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The Ecology, Morphology, Distribution and Speciation of a New Species and Subspecies of the Genus Egernia (Lacertilia: Scincidae)

By
HAROLD G. COGGER

Pages 95–105 Plates I and II Figs 1–3

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THE ECOLOGY, MORPHOLOGY, DISTRIBUTION AND SPECIATION OF A NEW SPECIES AND SUBSPECIES OF THE GENUS EGERNIA (*Lacertilia : Scincidae*)

By HAROLD G. COGGER,
Australian Museum

(Figs. 1–3) (Plates 1 and 2) Manuscript Received 13.10.59

SUMMARY

A new scincid species (*Egernia saxatilis*) from the Warrumbungle Mountains, New South Wales, and a new subspecies (*Egernia saxatilis intermedia*) from Kanangra Walls, New South Wales, are described. Morphological variations in these forms, and in the closely allied *Egernia striolata* (Peters), are tabulated.

Egernia saxatilis saxatilis appears to be confined to the Warrumbungle Mountains, while *Egernia saxatilis intermedia* is distributed throughout various parts of the eastern highlands. *Egernia striolata* is found largely west of the Great Dividing Range. Although the latter occurs in many parts of Australia, the present study is restricted to specimens from south-eastern Australia.

A microdistributional study within the Warrumbungle Mountains of *Egernia saxatilis saxatilis* and *Egernia striolata* has shown that the former is strictly saxatile in its habits, whereas the latter is equally strict in its preference for an arboreal habitat. It is suggested that these habitat preferences may have been important in maintaining isolation between these two forms in the final stages of speciation. Such morphological features as colour, size and scale rugosity are discussed in relation to the possible advantages which they confer on these two species within their selected habitats.

The available evidence suggests that where *Egernia saxatilis intermedia* and *Egernia striolata* come into contact hybrid zones may occur.

INTRODUCTION

Between 1953 and 1958 a number of specimens of *Egernia* were collected during routine field investigations in the Warrumbungle Mountains. The initial problem arising out of the collection of these animals was their identification, but closer examination disclosed an example of ecological replacement and some interesting correlations were noted.

The preserved material in the collection of the Australian Museum was later studied in the hope that some light might be shed on the problems arising out of the Warrumbungle Mountains investigation. The present study is confined to specimens from eastern Australia, as it is only from this area that adequate collections are available which permit a relatively comprehensive zoogeographical survey.

As a result of the evidence presented in the second part of this paper, formal descriptions of a new species and a subspecies become necessary, and these precede the discussion. They are placed at the beginning to permit the use of the new names in the text, and they are secondary to, and essentially dependent upon, the discussion which follows them.

The bracketed figures following many of the localities mentioned refer in all cases to the relative position of the localities in Plate I, 1.

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Egernia saxatilis saxatilis sp. et subsp. nov.

Type.—R15282 in the collection of the Australian Museum; an adult male from the Warrumbungle Mountains, New South Wales. Collected by the author in December, 1958.

Diagnosis.—36-41 mid-body scale rows; four spinose auricular lobules on each side, dorsal colour dark brown, without lighter, broad dorsolateral stripes. For a differential diagnosis, reference should be made to pertinent sections of the general discussion, which are summarised in Table I.

Description of Type.—Head slightly distinct from neck; frontal and interparietal equal in length; width of the former two-thirds its length; interparietal twice as long as broad; two frontoparietals; prefrontals in contact; frontonasal in contact with the rostral; four supraoculars, the first two in contact with the frontal; six supraciliaries; lower eyelid scaly; a post-narial groove on both sides, almost dividing the nasal on the right side only; four spinose auricular lobules on each side; eight supralabials, the sixth and seventh subocular; eight infralabials. Three pairs of pluricarinate nuchals; dorsal scales on body and limbs bicarinate, tricarinate and quadricarinate, with occasional quinquecarinate scales (particularly on the nuchal region); carinations relatively strong (sufficient to make the skin rough to touch); ventral scales smooth, subequal in size to the laterals, which are smaller than the dorsals; 39 rows of scales around the middle of the body; 24 lamellae under the fourth toe; dorsal caudal scales pluricarinate; five pairs of mid-dorsal scales on basal portion of tail, remainder of tail with a single row of mid-dorsal scales; mid-ventral subcaudal scale row enlarged; basal portion of tail slightly compressed dorsoventrally, remainder more or less cylindrical.

Dorsal colour dark brown (almost black in life); many scales with a black bar longitudinally through their centres, these scales being irregularly placed over the dorsal surface; sparsely scattered small, white flecks anteriorly; each alternate scale in the dorsal caudal series with a black posterior edge. Lateral surfaces of body black, with scattered lighter brown scales. Auricular lobules and labials light brown or cream, variegated with darker brown. Gular region white, variegated with black. Ventral surface of body and tail white or cream (bright orange in life). Lower surfaces of feet and digits a shiny black.

Dimensions.—

Total length, 260 mm.;
Head + body, 113 mm.;
Tail, 147 mm.;
Head width (maximum), 21 mm.;
Snout-axilla, 46 mm.;
Axilla-groin, 54 mm.;
Length of right fore limb, 36 mm.;
Length of right hind limb, 49 mm.

Variation.—Variation in the principal diagnostic characters is dealt with in the following pages.

Egernia saxatilis intermedia subsp. nov.

Type.—R15273 in the collection of the Australian Museum; an adult female from Kanangra Walls (3,400 ft.), New South Wales. Collected by the author on April 12, 1959.

