurus.* Though *P. pulverulenta,* like all mangrove species, is undoubtedly "broken up" distributionally the nature of its geographic variation suggests Gloger influences to be operative and that variation is largely clinal.

Peneoenanthe pulverulenta leucura (Gould) 1869: Cape York and eastern Queensland.

P. pulverulenta alligator (Mathews) 1912: Gulf of Carpentaria to coastal Northern Territory.

P. pulverulenta cinereiceps (Hartert) 1905: Mid-western Australia to Kimberleys.

Under this arrangement *normani* and *greda* become synonyms of *alligator* and *connectens* of *cincereiceps.*

Heteromyias cinereifrons (Ramsay) 1875 (Grey-headed Robin)

This robin is confined to the rain forests of the Atherton area of north-eastern Queensland. It is a close relative of *H. albispecularis* of New Guinea from which it has just about reached that stage of differentiation entitling it to be called a species. The genus is absent from the intervening rain forests on Cape York so that the two stocks are isolated by 500 miles.

Specimens: Ten from the general Atherton-Cardwell area.

Geographic Variation: As would be expected from its restricted range there is no evidence of geographic variation in this species. Mathews' race *'athertoni'* was subsequently reduced to synonymy by its author.

Males vary in wing-length from 104-113 mm (mean of 7, 109). The bill ranges from 14.2-14.9 mm.

Poecilodryas superciliosa (Gould) 1847 (White-browed Robin)

This species extends along the northern coastline of the continent from about Derby in the north-west to Inkerman and the Burdekin Lakes in eastern Queensland. In the Derby area Rogers refers to the species occurring in the thick growth along river banks, whilst Elsey states that on the Victoria River it feeds on the ground and makes for pandanus thickets when disturbed (in Mathews, 1919-20; 8: 193). On Cape York the species is described (by Macgillivray) 1919-20 in Mathews 8: 189) as occurring along the edges of the scrub. Thomson (1935) refers to them being numerous in scrub fringing the Coleman River and in small areas of scrub that exists as 'outlyers'. Gilbert (1919-20 in Mathews 8: 189) states that along the Burdekin *P. superciliosa* inhabits the dense, jungle-like vegetation growing beneath the shade of fig trees along the banks. It would appear from the above that *P. superciliosa* is essentially a monsoon forest form and does not occupy mangroves. This is important in explaining its breaking up into north-western and eastern forms.

Specimens: Fitzroy River (5); Parry's Creek (5); coastal Northern Territory—Alligator, Daly, and Margaret Rivers (4); McArthur River (1); Gregory River (5); Cape York (2); Cairns-Cardwell (5); Inkerman (1).

Geographic Variation: *P. superciliosa* falls into two distinctive types.

(*a*) Fitzroy River in the Kimberleys to Gregory River in the Gulf of Carpentaria (*cerviniventris* (Gould) 1857). In this form the flanks are a pronounced rufous, the back is brownish and the top of the head is dark.

(*b*) Cape York to Inkerman (*superciliosa*). This form lacks the reddish colouring altogether and the flanks are plain like the breast.

Wing-length measurements of adult males (mm) from various parts of the range are as follows: Derby (4), 85-91 (88); Parry's Creek (3), 87-90 (88); coastal Northern Territory (3), 86-92 (88); McArthur River (1), 88; Gregory River (4), 83-91 (86); Cairns-Cardwell (3), all 82; Inkerman (1), 78. Eastern birds would appear to be smaller than those from the north-west and Northern Territory but more material would be necessary to prove this.

Mathews has described several additional forms in *P. superciliosa*. Cape York birds are said to be darker and smaller than those from further south in Queensland (*'yorki'* 1916). Kimberley birds are described as being different in having a grey band on the throat and the buff on the sides very much lighter (*'belcheri'* 1912). Derby birds are stated to have the fore-head brown instead of blackish and more white on the outer tail-feathers (*'derbyi'* 1913). The Gulf birds (*'gregori'* 1914) are said to have the band on the upper-breast much lighter, the belly and abdomen white, and the sides and flanks much less buff.

Nomenclature: I agree with Mack (1953) that only north-western and north-eastern forms should be allowed. Accordingly, *yorki* becomes a synonym of *superciliosa*, and *belcheri*, *derbyi*, and *gregori*, synonyms of *cerviniventris*.

