

THE DISTRIBUTION OF AUSTRALIAN LAND BIRDS (I). (PL. VII.)

BY ROBERT HALL, C.M.Z.S., COL. M.B.O.U.

(Read 8th August, 1910.)

Previously (2) I indicated the Geographical Distribution of Passerine Birds in Australia, and what appeared to me to be the directions of their expansion over the Continent.

The numerals (1 to 9) were placed upon those portions of the map which I considered to be the natural avifaunal areas. Had I then realised the order in which they spread over the Continent I should have placed 1 where 8 is, 2 where 1 is, and 8 where 7 is now, and so on, for convenience sake.

At that time, when dealing with the Passeres alone, the area 2 was strongest in species and area 3 in genera.

I expressed the opinion that the Passerine birds of area 2 had their origin in the old Papuan sub-region, and that the greater part of the remaining Passerine birds of Australia was derived from this area, travelling along three routes—from the N.E. to the W., from the N.E. to the S.E., and from the S.E. to the S.W. of the Continent (3). The present-day parrots do not lend themselves to any of these lines of expansion, a recent evolutionary centre appearing to have been in area 7. Taking for example the large genus, *Neophema*, we find the line 2, 1, 8 unrepresented, and with only a single species in area 9, as the tip of the western wing.

(1) Not including the migratory Charadriiformes and the swimming birds, and referring only to the Australian continent and Tasmania.

(2) Key, Bds. Austr. (1906).

(3) Pl. vii., indicating lines of expansion.

To strengthen that opinion, I have tabulated the whole of the Australian birds, and find the same comparison is equally strong with every area (4).

From the Papuan sub-region almost the whole of the present bird fauna appear to have had their origin.

Approximately 200 species of the 350 species of area 2 gradually emigrated from area 2 into area 1, while 170 species of the 250 of area 1 gradually emigrated into area 8, and gave it the greater part of its present avifauna. A census of the avifauna of Northern Australia shows that the greater part of the areas 2, 1, 8 is the same with regard to species, being numerically the strongest in species and genera in area 2, getting less in number as we travel from the Gulf country to the Fitzroy River country (area 8). That is the positive evidence. The negative is seen in the comparisons of the area 2 with 3 and 4, 1 with 7, 8 with 9.

In comparing areas 8 and 9 (1) I find area 8 has approximately 200 species, and area 9 also has 200 species. Common to both are 100 species, leaving 100 species in 8 and 100 species in 9 that do not encroach on each other's territory. The distribution of the species of this census shows that the 100 species of 8 are derived from 1, and the 100 species of 9 are mostly derived from 6 and 7. The reason surely lies with the desert between 8 and 9, and the desert of area 7, acting as a barrier to expansion. This does not exclude the migration of species between 8 and 9, which are a part of the 100 species common to both.

Area 8 is conspicuously made up of the genera of the north, derived from area 2, while area 9 is as prominently composed of the genera of the south, derived from area 6 and 4. This is exemplified in the Ploceidae of the north and in *Neophema* of the south.

Both areas 8 and 9 have scarcely any genera not represented in 2 and 4 respectively, while numerically they are very much weaker through the wave of emigration decreasing as it went westward.

(4) The distribution of the genera and species is where they more commonly occur, and certainly not as "accidentals;" further, sub-species recorded as such, and certain sub-species recently recorded as species, are mostly not included in the Tables. Gregory Mathews' Hand List has been referred to.

(1) See Table III.

In comparing the species of area 1 and 7 it is to be seen (1) that the birds of area 1 are derived from area 2, while the birds of area 7 are derived from 2, 3, 4, and 6.

The mass of the species that are found in areas 2, 3, 6, and 7 conjointly are not included in areas 8 and 1. It is noticeable in the census I prepared to get these data that areas 7 and 6 are strongly connected by common species. I take it that the Darling River and the Lake Eyre Basin, by means of their water ways, have been important feeders of the eastern half of area 7.