Diagnosis.—As for *Egernia saxatilis saxatilis,* except that the auricular lobules, though rugose, are rarely spinose, and may number as few as two on each side; 28-35 mid-body scale rows.

Description of Type.—Scalation and colour as in the type of *Egernia saxatilis saxatilis*, except that the auricular lobules, though very rugose, are not spinose; four pairs of pluricarinate nuchals; 32 rows of scales around the middle of the body; 21 lamellae under the fourth toe; seven pairs of mid-dorsal scales on basal portion of tail.

Most dorsal scales with a central, longitudinal black bar, giving an appearance of narrow, black longitudinal stripes.

Dimensions.—

Total length, 215 mm. +;
Head + body, 113 mm.;
Tail, 102 mm. +;
Head width (maximum), 18 mm.;
Snout-axilla, 45 mm.;
Axilla-groin, 56 mm.;
Length of right fore limb, 31 mm;
Length of right hind limb, 43 mm.

Variation.—Variation in the principal diagnostic characters is dealt with in the following pages.

Juvenile colouration.—Two juvenile specimens (R15270 and R15271) were collected from Kanangra Walls. In these specimens the dorsal and lateral ground colour is black; white scales or scales with white posterior borders are scattered over the dorsal and lateral surfaces. The black head is variegated with white. (Plate II, 3).

DEVELOPMENT OF THE PROBLEM

The Warrumbungle Mountains rise to a height of nearly 2,000 ft. above the surrounding country (4,200 ft. above sea-level), and are remnants of volcanoes which ceased activity during the Tertiary Period. Most of the country is covered by a dry sclerophyll forest (30-70 ft.), with a small tree layer sometimes present. However, in local patches that have been cleared for grazing, local scrub communities of ti-tree (*Leptospermum*) have formed; river she-oaks (*Casuarina*) fringe the watercourses.

There are a number of unusual and impressive rock features which are almost devoid of plant life. These take the form of spires and pinnacles, and are remnants of volcanic plugs from which the cones have been weathered away and which are usually capped by the remains of harder lava flows. (For a summary of the physiography, geology and botany, see Beadle et al., 1948).

Egernia striolata is a very common skink west of the Dividing Range in New South Wales, including the Warrumbungle Mountains. Some 50 specimens were collected in the latter area and many more were seen, and all were found under the loose bark of standing or fallen trees; at no time were any collected from cover on the ground. Whether this species ranges into those areas in the mountains in which snow falls in winter is unknown, although representatives were found from the valley floors to the tops of several of the mountains studied.

The first opportunity to examine the large rocky peaks came in April, 1955, when the author climbed almost to the top of Tonduron Spire (Plate I, 3), a distinctively shaped structure, the lower parts of which are clothed in relatively dense forest, while the upper 300–700 ft. consist of exposed, and often precipitous, rock faces on which only occasional pockets of sparse vegetation exist. Immediately noticeable was the presence of a large, dark *Egernia*, remarkably dissimilar to the arboreal population of *Egernia striolata* found at times only 30 yards below the tree-line. This population was living among large slabs of rock on the cliff faces, and, although a number were seen, owing to the precarious situation only three were collected.

On subsequent trips to the area in 1957 and 1958 five more specimens of this unusual form were taken from a rocky habitat on the Breadknife (A22, B5) and from a rock slide on Mount Dagda (A17, B10; Plate II, 8 and 9), the latter being fully forested as far as the summit. Again, many specimens were observed, but proved difficult to collect. These aberrant specimens may be distinguished from the typical arboreal *E. striolata* by the characteristics listed in Table 1. This form is described as a new species *Egernia saxatilis*.

Table I

Egernia striolata General Series	*Egernia striolata* Warrumbungle Series	*Egernia saxatilis saxatilis* Warrumbungle Series	*Egernia saxatilis intermedia*
Low mid-body scale count (mean 31).	Low mid-body scale count (mean 31).	High mid-body scale count (mean 39).	Low mid-body scale count (mean 32).
Smaller size (mean 97 mm.).	Smaller size (mean 92 mm.).	Greater size (mean 113 mm.).	Greater size (mean 122 mm.).
Light dorsal colouration.	Light dorsal colouration.	Dark dorsal colouration.	Dark dorsal colouration.
Almost smooth dorsal scalation.	Almost smooth dorsal scalation.	Very rugose dorsal scalation.	Very rugose dorsal scalation.
Ventral surfaces of feet light.	Ventral surfaces of feet light.	Ventral surfaces of feet black.	Ventral surfaces of feet black.
Ventral surface pale orange in life.	Ventral surface pale orange in life.	Ventral surface bright orange in life.	Ventral surface bright orange in life.
Supralabials white.	Supralabials white.	Supralabials variegated with darker.	Supralabials variegated with darker.
Auricular lobules small, scale-like.	Auricular lobules small, scale-like.	Auricular lobules long,u sually spinose.	Auricular lobules, though rugose, rarely spinose.
17-23 lamellae under 4th toe (mean 19).	18-22 lamellae under 4th toe (mean 19).	20-24 lamellae under 4th toe (mean 22).	19-25 lamellae under 4th toe (mean 22).

The real interest of the case outlined above lies in four directions :—

(1) The apparent close link between general morphology and the habitat occupied.

(2) The potential advantages of the principal morphological features of *E. saxatilis* within its selected habitat.

(3) The genetic status of the forms within the *striolata-saxatilis* complex and the circumstances under which they developed.

(4) The systematic treatment of the problem.

It is evident that these four problems are interdependent, but for clarity they are discussed separately in the following pages.

