THE UNEQUAL DISTRIBUTION OF SOME INVERTEBRATE ANIMALS IN SOUTH AFRICA*

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ABSTRACT

The South African region is divided by a mountain barrier skirting the southern and eastern seaboards of the sub-continent into two faunistic zones; an inland zone which includes all the arid or semi-desert areas but no natural forest, and the more fertile coastal zone which contains all the indigenous forest. The last named is regarded as an area of 'potential forest' and supports the bulk of the terrestrial invertebrate fauna of South Africa, with the exception of the insects, and most of the indigenous and peculiar species.

The two zones are characterized by marked differences in the number of species of certain invertebrate groups. In typical moisture-loving orders such as the harvest spiders and millipedes 92 and 81·5 per cent respectively of the species live in the zone of potential forest; in xerophilous orders on the other hand, such as the scorpions and Solifuges, 70 and 68 per cent respectively inhabit the inland zone.

THE South African region can in general be divided into two fairly distinct faunistic zones by a number of mountain ranges which skirt the southern and eastern seaboards of the subcontinent; these together make up an almost continuous chain, forming a kind of mountain rampart which, in its eastern half, has been called by geologists the 'great escarpment.' In the south this mountain barrier is composed of the Zuurberg and Langeberg ranges, in the south-east of the Stormberg and Drakensberg mountains; the last named is the longest and most formidable of the series, forming the north-western boundary of Natal and Zululand before it turns almost due north along the eastern borders of the Transvaal as far as the Zoutpansberg; a northern extension of it also forms part of the eastern boundary of Southern Rhodesia.

The inland zone, separated from the seaboard by this natural barrier, is characterized by a number of enormous and elevated plateaux which consist of wide monotonous plains becoming progressively more arid towards the western coastline, where in parts at least, desert conditions prevail, with large sandy and treeless stretches. The rainfall of this zone in general is subject to considerable fluctuations, with periodic droughts: the run-off of what rain is deposited, is considerable, and little is absorbed by the sun-baked top-soil, which is shallow, poor in quality, and liable to extensive erosion by wind and water. In the most extreme examples of this zone, the coastal regions of Namaqualand and South West Africa, vegetation is scanty and trees, if they exist at all, are few and scattered. A forest climax is unknown.

The zone lying to the south and east of the great mountain barrier is very different; it consists of low-lying slopes, often broken by successive terraces of smaller ranges between the sea and the foot of the escarpment; most of its area lies at a far lower altitude than that of the inland plateaux. This narrow belt between the escarpment and the sea in general enjoys a higher and more dependable rainfall than the hinterland, most of it being derived from warm moisture laden winds carried in from the sea. These winds strike against the elevations of the escarpment and deposit rain. The general level of the ground is more broken and the soil much more porous, so that vegetation is rich and abundant.

For these reasons the coastal zone contains practically all the natural forest which exists in South Africa, even though the forest region is an extremely small fraction, 0·2 per cent, of the total area of the whole country. Although this forested area is of insignificant size, existing for the most part only as small isolated patches, the whole of this coastal zone can be regarded as an area of potential forest and it is the only part of the South African region in which a forest climax is possible.

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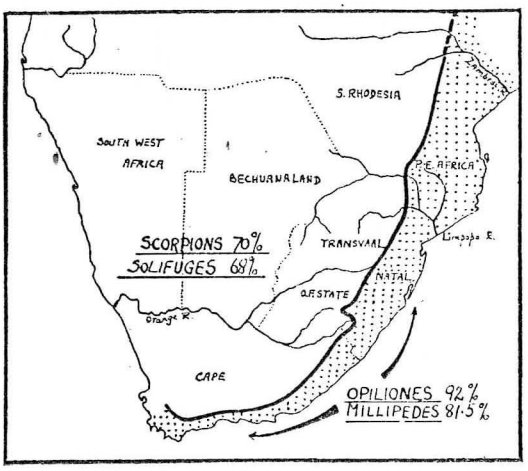

Fig. 1

A map of the South African region showing how the zone of potential forest (stippled area) is separated from the inland unforested zone by the great escarpment. Moisture-loving orders of invertebrates (Opiliones and millipedes) are represented by a predominant number of species in the forested zone, xerophilous orders (Scorpions and Solifuges) being predominant in the semi-arid inland zone

Faunistically the life of these two zones is as different as the climatic and topographical conditions which characterize them. The long and fairly narrow strip of fertile land which forms the coastal area is inhabited by a forest fauna which, compared with that of the bare table-lands of the interior, is homogeneous and strikingly similar throughout its 1,500 miles. The various invertebrate phyla, classes and orders which make up this fauna are represented by the same genera throughout the whole region or by very closely allied genera, while in one or two cases the same species may occur from the Cape Peninsula to the Zoutpansberg in the Transvaal. This assemblage of animals is a characteristically forest-living one since its members are seldom found in the tree-less plains of the interior.

