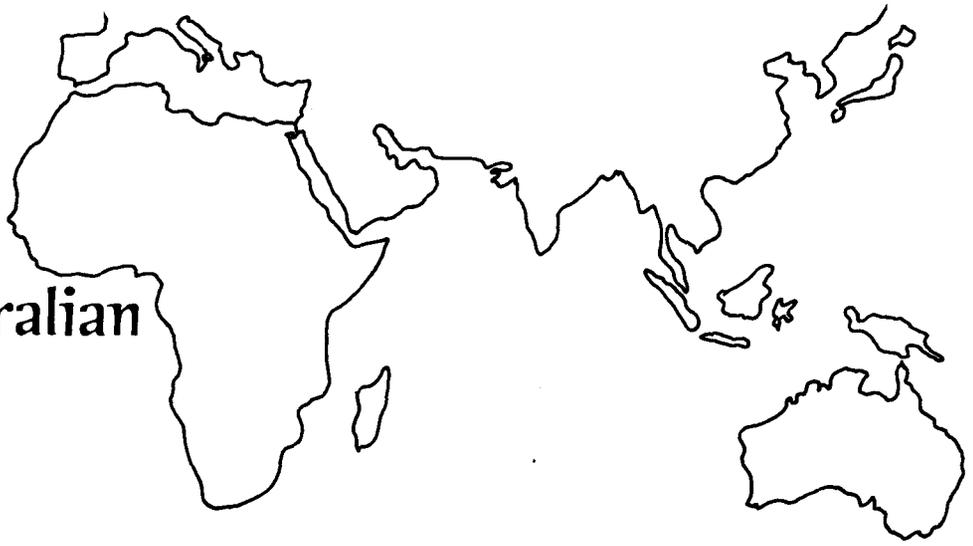


A Comparison Of African And Australian Grass Finches

By Klaus Immelmann



PART II

(Continued from Feb/March '76 issue)

IV. FLOCK FORMATION

Within the African and Australian species of Grass Finches, big differences in sociability exist. Inhabitants of dense vegetation types are solitary in habits, feeding singly, in pairs, or in small family parties all the year round and inhabit fairly large territory during the breeding season. The open country species, on the other hand, may form big flocks outside the breeding season. Some of them may even breed in colonies (see below) (Australia, Cayley 1932, Immelmann 1962, 1965; Africa, Roberts 1940, Chapin 1954, Mackworth-Praed and Grant 1963 a.o.).

Again these differences may be a consequence of different food sources. Grass Finches which have to search for evenly distributed but not very plentiful prey will be most successful when moving solitarily. Species which feed on locally super-abundant food can congregate more quickly at such areas and thus can better exploit the available food when moving in flocks (cf. Crook 1962 for Weaverbirds).

Except for the better utilization of food sources, however, sociability in arid country birds obviously still has another selective advantage (see below).

VII. SOCIAL COMMUNICATION

Forest Grass Finches usually have cryptic plumage colours without bright markings. As has been shown in the Australian *Zonaeginthus* species contact between the partners of a pair or a family party seems to be maintained mainly by different calls. The social open country species, on the other hand, have developed bright plumage markings contrasting strongly with the surrounding plumage, such as earpatches, collars, throat patches, face masks, etc. In many Australian Grass Finches the large and heavy bills (see below) are brightly coloured additionally.

The plumage markings as well as the beak colours may serve as social releasers and may thus—together with the calls—

help to keep a pair, a family, or a flock together. This function has been proved experimentally in the Australian *Taeniophgia guttata castanotis* (Immelmann 1959). Beak colours may even function as interspecific signals: In northern and central Australia several species of Grass Finches regularly form mixed flocks outside the breeding season. As I was able to show, only species with the same bill colour keep together permanently (Immelmann 1962b).

VIII. NEST SITE

Woodland Grass Finches are surrounded by a great variety of possible nest sites to choice. Usually they build their nests in dense bushes or trees where they are well camouflaged by the foliage.