MORPHOLOGICAL VARIATION, DISTRIBUTION AND HABITAT PREFERENCES

For the purposes of the present discussion, the available specimens have been separated into four series :—

(1) Typical *Egernia striolata* from the Warrumbungle Mountains.

(2) *Egernia saxatilis saxatilis* from the Warrumbungle Mountains.

(3) Typical *Egernia striolata* from other localities in eastern Australia.

(4) Forms intermediate in characteristics between *E. striolata* and *E. s. saxatilis* (*Egernia saxatilis intermedia*) from other localities in eastern Australia.

Series (1) and (3) are morphologically and ecologically indistinguishable, and have been treated separately only to allow comparisons to be drawn between the two sympatric Warrumbungle Mountains populations. Hence, the material can be divided into three distinct morphological groups—*E. striolata*, *E. s. saxatilis* and intermediates between the two.

Significant variation has been noted in the following external morphological features :—

(1) The number of mid-body scale rows.

(2) Maximum size.

(3) Body colour (dorsal and ventral).

(4) Rugosity of the scale carinations.

(5) Colour on ventral surfaces of feet.

(6) Colour of labial scales.

(7) Number of lamellae beneath the fourth toe.

(8) Number and rugosity of the auricular lobules.

Of these characters, the first four have been used as major diagnostic features because of their constancy within a population and the degree of variation between the different series studied. The remainder, though less constant, can be used to indicate definite trends, and have been used to substantiate the conclusions drawn from the above four morphological features, together with ecological and geographic evidence.

Table I is a summary of the essential morphological differences between the four series of specimens listed above, and Figures 1 and 2 illustrate graphically and quantitatively some of these differences. The distribution of these various forms is shown in Figure 3. Together with the morphological differences outlined above, the differences in habitat preference within the Warrumbungle Mountains (as mentioned earlier) should be stressed, as it is considered that they may have played an important part in the process of speciation. No exception to the arboreal habitat of *E. striolata* was observed, and similarly all of the *E. s. saxatilis* collected and observed were restricted to a rocky habitat. It can be seen from Plate I, 1, that the only areas in the Warrumbungle Mountains in which the rock-dwelling form has been found are very restricted and that they are surrounded by an environment inhabited only by *E. striolata.*

A knowledge of the habitat of *E. s. saxatilis*, together with an aerial photograph of the area (Plate I, 1), would probably allow one to plot accurately the distribution of this form within the Warrumbungle Mountains. The evidence suggests that this species is to be found only on the isolated, open, exposed rock masses and slides, which can be seen distinctly in the photograph.

The occurrence of numerous rock slides in the area (e.g., A21, B14; A15, B10; A18, B3) would probably permit an interchange of individuals between the otherwise isolated populations of *E. s. saxatilis*. Furthermore, if this form occurs outside the area under discussion (it is possible that it can be found in other isolated mountains, such as the Nandewar Range) then it is evidently effectively isolated from its Warrumbungle Mountains representatives.

The demonstration of this correlation between habitat and morphology led to a programme of widespread collection of members of this species complex in New South Wales. A large number of typical *E. striolata* have been collected by the author in many parts of New South Wales during the past 10 years, and nearly all were found under arboreal conditions. Of the intermediate forms listed above, the author has collected specimens at Kanangra Walls and on the highlands behind Wollongong, New South Wales; nearly all were found in a rocky habitat. However some specimens collected from the latter locality were found in hollow logs and in tree stumps, so it is apparent that the saxatile habits of this form are not as strict as in its Warrumbungle Mountains relatives.

It will also be noted that there is apparently no close correlation between the distribution of either the intermediate series or typical *striolata* and any major topographical feature or environmental component. There is merely a tendency for the former to occupy an area roughly restricted to the eastern highlands and the latter to occupy a lowland habitat, although each extends into the other's territory when the latter appears to be absent. This interdigitation has been shown in Figure 3, in which an arbitrary altitude of approximately 500 metres has been chosen to represent the highland regions.

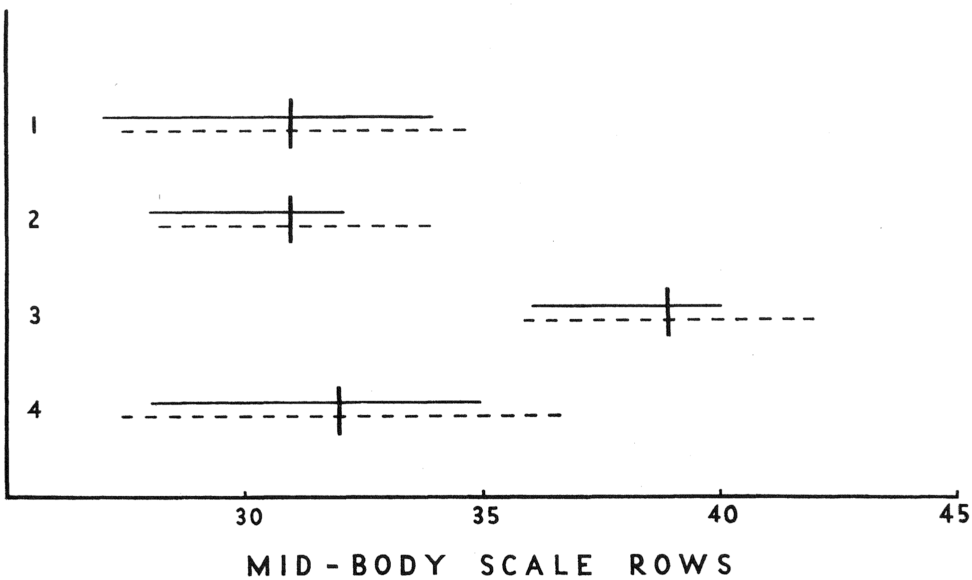


Figure 1.—Graph showing differences in relative scale size (as indicated by the number of mid-body scale rows) in *Egernia striolata*, general series (1); *Egernia striolata*, Warrumbungle Mountains series (2); *Egernia saxatilis saxatilis* (3), and *Egernia saxatilis intermedia* (4). The vertical bar represents the mean value, the solid horizontal bar the observed variation, and the broken horizontal bar four standard deviations.

