Natural History Note

Variation in population size of Bouton's snake-eyed skink (Reptilia: Scincidae) at Black Rock in northern KwaZulu-Natal, South Africa

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Bouton's snake-eyed skink *Cryptoblepharus boutonii* sp. occurs in scattered island or coastal populations in the Indian Ocean. The most southern known population occurs on Black Rock on the northern coast of KwaZulu-Natal. This tiny population was monitored over a period of 14 summer seasons and a final check was made 10 seasons later. This population consisted of an average of about 58 individuals, but has fluctuated by more than 100 %, suggesting that its existence is very tenuous. The re-check during October 2001 produced very positive figures, indicating that this population, observed over 23 years, is doing very well, is maintaining its numbers within acceptable parameters and is in a good position to survive without special precautions.

Key words: Bouton's snake-eyed skink, *Cryptoblepharus boutoni*, Black Rock.

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Introduction

Bouton's snake-eyed skink is a small, slender skink (Fig. 1), of which the individuals of the population under discussion reach a head-body length of just under 50 mm and a tail which may be nearly 20 mm longer. Its preferred habitat is the intertidal zone of rocky coastlines and its distribution appears to have been achieved by passive rafting (Wilson & Knowles 1988; Spawls *et al*. 2002).

Only a single population of this snake-eyed skink, presently still referred to as *Cryptoblepharus boutonii africanus* (Sternfeld), is known to occur within the limits of the Republic of South Africa (Haacke 1977; McLachlan 1978; Bruton & Haacke 1980; Haacke 1988; Branch 1988; Branch 1998). The locality, Black Rock (27°08'S, 32°50'E; 2732Bc), is a coastal cliff on the Maputaland coast about 35 km south of the Mozambique border in northern KwaZulu-Natal (Fig. 2.). The next and nearest apparently conspecific population is known from about 550 km further north near Inhambane on the Mozambique coast.

Mertens (1931, 1933, 1934, 1963) viewed what is now the *Crytoblepharus* complex (Fuhn 1970) as 36 subspecies of *Ablepharus boutonii* (Desjardin) (Type locality: Roche Noir [= Black Rock], Mauritius) the lizard species with the widest distribution in the world, which extended from the African East Coast, across various islands of the Indian Ocean, Australia and islands of the Pacific as far as the Easter Islands. In contrast, a reassessment by Storr (1976) suggested a much more complicated species complex and, by raising the status of many taxa to full species, he fragmented this range considerably. The most important study concerning Indian Ocean populations is that of Brygoo (1986). Welch (1982), without giving any reasons, raised all the taxa in the Indian

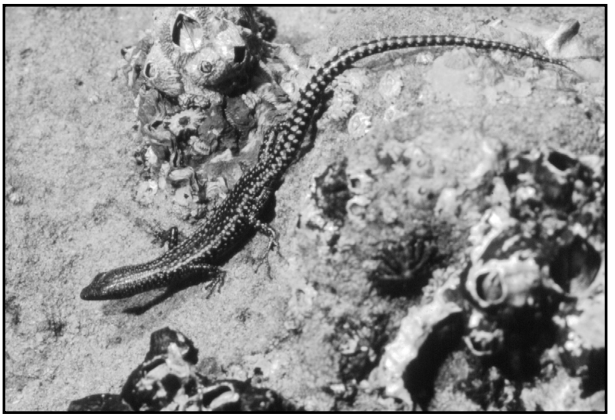

Fig. 1. *Cryptoblepharus boutonii* in the barnacle zone at Black Rock.

Fig. 2. Black Rock from the air, showing the bay and the sandy channel separating it from the dune forest.

Ocean and on the African East Coast to full species status, with *C. africanus* occurring from coastal Somalia to Tanzania. Brygoo (*op. cit.*) could not agree without a full assessment of all the populations and retained the subspecies *C. boutonii africanus* for the coastal populations from Mogadishu in Somalia to the Cabaceira peninsula in Mozambique. The populations further south were not known to either of the latter authors.

The presence of this most southern population on the African continent was first brought to the attention of science in 1964 by Dr Ortwin Bourquin, then employed as a temporary student helper of the Marine Turtle Survey, who collected some specimens and had them identified by Dr. D.G. Broadley, of the then Umtali Museum in Rhodesia (= Mutare, Zimbabwe). After a number of specimens were collected and the basic situation was assessed, it was apparent that a minute population was involved. This was considered a serious conservation problem. Accordingly, it was agreed upon by interested individuals in the Natal Parks Board and the Transvaal Museum not to deplete this small, isolated population any further by unreasonable collecting. It was also decided to monitor this population by an annual census over a number of years. A start was made during February 1978 and, although it was impossible for the author to visit Black Rock annually, it was visited 11 times until March 1992. In October 2001, a follow-up visit was made to assess the current status after a period of nearly ten summer cycles.

