The terrapins and tortoises (Chelonia: Pelomedusidae and Testudinidae) of Swaziland

RICHARD C. BOYCOTT
Malolotja Nature Reserve, Swaziland National Trust Commission, P.O. Box 1797, Mbabane, Swaziland
E-mail: richjude@realnet.co.sz

Summary

The terrapins and tortoises (Chelonia: Pelomedusidae and Testudinidae) of Swaziland *Durban Museum Novitates* 26: 25-37. The objectives of this study were to determine the composition, habitat, distribution and conservation status of the terrapins and tortoises of Swaziland and to provide a key to their identification. The study commenced in 1988 at which time the distribution of tortoises in Swaziland was poorly known, with only one species being recorded from the country based on voucher specimens and two others from sight records. The results are based on material collected locally and lodged in museum collections in southern Africa and overseas, as well as on numerous sight records. Terrapin and tortoise habitats are described and their distributions in Swaziland mapped. Attention is drawn to erroneous distributional data and mis-spelt localities. The conservation status of Swaziland's terrapins and tortoises is assessed and it is concluded that most species are adequately protected. Of the five species of chelonians recorded from Swaziland, one is considered rare. A key to the identification of the terrapins and tortoises of Swaziland is provided.

KEYWORDS: *conservation status, distribution, habitat, identification, Swaziland, terrapins, tortoises.*

Introduction

Swaziland is located in the subtropics of southeastern Africa, between latitudes 25°45'S and 27°20'S and between longitudes 30°45'E and 32°10'E. As a consequence of the varied topography and climate, giving rise to both temperate and tropical elements, a large variety of habitats is available for reptiles. The diverse reptilian fauna of Swaziland comprises 111 species, including one crocodile, five tortoises, forty-four lizards and sixty-one snakes (Boycott 1992c, 1996). Topographically, vegetationally, and climatically Swaziland can be divided into four major regions (after Compton 1966; I'ons 1967; Goudie & Price Williams 1983). From the west, these are the Highveld (1000 m to 1860 m a.s.l.), Middleveld (300 m to 1000 m a.s.l.), Lowveld (150 m to 300 m a.s.l.) and Lubombo regions (150 m to 780 m a.s.l.) (Fig. 1).

The Highveld of Swaziland is essentially part of the Drakensberg escarpment and is the coolest and wettest part of the country, mainly because of altitude. The summers are warm and humid, and the winters cool and dry, with light to moderate frosts. Snow is a rare occurrence having fallen on three occasions in the last 12 years. The climate of the Middleveld is generally warmer and drier, the summers being warm to hot and the winters mild with occasional light frosts over higher ground. The climate of the Lowveld is hotter and drier than that of the Middleveld. The summers are hot and humid, especially after rain, while the winters are mild with occasional light frosts along drainage lines. The climate of the Lubombo region is similar to that of the Middleveld. The highest temperatures in Swaziland are recorded in the eastern Lowveld where they have been known to reach 49°C. Conversely, the lowest temperatures are recorded in the Highveld where mid-winter temperatures of -6°C have been recorded. Temperature varies according to altitude and with a mean air temperature of 22°C in the eastern Lowveld and 16°C in the western Highveld; there is a decrease of approximately 0.5°C for every 100 metre increase in altitude (Goudie & Price Williams 1983). Annual rainfall ranges from 1500 mm in the northwestern Highveld to 550 mm in the southeastern Lowveld, and there is a slight decrease in annual rainfall from the northern Lowveld to the southern Lowveld. As with temperature, rainfall varies with altitude and it is estimated that for every 30 m increase in altitude, there is an increase of approximately 25 mm in mean annual rainfall (Goudie & Price Williams 1983).

The country is dissected by several large rivers flowing from west to east namely the Mlumati, Nkomati, Mbuluzi, Usuthu, Ngwempisi, Mkondo and Ngwavuma (Fig. 1). Due primarily to altitude, the Highveld region comprises a temperate (Afromontane) faunal element, while the Middleveld, Lowveld and Lubombo regions comprise a lower-lying tropical (Afrotropical) faunal element. Both elements interdigitate as a result of intrusions into the Highveld by the lower, warmer river valleys such as the Mlumati, Nkomati, Usuthu and Mkondo that have enabled tropical species to extend westwards in Swaziland.

It appears that the first tortoise collected in Swaziland was a hinged tortoise, *Kinixys spekii* (TM24205), collected from Bremersdorp (= Manzini) in 1956 and lodged in the Transvaal Museum collection. Almost 20 years were to pass before the next museum specimens, three more *Kinixys spekii*, were collected in the 1970s and sent to the Transvaal and Umtali (=Mutare) museum collections. These were from just north of Manzini (TM42735), 5 km NW of Siphofaneni (TM51023) and Tshaneni (NMZB UM33418). It has only been during and after the 1980s that additional specimens, representative of other species, have been collected in Swaziland.

The first published records of tortoises and terrapins in Swaziland were by Greig & Burdett (1976) and Broadley (1981a) respectively, the former authors recording *Kinixys belliana*

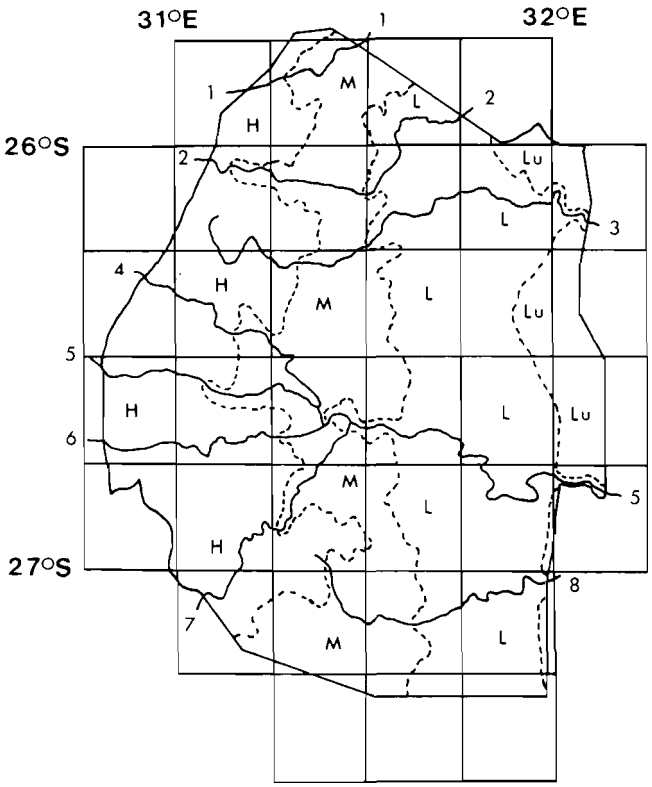

Fig. 1. Major topographical features of Swaziland overlain by the quarter-degree latitude/longitude grid. H= Highveld region, M= Middleveld region, L= Lowveld region, Lu= Lubombo region. 1= Mlumati River, 2= Nkomati River, 3= Black Mbuluzi River, 4= Little Usuthu River, 5= Great Usuthu River, 6= Ngwempisi River, 7= Mkondo River, 8= Ngwavuma River.

(*sensu* Loveridge & Williams 1957) from two localities in Swaziland (Manzini and Tshaneni), and the latter author *Pelusios sinuatus* from a single locality (Tshaneni). Broadley (1981b) confirmed the earlier *Kinixys* records, added two more, and listed the species occurring in Swaziland as *Kinixys belliana spekii*, while also providing the first records of *Kinixys natalensis* from Swaziland. Boycott (1988) and Boycott & Jacobsen (1988) recorded sympatry between *Kinixys natalensis* and *Kinixys belliana spekii* at localities in the Lubombo range in Swaziland. A survey of the herpetofauna of Swaziland conducted between 1988 and 1992 listed additional species for Swaziland (Boycott 1992c; Boycott & Culverwell 1992). Since 1992 several additional records have been obtained and observations made. The populations of *Kinixys* in southern Africa have been reviewed (Broadley 1993) and *Kinixys spekii* has been re-instated as a full species (Broadley *op. cit.*). Four savanna species of *Kinixys* occur in southern Africa (Broadley 1993; Boycott & Bourquin 2000), two of which occur in Swaziland and a third in adjacent southern Mozambique and northeastern South Africa. The habitat, distribution and conservation status of Swaziland's terrapins and tortoises are presented and a key to their identification is provided.

Methods

This study is based mostly on material collected by the author in Swaziland between 1988 and 2001 as well as on sight records made by the author, including photographs taken by him. Some tortoises were identified from photographs of specimens taken by other individuals. Sight records made by other observers were based on their identification of specimens using references such as Broadley (1981b), Boycott & Jacobsen (1988) and Boycott & Bourquin (1988).

Colour photographs of terrapins and tortoises were shown to farmers and members of local communities to determine which species they recognised from their area. Although recognition of a particular species was not used as an authentic sight record from a particular locality, because of possible confusion between the two species of terrapins and the two hinged tortoises, these incidental observations were noted. This exercise resulted in the acquisition, by the author, of live or dead specimens at a later date on return visits. Binoculars were used by the author at some localities to identify basking terrapins. Forty-six specimens have been collected in Swaziland during the study period, 35% of which are road kills. Some specimens were deliberately trapped while others were accidentally captured, for example, in rodent traps. Most of the voucher specimens comprise complete animals or shells, others may comprise a skull, one or more carapacial shields or mutilated remains from road kills identified by the author. In the latter cases there was little else that could be salvaged from such road kills and valuable distributional data was derived from such specimens.