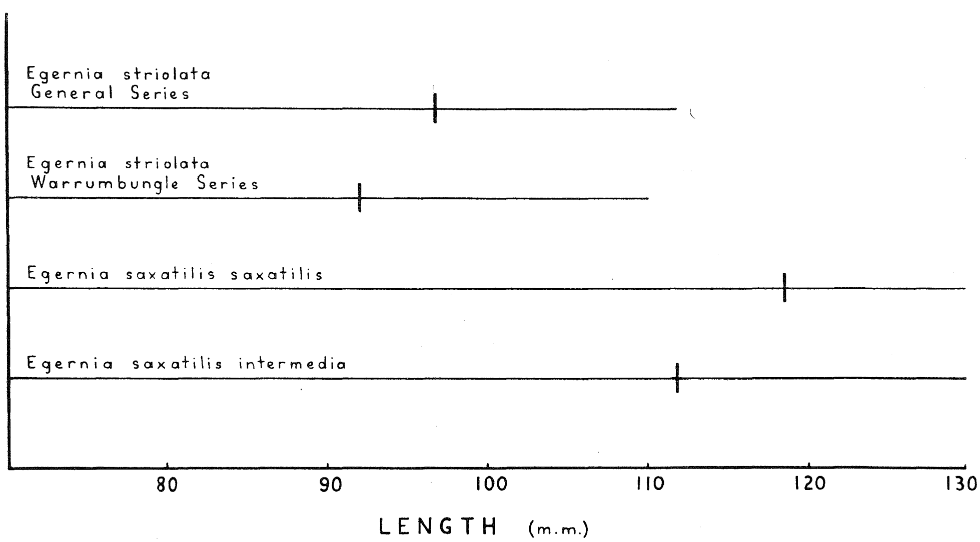


Figure 2.—Graph showing the mean size (vertical bar) and the total observed variation of the four series listed above. The means were determined using all specimens more than 70 mm. in length (snout-vent), this figure being chosen to represent an arbitrary minimum size for adulthood.