Poecilodryas superciliosa superciliosa (Gould) 1847: Cape York to Inkerman.

P. superciliosa cerviniventris (Gould) 1857: Fitzroy River (Kimberleys) to Gregory River, Gulf of Carpentaria.

These forms are well-differentiated isolates approaching species status.

Tregellasia capito (Gould) 1954 (Pale Yellow Robin)

(Figure 7.)

This species ranges along the east coast of the continent from about the Williams River, New South Wales, to the Cedar Bay-Cooktown area. The habitat, rain forest, is broken up into a series of pockets.

Specimens: Series from northern New South Wales (Dorrigo, Bellingen River, Richmond and Tweed Rivers); single bird from Brisbane area; Cardwell and Cairns (series); Cedar Bay (3).

Geographic Variation: The species falls into two colour forms, differing in that the northern one (*nana* (Ramsay) 1878) has a rufous tint on the lores and round the eye, as noted in the author's original description. The distribution of these forms corresponds to the two main belts of rain forest (Fig. 6). There is no doubt that they are isolated from each other.

Wing-length measurements (mm) of adult males are as follows: Dorrigo (1), 84; Bellingen (4), 74-81 (79); Richmond River (3), 77-83 (8); Tweed River (1), 75; Brisbane (1), 82; Cardwell-Cairns (7), 72-77 (75); Cedar Bay (2), each 74. It is apparent that the northern form is the smaller. The northern form would appear to have the larger bill, as indicated by measurements (mm) of males: New South Wales (9), 8.8-9.4 with one at 9.8 (9.1); North Queensland (7), one 9.3 with others 9.7-10.0 (9.8).

Nomenclature: *Tregellasia capito capito* (Gould) 1854: New South Wales to the Rockhampton area of Queensland (Mack 1953).

T. capito nana (Ramsay) 1878: North Queensland from Cardwell to the Cooktown district. Mathews' *'barroni'* 1916 is a synonym if this form.

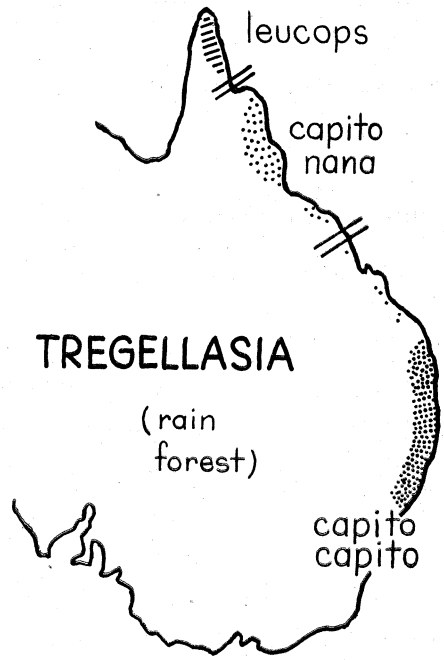

Fig. 7.—Distribution of forms in the rain-forest genus *Tregellasia* (large-headed robins). *T. capito* is broken up into a southern and a northern form by the extensive gap in its habitat in central Queensland. *T. leucops* is a New Guinea species that has established itself (like *Monarcha frater*, *Microeca griseoceps*, and others) in the rain-forests of northern Cape York.

Tregellasia leucops (Salvadori) 1876. (White-throated Robin)

(Figure 7.)

The Australian range of this New Guinea species extends southwards down eastern Cape York Peninsula to the Rocky Scrub district at the end of the northern rain forests (Mack 1953). It is the counterpart of *T. capito* in the Cape, inhabiting tropical rain forest.

Specimens: Odd birds from Piara (including type of Mathews' '*piara*' 1916), Claudie River, and 'Cape York', including type of Rothschild and Hartert's '*albigularis*' 1907).

Geographic Variation: The Australian populations are distinct from those of New Guinea (whole of throat white, etc.) and constitute a good isolate. As noted by Mathews, when he reduced '*piara*' to synonymy, and Mack (1953), *T. leucops* does not vary within Australia.

Three Australian males have wings measuring 77 (the type), 74, and 79 mm respectively. Two females, one of them the type of '*piara*', each have wings measuring 72 mm.

Tregellasia leucops albigularis (Rothschild and Hartert) 1907: Cape York (south to Rocky Scrub).