Identifications of Swaziland material lodged in museum collections in southern Africa and overseas, not examined by the author, were supplied (in institutional printouts) by resident or consulting herpetologists attached to those institutions. Distributional data from this material have been incorporated into this study. These comprise data from 13 specimens not examined by the author. Erroneous or dubious records have been excluded. All other material has been examined by the author. Swaziland material has been deposited in the British Museum of Natural History (BMNH), London, England; Field Museum of Natural History (FMNH), Chicago, United States; National Museum (NMB), Bloemfontein, South Africa; Natural History Museum of Zimbabwe (NMZB), Bulawayo, Zimbabwe; Transvaal Museum (TM), Pretoria, South Africa; and the John Visser Private Collection (JV), Cape Town, South Africa. Other specimens in the author's private collection (RCBS), Mbabane, Swaziland will be deposited in the Transvaal Museum collection in due course.

Some earlier publications (Broadley 1981a, 1981b; Boycott & Jacobsen 1988) contain locality records for Swaziland based on photographs and not voucher specimens. These literature records have been incorporated into this study. In all, 59 specimens from 41 localities and sight records from an additional 43 localities are listed. All distribution records based on voucher specimens, sight records (including photographs) and literature records have been plotted on distribution maps. Several localities are given in distances north (N), south (S), west (W) or east (E) of a reference point. Some of the earlier locality records are given in miles (m) while more recent locality records are given in kilometres (km). Erroneous distribution records and mis-spelt localities for some species are corrected. The regional coverage of Swaziland and the number of terrapin and tortoise species per quarter-degree cell are depicted in Figures 2 and 3.

The demarcation of vegetation types in Swaziland by Low & Rebelo (1996) is inaccurate and misleading. While all species of terrapins and tortoises in the country occur primarily in the savanna biome, the boundary between the savanna and grassland biomes depicted on Low & Rebelos' (1996) map does not reflect the true situation on the ground. Consequently terrapin and tortoise habitats are described according to Acocks' (1975) veld types.

The distribution maps of the five species of tortoises and terrapins are based on the quarter-degree latitude and longitude grid. Square symbols represent voucher specimens and literature records based on voucher specimens while triangle symbols represent sight records and photographs, and literature records based on sight records or photographs only. For a reference map of localities in Swaziland refer to Boycott (1992a). All voucher specimens that were traced are listed in Appendix I and a gazetteer of localities is provided in Appendix II. The specimens are listed under each species for ease of reference and the locality is given in parenthesis. Data from 59 voucher specimens are presented.

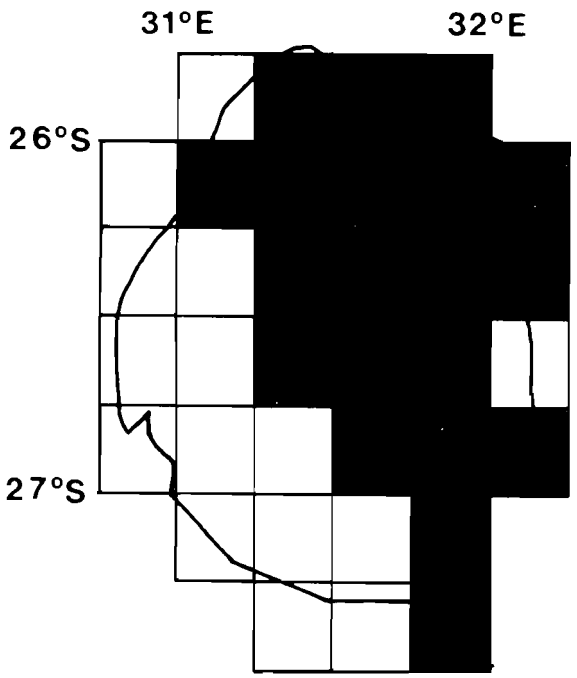

Fig. 2. Swaziland tortoise survey - regional coverage on the quarter-degree grid.

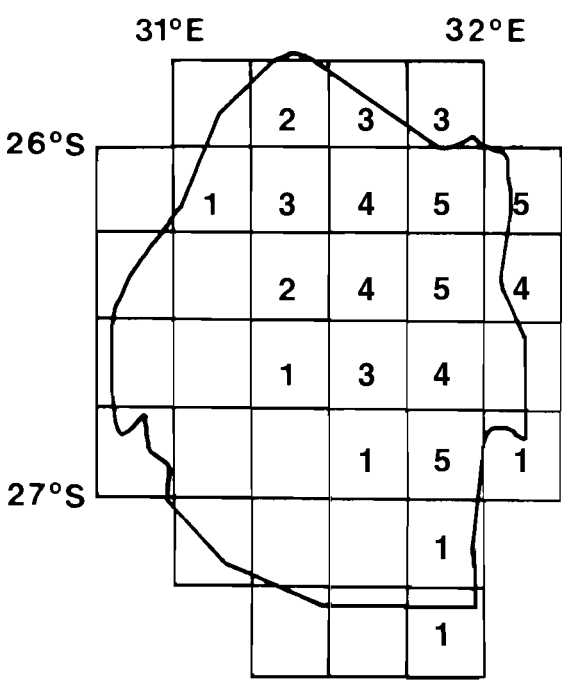

Fig. 3. Swaziland tortoise survey - number of species per quarter-degree grid cell.

Vernacular names for testudinid taxonomic categories

Class REPTILIA (all reptiles)
Order CHELONIA (tortoises, terrapins and turtles)

Suborder PLEURODIRA (side-necked tortoises)
Family PELOMEDUSIDAE (freshwater terrapins)

Genus *Pelomedusa* (non-hinged terrapins)
Species/subspecies *Pelomedusa subrufa subrufa*
Helmeted terrapin
Other names: common African helmeted terrapin, Cape terrapin, water tortoise, freshwater terrapin, marsh terrapin, hingeless terrapin.

Genus *Pelusios* (hinged terrapins)
Species *Pelusios sinuatus*
Serrated hinged terrapin
Other names: serrated terrapin, serrated turtle.

Suborder CRYPTODIRA (hidden-necked tortoises)
Family TESTUDINIDAE (terrestrial tortoises)

Genus *Geochelone* (large land tortoises)
Species *Geochelone pardalis*
Leopard tortoise
Other names: mountain tortoise, tropical leopard tortoise.

Genus *Kinixys* (hinged tortoises)
Species *Kinixys natalensis*
Natal hinged tortoise
Other names: hingeback tortoise.

Species *Kinixys spekii*
Speke's hinged tortoise
Other names: savannah hinged tortoise, Speke's hinge-back tortoise.

Checklist of the Testudines of Swaziland

Class REPTILIA
Subclass ANAPSIDIA
Order CHELONIA
Suborder PLEURODIRA
Family PELOMEDUSIDAE

Genus *PELOMEDUSA* Wagler
Pelomedusa Wagler, 1830, *Syst. Nat. Amphib.*: 136. Type by monotypy: *Testudo galeata* Schoepff = *T. subrufa* Lacépède.

Pelomedusa subrufa subrufa (Lacépède, 1788)
Fig. 4

Testudo subrufa Lacépède, 1788, *Hist. Nat. Quadrup. Ovip. Serpens, 1. Synopsis methodica*: 173, pl. xii. Type locality: Taolanaro (Fort Daupin), Madagascar.
Pelomedusa subrufa (Lacépède, 1788). Boycott 1992b: 9; Boycott & Bourquin 2000: 52.
Pelomedusa subrufa subrufa (Lacépède, 1788). Boycott 1992c: 61; Boycott & Culverwell 1992: 39.

Common name: helmeted terrapin
siSwati name: *Lufudvu lwemanti*

Fig. 4. Helmeted terrapin *Pelomedusa subrufa subrufa*. In this species the posterior shell margin is smooth.

Range:
Throughout Africa from the Cape Peninsula to the Sudan (Boycott & Bourquin 2000).

Distribution in Swaziland:
First recorded from Swaziland by Boycott (1992b). The species occurs in the Middleveld, Lowveld and Lubombo regions of Swaziland, between 100 m and 480 m a.s.l. The species remains unrecorded from the Highveld. Locality details based on 10 voucher specimens and eight sight records are provided (Fig. 5).

Localities:
Big Bend, just S of (FMNH224432) (2631DD); Big Bend, 16 km NW of (FMNH224443) (2631DB); Bordergate, 7 km SW of (TM83083) (2531DC); Cyrildene Farm, 2 km NE of (sight record) (2632AC); Dinedor Farm (RCBS1944) (2631BC); Hlane Clinic, 9 km SE of (sight record) (2631BD); Hlane Game Reserve (south) (sight record) (2631BD); Lonhlupheko, 3 km N of (TM83521) (2631BD); Lukhula (sight record) (2631BD); Lukhula, S of (sight record) (2631BD); Maphiveni (sight record) (2631BB); Mbuluzi Estate (sight record) (2631BB); Mlawula Station, Mlawula Nature Reserve (east) (sight record) (2632AA); Nkambeni, 4 km E of (TM83081, 83082) (2631BA); Siphofaneni, 3 km E of (TM69930) (2631DA); Siphofaneni, 15 km SE of (TM83008) (2631DD); Siphofaneni, 25 km SW of (TM69931) (2631DC).