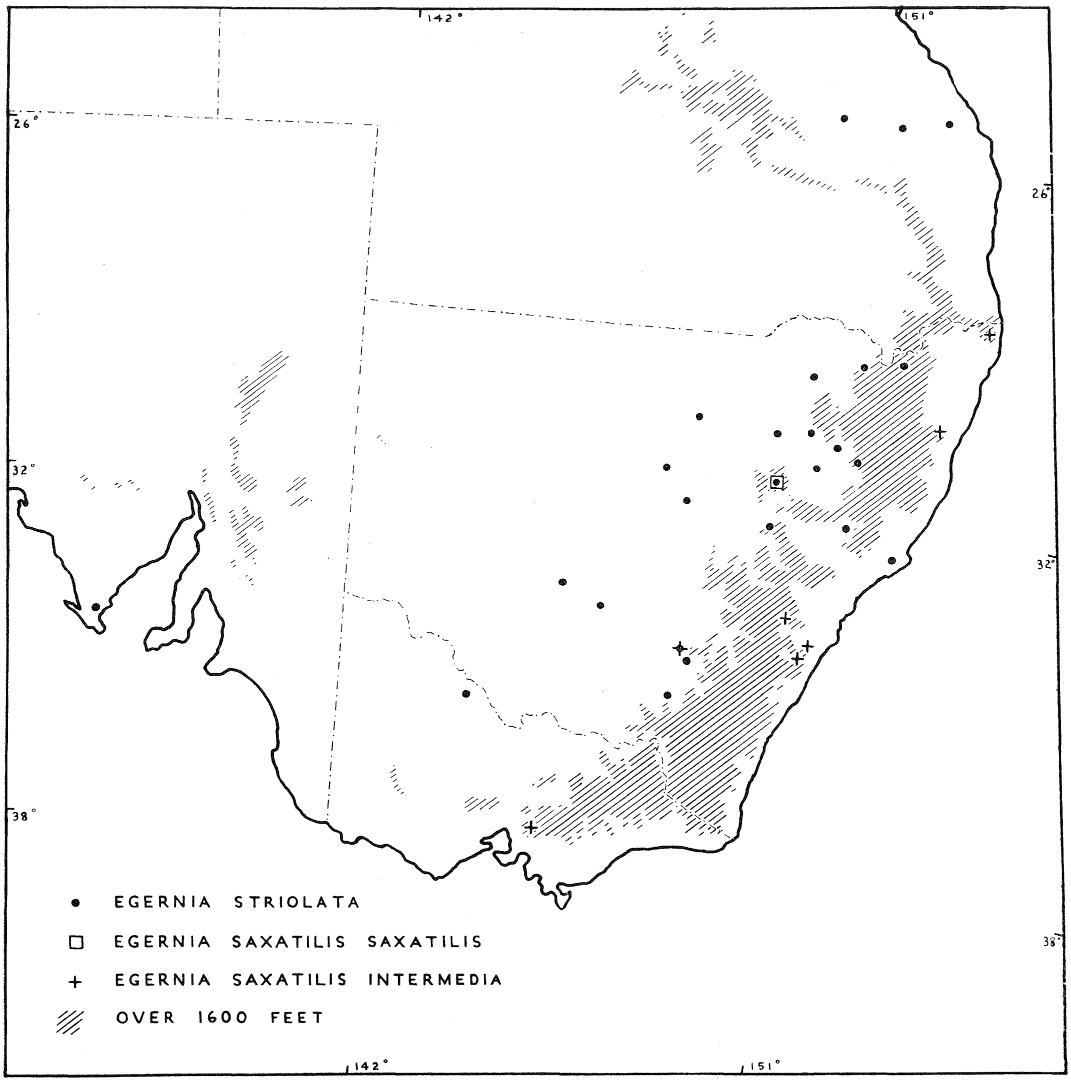


Figure 3.—Map showing locality records in south-eastern Australia of specimens examined of *Egernia striolata*, *Egernia saxatilis saxatilis* and *Egernia saxatilis intermedia*. The shaded area represents all altitudes over 1,600 ft. (500 metres).

SELECTION AND MORPHOLOGICAL CHARACTERISTICS IN EGERNIA SAXATILIS

Intensive selection would appear to be responsible for the morphological features associated with the more specialised habitat preferences of *E. saxatilis* within the Warrumbungle Mountains. For this reason, it is important to attempt to determine the potential advantages of those features of *E. saxatilis* which distinguish it from *E. striolata* :—

(1) *Melanism* :—Parker (1935) discussed the advantages of melanism to poikilothermic animals living on barren rock surfaces in tropical and temperate areas, and this would probably account for melanistic tendencies in *E. saxatilis*. The author agrees with Parker that the protective nature of such colouration is probably secondary to its thermoregulatory function.

(2) *Larger size* :—The advantages of the larger size of *E. saxatilis* are not obvious, for the relative decrease in surface area with larger size would mean that heat loss by radiation would be less than in the smaller *striolata*. However, as the saxatile environment (associated partly with altitude) is usually subject to greater temperature extremes than the forested areas, this increase in body size may be associated with heat conservation at low temperatures.

It would appear, then, that melanism and increased size interact to provide optimal thermoregulatory control within such a distinctive environment.

(3) *Rugose scalation and smaller dorsal scales* :—In an attempt to determine quantitatively the potential advantages of the rugose scalation and the smaller mean scale size in *E. s. saxatilis*, specimens of this form and of *E. striolata* from the Warrumbungle Mountains series were examined. As the ventral scales are more or less equal in both forms, it is evident that the mean size of the dorsal and lateral scales (which bear the carinations) in *E. s. saxatilis* is smaller than in *E. striolata*. Hence, as there are. on the average, between four and seven extra longitudinal rows of scales over most of the body in *E. s. saxatilis*, and as this form has approximately 65 transverse rows of scales (between the nape and the base of the tail) as compared with approximately 55 rows in *E. striolata*, it can be seen that the former possesses somewhere between 300 and 600 scales more than the latter. Apart from the fact that the rugosity of the scalation is much greater in *E. s. saxatilis*, if one considers that the average number of carinations on each extra scale would be approximately three, then it is evident that *E. s. saxatilis* possesses between 900 and 1,800 more carinations than *E. striolata*. The increase in rugosity, size and number of the auricular lobules, together with a greater number of infradigital lamellae, would also assist in maintaining a purchase in the rocky environment. The wedging effect of these characteristics may also be important in reducing predation, for when any attempt is made to extricate these lizards from the rocky crevices in which they live the body is inflated so as to press the rugose scales against irregularities in the rock surface, the auricular lobules are raised for the same purpose and the tail is turned toward the aggressor to enable the backwardly-directed rugosities to gain full purchase.

THE GENETIC STATUS OF FORMS WITHIN THE STRIOLATA-SAXATILIS COMPLEX AND THE CIRCUMSTANCES UNDER WHICH THEY DEVELOPED

Egernia striolata has an Australia-wide distribution, being absent only from various relatively restricted areas where unsuitable environmental conditions prevail. The limits of the variation which have been described for this widely-ranging species (Mitchell, 1950) do not overlap with those described in the present paper for *Egernia s. saxatilis*. It is therefore evident that morphological differences of this nature are of such magnitude that they could arise only as a result of effective isolation over a long period. The fact that these two forms coexist (geographically) in the Warrumbungle Mountains with complete genetic stability is supporting evidence of the specific recognition afforded them in the present paper.

It is known that where two closely related sympatric species occupy different habitats, the local absence of one may result in the occupation of both habitats by the other within that area. In eastern Australia, *E. s. intermedia*, though primarily saxatile, is sometimes found under arboreal conditions where these are available and where *E. striolata* is absent. Conversely, the latter is sometimes taken in the rocky habitat in areas where *E. s. intermedia* does not occur. Mr. F. J. Mitchell informs the author that the South Australian *E. striolata* (not covered in the present paper) are essentially saxatile, although morphologically indistinguishable from their arboreal eastern representatives. This lack of strict habitat segregation outside areas of overlap need in no way reduce the significance of the Warrumbungle Mountains complex.

It is evident that strictness of habitat preference can only be of significance in the speciation process when two closely allied allopatric forms come together, for only then can such factors as competition and degree of genetic stability determine the fate of the two forms.