If the Cooper and Diamantina at one time flowed into the Murray Basin, this was certainly a good opportunity to reach Central Australia from the south-east. Since that period Central Australia had its Lake Eyre subsidence—a period of good food for the birds. Then followed the salting of the central lakes, and a period of great stress for all the animals. It is probable that the bird population was so reduced that a second series then worked up from area 6, like those of that area.

The Great Valley of South Australia in a series of suitable seasons would offer facility for birds of area 6 to emigrate into the valleys of the Cooper and Diamantina.

That the species of area 7, for the most part, came from areas 6 and 3, and for the least part from areas 2 and 1, appears to be so. The watershed between Hughenden and Cloncurry may have had some small barrier effect in the north.

In comparing areas 2 and 3 it will be seen that a strong affinity exists. In area 2 there are 342 species, in area 3 297 species. Excepting a few species these 297 are found in area 2. The further south this emigration course extends the weaker it becomes in species. The tables show the decreasing values of 2, 3, 4, and 5, indicating the area 2 to be by far the strongest in species; then 3, 4, and 5, each in order getting weaker than the last.

Between the Hawkesbury and Richmond Rivers (areas 3 and 4) we get a change of vegetation that affects the avifauna—a plant-zone barrier.

(1) See Tables I. and III.

Between areas 4 and 5 we have a water barrier. As Tasmania is considered to have been connected with Victoria in post-glacial times, it would appear as if such forms as *Menura*, *Psophodes*, and *Sphenura* would not enter the higher latitudes when they had the opportunity. This is so with a large portion of the birds of area 4. If they then existed in area 4, surely a larger proportion, including *Menura*, should be showing in area 5. Possibly *Menura* got further south, in area 4, as *Sarcophilus* and *Thylacinus* died out, and was not far enough south when the subsidence of Bass Strait occurred.

At the southernmost end (area 5) of this eastern course of emigration there are known to us only two genera peculiar to it, and one of them ill-defined (*Acanthornis*). Its close allies (*Acanthiza* and *Sericornis*) (1) are of a family that has mostly evolved its numerous species in Southern Australia, these two genera being scarcely represented in areas 2, 1, 8, though represented in New Guinea.

The western line of emigration, beginning at area 4 and continuing through 6 to 9, is one of much interest.

Area 9 has derived its avifauna from areas 7 and 6. Area 6 has derived a large portion from area 4. Area 7, adjacent to 6, has locally evolved a part of its species, and sent a portion of it to area 6.

Thus area 6 is larger in number of species than area 4, pointing to the favourable conditions for species making by the already mentioned waterways of the Eyrean sub-region.

That area 7 appears to derive its genera and most of its species from areas 3 and 6 may be deduced from the data of geographical distribution in the faunal sub-regions.

An examination of these data will show that it is, least of all, in harmony with the areas 8 and 1. It is not easy to prove that area 7 was not populated by immigrants from area 2, but it is easier to attempt to prove that it was in the greater part populated from areas 4 and 6.

(1) Strangely enough the two closest offshoots of *Sericornis* in Australia are at the opposite poles of its eastern range, viz., *Oreoscopus* in area 2 and *Acanthornis* in area 5. A comparison of the pterylosis of these three genera would be interesting.

From the same data I find that area 8 received its present genera and most of its species from area 1, which in its earlier turn received its forms from area 2. That is the northerly line of westerly emigration.

In considering the distribution of the present races of the genera, it would appear very much as if Western Australia had drawn its avifauna from Eastern Australia. *Lacustroica* (1) is the only genus peculiar to 9, while area 8 has only one genus peculiar to it. Of *Lacustroica* there are no external characters that lead one to see in it a remaining form of an old fauna, and there is nothing on the whole face of the avifauna of Western Australia to indicate a western origin.

Neither does the indication point to an Eyrean origin in so far as genera are concerned. There is in area 7 not a genus peculiar to it, all being eastern and south-eastern genera.

What the avifauna of 7 was like when the Thylacine wandered about Lake Eyre I am not prepared to say, except that I believe it originally came from the north-east of the continent.

It is the "dead heart" of Australia that has passed on to area 9 the present fauna, assisted by area 6, portions of which evidently have passed through the same troublesome period.