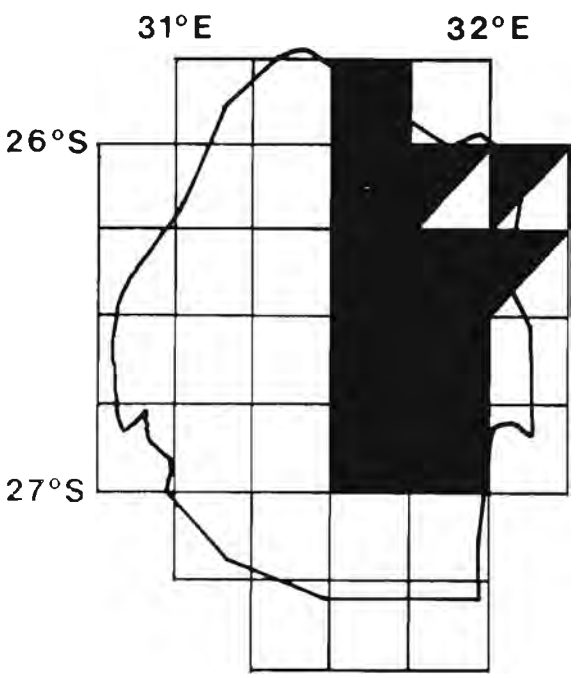

Fig. 5. Distribution of *Pelomedusa subrufa subrufa* in Swaziland. Squares represent voucher specimens, triangles represent sight records.

Literature records:
Mhlosinga Nature Reserve (Washington 1992) (2631DD).

Taxonomic note:
Several species and subspecies of *Pelomedusa* have been described from southern Africa (see Loveridge 1941: 470-474). While placing the majority of these forms in the synonymy of *Pelomedusa subrufa subrufa*, Loveridge (1941) retained the use of trinomials as he recognised *Pelomedusa subrufa olivacea* from Eritrea. A poorly defined race in southeastern southern Africa, *Pelomedusa subrufa nigra*, with dull colouration and a black plastron, although synonymised by Loveridge (1941), is recognised by some authors (Bour 1986; Branch 1998). As there is great variation in the colour and pattern of the carapace and plastron in the Swaziland population of *Pelomedusa* (pers. obs), it is presumed that the subspecies in Swaziland is *subrufa*. However, as pointed out by Branch *et al.* (1995), a fuller analysis of the situation in southern Africa is required in order to determine the validity of *P. s. nigra*. In the present paper trinomials are used as the northern subspecies *olivacea* is still recognised (Pritchard 1979).

Remarks:
The helmeted terrapin is a common species in the Lowveld and Middleveld, and is expected to have a much wider range within Swaziland. Jacobsen (1989) recorded the species up to an altitude of 1600 m in adjacent South Africa, which is considerably higher than the maximum recorded (480 m) for Swaziland. *Pelomedusa s. subrufa* occurs in tropical bushveld and tropical savanna habitat types, and marginally in Zululand thornveld on the Lubombo plateau (Acocks 1975). The helmeted terrapin seems to prefer temporary pans, puddles of water, man-made dams and borrowpits. At night they are easily captured at the water's edge and have also been collected crossing roads, far from the nearest water-body, at this time. In Swaziland, *Pelomedusa* prefers temporary water-bodies and avoids rivers and streams, whereas *Pelusios* prefers permanent water-bodies, whether these are rivers, streams, dams or flooded quarries. Although having been recorded with other species of terrapins (*Pelusios sinuatus* and *P. subniger*) in the same water-body near Selebi Phikwe, in Botswana (Jacobsen & van der Waal 1995) and in the Kruger National Park, South Africa (Hoffman & van der Bank 2001), *Pelomedusa* has yet to be recorded at the same locality as *Pelusios* in Swaziland. *Pelomedusa s. subrufa* has been recorded from Hlane Game Reserve and Mlawula Nature Reserve, and probably also occurs in Mhlosinga Nature Reserve (Washington 1992). The species is under no immediate threat as suitable, albeit modified, habitat outside of protected areas is abundantly available throughout its Swaziland range. However, to maintain suitable habitat for this species and, perhaps to a lesser degree, also for the serrated hinged terrapin, it is recommended that borrowpits resulting from road construction and maintenance, should not be filled in or re-habilitated to such an extent that they become unsuitable for terrapins.

Genus *PELUSIOS* Wagler
Pelusios Wagler, 1830, *Syst. Nat. Amphib.*: 137. Type by monotypy: *Emys castanea* Schweigger.

Pelusios sinuatus (A. Smith, 1838)
Fig. 6

Sternothaerus sinuatus A. Smith, 1838, *Ill. Zool. S. Afr., Rept., pl. i.* Type locality: Crocodile/Marico River confluence, N. Transvaal, South Africa (restricted by Broadley, 1981a).
Pelusios sinuatus (A. Smith, 1838). Broadley 1981a: 680; Patterson 1987: 17; Boycott 1992b: 9; Boycott 1992c: 61; Boycott & Culverwell 1992: 39; Boycott & Bourquin 2000: 65.

Common name: serrated hinged terrapin
siSwati name: *Lufudvu lwemanti*

Range:
Tropical eastern and southeastern Africa (Boycott & Bourquin 2000).

Distribution in Swaziland:
First recorded from Swaziland by Broadley (1981a) who based the record on photographs. The species occurs in the Middleveld, Lowveld and Lubombo regions of Swaziland, between 180 m and 640 m a.s.l. The species' range extends westwards into the larger warmer valleys that penetrate the Highveld, such as the Mlumati, Nkomati and Usuthu. The westernmost record for the species is in the Nkomati Gorge in Malolotja Nature Reserve. Locality details based on 19 voucher specimens and 21 sight records are provided (Fig. 7).

Localities:
Balegane, 4 km NE of (sight record) (2631BA); Balegane district (sight record) (2631BA); Croydon, 8 km N of (sight record) (2631BA); Dinedor Farm (TM71098, TM83529) (2631BC); Hlane Clinic, 4 km W of (sight record) (2631BA); Hlane Game Reserve (north) (sight record) (2631BB); Hlane Game Reserve (south) (sight record) (2631BD); IYSIS barrage, near (TM83001) (2631BA); Mafutseni, 2.5 km N of (RCBS1945) (2631BC); Mafutseni, 3 m E of (sight record) (2631BC); Mafutseni, 8 km N of (TM83528) (2631BC); Mafutseni, 15 km NE of (sight record) (2631BC); Matsapha (sight record) (2631CB); Mbuluzane River (sight record) (2631BB); Mbuluzi Gorge, Mlawula Nature Reserve (east) (sight record) (2632AA); Mbuluzi Nature Reserve (east) (sight record) (2632AA); Mbuluzi Nature Reserve (west) (sight record) (2631BB); Mbuluzi River (lowveld) (sight record) (2631BB); Mndobandoba River (RCBS2001) (2631DD); Mlawula Nature Reserve (east) (sight record) (2632AA); Mlawula Nature Reserve (southeast) (sight record) (2632AC); Mlawula Nature Reserve (southwest) (sight record) (2631BD); Mlawula Nature Reserve (west) (sight record) (2631BB); Mzimnene River (TM82988) (2631BA); Mzimphofu River (TM83080) (2631DB); Ngonini Estate (sight record) (2531CD); Nkomati Gap (TM83004) (2631AB); Nkomati Gorge, Malolotja Nature Reserve (TM79819) (2631AA); Nkomati River bridge (new) (sight record) (2631AA); Nsoko (TM79821) (2731BB); Nyetane Dam (sight record) (2631DB); Piggs Peak, 30 km SE of (NMB8210, 8211; TM83324, 83325, 83326, 83327, 83328) (2631AB); Sand River Dam (TM79818) (2531DC).

Literature records:
Tshaneni (Broadley, 1981a) (2531DD); Mhlosinga Nature Reserve (Washington 1992) (2631DD).

Fig. 6. Serrated hinged terrapin *Pelusios sinuatus*. In this species the posterior shell margin is sinuous.