Suppose that, as a result of the setting-up of a geographic barrier (and after a sufficient period of time), a species is divided into two distinct races, each potentially capable of interbreeding with the other. Should this barrier be broken down, either extensively or at one point, and the two races allowed to meet, there are but two possible consequences. Either the two races will freely interbreed, resulting in a hybrid zone (or a complete loss of separate identity) or, due to some ecological or behavioural differences between the two races, psychological barriers (in the broadest sense) will be set up which prohibit interbreeding just as effectively as do genetic or physical (morphological) ones. In this case, as a result of selection pressure and various competitive factors, differences in ecology and behaviour will tend to become exaggerated and hence assist in the maintenance of reproductive isolation. In this manner it would be possible for the *completion* of the speciation process to take place under conditions of sympatry.

Mayr (1942) considers that differences in habitat preference cannot result in sympatric speciation. Hinde (1959) states that ". . . differences in habitat preference between sympatric or incipient species may be important in reducing both interbreeding and competition". He also concludes that such differences ". . . are sometimes conducive to reproductive isolation". He rather questionably supports this (in part) by pointing out that sympatric closely-related bird species frequently occupy different habitats.

It would certainly appear that habitat preferences, no matter how significant in the later stages, *can not initiate species formation*, and therefore it is highly improbable that ecological differences between *E. striolata* and *E. saxatilis* could originate other than by geographic isolation.

It is possible that the case under discussion represents an example of *character displacement* (Brown and Wilson, 1956), in which two allopatric species meet, their differences becoming exaggerated in the zone of overlap due to genetic reinforcement and/or ecological displacement. However, the author considers that if two distinct (reproductively incompatible) species were involved, one would expect character displacement to occur in other zones or overlap, but this does not seem to be the case. Although the evidence is admittedly inconclusive, it would appear that hybrid zones do exist wherever *E. striolata* and *E. saxatilis intermedia* come together, for specimens apparently lying between these two forms have been taken at Cootamundra, New South Wales, and from the northern coastal regions of New South Wales (page 104).

Taking into account the various factors brought out in the preceding discussion, to what extent can the origins and phyletic relations of the three forms under discussion be determined ? It is suggested that the differentiation of the three forms was probably initiated as a result of some geographical isolating mechanism. In this way a formerly widely-ranging species was broken up into two diverging populations, one of which (on present data) tended to be restricted to the well-forested highlands of eastern Australia and the other to the grassy open sclerophyll of the drier inland regions. (*E. striolata* has reached coastal districts in a number of places, however, apparently through breaks in the mountain barrier—for example, via the Hunter River valley). Possibly as a result of the environmental conditions found in the areas in which they occurred, each form tended toward a particular habitat, the highland form (*E. s. intermedia*) inhabiting rocky areas, the lowland form (*E. striolata*) choosing an arboreal existence.

The Warrumbungle Mountains, by virtue of their structure, probably represented a western outpost and refuge for *E. s. intermedia*, which was cut off from the parental eastern stock. This separation was probably due to a secondary invasion of *E. striolata* from the west, and physiographical changes in the intervening country may have been involved. In any case, with the eventual breakdown of the initiating geographic barrier the two races came together, at least within the Warrumbungle Mountains, and possibly in other parts of their ranges.

The result appears to have been that within the Warrumbungle Mountains initial habitat preferences became exaggerated and hence prohibited reproductive exchanges between the two races. Finally, through lack of interbreeding, the two forms achieved full genetic stability associated with constant differences in morphology and characteristic habitats. Hence, the Warrumbungle Mountains complex is apparently a case of partial sympatric speciation, in which at least the final stages of species formation (from subspecific to specific status) evolved under conditions of sympatry.

However, the evidence (though incomplete) suggests that there may occur in other parts of the range the other of the two possible consequences of two overlapping races, the formation of a hybrid zone in which all morphological and ecological intermediates may be found.

SYSTEMATICS

As has already been noted, the coexistence of *E. striolata* and *E. s. saxatilis* within the Warrumbungle Mountains with complete genetic stability, together with the constancy and degree of their morphological differences, would indicate that the most reasonable solution would be to afford them full specific status.