The inferences drawn show the gradual blending of the areas 1—9, directly or indirectly, into area 2, or less remotely into areas 2 and 3 combined.

We know that many of the Australian passerine genera are also represented in other zoological regions—the *Zosteropidæ*, *Dicaeidæ*, etc. (2).

A knowledge of the expansion of their areas would be interesting. *Zosterops*, from an Australian point of view, has four much deflected radii from the Papuan sub-region—(a) the northern coast of Australia; (b) the eastern coast of Australia, altering its course in area 4 to pass into area 9; (c) Japan via China; (d) South Africa via the horn of Africa and India. The distribution of each radius, broadly speaking, is a continental fringe.

(1) *Emu*, vol. ix., pl. 15 (1910).

(2) *A.A.A.Sc.*, Brisbane (1909), pl. p. 748.

RELATIONSHIP OF THE AREAS.

Considering first the area 2, we find four associations—New Guinea on the north, area 3 to the south, area 1 westward, and area 7 south-west. In comparing the birds of New Guinea with those of York Peninsula, we find that the birds of the Peninsula are more closely allied to those of areas 1, 3, 7 than those of New Guinea are to them. Area 2 and New Guinea have so many genera in common that Bowdler Sharpe united them as the Papuan sub-region. The Paradisea and Cassowary connect them (1). Area 3 is found by species to be more closely in association with area 2 than New Guinea is, and less closely as far as peculiar genera are concerned. There are at least five (2) conspicuous genera in area 2 that are entirely absent from area 3. Other than these, there are at least five (3) conspicuous genera in area 2 absent from area 1; and at least five (4) conspicuous genera in 2 absent from 7.

To indicate the strength of age of area 2 it may be seen that it has twelve well marked genera within it and peculiar to it as far as Australia is concerned. There are six more genera in area 3 than in area 2, but, excepting one, they are not peculiar to it.

A suggestion, in explanation, is offered when referring to area 3. The table III. shows 342 species as found in area 2.

GENERA IN AREA 2 NOT KNOWN IN
AREA 3 (5).

(21 Genera=12¼ Per Cent. of the 172 Genera.)

Gypoictinia	1, 2, 6, 9
Craspedophora	2
Phonygama	2

(1) As well as Graucalus (Coracina), Grallina, Pinarolestes, Microeca, Malurus, Gerygone, Drymaoedus, Cracticus, Eopsaltria, Cinclusoma, Climacteris, Pachycephala, Podargus.

(2) Craspedophora, Prionodura, Heteromyias, Arses, Calornis.

(3) Ptilorhis, Geocichla, Acanthiza, Meliphaga, Meliornis (all present in area 3).

(4) Cinnerys, Phonygama, Craspedophora, Calornis, and Ptilorhis.

(5) Most closely related to New Guinea genera.

Prionodura	2
Heteromyias	2
Machæorhynchus	2
Arses	1, 2
Scenopæetes	2
Oreoscopus	2
Cyrtostomus	2
Lamprocorax	2
Neochmia	1, 2, 8
Pitta	1, 2, 8
Syma	1, 2
Tanysiptera	2
Microglossus	2
Myristicivora	1, 2
Megapodius	1, 2
Rallina	2
Eulabeornis	1, 2, 8
Poliolimnas	1, 2

Area 3 is more closely allied to area 2 than it is to area 4, one reason showing in that it has 297 species to compare with 342 of area 2 (2), while it can compare with only 222 in area 4, and 243 in area 7.

A stronger reason of its closer affinity with area 2 is that the great bulk of its genera are allied to those of Papua.

Certain genera (2) of area 3 present in 2 and absent in 4 are examples.

Still there are forms (3) that appear to indicate other than a direct Papuan origin, unless the generic links have been weakened and the species rapidly evolved under the different conditions of Southern Australia. In the concluding part of this paper it is considered they have been evolved under the special Australian conditions.

The greater number of Passerine genera of area 3 over area 2 (Table I.—7 per cent.) may be marked of

(2) Bathilda, Poephila, Pseudogerygone, Poecilodryas, and Plectrorhynchus.