Remarks:
This species is common in the larger perennial rivers in the Middleveld, Lowveld and Lubombo regions but has also been recorded from man-made dams. Although these terrapins may prefer larger perennial water-bodies such as large rivers and dams they are surprisingly adaptable in that they also occur in smaller temporary water-bodies, such as borrowpits. *Pelusios sinuatus* occurs in lowveld sour bushveld, tropical bushveld and tropical savanna habitat types and, marginally, in Zululand thornveld on the Lubombo plateau (Acocks 1975). As with *Pelomedusa* this species is easily collected at night in the shallows of rivers and borrowpits. It readily enters terrapin traps and many specimens may be collected in this way as evidenced, on one occasion, when 13 specimens were captured overnight in a trap left in a flooded quarry near St Peregrine's, 30 km SE of Piggs Peak. During wet weather specimens have been collected, at night, crossing roads, sometimes far from the nearest water-body. *Pelusios sinuatus*

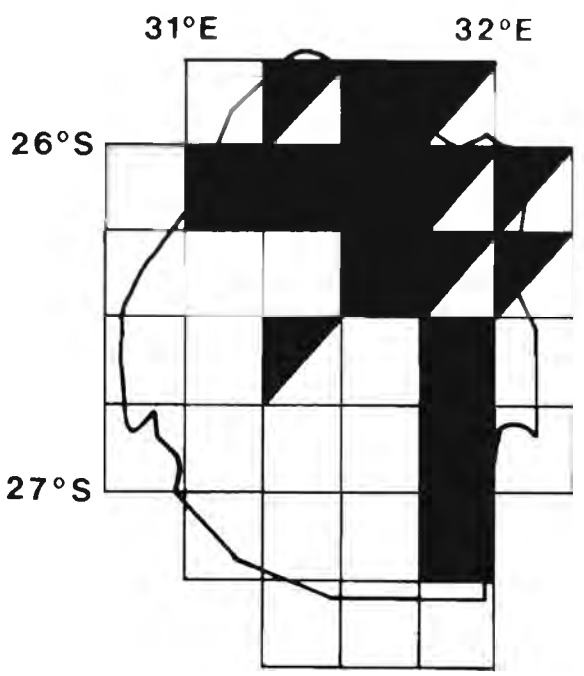

Fig. 7. Distribution of *Pelusios sinuatus* in Swaziland. Squares represent voucher specimens, triangles represent sight records.

has been recorded from Hlane Game Reserve, Malolotja Nature Reserve, Mbuluzi Nature Reserve and Mlawula Nature Reserve, and probably also occurs in Mhlosinga Nature Reserve (Washington 1992). As with *Pelomedusa* this species is under no immediate threat as there is an abundance of suitable habitat, particularly large perennial rivers and streams, throughout its Swaziland range. Broadley's (1981a) locality, Tshaneni, was misplotted as 2631BB instead of 2531DD (Boycott 1992c). Confirmation of the locality details was obtained from B. Washington (pers. comm.).

Suborder CRYPTODIRA
Family TESTUDINIDAE
Genus *GEOCHELONE* Fitzinger
Geochelone Fitzinger, 1835, *Ann. Weiner Mus.*, 1: 111-112, 122. Type by original designation: *Testudo stellata* Schweigger = *T. elegans* Schoepff.

Geochelone pardalis (Bell, 1828)
Fig. 8

Testudo Pardalis Bell, 1828, *Zool. Jour.*, 3, p. 420, pl. xxv. Type locality: Cape of Good Hope, South Africa.
Geochelone pardalis (Bell, 1828). Boycott 1992b: 10; Boycott 1992c: 62; Boycott & Culverwell 1992: 39; Boycott & Bourquin 2000:139.

Common name: leopard tortoise
siSwati name: *Lufudvu lwesiganga*

Range:
Widespread in central and southern Africa, from Ethiopia and the Sudan to the southern regions of South Africa (Boycott & Bourquin 2000).

Distribution in Swaziland:
First recorded from Swaziland by Boycott (1992b). The species occurs in the Middleveld, Lowveld and Lubombo regions of Swaziland between 135 m and 540 m a.s.l. and is absent from the Highveld. The westernmost record for the species is in the Nkomati Valley (Nyonyane Sisa Ranch), approximately 37 km southeast of Piggs Peak. Locality details based on seven voucher specimens and 18 sight records are provided (Fig. 9).

Localities:
Big Bend (sight record) (2631DD); Big Bend/Siteki road (sight record) (2631DB); Bordergate, 20 km S of (TM83517) (2631BA);

Fig. 8. Leopard tortoise *Geochelone pardalis*. In this species the nuchal shield is absent.

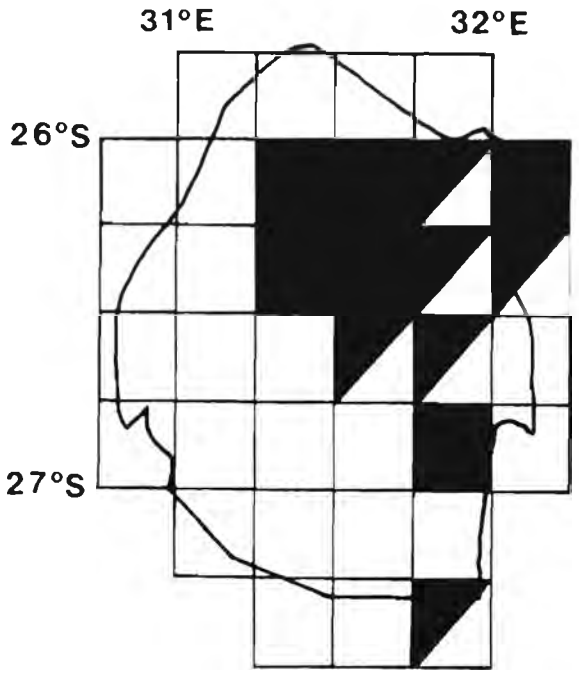

Fig. 9. Distribution of *Geochelone pardalis* in Swaziland. Squares represent voucher specimens, triangles represent sight records.

Dinedor Farm (sight record) (2631BC); Great Usuthu River, 4.5 km S of (TM83078) (2631DD); Hlane Game Reserve (south) (sight record) (2631BD); Lavumisa (sight record) (2731BD); Manzini (sight record) (2631AD); Manzini, 8 m E of (sight record) (2631DA); Mbuluzi Nature Reserve (east) (sight record) (2632AA); Mbuluzi Nature Reserve (west) (sight record) (2631BB); Mlawula Nature Reserve (east) (TM78949, TM83519) (2632AA); Mlawula Nature Reserve (southeast) (sight record) (2632AC); Mlawula Nature Reserve (southwest) (sight record) (2631BD); Mlawula Nature Reserve (west) (sight record) (2631BB); Mnjoli Dam (sight record) (2631BA); Mpaka (sight record) (2631BD); Ndzindza Nature Reserve (sight record) (2632AA); Nyonyane Sisa Ranch (TM83518) (2631AB); Oribi Ranch (sight record) (2632AC); Scotts Ranch (TM83520) (2631BC); Siteki, 10 m NE of (sight record) (2631BD); Siteki, 13 km E of (sight record) (2632AC); St Joseph's Mission (TM80827) (2631AD).

Literature records:
Mhlosinga Nature Reserve (Washington 1992) (2631DD)

Taxonomic note:
Some authors (Loveridge & Williams 1957; Wermuth & Mertens 1961; Broadley 1988, 1989a; Broadley & Howell 1991; Branch 1998; Lambiris 1999) recognise two subspecies of *Geochelone pardalis*, a dwarf northern race (*G. p. babcocki*) occurring in most of eastern and southern Africa and a southern race (*G. p. pardalis*) restricted to the southern and eastern Cape, with a relict population in southern Namibia. The respective distributions of the two forms are given by Broadley (1989a) who recognises the Swaziland population as *G. p. babcocki*. The distributional limits of both forms are uncertain (see Greig & Burdett 1976 and Broadley 1989a) and the validity of the two subspecies has been questioned by some authors (Greig & Burdett 1976, Boycott & Bourquin 1988, 2000; Jacobsen 1989; Bauer *et al.* 1993) as, in many

respects, the diagnostic characters are contradictory and unconvincing. Consequently no subspecies are listed in the present account as a fuller analysis of the situation in southern Africa is required in order to determine the validity of the two subspecies.

Remarks:
The leopard tortoise is common in the Middleveld, Lowveld and Lubombo regions of Swaziland where it occurs in lowveld sour bushveld, tropical bushveld and tropical savanna habitat types and, marginally, in Zululand thornveld on the Lubombo plateau (Acocks 1975). During warm summer thunderstorms, in the daytime, there is often a spontaneous emergence of these tortoises. A juvenile of this species was found swimming far from the shore in Mnjoli Dam. A specimen found dead on a road at Nyonyane Sisa Ranch, in the Nkomati valley, was being eaten by a Nile monitor *Varanus niloticus*. Much of the natural bushveld of the lowveld has been cleared for sugarcane and citrus and, as a consequence, the leopard tortoise has lost large tracts of its natural habitat. *Geochelone pardalis* has been recorded from Hlane Game Reserve, Mbuluzi Nature Reserve, Mlawula Nature Reserve and Ndzindza Nature Reserve, and probably also occurs in Mhlosinga Nature Reserve (Washington 1992). The species is still commonly found throughout the natural areas in the Lowveld and Middleveld regions and on the Lubombo plateau. The biggest threat to the species, in the long-term, is the fragmentation of the remaining natural habitats in which it occurs in the wake of rapidly expanding agriculture.

Genus *KINIXYS* Bell
Kinixys Bell, 1827, *Trans. Linn. Soc. Lond.*, 15: 398. Type by original designation: *K. castanea* Bell = *Testudo erosa* Schweigger.