VARIATION AND SPECIATION

The various flycatchers differ widely in the extent and nature of their geographic variation. There are a number of well-differentiated isolated forms and others in which striking colour and size clines occur. At the other extreme several widely-ranging species do not vary at all geographically.

Speciation is occurring in a number of flycatcher genera. The number of morphologically differentiated isolates, forms that have the potential of developing into new species, is in the region of fifteen, or slightly less than one to every two species. This figure of course applies to the Australian continent only. These isolates are at different stages of differentiation. The most distinctive, the insular *Petroica rodinogaster*, has now demonstrated that it has reached species status by renewing contact with the parental *P. rosea* without interbreeding. Only slightly less distinct from their parental stocks are *Poecilodryas superciliosa cerviniventris* and *Eopsaltria australis griseogularis* and, at a somewhat lesser stage of differentiation, are *Rhipidura fuliginosa albicauda* of the central desert mountains, *Petroica multicolor campbelli* of the south-western sclerophylls, and isolates in north-eastern rain forest species (*Tregellasia capito nana, Monarcha trivirgata albiventris, Machaerirhynchus flaviventer secundus*).

Distributional barriers of fundamental importance in speciation in the Australian flycatchers may be summed up as areas of inhospitable terrain (from which the relevant habitat is absent) and areas of sea (*e.g.*, Torres Strait). It is significant that the land barriers breaking up the distribution of widely-ranging species tend to be the same from species to species and agree with those in other bird groups as well. Thus, in many species there is a distinctive north-eastern and north-western form isolated by the Gulf of Carpentaria and dry country about its head (*Rhipidura rufifrons, Myiagra rubecula, Piezorhynchus alecto.* (See Fig. 2.) A similar situation exists in the south where eastern and western populations of sclerophyll species are isolated by Spencer's Gulf and the Nullarbor Plain (*Eopsaltria australis, Petroica multicolor.* (See Fig 6.) Rain forest species have, in several instances, developed distinctive forms on either side of the gaps in that habitat in southern Cape York and southwards from Cardwell (Fig. 7). In odd instances, however, notably in the case of the savannah woodland *Seisura inquieta*, the isolating barrier is not readily apparent (Fig. 4).

Clinal variation, that, since no isolation is involved is of no immediate significance from the view point of speciation, is well developed in many Australian flycatchers. The bulk of the variation in the plastic *Rhipidura fuliginosa* (Fig. 1) comes into this category. The colour of *R. fuliginosa* would appear to be strongly influenced by the environment for populations inhabiting forested areas of high rainfall are dark grey in colour, whilst those in dry places are a lighter greyish-fawn. South-north clines of decreasing size (the ecophysiological basis of which is believed to be associated with questions of heat exchange) occur in many species, vide *Rhipidura leucophrys* (Fig. 3), *Petroica cucullata, Myiagra rubecula,* and others.

It might be noted, in conclusion, that the actual pigments in the make-up of species would appear to influence their potentiality to varying in colour geographically. Of six flycatchers that range widely through the continent the two that are grey-brown in colour (*Rhipidura fuliginosa* and *Microeca leucophaea*) vary in tone to a marked degree but the pied species (*Rhipidura leucophrys, Seisura inquieta, Petroica cucullata*) and the one in which black and red are dominant (male *Petroica goodenovii*) do not vary at all. The explanation obviously lies in the climate influencing some pigments but not others. It operates, of course, through the genotype, not the phenotype.

NEW NAMES

Genera: The name *Peneoenanthe* Mathews is reintroduced for the robin *Quoyornis leucurus* (R.A.O.U. *Checklist* 1926) = *Poecilodryas pulverulenta* (Mayr 1941).

NEW SYNONYMY

Genera: New synonyms are listed in brackets under the genera with which they have been grouped:

Genus *Monarcha* Vigors and Horsfield (synonym: *Carterornis*).

Genus *Petroica* Swainson (synonyms: *Amaurodryas* and *Melanodryas*).

Genus *Eopsaltria* Swainson (synonym: *Quoyornis*).

Races: New synonyms are listed in brackets under the races with which they have been grouped:

Rhipidura fuliginosa alisteri Mathews 1911 (synonyms: *victoriae* and *whitei*).