(3) Sericornis, Acanthiza, Ploceidae, Psittaciformes.

doubtful importance when such forms as *Myzantha*, *Aidemosyne*, *Cinclosoma*, and *Pterypodocys* are considered. Table II. shows area 2 to have 95 genera and area 3 to have 90 genera; while Table III. shows area 2 to have 172 genera and area 3 to have 173 genera.

The following table shows the genera of area 3 not found in area 2:—

GENERA IN AREA 3 NOT KNOWN IN
AREA 2 (1).

(22 Genera=12½ Per Cent. of the 173 Genera.)

<i>Hylacola</i>	3, 4, 6, 7, 9
<i>Sericulus</i>	3, 4
<i>Pterypodocys</i>	3, 6, 7, 9
<i>Stipiturus</i>	3, 4, 5, 6, 8, 9
<i>Sphenura</i>	3, 4, 6, 9
<i>Origma</i>	3, 4
<i>Chthonicola</i>	3, 4, 6
<i>Cinclosoma</i>	3, 4, 5, 6, 7, 8, 9
<i>Gymnorhina</i>	3, 4, 5, 6, 7, (8), 9
<i>Acanthorhynchus</i>	3, 4, 5, 6
<i>Myzantha</i>	1, 3, 4, 5, 6, 7, 8, 9
<i>Annelobia</i>	3, 4, 5, 6, 9
<i>Staganopleura</i>	3, 4, 6, 7
<i>Zonaeginthus</i>	3, 4, 5, 6, 7, 9
<i>Aidemosyne</i>	3, 7
<i>Atrichornis</i>	3, (4), 9
<i>Menura</i>	3, 4
<i>Callocephalon</i>	3, 4, 5
<i>Neophema</i>	3, 4, 5, 6, 7, 9
<i>Euphema</i>	3, 4, 5, 6, 7
<i>Pezoporos</i>	3, 4, 5, 6, 9

There are in area 3 certain genera absent in 2 while present in area 4. It is these southern and central genera coming into 3 from areas 4 and 7 that make the genera of area 3 numerically greater than that of area 2. But it is only to increase the number of genera, and not disturb the northern origin. Certain of the genera (2) in-

(1) Not having a northern distribution (8, 1, 2), with exceptions.

(2) *Atrichia*, *Meliornis*, *Aeluroedus*, *Piezorhynchus*, and *Eopsaltria*.

dicating this area as a well timbered and moist one, do not pass into area 7.

Area 3 contains 297 species, while area 7 contains 243 species, the bulk of which are derived from areas 3 and 6. The genus *Sericulus* is the only one peculiar to the area.

The Bassian sub-region in its low latitudes gradually loses the tropical and sub-tropical forms carried on with the stream from 3 into the northern part of area 4. Area 4 has its northern boundary between the Clarence and the Hawkesbury Rivers. There the northern rich scrubs cease, as do the fruit pigeons.

It has 222 species, which are more like those of area 3 than any other area excepting 5, which is simply a severed portion of 4, having an insular fauna, very slightly modified.

Of the 139 genera in area 4, four (1) are not to be found in area 3; twenty-two (2) in area 6; and forty (3) in area 5. This tends to show how the journey south gradually loses from the list of each area a growing number of genera. Twenty-five (4) are not to be found in area 7. Very few genera are added to area 4 from areas 7 and 6, and not any from area 5 (5), because there is no available continuous area from which to draw. The genus peculiar to area 4 is *Pycnoptilus*.

Area 5 but for Bass Strait would be the southern faunal end of area 4. The insular area is evolving species, though with one exception making no genera different from those in area 4.

Area 5 has 114 species. Of these, approximately, 100 are contained in the 222 species of area 4; thus about 100 have been lost to this last part of the course of the southern emigration. The subsidence that formed Bass Strait has not changed sufficiently the conditions of area 5 to make a specially noticeable change in its fauna.