Kinixys natalensis Hewitt, 1935
Fig. 10

Kinixys natalensis Hewitt, 1935, *Records of the Albany Museum* 4: 353, pl. xxxv, figs 3-4. Type locality: Jameson's Drift, Tugela River, Natal.
Kinixys natalensis Hewitt, 1935. Broadley 1981b: 207; Boycott 1988: 90; Boycott & Bourquin 1988: 127; Boycott & Jacobsen 1988: 100; Broadley 1989b: 61; Boycott 1992b: 10; Boycott 1992c: 63; Boycott & Culverwell 1992: 39; Broadley 1993: 46; Boycott & Bourquin 2000: 182.

Fig. 10. Natal hinged tortoise *Kinixys natalensis*. Note the poorly developed carapacial hinge between marginal shields seven and eight.

Common name: Natal hinged tortoise
siSwati name: *Lufudvu lwesiganga*

Range:
Endemic to southern Africa, it is restricted to southeastern South Africa, Swaziland and southwestern Mozambique (Boycott & Bourquin 2000).

Distribution in Swaziland:
First recorded from Swaziland by Broadley (1981b) who based the record on photographs. The species is restricted to the Lubombo and Lowveld regions of Swaziland. It occurs along the length of the Lubombo mountain range and foothills, between 100 m and 655 m a.s.l. Its range extends into the eastern Lowveld as far as Tshaneni and Mpaka. Locality details based on six voucher specimens and seven sight records are provided (Fig. 11).

Localities:
Big Bend, 6 km E of (TM71015, 71016) (2632CC); Lonhlupheko, 3 km W of (TM83534) (2631BD); Mlawula Nature Reserve (southwest) (sight record) (2631BD); Mlawula Nature Reserve (west) (sight record) (2631BB); Ndzevane (sight record) (2631DD).

Literature records:
Big Bend (Broadley 1993) (2631DD); Groenpan Farm (Broadley 1981b) (2631BD); Mbuluzi Nature Reserve (east) (Boycott & Jacobsen 1988) (2632AA); Mlawula Nature Reserve (east) (Boycott & Jacobsen 1988) (2632AA); Ndzindza Nature Reserve (Broadley 1981b) (2632AA); Tshaneni (Broadley, 1981b) (2531DD).

Remarks:
The Natal hinged tortoise is rare in Swaziland and is, for the most part, restricted to the Lubombo Mountain range and its foothills, with three records from the eastern Lowveld. In

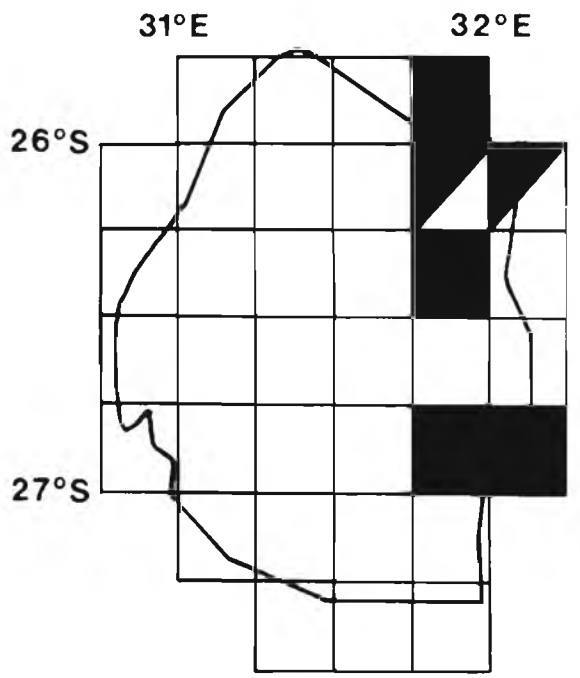

Fig. 11. Distribution of *Kinixys natalensis* in Swaziland. Squares represent voucher specimens, triangles represent sight records.

Swaziland *Kinixys natalensis* occurs predominantly in Zululand thornveld and marginally in tropical bushveld and tropical savanna habitat types (Acocks 1975). The species occurs sympatrically with *Kinixys spekii* in parts of the Lubombo Mountains at Mlawula and Mbuluzi Nature Reserves (Boycott 1988; Boycott & Jacobsen 1988, and in the eastern Lowveld just west of Lonhlupheko, several kilometres west of the Lubombos, at Tshaneni and at Big Bend. Specimens of *K. natalensis* have been found during the day under rocks on the Lubombo plateau, a plateau liberally littered with rhyolite rocks, many suitable as retreats for this tortoise. These tortoises become more active, and may be found out in the open, during cool and wet weather, often during overcast conditions. *Kinixys natalensis* has been recorded from Mlawula Nature Reserve, Mbuluzi Nature Reserve and Ndzindza Nature Reserve. Without doubt it is the rarest tortoise in Swaziland. Fortuitously it occurs along the entire length of the Lubombo range in Swaziland, a habitat that due to its rugged topography has remained relatively intact. However, *Kinixys natalensis* must have lost habitat along the periphery of its range as many of the lower foothills and ridges, at the base of the Lubombo range and in the eastern Lowveld, have been cleared of bush and no longer resemble the original habitat. The lowveld specimen (TM83534), from near Lonhlupheko, is a mutilated road kill and therefore some of the most useful diagnostic characters, such as the tricuspid beak and divided supracaudal shield (Boycott & Jacobsen 1988), cannot be used for identification. However, the specimen has a vivid concentric pattern on the carapace and the plastron has the typical *natalensis* pattern of dark brown or black ocelli on a light brown or yellow background. Broadley's (1981b) Ndzinda (*sic*) Nature Reserve record was misplotted as 2632AC instead of 2632AA and the correct spelling is Ndzindza (J. Culverwell pers. comm.). This locality was also misplotted by Boycott & Jacobsen (1988). In Broadley's (1993) subsequent paper, the localities of Tshaneni and Groenpan have been misplotted, Tshaneni as 2631BB instead of 2531DD, and Groenpan as 2631BB instead of 2631BD. Confirmation of the locality details for Tshaneni was obtained from B. Washington (pers. comm.) and for Groenpan from J. Culverwell (pers. comm.).

Kinixys spekii Gray, 1863
Fig. 12

Kinixys Spekii Gray, 1863, *Ann. Mag. Nat. Hist.*, 3(12): 381. Type locality: Central Africa (probably northwestern Tanzania).
Kinixys belliana Gray, 1863. Greig and Burdett 1976: 257.
"Kinixys spekii". Broadley 1989b: 53.
Kinixys belliana spekii Gray, 1863. Broadley 1981b: 215; Boycott 1988: 90; Boycott & Bourquin 1988: 124; Boycott & Jacobsen 1988: 93; Boycott 1992b: 10; Boycott 1992c: 62; Boycott & Culverwell 1992: 39.
Kinixys spekii Gray, 1863. Broadley 1993: 47; Branch 1998: 35; Boycott & Bourquin 2000: 186.

Common name: Speke's hinged tortoise
siSwati name: *Lufudvu lwesiganga*

Range:
Occurring in tropical central, eastern and southern Africa this species reaches the southernmost limit of its range in South Africa, Swaziland and southwestern Mozambique (Boycott & Bourquin 2000).

Fig. 12. Speke's hinged tortoise *Kinixys spekii*. Note the well-developed carapacial hinge between marginal shields seven and eight and costal shields two and three.

Distribution in Swaziland:
First recorded from Swaziland by Greig & Burdett (1976) and subsequently confirmed by Broadley (1981b). The species occurs in the Middleveld, Lowveld and Lubombo regions of Swaziland between 100 m and 600 m a.s.l. The westernmost records are from the Mlumati (NE of Piggs Peak) and Nkomati (SE of Piggs Peak) valleys where subtropical corridors penetrate the Highveld region. Locality details based on 17 voucher specimens and 12 sight records are provided (Fig. 13).

Localities:
Balegane, 8 km SW of (TM80826) (2631BA); Big Bend (photo J. Dalton) (2631DD); Big Bend, 13 km NW of (sight record) (2631DB); Dinedor Farm (RCBS1856) (2631BC); Hlane Game Reserve (north) (sight record) (2631BB); Lonhlupheko, 2.5 km W of (TM83538) (2631BD); Mafutseni, 1 km E of (RCBS1951) (2631BC); Mafutseni, 7 km E of (RCBS1952) (2631BC); Manzini, N of (TM42735) (2631AD); Manzini, 21 km E of (sight record) (2631BC); Mbuluzi Nature Reserve (east) (sight record) (2632AA); Mbuluzi Nature Reserve (west) (sight record) (2631BB); Mlawula Nature Reserve (east) (sight record) (2632AA); Mlawula Nature Reserve (southeast) (sight record) (2632AC); Mlawula Nature Reserve (west) (sight record) (2631BB); Mlawula Nature Reserve entrance, 1.5 km W of (TM82989) (2631BB); Mpaka, 18 m NE of (sight record) (2631BB); Ndzindza Nature Reserve (sight record) (2632AA); Nyonyane Sisa Ranch (TM83535) (2631AB); Phophonyane Valley (photo R. Freemantle) (2531CD); Piggs Peak, 12 km NE of (RCBS1902) (2531CD); Tunzini Estate (TM71858) (2531DC).

Literature records:
Manzini (Broadley 1993) (2631AD); Mhlosinga Nature Reserve (Washington 1992) (2631DD); Siphofaneni, 5 km NW of (Broadley 1993) (2631DA); Tambuti Estate (Broadley 1993) (2631DB); Tshaneni (Broadley 1993) (2531DD).