R. rufifrons rufifrons (Latham) 1801 (synonyms: *inexpectata, intermedia, kempi*).

R. r. dryas Gould 1842 (synonym: *parryi*).

R. rufiventris isura Gould 1840 (synonyms: *tormenti, macgillivrayi, superciliosa*).

R. leucophrys leucophrys (Latham) 1801 (synonym: *carteri*).

R. l. picata Gould 1848 (synonym: *utingu*).

Seisura inquieta inquieta (Latham) 1801 (synonym: *nea*).

S. inquieta nana Gould 1870 (synonym: *rogersi*).

Piezorhynchus alecto nitida Gould 1840 (synonym: *melvillensis*).

P. alecto wardelli Mathews 1911 (synonym: *campbelli*).

Myiagra rubecula rubecula (Latham) 1801 (synonym: *ringwoodi*).

M. rubecula concinna Gould 1847 (synonyms: *melvillensis* and *broomei*).

M. cyanoleuca (Vieillot) 1818 (synonym: *robinsoni*).

M. ruficollis mimikae Ogilvie-Grant 1911 (synonyms: *kempi, cooperi, tormenti.*

Monarcha frater periophthalmicus Sharpe 1882 (synonyms: *canescens, kurandi, claudia*).

M. trivirgata gouldi Gray 1860 (synonym: *stalkeri*).

M. leucotis Gould 1850 (synonym: *gracemeri*).

Microeca leucophaea leucophaea (Latham) 1801 (synonym: *victoriae*).

M. l. assimilis Gould 1840 (synonym: *howei*).

M. l. pallida De Vis 1884 (synonym: *subpallida*).

M. flavigaster flavigaster Gould 1843 (synonym: *melvillensis*).

M. f. terraereginae Mathews 1912 (synonym: *laetissima*).

Petroica multicolor boodang (Lesson) 1837 (synonyms: *leggii, halmaturina, frontalis*).

P. goodenovii (Vigors and Horsfield) 1827 (synonyms: *ramsayi, quoyi, ruficapilla, alexandrae*).

P. phoenicea Gould 1837 (synonyms: *addenda, albicans, tasmanica*).

P. rosea Gould 1839 (synonym: *queenslandica*).

P. rodinogaster (Drapiez) 1819 (synonym: *inexpectata*).

P. cucullata cucullata (Latham) 1801 (synonyms: *vigorsi, westralensis*).

P. c. picata (Gould) 1865 (synonyms: *subpicata, melvillensis*).

P. vittata (Quoy and Gaimard) 1830 (synonym: *bassi*).

Eopsaltria australis griseogularis Gould 1838 (synonyms: *wongani, quoyi*).

E. georgiana georgiana (Quoy and Gaimard) 1830 (synonym: *warreni*).

Peneoenanthe pulverulenta alligator (Mathews) 1912 (synonyms: *normani, greda*).

P. p. cinereiceps (Hartert) 1905 (synonym: *connectens*).

Heteromyias cinereifrons (Ramsay) 1875 (synonym: *athertoni*).

Poecilodryas superciliosa superciliosa (Gould) 1847 (synonym: *yorki*).

P. s. cerviniventris (Gould) 1857 (synonyms: *belcheri, derbyi, gregori*).

Tregellasia capito nana (Ramsay) 1878 (synonym: *barroni*).

ACKNOWLEDGMENTS

To the authorities of the American Museum of Natural History, the Australian Museum, the National Museum of Victoria, the West Australian Museum and the Los Angeles County Museum I should like to express my sincerest thanks for the opportunity to study the necessary material. I am also indebted to Dr. E. Mayr for making his measurements of *Eopsaltria australis* available to me. Figs 1, 3 and 4 are the work of Mr. B. Bertram, Australian Museum.

REFERENCES

Amadon, D. 1943. Bird weights as an aid in taxonomy. *Wilson Bull.* 55: 164.

Barnard, C. A. and Barnard, H. G. 1925. A review of the bird life on Coomooboolaroo Station, Duaringa District, Queensland, during the past fifty years. *Emu* 24: 252.

Bonaparte, C. L. 1850. *Conspectus Generum Avium.* E. J. Brill 1: 358.

Bourke, P. A. and Austin, A. F. 1947. The Atherton Tablelands and its avifauna. *Emu* 47: 87.

Campbell, A. G. 1909. The Flame-breasted Robin (*Petroica phoenicea*): a monograph. *Emu* 8: 122.