- (1) *Calamanthus*, *Pycnoptilus*, *Monarcha*.
- (2) e.g., *Atrichia*, *Psophodes*, *Oriolus*.
- (3) e.g., *Ptilonorhynchus*, *Piezorhynchus*, *Aegintha*.
- (4) e.g., *Menura*, *Pycnoptilus*, *Sphenura*.
- (5) *Tribonyx* is accidental.

One genus absent from 6 that is present in areas 4 and 5 is *Cisticola*. *Cisticola* in emigrating from 4 to 5 did not get further south than the Bass Strait Islands.

Acanthornis is the only passerine genus peculiar to area 5, while *Tribonyx* is the second peculiar genus.

Area 6 with its 239 species appears to have been constructed from areas 4 and 7. It would seem as if it had drawn largely from area 4, then passed many of the species on to area 7, differentiated certain of them there, and had returned to area 6 a part of each of those species. By this means it could make a large list of species. The hawks and parrots so largely represented in area 7 are mostly common to area 6. These are barely represented in area 4, thus making a distinct difference by two important orders between areas 6 and 4.

Xerophila, *Amytornis*, *Oreoica*, *Drymædus*, and *Entomophila* are not found in area 4, being immigrants from area 7 to 6.

Eopsaltria, *Meliornis*, *Acanthorhynchus*, *Pseudogerygone*, and *Chibia* of area 6 are found in area 4, but not in area 7. All but *Chibia* continue their westerly course in area 9.

Origma, *Menura*, and *Pycnoptilus*, of area 4, do not find suitable country in area 6, and are absent from it.

This area is devoid of strong opposing characters when compared with area 7, but because of the forms that are passing through it and not through area 7, to area 9, it is sufficiently differentiated to be recognised as an avifaunal area. It is here that *Lipoa* and *Menura* almost meet—birds of the ultra-dry and ultra-moist country respectively.

Area 7 is the broadest—and the desert area. The relation of Passerine genera and species to the other areas is shown in Table I. It is seen how it is least of all in affinity with areas 8 and 1, and most of all with areas 6 and 3.

The generic relationship of area 7 with the other areas may be shown by stating the principal genera of 7 absent in the areas, as follows:—

Area 6.	Area 3.	Area 9.	Area 2.
Bathilda.....	Struthidea.....	Entomyza.....	Pteropodocys..
Emblema.....	Amytornis.....	Meliphaga.....	Acanthochaera.
Aidemosyne...	Drymaedus.....	Philemon.....	Amytornis.....
Myiagra.....	Calamanthus..	Staganopleura.	Calamanthus..
Gerygone.....	Entomophila...	Aidemosyne...	Staganopleura.

Area 4.	Area 1.	Area 8.
Chlamydodera.	Corcorax.....	Sericornis.....
Aphelocephala.	Cinclosoma...	Hylacola.....
Oreoica.....	Acanthiza.....	Megalurus.....
Entomophila...	Falcunculus...	Pteropodocys..
Emblema.....	Strepera.....	Strepera.....

The genera above as absent from area 6 have a northern and eastern distribution; those absent from area 3 have a dry country distribution (excepting certain of the Calamanthi); those absent from area 9 have an eastern distribution; those absent from area 2 have a southern and western distribution; those absent from area 4 have a distribution in districts of small rainfall; those absent from area 1 are genera with a southern distribution; while wanting in area 8 are Strepera and Megalurus, which are distributed all over the continent excepting the north-west; Hylacola and Pterypodocys not represented in Northern Australia; Sericornis and the other large and closely allied Acanthiza being scarcely, if at all, represented in North-west Australia.

Area 9 appears to have for its birds two places of origin—areas 7 and 6. The western plateau of Central Australia is continuous with that of the eastern portion of Western Australia. There is in fact no barrier across the whole of Southern Australia for those genera that can live in arid country.

In the south-west of area 9 there is a small area of country in which one may naturally be interested. It is isolated and separated from its like by about half of the continent. Its like is the south-east corner of Australia (area 4). Yet it has genera (1) that are found in area 4 and not in the intervening country.

(1) Psophodes, Atrichornis, and Sphenura.