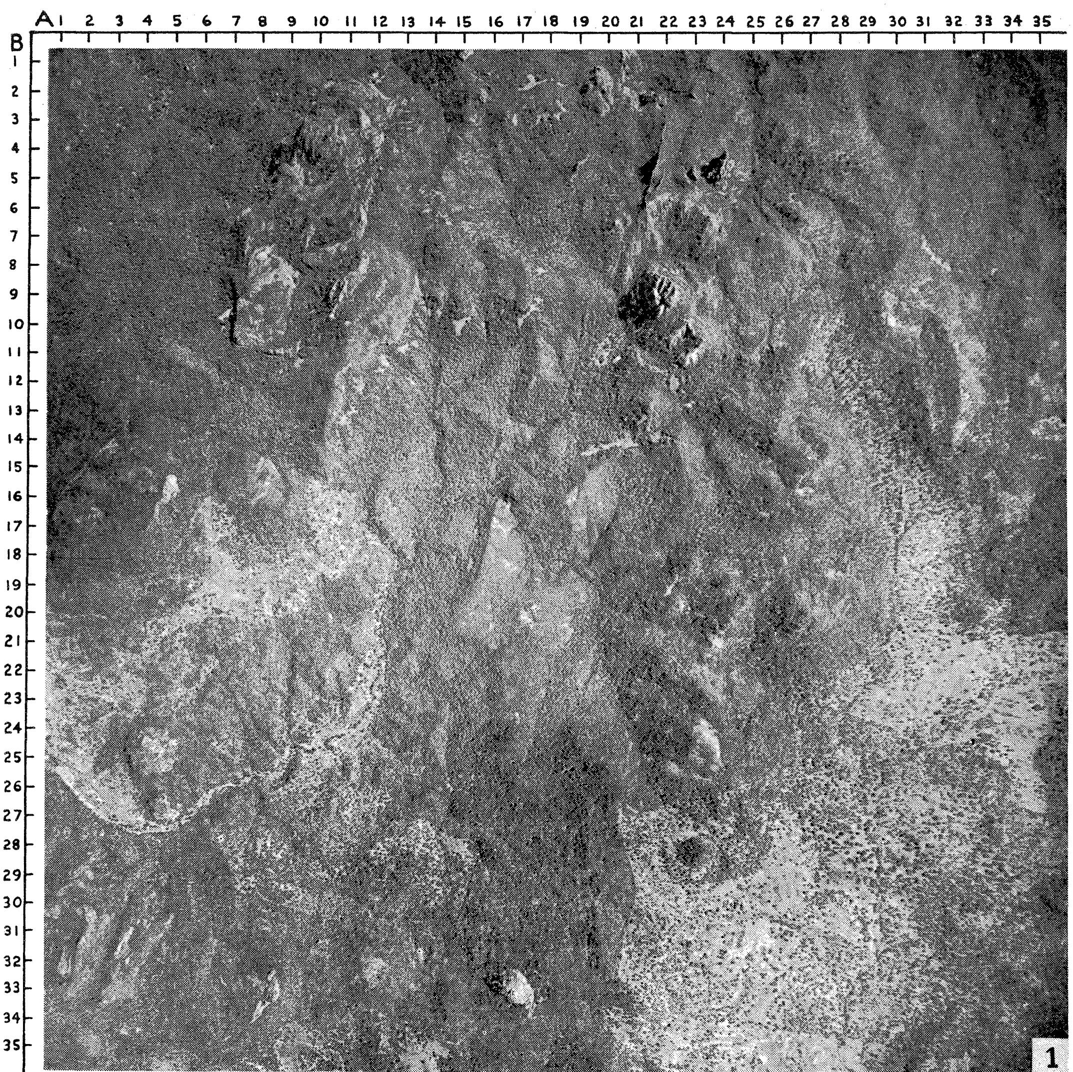
The taxonomic relationships of the intermediate specimens are not so apparent, however. As can be seen from Table I, they can be readily distinguished from either extreme. Nevertheless, the only characteristic of *E. s. saxatilis* which they lack is the higher scale-row count, so that it would appear that their affinities lie closer to *saxatilis* than to *striolata.*

However, although these specimens are morphologically distinct from *E. striolata*, the two appear to occupy different geographical regions; hence, it has not been possible to determine whether they represent genetically stable, specifically distinct forms.

Within the series of intermediate forms, however, are three specimens (R793, R11859, R12740) which appear to be much closer to *E. striolata* than the others, and this would indicate that there is a gradation from one form to the other, particularly in the northern part of New South Wales. Whether any true zones of sympatry or hybridisation occur is difficult to determine. The only potential example in the present study was the record of several typical *striolata* from Cootamundra, together with one example possessing a number of intermediate characteristics.

It would therefore appear that the series of specimens which have been labelled "intermediates" are probably intermediates in the strictest sense—that is to say, they represent, morphologically and ecologically, an intermediate stage in the differentation of *E. saxatilis* from *E. striolata*. They are probably genetically labile (as a group, but undoubtedly with exceptions), and not isolated reproductively from either *striolata* or *saxatilis*. How, then, are these intermediate specimens to be placed in the present scheme of classification ? Perhaps the most satisfactory solution would be to relegate them to subspecific status, as they are apparently morphologically distinguishable geographic representatives of either *E. saxatilis* or *E. striolata*, depending on which of these can be considered as the parental stock. However, the same problem arises as in a circular cline, for although the two sympatric extremes are reproductively isolated, allocation of any intermediate population to either extreme infers a false reproductive isolation between it and the other extreme. On the other hand, if the intermediate form is not named distinctively it must be relegated to either one species or the other, thus providing an even falser picture.