Habitat

On the generally sandy Maputaland coastline occasional rocky outcrops, consisting of consolidated, fossilised, ancient dune deposits (Dr. A. Kaiser *pers. comm*.), occur. It is probably also of Pleistocene origin, with physical, faunal and botanical aspects very similar to those described for Cabo Inhaca on Inhaca Island (Macnae & Kalk 1958). Black Rock is one of these, forming a prominent cliff and the tip of a short peninsula at the southern end of a shallow bay with a wide sweeping sandy beach (Fig.2). The beach is edged by typical low vegetation, which quickly

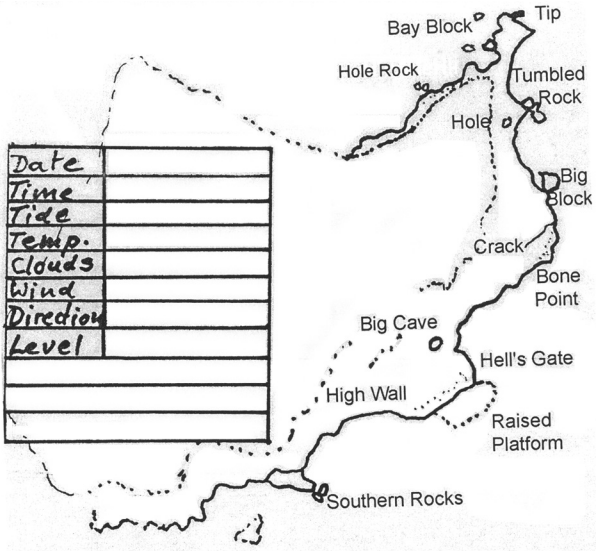

Fig. 3. Working sketch of Black Rock with arbitrary names often indicating concentration areas of lizards.

changes into wind-trimmed dense coastal forest covering the dune ridge parallel to the coast. This beach vegetation reaches the top edge of the rocks. A broad sandy gully, probably formed by some exceptional storm tides in the past and maintained by previous vehicular traffic and prevailing winds, between the base of the high dune and the cliff, left an elevated vegetation island on the high ground of the peninsula behind the cliff. About a hundred metres south of the above 'island', higher up on the beach and only rarely reached by exceptionally high tides, lies a similar, but much smaller, island. No snake-eyed skinks have ever been noticed there.

The rocky cliff rests on a broad shelf which becomes exposed during low tides. On the inside of the bay the rocky habitat starts with the presence of loose lying rocks which, according to season and past weather conditions, may be covered in sand or more or less exposed. Towards the NE the loose rocks are backed by a continuous rock bank, increasing in thickness and overlain by vegetated white sand. From the most southern point of the bay these rocks lie in a north-eastern direction for about 30 m, before the cliff swings northwards. From this point the cliff consists of jagged, porous, exposed rock without sand cover or vegetation. This bare 25 m point of the peninsula rises to about 4 m above the base shelf, which is about a metre below mean high water mark and the oyster zone. A mushroom-like, free-standing rock forms the most northern point. From there the eastern, seaward edge of Black Rock runs in a generally southern direction for about 50 m and then swings into a south-westerly direction, terminating in beach sand about 200 m away. The more or less vertical cliff face is often deeply undercut and in places reaches 8–10 m in height. The bottom shelf is only negotiable during low and preferably spring low tide. This is essential as the lizards descend from their roosting sites into the intertidal zone to feed, which is the optimum exposure for counting and thus establishing the population size.

As mentioned before, the rock surface is extremely leached and weathered resulting in a viciously rough surface which provides ample retreat for the tiny skinks. At several points on this rock outcrop groups of pecu-

Fig. 4. Black Rock bay at low tide, showing 'Hole Rock' and adjacent terrain.

Fig. 5. The northern 'tip' of Black Rock showing the extremely eroded and jagged rock type.

liar, circular, vertical, slightly conical holes occur, with an upper diameter of up to about one metre. They are the result of chemical leaching and subsequent erosion. Many are partially filled with sand and in some this filling appears to have consolidated and even fossilized. A considerable number extend 3–5 m down and some have actually broken through into the undercut in the base of the cliff face. Similar situations along the Mozambique coast result in well-developed 'blow holes'. In the situation at Black Rock, these shafts provide additional shelter and vertical migration routes from the high tide and night retreats at the top of the cliff to the low tide feeding grounds in the oyster-barnacle zone.

