

Original article

Inter-island variation and taxonomy of Seychelles *Trachylepis*

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Abstract.—Skinks of the genus *Trachylepis* are geographically widespread and diverse. In the Seychelles islands two species are present, *T. sechellensis* and *T. wrightii*. All island populations of these two species were studied in 2000-2003 and the morphology of the populations compared to museum specimens. The two species are distinctive in morphology, although convergence occurs on some small islands occupied by large colonies of breeding sea birds. The taxon '*Mabuya wrightii ilotensis*' represents one example of this and was re-identified as a form of *T. sechellensis*. The morphology of this population has changed over the last 67 years, probably as a result of the decline of the sea bird colony on the island. More extreme changes have occurred on other islands where the loss of sea bird colonies has been followed by the replacement of the sea bird specialist *T. wrightii* by the more generalist *T. sechellensis*. A reverse process of convergence towards the *T. wrightii* morphology was observed in recently established *T. sechellensis* populations on islands with large or increasing sea bird colonies. This highlights the adaptability of some island populations and the need to consider distinct islands as part of a metapopulation.

Key words.—*Trachylepis*, skink, islands, populations, metapopulations.

The skink genus *Mabuya* has long been considered to be diverse and the only circum-tropical skink genus (Mausfeld *et al.* 2000). Recently it has been divided into several genera, of which *Trachylepis* occurs in Africa and the Malagasy region (Mausfeld *et al.* 2002; Bauer 2003). There is a large number of *Trachylepis* species in Africa. Africa was formerly considered to be the centre of diversity for '*Mabuya*' (Greer 1977; Greer *et al.* 2000) and a notable radiation in the western Indian Ocean (Mausfeld *et al.* 2000). Many species are generalists with a wide ecological tolerance, although there are several more specialised species. Of the western Indian Ocean species some have adapted to the presence of large sea-bird colonies; this has been demonstrated ecologically (Brooke & Houston 1983) and based on a correlation between their distribution and that of sea-bird colonies (Vesey-Fitzgerald 1947; Honegger 1966; Cheke 1984).

The Seychelles *Trachylepis* species have long been noted to be close to the Comoros species *T. comorensis* (Peters 1882). The two Seychelles species were first separated by Boulenger (1909) on the basis of size, scale counts, snout length, the proportions of the frontals and the absence of pale markings on the upper jaw of *T. wrightii*. Rendahl (1939) further noted that there were differences in the proportions of the frontonasal, and described one population as a distinct subspecies, *T. wrightii ilotensis*, recognised by its low mid-body scale count of 36. In a more extensive study of western Indian Ocean *Trachylepis*, Brygoo (1981) confirmed the species differences but noted that the two species were closely related and showed little obvious relationship to any of the Comoros or African species. He further noted that the subspecies *T. wrightii ilotensis* was of doubtful validity due to a paucity of specimens. According to Brygoo (1981) the two Seychelles species differ from

other Indian Ocean species by their head shape, cephalic scales, numbers of midbody scale rows, scales beneath the 4th toe and the head shape.

In 1947, Vesey-Fitzgerald noted the ecological separation between the species, with *T. sechellensis* preferring the coconut plantations whilst *T. wrightii* was restricted to sea bird colonies. This was further elaborated on by Honegger (1966) who noted that *T. wrightii* was a habitual predator of tern eggs. However, these studies considered only a limited range of islands.

The Indian Ocean Biodiversity Assessment 2000-2005 visited all the granitic islands of the Seychelles group and selected coral islands, covering the full range of Seychelles *Trachylepis* species. This enabled a comparison to be made between populations of skinks throughout their range on the Seychelles islands.