In open country, the number of bushes and trees may be limited. For this reason, some species tend to build on the ground while others construct their nests between grass stems. Nests placed on the ground or between grasses are usually well camouflaged even in open country. The nests in bushes and trees, which are sometimes only sparsely covered with leaves may be more easily detected by predators. This disadvantage may be enlarged still further by the fact that many open country Grass Finches tend to breed in colonies (see above). For this reason, several species have evolved special methods for nest protection: They nest in terminal twigs overhanging water, in thorn trees, in the vicinity of stinging or biting insects, or in the stick nests of eagles and hawks (Australia: Cayley 1932, Hindwood 1955, Immelmann 1962 1962a, 1965 a.o.; Africa: Meyers 1935, Moreau 1942, Chapin 1954, van Someren 1956 a.o.). Similar adaptations have been described for the Weaverbirds (Crook 1963, Collias and Collias 1964).

In Australia, one more method of nest protection is to be observed which does not seem to have been noted in the Afri-

can species: The *Neochmia*, *Stizoptera*, *Poephila*, and *Taeniopygia* species occasionally construct their nests in hollow limbs of trees or in Kingfishers' holes in termite mounds. In *Chloebia gouldiae* hollow nests are even more common than freestanding nests in trees. The same applies to the South Pacific genus *Erythrura*.

V. NOMADISM

While the differences between forest and open country Grass Finches mentioned so far have to be regarded mainly as adaptations to the different *kind* of food and its *spatial* distribution, other peculiarities may be seen as adaptations to the seasonal distribution of food.

(1) In conformity with the absence of marked fluctuations in food supply, forest Grass Finches show a strong tenacity to the one environment throughout the year. In the Australian *Zonaeginthus oculatus*, for example, I regularly found the birds within their fairly large territories which under normal conditions they never seem to leave. The same persistence in one area has also been noted in the South Australian *Zonaeginthus bellus* (Ashby 1920).

(2) In arid country, on the other hand, Grass Finches (like other birds) are more or less nomadic. Their migrations are primarily forced by the lack of food or water during the dry season (cf. Keast 1960).

VI. SOCIAL BREEDING

As has been mentioned above, arid regions are usually characterized by marked seasonal fluctuations in food supply: There might be a surplus of seeds and insects during and shortly after the wet season while food may be scarce during the dry months. Consequently in most species of birds young can be reared only during part of the year and this fairly brief possible breeding period has to be used

for reproduction as efficiently as possible. Several adaptations have been developed for this purpose which I have described elsewhere for birds of northern and central Australia (Immelmann 1963).

One of these adaptations may be colony breeding. While forest Grass Finches typically are solitary breeders the arid country species often breed in colonies. In Australia, these colonies even tend to get more compact towards the arid centre of the continent. Such differences may occur even within a single species: In the Zebra Finch *Taeniopygia guttata castanotis* the breeding colonies I found in the coastal areas usually contained only one nest per tree. In arid central Australia, I found up to nine nests per tree even when equivalent trees in the vicinity were unoccupied. Near Oodnadatta, McGilp (1944) noted 21 occupied nests in a single tree.

In all northern and central Australian Grass Finches, the members of a breeding colony keep together very tightly. Neighboring pairs know each other and visit each other. Once or twice a day the members of one or several colonies come together for social meetings during which they feed together, bathe together, preen each other, etc. Several special behavior patterns seem to promote flock cohesion such as social preening, or social singing in duets and trios. *Poephila personata* possesses a special call which is used only during group encounters. In other species one bird may sing while other members of the colony are listening ("peering") (for detailed description see Immelmann 1962a). Several members of a flock, or a breeding colony may roost together in a single roosting nest, even when there are equivalent empty nests in the vicinity and even in the same tree. Such "social roosting" has been noted mainly in *Stizoptera bichenovii*. In Africa it has been observed in *Spermestes cucullata* (Vincent 1949, Bannerman 1949) which also inhabits open country types.

It has been suggested that mutual stimulation in breeding colonies may help to synchronize the group and to accelerate ovulation (Darling 1938, Marshall 1960 a.o.). It therefore seems almost certain that the above-mentioned special behavior patterns and joint activities, or at least part of them, may serve the same purpose. In this respect, they have to be regarded as being adaptations to the fairly brief breeding season in arid environments.