Many of the orders which are well represented in the coastal zone are either entirely absent or greatly reduced in numbers of species and individuals in the inland zone. The forest-living Onychophora, the terrestrial Planarians and the terrestrial Amphipoda are not found to the north and east of the great escarpment at all; other groups such as the Mollusca and various groups of small Apterygote insects fall off very greatly in numbers. In most other invertebrate orders, however, some representatives are found in both zones, but there is a very considerable discrepancy in the distribution of the species population of the two regions, and the species themselves are quite different. As an illustration of this unequal distribution four orders of invertebrates have been chosen, two of them typically forest-living and two adapted to dry and semi-desert conditions, the number of species of each order found in the two regions being compared against each other.

The Opiliones among the Arachnida and the Diplopoda among the Myriopoda are almost exclusively shade and moisture-loving Arthropods. Taking the millipedes first, about 155 species live in the zone of potential forest as compared with only 35 in the far more extensive table-lands of the interior. If we exclude the worm-like millipedes or Juliformia, which contain all the large-bodied examples of the South African fauna, the difference in the number of species is still more striking, being 90 and 7 respectively. Thus along the first 450 miles of the southern sea-board of South Africa from Cape Town eastwards, nearly the whole of the Diplopod fauna is concentrated in a narrow coastal strip which does not extend much more than 50 miles inland. The great majority of these forest-living forms are small to moderate in body size so that those belonging to the suborders Oniscomorpha, Polydesmoidea and Colobognatha tend to live almost entirely along the coastal forest belt; conversely the inland forms are composed predominantly of large-bodied millipedes with extremely thick and powerful body coverings; these in South Africa all belong to two subdivisions of the Juliform millipedes, the Spirostreptoidea and Odontopygidea. The species of Diplopoda with the widest distribution are also found among these two tribes of large-sized millipedes, all the forest-living species on the other hand being peculiar to South Africa and with a very localized distribution.

Of the Harvest-spiders (Opiliones), 138 species live in the areas of potential forest and only 12 inland. The great majority of the former belong to a single family, the Triaenonychidae, which has a far greater abundance of representatives at the southern apex of the continent than in any other region of Africa. The members of this family appear to have southern Africa as

their centre of dispersal but have been unable to spread very far from the coastal region where they are so highly concentrated. Towards the north the number of species becomes progressively less, especially on the western side of Southern Africa where the Namaqualand and Kalahari deserts seem to have interposed an impassable barrier to their dispersal northwards; thus only one species is found in South West Africa and none in Angola, though one or two occur in the forests of the eastern borders of Southern Rhodesia.

Another family, the Assamiidae which is represented in the coastal zone by only one species, seems to have displaced the South African Triaenonychidae in the more tropical regions of Africa; at least 3 species of this family are found in South West Africa, 11 in Angola, while the bulk of the fauna of central Africa appears to be composed of Assamiids.

As opposed to the humicolous harvest-spiders and millipedes, the scorpions and Solifuges among the Arachnida are taken as examples of animals which live and flourish in dry and desert surroundings. In these two orders there is a reversal of the population density with regard to numbers of species, the inland zone supporting a considerably greater number than the forested one. The number of scorpion species living in the semi-desert inland zone of South Africa is 66, in the area of potential forest only 28, while in the case of the Solifugae the numbers are 102 and 48 respectively; the discrepancy in the number of species living in the two types of habitat is thus not so great as in the case of the millipedes and Opiliones; while twice as many Solifuges and Scorpions live in semi-desert areas as in forested ones, six times as many millipedes and Opiliones live in forested areas as in semi-desert ones, suggesting that it is easier for some of the xerophilous species to exist in fairly humid surroundings than it is for forms requiring a high degree of humidity to survive the rigorous conditions of life in the open.

As has been said, the inland zone lying behind the great escarpment is very much larger in area than the coastal zone and it will be more advantageous to compare two areas of approximately the same size, Little Namaqualand (from Clanwilliam to the Orange River) and the Natal-Zululand province. In the dry and stony region of Little Namaqualand 40 species of Solifuges and 25 of scorpions occur; in the well forested Natal-Zululand area only 7 and 12 species of these two orders of Arachnids.

We thus have in South Africa a small, temperate, fertile and well-watered zone lying side by side with a large semi-desert zone liable to periodic droughts, rapid soil erosion and all the concomitants of these two evils. For the ecologically-minded zoologist the situation presents unique opportunities for comparing two extreme types of physiological adaptation, the xerophilous animals of the arid interior and the forest-living ones, which are in many cases restricted to a highly humid atmosphere, often near saturation point.

It can safely be said that the zone of potential forest not only supports most of the Harvest-spiders and Diplopoda, but also the bulk of the South African Arachnida and Myriopoda in general and most of the terrestrial Crustacea, Mollusca, terrestrial Patyhelminthes and Annellida.

The oldest and most interesting members of South African animal population are thus crowded into a narrow strip along the southern and south-eastern coast lines. All the species of invertebrate animals found here are indigenous and peculiar to South Africa and they greatly exceed in numbers, both of individuals and of species, those found in the whole of the remainder of the region, a territory vastly greater in extent but much less favoured climatically.

Drawing board for blind children

A teacher at a Moscow school for blind children has invented a board which enables his pupils to draw. They are supplied with a mastic and modeling tools with which they can make original relief drawings, or produce diagrams for their science classes. In this way the blind children learn more easily, and get a better conception of space.

—U.N.E.S.C.O.