The extreme porosity of the northwest-facing rocks facing the bay and the northern tip of the peninsula appears to be favoured by the lizards, as several concentration points exist. The greater part of the main seaward-facing high cliffs, although roughly eroded, is less porous and therefore appears less suited as retreats since fewer skinks were observed there. In a number of places accumulations of large boulders lying against the base of the cliff face provide protected feeding areas and consequently have resident groups of skinks. The most important sites were named and indicated on the sketch plan (Fig. 3) on which sightings were recorded.

Starting in the bay amongst the smaller boulders partially covered in sand, the significant groups of rocks or sites are:

a) 'Hole Rock', a small cluster of very leached rocks lying on sand leading up to a slightly isolated, but dominant boulder about 2 m high with a big, cloverleaf shaped diagonal hole through it, which is much favoured by the skinks (Fig.4.).
b) 'Bay Block', a large block which broke off the main cliff and settled next to it and a few smaller ones which form a bridge for the lizards.
c) 'The Tip', the most northern tip of the peninsula, with lots of cavities, recesses and rock pools, used by 'rock-hopper' fish (Blenniidae) (Day 1968), providing safe feeding areas for lizards (Fig. 5).

Southwards, the first important site is:

d) 'Tumbled Rocks', where a group of large rocks provide access to the barnacle-oyster zone with safe retreats and a cliff face top with night retreats. These boulders lie in front of
e) 'The Hole', where the roof of an undercut collapsed, provides access to the very jagged cliff-top. 'The Hole' is surrounded by vertical leach holes.
f) 'Big Block'. A big section of the cliff face broke off and settled on the bottom shelf with a slight tilt. The sheltered,

narrow gap between the cliff face and the 'Big Block' attracts lizards.

g) 'The Crack'. The cliff face developed a massive crack, where another huge block will part from the rock face to settle next to it. It is partly opened and is used as a safe vertical passage or for basking in the top section.

h) 'Bone Point' is the most easterly projection, marked by the exposure of sub-fossil buffalo teeth (id. Mrs E. Voigt *pers. comm*.) and some bone splinters. This point has no particular attraction for the lizards, but from here the direction of the cliff swings to the south-west, often facing rough seas and strong wind, making it less attractive to the lizards.

i) 'Big Cave'. The roof of a large undercut, caused by wave erosion, collapsed as it was weakened by deep, vertical, leaching holes. The remaining leaching holes surrounding the collapsed ceiling are used by the skinks as sheltered living areas. These lizards will not normally descend here into the oyster-barnacle zone as the descent is either exposed or overhanging and in the dark.

j) 'Hell's Gate'. Of no consequence to the lizards, but it is a gully which observers have to cross by climbing over. It may suddenly fill up by wave action and thereby endanger the safety of the team (Fig. 6.). It can only be crossed safely during low, preferably spring low tides.

k) 'Raised Platform'. A beautiful raised open air aquarium, which indicates the northern beginning of the

l) 'High Wall'. A near vertical, very jaggedly eroded cliff face, mostly avoided by the lizards, varying in height from 8–10 m and extending for 40–50 m as far as the

k) 'Southern Rocks', which consist of an accumulation of large boulders extending due east for about 15 m. This landmark is much favoured by the skinks.

After the last landmark the rock face becomes lower and lower, only occasionally visited by individual lizards, and eventually ends in beach sand. About 100 m further south is the small island, described above. Black Rock appears to act as an interference to the sea current, carrying debris from the north, as on several occasions huge logs were dumped on the beach. Some were of a type, with nooks, crannies and borer holes, which one could imagine to have acted as potential rafts for the little skinks.

Fig. 6. The lower shelf of BLack Rock at low tide, showing the oyster-barnacle zone near the entrance of the 'Big Cave' on the right, two observers crossing the 'Hell's Gate' Channel, with the 'Raised Platform' in the back.

Census methods

At high tide only the top of the cliff is accessible to humans. At low tide, preferably spring low, once the base shelf becomes exposed, one can walk along the bottom edge of the cliff in the barnacle-oyster zone, which, on sunny days is the main feeding area for the lizards. Returning along the top edge of the cliff, those lizards which had remained there, may be counted. Initially repeated rounds were made from very early in the morning until late afternoon, but it soon became apparent that the prime feeding time shifts with the tides and time of the year and on a sunny day or with only a hazy sun may be from about 08:40 to 11:30. Weather and tide conditions, combined with wave action and human activity, can influence the results significantly. As a consequence it was found that a single thorough count per day during midmorning, repeated over four or five days around spring tide, reduces the effect of poor weather conditions or human presence and allows the figures obtained by two or more people working as a team to be acceptable.