IX. NESTING MATERIAL

As mentioned above Grass Finches usually use grasses for nest construction. In the wetter regions of both continents,

most species prefer soft, green grasses while in the arid zones the birds have to rely on dry, stiff material. Special adaptations to the environment have been described in two Australian species: The southwest Australian *Zonaeginthus oculatus* builds its nests high in the forks of the outermost branches of eucalyptus trees. In contrast to the other Australian Grass Finches it uses liana-like twining plants for the outer construction of the nest. Consequently the nest is extremely tough and is very difficult to destroy even if a considerable pull is exerted. Since the terminal branches of eucalyptus trees are frequently swayed violently by strong coastal winds, the use of liana-like nesting material is highly adaptive (Immelmann 1959). The central Australian *Emblema picta*, an inhabitant of semi-desert country covered with "spiniflex grass" (*Triodia* spec.), shows another adaptation in nest construction: Before starting to build the proper nest, the birds will construct a platform for the nest to rest on. It consists of bark, small stones, clods of earth and a few short sticks or twigs and probably serves to prevent the sharp and pointed spiniflex-stalks from penetrating into the nest and from hurting eggs and young (Immelmann 1962). As far as I know, similar adaptations have not yet been described in the African Grass Finches. They have been mentioned, however, by Crook (1963) for the African Weaverbirds.

As far as the nesting-habits are concerned, an interesting difference between African and Australian Grass Finches has to be mentioned. In Africa there are numerous species of Weaverbirds and Sunbirds which build domed nests similar in construction to the nests of Grass Finches. Most of them are extremely tough and may outlast many breeding seasons. As their owners build a new nest for every brood there is a fairly large number of unoccupied nests available to other birds. For this reason it is not amazing that many Grass Finches use old nests for breeding. This habit has been described for several species of *Nesocharis*, *Clytospiza*, *Lagonosticta*, *Uraeginthus*, *Estrilda*, *Amandava*, *Amdina*, *Euodice*, and *Spermestes* (Roberts 1940, Bannerman 1949, Chapin 1954, 1959, Mackworth-Praed and Grant 1963 a.o.). In *Amandava subflava* the habit of nest usurpation has become so strongly developed that it builds its own nest only in emergency cases. In Australia, on the other hand, Weaverbirds and—with one exception—Sunbirds are lacking. Consequently, Grass Finches have to build their own nests. Only occasionally an old nest of another Grass Finch or of a

continued on next page

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Babbler (*Pomatostomus*) or a Thornbill (*Acanthiza*)—the only other passerine birds which build domed nests in Australia—may be used.

Another interesting feature occurring in African Grass Finches is the so-called “cock’s nest” which is built on top of the proper nest in some *Estrilda* species and in *Hypargos niveoguttatus*. Though several theories as to the purpose of the second nest have been developed, I agree with Delacour (discussion in R. Chapin 1959) that it is just a functionless outcome of the male’s urge to build. Curiously enough, this habit has never been observed in any Australian species. Anyhow, the same overpowering impulse is likewise seen in the nest-building habits of the Australian Crimson Finch *Neochmia phaeton*. In this species, several nests are constructed consecutively prior to the final acceptance of one in which the eggs are laid and incubated. In the Australian Zebra Finch, the male has been observed beginning new nests while the female is incubating but obviously these “cock’s nests” are never built on top of the proper nest. Interestingly enough, however, quite another group of Australian passerine birds, the Thornbills (*Acanthiza*) build similar “cock’s nests” on top of the nest chamber. Here, too, it has been suggested—besides many other theories—that the construction of the upper nest is due to the persistence of the male bird’s nest-building impulses long after the essential nest is completed (Hindwood 1947).

X. DRINKING HABITS

Finally a special adaptation to arid environment may be mentioned which is to be found in several Australian Grass Finches (*Zonaeginthus guttatus*, *Bathilda ruficauda*, *Chloebia gouldiae*, *Taenopygia guttata*, *Stizoptera bichenovii* and the three *Poephila* species): Unlike all other passerine birds these species drink by sucking in a pigeon-like manner (Plate I). Sucking bouts of 21 seconds duration have been observed in *Poephila acuticauda*. Probably this form of drinking originated as a method of taking dew from the surface of leaves. Sucking offers a twofold advantage to the birds: It enables them to exploit even the smallest amount of water (e.g. in muddy soil) and at the same time reduces the time needed for drinking at the open water hole where the birds usually are completely unprotected against predators. For these reasons, sucking can be regarded as an adaptation to life in dry open country. Consequently it is mainly the dry country species which drink by sucking whereas the inhabitants of the wetter coastal areas

employ the usual method of passerines by drinking in single sips with lifting the head. Within the Australian Grass Finches sucking seems to have developed several times independently within different species groups (Fig. 1). As far as we know this behavioral adaptation is not found in the African Grass Finches.