Remarks:
Speke's Hinged Tortoise is common throughout the Middleveld, Lowveld and Lubombo regions of Swaziland where it occurs predominantly in tropical bushveld and tropical savanna but also in sour bushveld and, marginally, in Zululand thornveld on the Lubombo plateau (Acocks 1975). The species occurs sympatrically with *Kinixys natalensis* in the Lubombo Mountains, in Mlawula and Mbuluzi Nature

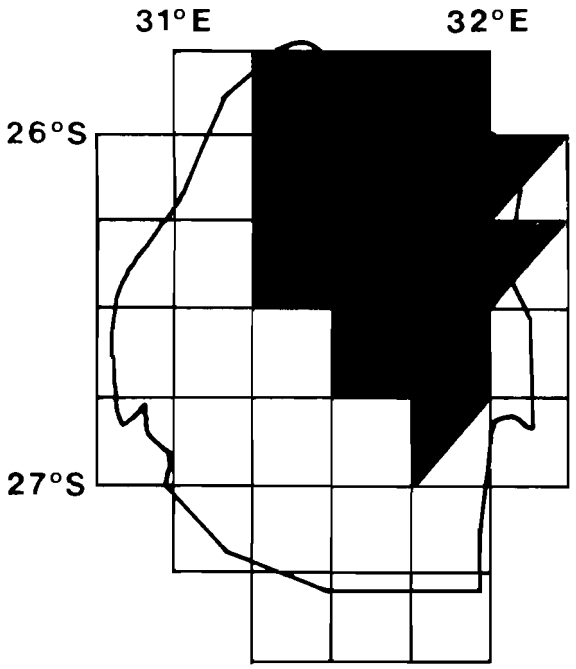

Fig. 13. Distribution of *Kinixys spekii* in Swaziland. Squares represent voucher specimens, triangles represent sight records.

Reserves, and at three localities in the Lowveld, and is more common than *natalensis*. As with most terrestrial tropical tortoises, *Kinixys spekii* becomes more active during overcast and cooler conditions, especially after a shower of rain. One specimen was captured in a rodent trap on Tunzini Estate and another was electrocuted in an electric fence. A large female specimen from Dinedor Farm, represented by a complete shell (RCBS1856), has a total length of 210 mm, a width of 134 mm and a height of 89 mm, exceeding the largest specimen (AM78C: 183 X 115 X 70 mm) recorded by Broadley (1993). Much of the natural bushveld of the lowveld has been cleared for sugarcane and citrus and as a consequence Speke's hinged tortoise has lost large tracts of its natural habitat. *Kinixys spekii* has been recorded from Hlane Game Reserve, Mbuluzi Nature Reserve, Mlawula Nature Reserve and Ndzindza Nature Reserve, and probably also occurs in Mhlosinga Nature Reserve (Washington 1992). As with the leopard tortoise, this species is still commonly found throughout the natural areas in the Lowveld and Middleveld regions and on the Lubombo plateau. The biggest threat to the species, in the long-term, is the fragmentation of the remaining natural habitats in which it occurs. Broadley (1993) lists four localities in his text but plots five on his distribution map. The extra locality on the map is presumably Mlawula Nature Reserve which has been misplotted as 2631BD instead of 2632AA. The Tshaneni locality was misplotted as 2631BB instead of 2531DD and Tambuti Estates was mis-spelt. Confirmation of the Tshaneni locality details was obtained from B. Washington (pers. comm.).

Conservation status of terrapins and tortoises in Swaziland

A study by Branch *et al.* (1995) investigated the diversity, distribution and conservation of southern African terrapins and tortoises. Density maps, plotted on a quarter-degree scale, were produced indicating tortoise and terrapin species richness. Two epicentres of total species richness were identified in southern Africa, namely the former Transvaal lowveld and adjacent KwaZulu-Natal, and the former eastern and southwestern Cape Province. A systematic survey by quarter-degree grid cells of terrapins and tortoises was not possible due primarily to time constraints and secondarily to limited resources. Consequently, because of a lack of comprehensive coverage (see Figs 2 and 3), a similar analysis to that undertaken by Branch *et al.* (1995) could not be done in this Swaziland study. Nonetheless, in the eastern lowveld and on the Lubombo plateau all five species of terrapins and tortoises known from Swaziland have been recorded from four quarter-degree grid cells, namely Mhlume (2631BB), Shewula (2632AA), Siteki (2631BD) and Big Bend (2631DD) (Fig. 3). Furthermore, four of the five species have been recorded from four other grid cells in this region: Nkambeni (2631BA), Malindza (2631BC), Sitsatsaweni (2632AC) and Sivunga (2631DB). The fifth species is likely to occur in at least two of these grid cells. The present study, although incomplete as far as full coverage is concerned, indicates that Swaziland, and more specifically the eastern Lowveld and Lubombo region, where the greatest diversity of chelonians is to be found, forms an integral part of the Mpumalanga lowveld and adjacent KwaZulu-Natal epicentre of total species richness identified in the earlier study by Branch *et al.* (1995).

In the grid cells from which all five species have been recorded there are five protected areas, and it can be seen from the above that species richness in terrapins and tortoises coincides with the distribution of existing protected areas in the Lowveld and Lubombo regions of Swaziland. It is also a fact that this region, particularly the Lowveld, is under the greatest threat from expanding agriculture and therefore greater efforts should be made to publicly and privately protect more areas in this part of Swaziland to ensure the continued survival of all species.

In this study all species of terrapins and tortoises have been recorded as occurring in two or more protected areas in Swaziland. Details are as follows: *Pelomedusa subrufa* (Hlane Game Reserve and Mlawula Nature Reserve); *Pelusios sinuatus* (Hlane Game Reserve, Mlawula Nature Reserve, Mbuluzi Nature Reserve and Malolotja Nature Reserve); *Geochelone pardalis* (Hlane Game Reserve, Mbuluzi Nature Reserve, Mlawula Nature Reserve and Ndzindza Nature Reserve); *Kinixys natalensis* (Mlawula Nature Reserve, Mbuluzi Nature Reserve and Ndzindza Nature Reserve); and *Kinixys spekii* (Hlane Game Reserve, Mbuluzi Nature Reserve, Mlawula Nature Reserve and Ndzindza Nature Reserve). Mlawula Nature Reserve provides protected habitat for all five species of Swaziland's terrapins and tortoises. Hlane Game Reserve and Mbuluzi Nature Reserve provide protected habitat for four of the five species. Ndzindza Nature Reserve provides protected habitat for three of the five species and Malolotja Nature Reserve one of the five species.

It can be concluded that Swaziland's terrapins and tortoises are well represented within protected areas, thereby offering a degree of protection to all species. Outside these protected areas the situation is more serious, especially in the Lowveld and Lubombo regions, as much of the remaining natural habitats are being cleared for agriculture (sugarcane and citrus) and seriously fragmented. Although cattle ranches generally provide suitable habitat for tortoises, in some cases extensive changes from woodland to grassland have occurred, especially on the Lubombo plateau. The effect of such habitat transformation is not known but it is likely that fire has become a factor and a possible additional threat to tortoises in these areas.

One species may have become locally extinct in western Swaziland. The helmeted terrapin occurs on the highveld of the former Transvaal (Jacobsen 1989) but remains unrecorded from the Swaziland highveld. It is a fact that the Highveld region of Swaziland has been modified, mostly through cultivation in upland vlei systems and excessive stock grazing, such that there are no longer any natural ephemeral pans in the region. Extensive forestry in this region has also contributed to the demise of natural wetlands. Another symptom of the man-altered habitats could be the disappearance of the African bullfrog *Pyxicephalus adspersus* from the Swaziland highveld in recent years. The last recorded sighting of these frogs was in 1987 (Boycott 1992a, 1992b, 1992c) from the Hawana area as one of the last remaining temporary wetlands in the highveld was flooded by the Hawana Dam. If it is assumed that the helmeted terrapin occurs in the same highveld habitat as the African bullfrog, this may explain why no highveld records for *Pelomedusa subrufa* exist in Swaziland. It would therefore not be unreasonable to presume that the species has become locally extinct in the Highveld region of Swaziland.

It is of some concern that terrapins and tortoises are translocated within Swaziland. On a number of occasions tortoises have been brought in to some of the nature reserves after being 'saved' from Swazis by misguided tourists, visitors and residents who have bought the animals from the locals. Some of these animals have found their way into private residences in the towns, especially in Mbabane and Manzini. These are mostly leopard tortoises but occasionally involve Speke's hinged tortoises as well. On one occasion a serrated hinged terrapin was collected at Hawana Dam in the Highveld region by one of the game guards based at the dam. This is out of the natural distribution range of the species, which could indicate that some well-meaning resident of Mbabane, or perhaps a tourist, may have decided to release this terrapin in the dam. The specimen was released in the Nkomati River at a site where the species had been observed previously. Translocations do not only involve species that naturally occur in Swaziland as on another occasion a Bell's hinged tortoise *Kinixys belliana belliana* was found in Mbabane. It is believed that the specimen may have come from Mozambique, the nearest location to Swaziland where the species occurs. Over the last decade travel between Mozambique and Swaziland has increased and controls at the borderposts are not strict.