Condon, H. T. 1951. Notes on the birds of South Australia: occurrence, distribution and taxonomy. *S. Austr. Ornith.* 20: 37.

Elliott, A. J. 1938. Birds of the Moonie River District adjacent to the border of New South Wales and Queensland. *Emu* 38: 40.

Favaloro, N. J. 1930. Two Australian flycatchers. *Emu* 30: 161.

————————. 1931. Notes of a trip to the Macpherson Range, south-eastern Queensland. *Emu* 31: 49.

————————. 1953. Where 'Robins' meet. *Emu* 53: 223.

Fleming, C. A. 1950. New Zealand flycatchers of the genus *Petroica* Swainson. *Roy. Soc. N.Z. Proc.* 78: 14 and 127.

Gould, J. and Sharpe, R. B. 1875-1888. *The Birds of New Guinea and adjacent Papuan Islands.* Henry Sotheran, London 2: No. 42.

Iredale, T. 1956. *Birds of New Guinea.* Georgian House, Melbourne 2: 18.

Jarman, H. E. A. 1944. The Birds on Banka Banka Station, Northern Territory of Australia. *S. Austr. Ornith.* 27: 27.

————————, 1953. The R.A.O.U. camp-out in central Australia, 1952. *Emu* 53: 169.

Keast, A. 1957. Variation and speciation in the Australian Treecreepers (*Climacteris*). *Aust. J. Zool.* in press.

Lamm, D. W. and Calaby, J. H. 1950. Seasonal variation of bird populations along the Murrumbidgee in the Australian Capital Territory. *Emu* 50: 118.

Mack, G. 1931. The genus *Arses* in Australia. *Emu.* 31: 66.

————, 1953. Birds from Cape York Peninsula, Queensland. *Mem. Qld. Mus.* 13: 29.

Mathews, G. M. 1919-1920 and 1921-1922. *The Birds of Australia.* H. F. & G. Witherby, London, 8 and 9: 58 etc. and 1 etc.

————————. 1946. *A Working List of Australian Birds including the Australian Quadrant and New Zealand.* Shepherd and Newman, Sydney: 78.

Mayr, E. 1934. Notes on the genus *Petroica.* *Am. Mus. Novit.* No. 714: 11.

————————. 1941a *List of New Guinea Birds. Am. Mus. Nat. Hist.*, New York, p. 132, etc.

————————. 1941b. The generic classification of some New Guinea flycatchers (*Microeca-Poecilodryas* group). Notes on New Guinea birds VIII. *Am. Mus. Novit.* No. 1133: 6.

Mayr, E. and Amadon, D. 1951. A classification of recent birds. *Am. Mus. Novit.* No. 1496: 19.

Mayr, E. and Moynihan, M. 1946. Evolution in the *Rhipidura rufifrons* group. *Am. Mus. Novit* No. 1321: 15.

North, A. J. 1895. Preliminary descriptions of a new genus and five new species of central Australian birds. *Ibis* 17th Ser.: 340.

————————. 1903. *Nests and Eggs of Birds found breeding in Australia and Tasmania.* Australian Museum, Sydney 1: 139 and 185.

Prescott, J. A. 1931. The soils of Australia in relation to vegetation and climate. *Coun. Sci. Industr. Res. Aust. Bull.* No. 52: 1.

Serventy, D. L. and Whittell, H. M. 1948. *A Handbook of the Birds of Western Australia.* Patersons Press, Perth: 247.

Sullivan, C. 1931. Notes from north-western New South Wales. *Emu* 31: 124.

Terrill, S. E. and Rix, C. E. 1950. The birds of South Australia, their distribution and habitat. *S. Austr. Ornith.* 19: 82.

Thomson, D. F. 1935. *Birds of Cape York Peninsula.* Government Printer, Melbourne: 54.

Vaurie, C. 1953. A generic revision of flycatchers of the tribe Muscicapini. *Bull. Am. Mus. Nat. Hist.* No. 100: 530.

White, S. R. 1946. Notes on the bird life of Australia's heaviest rainfall region. *Emu* 46: 81.

Whitlock, F. L. 1924. Journey to Central Australia in search of the Night Parrot. *Emu* 23: 248.

Sydney: A. H. Pettifer, Government Printer—1957.