CONCLUSIONS

It will have been noted that most examples I have mentioned for demonstrating connections between ecology and behavior in Grass Finches are drawn from Australian species. There is a simple reason for this: They are just much better known in this respect than their African relatives. The data available, however, suggests that there are striking similarities of adaptive radiation on both continents. A main purpose of this paper was, therefore, to conduct attention to this interesting field of research. Very similar adaptations to environmental factors have been described by Crook (1961, 1962, 1963a, b) for the Weaverbirds.

Except for the relations between ecology and behavior the comparison of African and Australian Grass Finches leads to still another conclusion: There seem to be more arid country Grass Finches (in regard to the number of species as well as to the number of individuals) and more marked adaptations to arid environment in Australia than in Africa. Probably this is a consequence of the complete lack of other seed-eating

passerines in Australia. In Africa some ecological niches are filled by Weavers (Ploceidae) or Finches (Fringillidae) which are totally reserved to Grass Finches in Australia.

(1) Forest Grass Finches feed mainly on a mixed diet of various plants, buds, berries, and insects, while open grassland species feed almost entirely on grass seeds.

(2) Most forest species have a weak pointed bill, while the beak of the open country species is powerful and typical finchlike.

(3) Forest Grass Finches are solitary and show strong tenacity to the one environment. Open country species may form big flocks outside the breeding season, may breed in colonies, and may be somewhat nomadic in habits.

(4) For this reason, the latter have developed several “social” behavior patterns which promote flock cohesion and mutual stimulation for breeding birds.

(5) Communication between members of the same species is mainly acoustic in the forest Grass Finches but mainly optical in the grassland species. Accordingly, the latter have evolved bright plumage markings and bill colours while the forest species are rather cryptic in colouration.

(6) Australian arid country Grass Finches have developed a special method of drinking (sucking in a pigeon-like manner) which reduces the time needed for drinking and allows them to exploit even the smallest amount of water.

PLATE I



Australian Zebra Finch *Taenopygia guttata*, drinks in a pigeon-like manner.

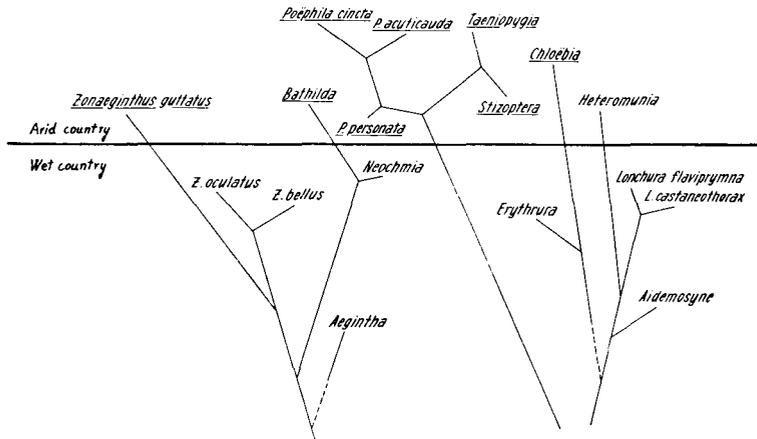


Figure 1. Ecological distribution of pigeon-like drinking within the Australian Grass Finches.

SUMMARY

In Africa and Australia, Grass Finches show an extensive adaptive radiation within different vegetation zones: dense rain-forest, open sclerophyll forest, open savanna country, grassland, and even semi-desert country. From various morphological characters it seems to be clear that the most primitive species inhabit

an intermediate type of vegetation (open sclerophyll forest or savanna woodland), while the more advanced ones have penetrated both into dense forest and into open grasslands. This radiation seems to have occurred several times independently in Africa as well as in Australia. Accordingly, parallel adaptations in behavior and breeding biology have been evolved in the different ecological groups ■

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