There is still the feeblest kind of bridge in the broad tract of southland between Eyre Peninsula and King George's Sound.

I think when the *Diprotodon* was being embedded in the pleistocene limestone the conditions were favourable to the passage of those genera now in the south-west, and consequently not favourable to their return. I have collected *Diprotodon* remains on the southern end of Eyre Peninsula. These are now in the Tasmanian Museum. The disturbances which formed the great valley of South Australia rather dislocated the western emigration course of the most southern birds from area 4.

According to Professor J. W. Gregory (1) this is of much later age than either the marine clays or desert sandstone of the central plains of area 7.

The Table I. shows ninety-nine species of Passerine birds found in area 9. Of these, two-thirds are to be found in area 7, as well as two-thirds in area 6, while only one-quarter of them is to be found in area 8. The same table shows sixty genera. Excepting four genera the whole of these are to be found in area 6, and the whole of the same in area 7, excepting seven genera, while in area 8 there are twenty genera absent. The effect of an intervening desert on a fauna that is not a desert fauna is clearly seen in these western areas.

Looking at the western line of emigration in the north, we find area 1 is the first western offshoot of the southern part of the old Papuan sub-region.

A reference to the relation of species with other areas has been made, as above. Generically the position is a similar one, there being only six of the fifty-four passerine genera absent from area 2. By the time the passerine genera of area 1 had populated area 8 no less than nineteen of these genera were found to be absent in area 8. About one-third of the passerine genera of area 1 is absent from area 7, as follows:—*Poephila*, *Mumia*, *Neochmia*, *Calornis*, *Eopsaltria*, *Monarcha*, *Piezorhynchus*, *Arses*, *Poecilodryas*, *Oriolus*, *Sphecotheres*, and *Chibia*. Genera in area 1 other than passerine, and

(1) "The Dead Heart of Australia," p. 241 (1909). See Year Book Commonwealth 1910, Geological Map.

absent from area 7, are :—Alcyone, Syma, Centropus, Ptilopus, Columba, Myristicivora, Lopholæmus, Macroptylgia, Chalcophaps, Petrophassa, Eulabeornis, Poliolimnas, Hydralector.

To area 8 I have already referred with regard to its species. Of the order of Passeres (1)—45 genera 77 species—eleven genera and fifty species are not represented in area 9. Twenty-five per cent. of the passerine genera of area 8 are not known in area 9., 11 per cent. of area 8 are not known in area 1, and 33 1-3rd per cent. of area 9 are not known in area 8. Although 75 per cent. of the genera of area 8 are recorded as found in area 9, it does not follow that they got into area 9 by means of area 8, but rather that they emigrated into area 9 by means of areas 6 and 7.

The generic contrasts of areas 8 and 9 are shown in the following two lists:—

GENERA OF AREA 8 NOT IN AREA 9.

PASSERES.	OTHER ORDERS.
Pitta	Eurystomus
Neochmia	Alcyone
Poephila	Dacelo
Bathilda	Endynamis
Munia	Phasianus
Philemon	Ptilosclera
Tropidorhynchus	Petrophassa
Poecilodryas	Geophaps
Gerygone	Lobivanellus
Oriolus	Eulabeornis

GENERA OF AREA 9 NOT IN AREA 8.

PASSERES.	OTHER ORDERS.
Strepera	Annelobia
Gymnorhina (seen only in the southern part)	Acanthorhynchus
Falcunculus	Zonaeginthus
Eopsaltria	Atrichornis
Pterypodocys	
Sericornis	Lipoa
Acanthiza (1 species)	Coturnix
Psophodes	Neophema
Calamanthus	Spathopteryx
Aphelocephala	Polytelis
Acanthochaera	Glossopsittacus
Acanthogenys	Lacustroica

(1) Brit. Mus. Cat. Bds. (1877-1890).