By repeating these census rounds for a few days in succession, it became obvious where concentrations of lizards occur and that individuals stay more or less within a limited home range.

This was confirmed when individuals were marked with a red paint spot on the back and individuals with broken tails, as well as juveniles, were recorded. Dispersal was quite slow and in principle individuals remained more or less in the same area where first found during a visit. It was also noted that according to circumstances not all lizards are active simultaneously. After each round the 'Total Number Counted' was established by adding up all the lizards recorded during one round and the 'Counted Maximum' was established at the end of a visit by picking the highest count of all the results. An 'Estimated Maximum' was also established at the end of each visit to Black Rock (Table 1.). Out of the set of four or five counts made during one visit the highest number of lizards per concentration point was selected and added. This figure was accepted as representing the actual total population as closely as it could be established.Accordingly indications of population fluctuations can be established. The means of the 'Counted Maxima' and the 'Estimated Maxima' were calculated to indicate the difference between these two parameters.

Results

Due to the rugged terrain at Black Rock it is impossible to do exact counts. By repeating counts during the optimum activity period and by adding up maximum counts at various concentration points including individual vagrants, an estimated population size present during a visit can be established. The range of the 'Counted Maximum' has varied between 28 (Feb. 1978) and 83 (Mar. 1989), for which seasons the 'Estimated Maxima' were 47 and 106 (Dec. 1980 = 112). This suggests a fluctuation in excess of 100 % (Range = 47–112) over 15 seasons, with a mean 'Counted Maximum' of 58 (= 57.55) and mean 'Estimated Maximum' of 80 (=79.8).

A follow-up check during the first week in October 2001, nearly ten seasons later, provided the very satisfactory results, viz., highest 'Counted Maximum' = 99 and the highest 'Estimated Maximum' = 113, suggesting a generally very positive situation (Table 1.).

Various questions arise when considering the survival potential of such a small, isolated population of a lizard which reproduces by laying a single, soft-shelled egg (rarely 2) at a time (Fricke 1970; own records).

Biological observations have been made (Haacke 1977) during these visits and will be reported on in greater detail elsewhere. In short, these skinks occupy a niche which is ideally suited for their small, thin bodies. Their colour matches the dark background and the availability of retreats protects against potential predators and inclement weather. The intertidal zone is without reptile competition. Larger lizards, such as *Mabuya depressa*, which may threaten mainly juveniles, occur in the vegetated zone adjacent to the bare rocks and will restrict possible expansion. A single juvenile White-throated Monitor (*Varanus albigularis*) was observed during one visit basking in front of a hole on the cliff face above 'Tumbled Rocks'. This lizard could be a serious threat, but its presence was apparently only of a temporary nature. On 'Tumbled Rocks', we found a single shed skin and a complete young specimen of a short-snouted

Table 1
Population variation of Cryptoblepharus boutonii *at Black Rock, Kwazulu/Natal*

Season	Counted Maximum	Estimated Maximum
Feb. 1978	28	47
Dec. 1978	44	60
Apr. 1980	50	63
Dec. 1980	75	112
Dec. 1981	60	7 9
Dec. 1984	41	65
Nov. 1986	60	85
Mar. 1989	83	106
Feb. 1990	66	87
Apr. 1991	63	94
Feb. 1992	63	81
Range	28-83	47-112
$n = 11$	x = 57.	x = 79.8
Check Oct. 2001	99	113

sand snake *Psammophis brevirostris* which appeared to have been killed and dropped by a bird.

Hardly any sea-birds were ever noticed in the area. Predation by shorebirds in the Pacific has been reported (Clapp 1967), but has not been confirmed here and it is unlikely, as the local terrain is unsuited for plovers.

Being tiny and non-spectacular, these lizards are safe from collectors and the pet trade and unless some mischievous persons destroy specimens, people do not appear to be a threat.

Conclusion

Under the present conditions, the tiny population of *Cryptoblepharus boutonii* cf. *africanus* on Black Rock maintained a population mean of 80 individuals over 15 seasons and consisted of a considerably higher figure when checked ten seasons later. From a conservation point of view this is a commendable situation, and if the conditions controlling access and utilisation can be maintained, no additional measures seem to be necessary to maintain this quaint population of tiny skinks.

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