Although the obvious solution would be to avoid taxonomic categories altogether, and merely present the evidence as an interesting example of the interaction of morphology and habitat, the author considers that the application of a name to the intermediate series would serve a greater function than mere museum "pigeon-holing". For this reason, this series is described as a race (*intermedia*) of *Egernia saxatilis*, though the decision to place *intermedia* as a race of *saxatilis* rather than of *striolata* is an arbitrary one and tends to conceal true phylogenetic relationships. Nevertheless, it should be stressed that this decision has been made because of the apparent close affinities (in morphology and ecology) between *intermedia* and *saxatilis*, and does not necessarily indicate reproductive incompatability between the former and *striolata*.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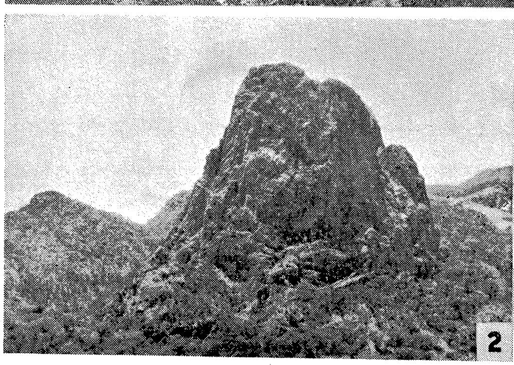
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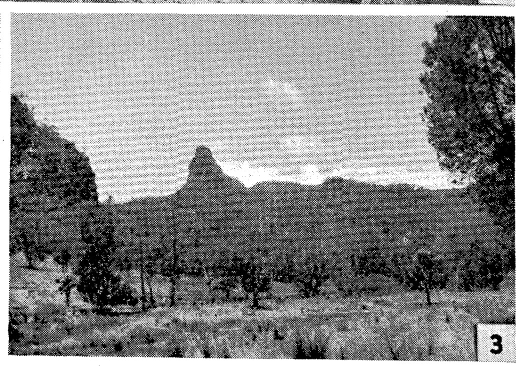
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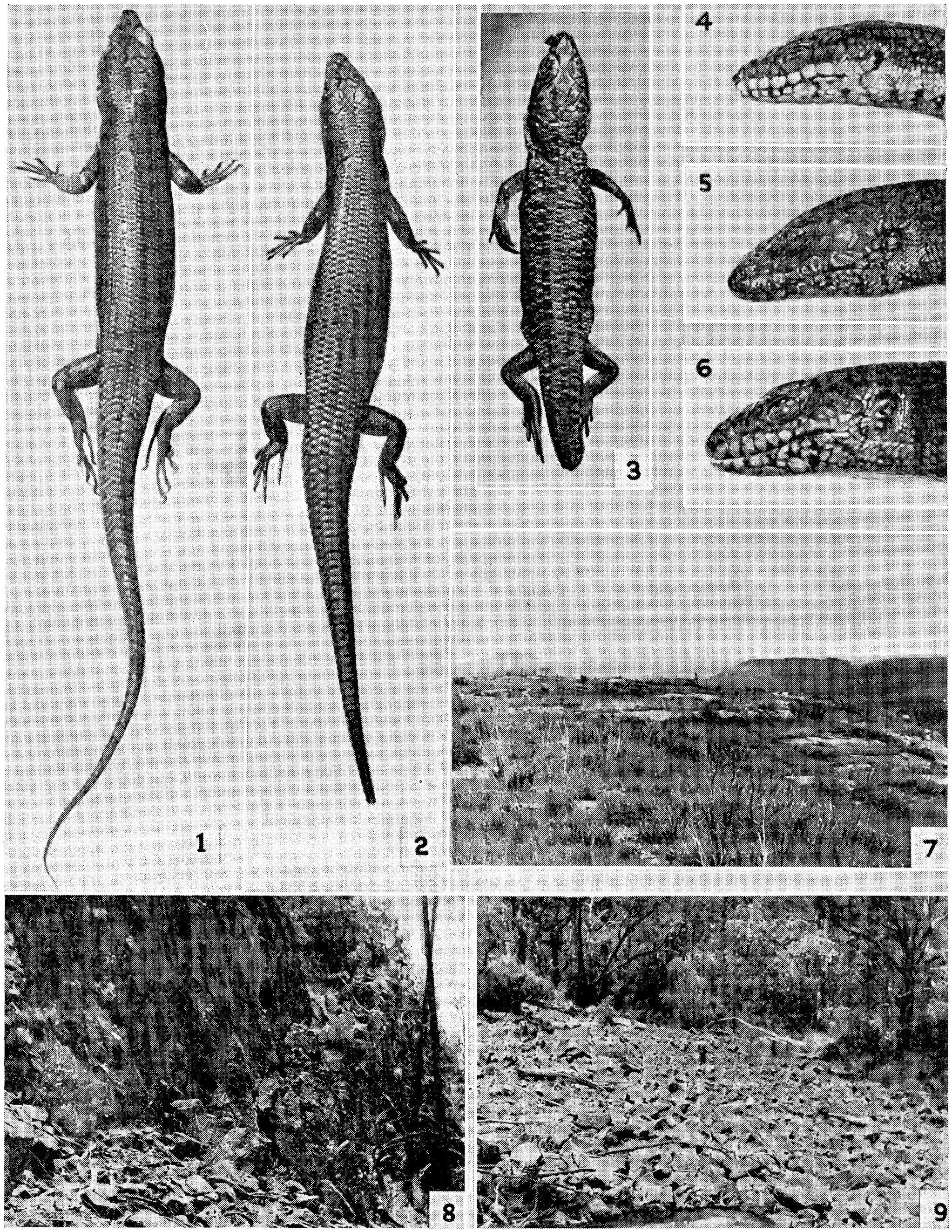

Explanation of Plates

Plate I

1. Aerial photograph of that section of the Warrumbungle Mountains, New South Wales, in which most of the present study was carried out. The two grid scales have been added to allow ready reference to the various places mentioned in the text.

2. Crater Bluff (A22, B9), viewed from Mount Dagda.

3. Tonduron Spire (A17, B33), viewed from below the Picnic Ground (A4, B25).

Plate II

1. Dorsal view of holotype of *Egernia saxatilis saxatilis*.

2. Dorsal view of holotype of *Egernia saxatilis intermedia.*

3. Dorsal view of juvenile *Egernia saxatilis intermedia* from Kanangra Walls, New South Wales.

4. Lateral view of head of *Egernia striolata* from the Warrumbungle Mountains.

5. Lateral view of head of holotype of *Egernia saxatilis intermedia.*

6. Lateral view of head of holotype of *Egernia saxatilis saxatilis*.

7. Plateau at Kanangra Walls, type locality of *Egernia saxatilis intermedia.*

8. Small cliff above rock slide (A17, B10) on Mount Dagda, typical of similar areas throughout the Warrumbungle Mountains in which *Egernia saxatilis saxatilis* occurs.

9. The rock slide below the cliff shown in (8).

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