Tortoises and possibly terrapins are used for medicinal purposes in Swaziland and the extent of this practice needs to be determined. The ash obtained from burnt tortoise shells is used to pack burns and scalding injuries. One species used for this purpose is Speke's hinged tortoise but this practice may involve other species as well. The extent of the medicinal use of tortoises and tortoise parts in Swaziland requires further investigation.

Conclusion

This study represents the most comprehensive yet undertaken on the chelonians of Swaziland. The habitat, distribution and current conservation status of each species have been investigated. Swaziland has a rich diversity of chelonians occurring in a variety of habitats at altitudes ranging from 100 m to 665 m a.s.l. The terrapins and tortoises of Swaziland occur in the warmer regions of the country, specifically in the subtropical Middleveld, Lowveld and Lubombo regions, where they form an integral part of the tropical herpetofauna of southeastern Africa. It has been demonstrated that Swaziland contributes significantly to one of the region's identified epicentres of chelonian total species richness and to the conservation of the region's chelonians.

Of the five chelonian species recorded, the Natal hinged tortoise is considered the rarest tortoise in Swaziland. It is recommended that greater protection under the Game Act be extended to all species of terrapins and tortoises in Swaziland, inside and outside of protected areas. The larger privately owned farms, cattle ranches and agricultural estates should be encouraged to maintain and protect natural habitats under their control to further safeguard Swaziland's terrapin and tortoise populations. Translocations of terrapins and tortoises need to be discouraged and their inclusion under the Game Act would help to achieve this.

Apart from the two hinged tortoises (*Kinixys* spp.), the different species of terrapins and tortoises in Swaziland may be identified fairly easily. Boycott & Jacobsen (1988) provide detailed descriptions of the differences between *K. natalensis* and *K. spekii* but do not provide a key to their identification. The key presented below addresses this and hopefully will facilitate the identification of Swaziland's terrapins and tortoises. This key is not for hatchlings or juveniles and is for adult tortoises only, but in many cases it can be used for juveniles as well. The key has been designed to identify normal specimens which excludes those with supernumerary or subnumerary shields and other abnormalities.

KEY TO THE IDENTIFICATION OF THE TERRAPINS AND TORTOISES OF SWAZILAND

1a. Head and neck withdrawn backwards into shell; terrestrial species ..... (tortoises) 3

1b. Head and neck withdrawn sideways into shell; aquatic species ..... (terrapins) 2

2a. Plastron hinged anteriorly; carapacial and plastral bridge formed by abdominal shields only; posterior marginals markedly serrate; plastron usually yellow with well-defined black edging..... *Pelusios sinuatus* (Fig. 6)

2b. Plastron not hinged anteriorly; carapacial and plastral bridge formed by pectoral and abdominal shields; posterior marginals not serrate; plastron not yellow with well-defined black edging..... *Pelomedusa subrufa subrufa* (Fig. 4)

3a. Nuchal shield absent; lower margin of third costal shield not markedly shorter than lower margin of fourth costal shield; carapace lacking posterior hinge between marginals 7 and 8. ..... *Geochelone pardalis* (Fig. 8)

3b. Nuchal shield present; lower margin of third costal shield markedly shorter than lower margin of fourth costal shield; carapace with posterior hinge between marginals 7 and 8. ..... (hinged tortoises) 4

4a. Upper beak tricuspid; carapacial hinge poorly developed and not extending beyond the marginal shields; gular shields together usually at least twice as wide as long; supracaudal shield often divided; abdominal shields have a central yellow patch ringed with black (old individuals excepted); plastron not markedly concave in adult males. ..... *Kinixys natalensis* (Fig. 10)

4b. Upper beak unicuspid; carapacial hinge well-developed and extending beyond the marginal shields; gular shields together usually less than twice as wide as long; supracaudal shield undivided; abdominal shields without a central yellow patch ringed with black; plastron markedly concave in adult males. .... *Kinixys spekii* (Fig. 12)

Acknowledgements

Don Broadley on behalf of the Natural History Museum of Zimbabwe (Bulawayo), and the Natural History Museum (London), Louis du Preez on behalf of the National Museum (Bloemfontein), Wulf Haacke of the Transvaal Museum (Pretoria), Alan Resetar of the Field Museum of Natural History (Chicago), and John Visser (JV Private Collection Cape Town) are thanked for providing details of preserved material from Swaziland in these collections. In particular, I would like to thank Neil la Croix, Richard Freemantle, John Harding, Ara Monadjem, Jon Putnam and Kim Roques for collecting specimens. For assistance in the field, I thank James Culverwell, Louis du Preez, Johan Engelbrecht, Bunny and Tao Fineberg, Alistair Gray and Barry Washington. Locality details for several sightings were provided by James Culverwell, Richard Freemantle, Ara Monadjem and Barry Washington. John Dalton and Richard Freemantle are thanked for tortoise photographic records. Richard Freemantle and Elphus Sigudla willingly imparted their knowledge on the use of burnt tortoise shells in traditional medicine. Leonard Mkhabela and Julius Mlotshwa assisted with the siSwati names used in Swaziland for tortoises and terrapins.

References

ACOCKS, J.P.H. 1975. Veld types of South Africa. *Memoirs of the Botanical Survey of South Africa.* 40: 1-128.

BAUER, A.M., BRANCH, W.R. & HAACKE, W.D. 1993. The herpetofauna of the Kamanjab area and adjacent Damaraland, Namibia. *Madoqua* 18(2): 117-145.

BOUR, R.H. 1986. Note sur *Pelusios adansonii* (Schweigger, 1812) et sur une nouvelle espece affine du Kenya (Chelonii, Pelomedusidae). *Stud. Palaeochelone.* 2: 23-54.

BOYCOTT, R.C. 1988. *Kinixys natalensis.* In: BRANCH, W.R. (ed.), South African red data book – reptiles and amphibians, pp. 90-92. *South African National Scientific Programmes Report* No. 151.

BOYCOTT, R.C. 1992a. New amphibian records for Swaziland. *Durban Museum Novitates* 17: 64-70.

BOYCOTT, R.C. 1992b. *An annotated checklist of the amphibians and reptiles of Swaziland.* The Conservation Trust of Swaziland: Mbabane.

BOYCOTT, R.C. 1992c. A herpetofaunal survey of Swaziland. Unpublished M.Sc. thesis, University of Natal, Durban.

BOYCOTT, R.C. 1996. *Lamprophis fuscus*: size, lepidosis and distribution. *African Herp News* 25: 40-41.

BOYCOTT, R.C. & BOURQUIN, O. 1988. *The South African tortoise book – a guide to South African tortoises, terrapins and turtles.* Southern Book Publishers: Johannesburg.

BOYCOTT, R.C. & BOURQUIN, O. 2000. *The southern African tortoise book – a guide to southern African tortoises, terrapins and turtles.* Published by O. Bourquin: Pietermaritzburg.

BOYCOTT, R.C. & CULVERWELL, J.B. 1992. Swaziland herpetofauna – a preliminary synthesis. *Journal of the Herpetological Association of Africa.* 40: 38-41.

BOYCOTT, R.C. & JACOBSEN, N.H.G. 1988. On the distribution, habitat and identification of *Kinixys natalensis* Hewitt, 1935 (Cryptodira: Testudinidae) in southern Africa. *Durban Museum Novitates* 14: 93-101.

BRANCH, B. 1998. *Field guide to the snakes and other reptiles of southern Africa.* Struik: Cape Town.

BRANCH, W.R., BENN, G.A. & LOMBARD, A.T. 1995. The tortoises (Testudinidae) and terrapins (Pelomedusidae) of southern Africa: their diversity, distribution and conservation. *South African Journal of Zoology* 30(3): 91-102.

BROADLEY, D.G. 1981a. A review of the genus *Pelusios* Wagler in southern Africa (Pleurodira: Pelomedusidae). *Occasional Papers of the National Museums of Rhodesia B Natural Science* 6(9): 633-689.

BROADLEY, D.G. 1981b. A review of the populations of *Kinixys* (Testudinidae) occurring in south-eastern Africa. *Annals of the Cape Provincial Museums (nat Hist.).* 13: 195-216.

BROADLEY, D.G. 1988. A check list of the reptiles of Zimbabwe, with synoptic keys. *Arnoldia Zimbabwe* 9(30): 369-430.

BROADLEY, D.G. 1989a. *Geochelone pardalis.* In: SWINGLAND, I.R. & KLEMENS, M.W. (eds), The conservation biology of tortoises, pp. 43-46. *Occasional Papers I.U.C.N. Species Survival Commission* No.5.

BROADLEY, D.G. 1989b. *"Kinixys spekii".* In: SWINGLAND, I.R. & KLEMENS, M.W. (eds), The conservation biology of tortoises, pp. 52-55. *Occasional Papers I.U.C.N. Species Survival Commission* No.5.

BROADLEY, D.G. 1993. A review of the southern African species of *Kinixys* Bell (Reptilia: Testudinidae). *Annals of the Transvaal Museum.* 36(6): 41-52.

BROADLEY, D.G. & HOWELL, K.M. 1991. A check list of the reptiles of Tanzania, with synoptic keys. *Syntarsus* 1: 1-70.