The following tables give the distribution of certain genera and species:—

TABLE I.—PASSERES. (1)

Area	8	1	2	3	4	5	6	7	9
Species	94	120	190	153	121	55	117	126	99
Species absent in ..							(2)		
	1-20	2-44	3-82	2-53	3-28	4-14	4-53	6-29	6-37
	7-37	7-84	1-109	4-47	6-52	6-29	9-61	9-46	6-37
	9-50	8-65	7-121	7-71	7-66		7-24	3-49	8-72
					5-90			4-68	
								2-69	
								8-92	
								1-96	
Genera	45	54	77	83	71	34	65	66	60
Genera absent in...	1-5	2-6	3-11	2-16	3-4	4-1	7-5	6-5	6-4
	7-6	7-16	1-27	4-15	6-21	6-4	9-11	3-10	7-7
	9-11	8-19	7-30	7-28	7-25		4-17	9-16	8-20
					5-39			2-19	
								4-21	
								1-26	
								8-34	

TABLE II.—ACCIPITRIFORMES, PSITTACIFORMES
TURNICIFORMES, RALLIFORMES, COLUMBI
FORMES, AND THE NON-MIGRATING CHARAD-
RIFORMES.

Area	8	1	2	3	4	5	6	7	9
Species	107	124	152	144	101	59	122	117	106
Species absent in ..	1-14	2-11	3-31	2-18	3-8	4-2	7-19	6-13	6-17
	7-37	8-28	1-44	4-47	6-12	6-5	4-36	3-28	7-25
	9-23	7-55	7-67	7-48	7-26		9-37	2-36	8-27
					5-36			9-37	
								4-46	
								1-50	
								8-52	
Genera	77	81	95	90	68	50	80	79	78
Genera absent in ..	1-8	2-4	3-12	2-6	3-4	4-1	9-9	6-5	6-3
	9-17	8-8	1-24	7-23	6-5	6-2	7-10	9-9	7-3
	7-18	7-19	7-34	4-25	7-12		4-16	3-11	8-10
					5-17			2-13	
								8-15	
								1-19	
								4-22	

(1) Brit. Mus. Cat. Bds. (1877-1890).

(2) Not taking into consideration certain doubtful insular species.

In the distribution of the birds under review there are certain points of interest—

- (a) The genera and species are numerically strongest in areas 2 and 3, those of area 2 not represented in area 3 being northern or Papuan forms, while those of area 3 not in area 2 being mostly southern or central forms (probably evolved in Australia), approximate 12 per cent. of the whole in each case.

That the list of the genera of either area 2 or 3 is 16 per cent. stronger than the genera of any other area, while in species area 2 is approximately 20 per cent. stronger than area 3, and 33 per cent. stronger than area 7, the next in comparative strength.

- (b) The genera and species get less and less as they travel west from area 2 so far as the Fitzroy River (area 8), and that they are mostly Papuan forms, or closely allied to them (1).
- (c) The genera and species get less and less the further south they get from area 3, the tropical forms rapidly decreasing in number, and giving place to many Australian-born genera and species.
- (d) The desert barrier maintains a difference between the Passerine genera and species of areas 8 and 9.
- (e) Area 7 derives its avifauna principally from areas 3 and 6, while the birds of area 9 are derived from areas 7 and 6.
- (f) *Porphyrocephalus* appears to be the only genus common to areas 8 and 9, and peculiar to them, i.e., to the western third of the continent. There are many genera peculiar to the eastern third.

(1) W. V. Legge, "A.A.A.Sc., vol. x., p. 220, 1904." points out that the avifauna of the Northern Territory would be closer related to that of New Guinea if the physical features and vegetation were not so different. While Colonel Legge sees little affinity between the birds of my areas 8 and 1 and those of New Guinea, I am of opinion that their origin can be traced to New Guinea and to area 7, rather than to Western Austro-Malaysia.

Emblema is one of the few genera peculiar to the western and central thirds (areas 9, 8, 7, 1).

The eastern third is rich in bird-life, in genera, and species; the central third less so; while the western third is least of all, and not rich.

It would appear that the present avifauna of the continent of Australia has been derived for the most part from north-east Australia.