COMPTON, R.H. 1966. An annotated check list of the flora of Swaziland. *Journal of South African Botany. Supplementary Volume* No VI.

GOUDIE, A.S. & PRICE WILLIAMS, D. 1983. The atlas of Swaziland. *Occasional Paper* No.4. Swaziland National Trust Commission: Mbabane.

GREIG, J.C. & BURDETT, P.D. 1976. Patterns in the distribution of southern African terrestrial tortoises (Cryptodira: Testudinidae). *Zoologica Africana* 11(2): 249-273.

HOFFMAN, D. & VAN DER BANK, H. 2001. *Pelusios subniger subniger* – geographical distribution. *African Herp News* 32: 24.

I'ONS, J.H. 1967. Veld types of Swaziland. Bulletin No.18. Swaziland Ministry of Agriculture: Mbabane.

JACOBSEN, N.H.G. 1989. A herpetological survey of the Transvaal. Unpublished Ph.D. thesis, University of Natal: Durban.

JACOBSEN, N.H.G. & VAN DER WAAL, B.C.W. 1995. *Pelusios subniger subniger* – geographical distribution. *African Herp News* 23: 49.

LAMBIRIS, A.J.L. 1999. The leopard tortoise, *Geochelone pardalis*: one taxon or two? *African Herp News* 28: 18-19.

LOVERIDGE, A. 1941. Revision of the African terrapin of the Family Pelomedusidae. *Bulletin of the Museum of Comparative Zoology Harvard* 88: 465-524.

LOVERIDGE, A. & WILLIAMS, E.E. 1957. Revision of the African tortoises and turtles of the Suborder Cryptodira. *Bulletin of the Museum of Comparative Zoology Harvard* 115(6): 161-557.

LOW, A.B. & REBELO, A.G. (eds.) 1996. *Vegetation of South Africa, Lesotho and Swaziland.* Department of Environmental Affairs and Tourism: Pretoria.

PATTERSON, R. 1987. *Reptiles of southern Africa.* C. Struik Publishers: Cape Town.

PRITCHARD, P.C.H. 1979. *Encyclopedia of Turtles.* T.F.H. Publications Inc.

WASHINGTON, B. 1992. *Some reptiles of Mhlosinga Nature Reserve.* Ubombo Ranches: Big Bend.

WERMUTH, H. & MERTENS, R. 1961. *Schildkroten, Krokodile, Brucheneksen.* Veb. Gustav Fischer Verlag: Jena.

Appendix 1. List of voucher specimens.

Voucher specimens of *Pelomedusa subrufa subrufa*
FMNH224432 (Big Bend, just S of)
FMNH224443 (Big Bend, 16 km NW of)
RCBS1944 (Dinedor Farm)
TM69930 (Siphofaneni, 3 km E of)
TM69931 (Siphofaneni, 25 km SW of)
TM83008 (Siphofaneni, 15 km SE of)
TM83081, 83082 (Nkambeni, 4 km E of)
TM83083 (Bordergate, 7 km SW of)
TM83521 (Lonhlupheko, 3 km N of)

Voucher specimens of *Pelusios sinuatus*
NMB8210, 8211 (Piggs Peak, 30 km SE of)
RCBS1945 (Mafutseni, 2.5 km N of)
RCBS2001 (Mndobandoba River)
TM71098, 83529 (Dinedor Farm)
TM79818 (Sand River Dam)
TM79819 (Nkomati Gorge, Malolotja Nature Reserve)
TM79821 (Nsoko)
TM82988 (Mzimnene River)
TM83001 (IYSIS barrage, near)
TM83004 (Nkomati Gap)
TM83080 (Mzimphofu River)
TM83324, 83325, 83326, 83327, 83328 (Piggs Peak, 30 km SE of)
TM83528 (Mafutseni, 8 km N of)

Voucher specimens of *Geochelone pardalis*
TM78949, 83519 (Mlawula Nature Reserve (east))
TM80827 (St Joseph's Mission)
TM83078 (Great Usuthu River, 4.5 km S of)
TM83517 (Bordergate, 20 km S of)
TM83518 (Nyonyane Sisa Ranch)
TM83520 (Scotts Ranch)

Voucher specimens of *Kinixys natalensis*
FMNH224437 (Big Bend)
FMNH224442 (Tshaneni)
JV1789 (Big Bend)
TM83534 (Lonhlupheko, 3 km W of)
TM71015, 71016 (Big Bend, 6 km E of)

Voucher specimens of *Kinixys spekii*
BM 1975.89, 1975.90, 1975.91 (Tshaneni)
NMZB-UM33418 (Tshaneni)
RCBS1856 (Dinedor Farm)
RCBS1902 (Piggs Peak, 12 km NE of)
RCBS1951 (Mafutseni, 1 km E of)
RCBS1952 (Mafutseni, 7 km E of)
TM24205, 42735 (Manzini)
TM51023 (Siphofaneni, 5 km NW of)
TM58100 (Tambuti Estate)
TM71858 (Tunzini Estate)
TM80826 (Balegane, 8 km SW of)
TM82989 (Mlawula Nature Reserve entrance, 1.5 km W of)
TM83538 (Lonhlupeko, 2.5 km W of)
TM83535 (Nyonyane Sisa Ranch)

Appendix 2. **Gazetteer of localities.**

All localities cited are listed in alphabetical order. These include localities from which voucher specimens were collected as well as localities where reliable sight records were made. The locus code (quarter-degree grid notation) for each locality is given. Localities are based on the Swaziland 1: 50 000 topographical series published by the Surveyor General's Office.

Balegane, 4 km NE of	2631BA
Balegane, 8 km SW of	2631BA
Balegane district	2631BA
Big Bend	2631DD
Big Bend, just S of	2631DD
Big Bend, 6 km E of	2632CC
Big Bend, 13 km NW of	2631DB
Big Bend, 16 km NW of	2631DB
Big Bend/Siteki road	2631DB
Bordergate, 7 km SW of	2531DC
Bordergate, 20 km S of	2631BA
Croydon, 8 km N of	2631BA
Cyrildene Farm, 2 km NE of	2632AC
Dinedor Farm	2631BC
Great Usuthu River, 4.5 km S of	2631DD
Groenpan Farm	2631BD
Hlane Clinic, 4 km W of	2631BA
Hlane Clinic, 9 km SE of	2631BD
Hlane Game Reserve (north)	2631BB
Hlane Game Reserve (south)	2631BD
IYSIS barrage, near	2631BA
Lavumisa	2731BD
Lonhlupeko, 2.5 km W of	2631BD
Lonhlupeko, 3 km N of	2631BD
Lonhlupeko, 3 km W of	2631BD
Lukhula	2631BD
Lukhula, S of	2631BD
Mafutseni, 1 km E of	2631BC
Mafutseni, 2.5 m N of	2631BC
Mafutseni, 3 m E of	2631BC
Mafutseni, 7 km E of	2631BC
Mafutseni, 8 km N of	2631BC
Mafutseni, 15 km NE of	2631BC
Manzini	2631AD
Manzini, N of	2631AD
Manzini, 8 m E of	2631DA
Manzini, 21 km E of	2631BC
Maphiveni	2631BB
Matsapha	2631CB
Mbuluzane River	2631BB
Mbuluzi Estate	2631BB
Mbuluzi Gorge, Mlawula Nature Reserve (east)	2632AA
Mbuluzi Nature Reserve (east)	2632AA
Mbuluzi Nature Reserve (west)	2631BB
Mbuluzi River (lowveld)	2631BB
Mhlosinga Nature Reserve	2631DD
Mlawula Nature Reserve (east)	2632AA
Mlawula Nature Reserve (south-east)	2632AC
Mlawula Nature Reserve (south-west)	2631BD
Mlawula Nature Reserve (west)	2631BB
Mlawula Nature Reserve entrance, 1.5 km W of	2631BB
Mlawula Station, Mlawula Nature Reserve (east)	2632AA
Mndobandoba River	2631DD
Mnjoli Dam	2631BA

Mpaka	2631BD
Mpaka, 18 m NE of	2631BB
Mzimnene River (Balegane district)	2631BA
Mzimphofu River	2631DB
Ndzevane	2631DD
Ndzindza Nature Reserve	2632AA
Ngonini Estate	2531CD
Nkambeni, 4 km E of	2631BA
Nkomati Gap	2631AB
Nkomati Gorge, Malolotja Nature Reserve	2631AA
Nkomati River bridge (new), near	2631AA
Nsoko	2731BB
Nyetane Dam	2631DB
Nyonyane Sisa Ranch (Balegane district)	2631AB
Oribi Ranch	2632AC
Phophonyane Valley	2531CD
Piggs Peak, 12 km NE of	2531CD
Piggs Peak, 30 km SE of	2631AB
Sand River Dam	2531DC
Scotts Ranch	2631BC
Siphofaneni, 3 km E of	2631DA
Siphofaneni, 5 km NW of	2631DA
Siphofaneni, 15 km SE of	2631DD
Siphofaneni, 25 km SW of	2631DC
Siteki, 10 m NE of	2631BD
Siteki, 13 km E of	2632AC
St Joseph's Mission	2631AD
Tambuti Estate	2631DB
Tshaneni	2531DD
Tunzini Estate	2531DC