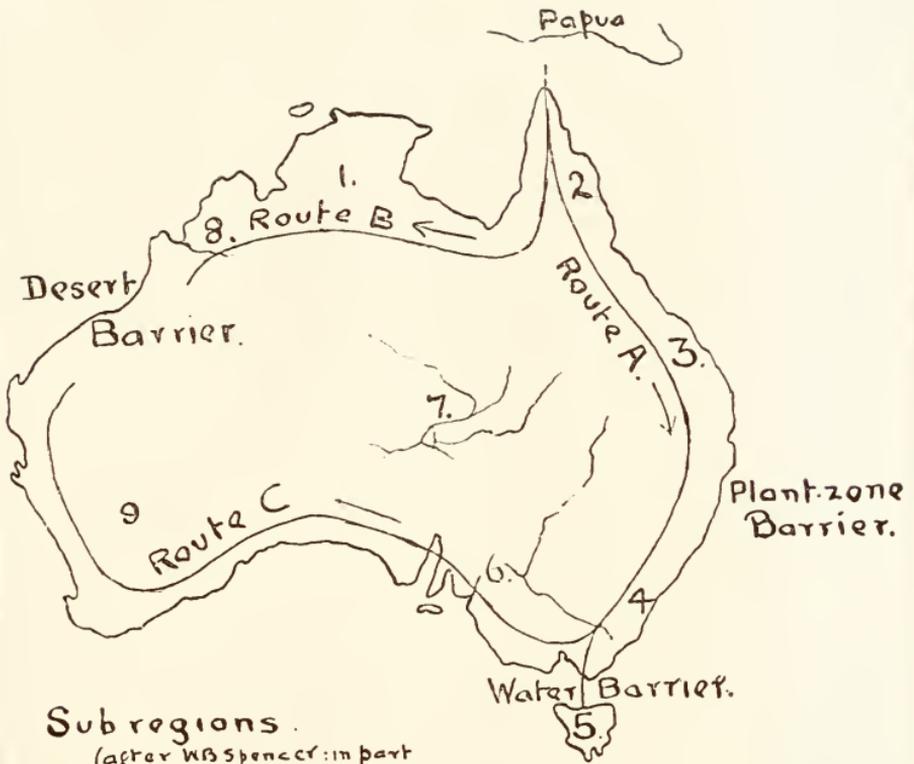
Mirafra, Pomatostomus, and Xerophila appeal to me as being among the few Passerine genera that entered Australia by way of the Timor-Australian land association. They are not Papuan, and the family is unrepresented in that area. Yet Xerophila has in New Zealand the allied genus Certhiparus.

Cape York Peninsula rather than the old connection with Timor is the door into Australia by which the Passeriforms have entered. The Indo-Malayan birds were probably not attracted to this continent, the character of the north-west being indicated in Timor. They passed on to Papua.

A third type of distribution, viz., that from the home nucleus, is shown in the Parrots, the Falcones, the Bowerbirds, and the Weaver-finches. Altogether the parrot tribe contains 500 species, well distributed in tropical and temperate countries, the Austro-Malayan being a sub-region of much interest in this respect. It is in Papuasias that we find the nucleus of the parrots of the Australian region, expanding north, east, south, and west. But this distribution from Papuasias specially refers to the fruit and honey-loving Parrakeets and Lorikeets, which may be claimed as being in particular Austro-Malayan. The Broad-tailed, and the Grass-loving Parrakeets, which make up two large genera, are purely Australian. Here we have a fine example of a large sub-region with a physiography of its own evolving the parrot tribe to its own end. This is so as well with the Ploceidæ.

Judging partly from the tables of genera found in area 2, and missing from area 3, and found in area 3 and

missing from area 2, the birds of North-east Australia, the stronghold of the birds of the continent, would appear to have had Papuasias as the main station from which emigrated the bulk of our birds. Following that a second and minor station appears to have come into existence, which probably evolved forms from their north-east ancestors, evolved in Australia, and consequently the true Australian fauna.



Sub regions.

(after W.B. Spencer: in part)

Torresian 8.1.2.3.

Bassian 4.5.

Eyrean 6.7.9.

Main Routes of Distribution.