MATERIALS AND METHODS

During 2000-2003, all the Seychelles islands inhabited by *Trachylepis* were visited. On each island, 20 adult and 5 juvenile *Trachylepis* of each species were captured and examined. No attempt was made to discriminate between sexes in this investigation; examination of six mating pairs of both species on Aride and Mahé islands failed to identify any sexually dimorphic characters. The following measurements were taken for each specimen: snout-vent length (SVL), snout length (snout tip to anterior eye margin), head length (snout tip to anterior ear margin), head depth. Measurements were taken to an accuracy of 0.1 mm using dial calipers. The number of mid-body scale rows was also recorded, as was the ornament of the scales and the colour pattern. Colour patterns were categorised into eight distinct types (Table 1). All animals were released alive and no specimens were retained. Photographs were

taken of one individual from each population, chosen as a representative on a subjective basis. Comparisons were made with available museum specimens (representing 16 populations of *T. sechellensis*, 8 of *T. wrightii* and one of *T. wrightii ilotensis* - Appendix 1.).

Measurement of live individuals inevitably includes some degree of measurement error. The significance of this was investigated by taking 10 repeat measurements (SVL, snout length, head length and head depth) from 10 individual *T. sechellensis* on Silhouette Island. Measurement error was found to be 0.5-4% in each measurement and therefore considered to be acceptable. Scale counts were taken at the mid-body point, the first scale to be counted was marked with paint to ensure that the endpoint was unambiguous.

Morphometric data were analysed in MINITAB 14 using regression analysis, principal component analysis and discriminant function analysis of the measurements and scale counts. Measurements were log transformed to minimise the effect of size difference between taxa, all factors were given equal weighting.

RESULTS

The two species were recognisable in principal component analysis (Table 2, Fig. 1). *Trachylepis wrightii ilotensis* was intermediate. Discriminant function analysis correctly assigned all individuals to their correct species (Table 3), with the exception of *T. wrightii ilotensis* specimens which could be assigned to either taxon.

Taxonomically uninformative characters include the supraoculars (both species with 4, rarely 3), supraciliaries (6, rarely 5 or 7), infralabials (6) and sublabials (5). In both species the ear is bordered by 4 small, indistinct spines anteriorly and one ventrally. Scale counts

Table 1. Colour pattern type and location of occurrence for *Trachylepis sechellensis* and *T. wrightii*.

Type	Description	<i>T. sechellensis</i>	<i>T. wrightii</i>
1.	Full stripe pattern	Mahé, St. Anne, Cerf, Moyenne, Long, Therese, Conception, Silhouette, North, Praslin, Curieuse, Petite Soeur, Felicite, Aride, Fregate	
2.	No copper, all bands dark brown, white or grey	Seche, Booby	
3.	Copper and dark brown replaced by light brown	Grande Soeur	
4.	White stripes absent	Cousin, Bird, Denis, D'Arros, St. Joseph	
5.	Brown, black and white speckles, darker patch on sides		Cousin, Cousine. Aride, St. Pierre, Fregate
6.	Grey flanks and darker stripe		Recifs
7.	No stripes, flanks greyer than back, random white speckling	Cousin	Mammelles
8.	Brown with random speckling, bluish tint all over	Isle aux Vaches Marines, Ilot Fregates	

formed two distinct groupings, which could be referred to the two described species. A notable proportion of scale counts resulted in odd numbers, although mid-body scale counts are usually expected to be even. This was recorded both in live individuals (29%; $N = 760$) and museum specimens (21%; $N = 150$). The similar proportion of odd numbers in counts of museum specimens and live individuals indicates that this is not due to counting error. This has been observed in the Seychelles *Trachylepis* species previously: Rehndal (1939) recorded odd numbers in 40% of speci-

mens ($N = 42$). Head shape was found to differ in the two species, as did the relative position of the nostril within the nasal scale (Fig. 3), frontonasal width and its degree of contact with the rostral, frontal width, number of scale keels, and coloration.

SYSTEMATICS

Three taxa have been described previously; two of these are recognised as valid by the present study and are described below. The third taxon, '*Trachylepis wrightii ilotensis*' is ambiguous in principal component and discriminant analysis (above) and on the basis of morphology is considered to be a form of *T. sechellensis*.

TRACHYLEPIS SECHELLENSIS (Duméril & Bibron 1839); Figs. 3a, 4, 5 & 7.

Type specimens.—Lectotype in the Museum national d'Histoire naturelle, Paris (MNHN 2946, ex 2810); lectotype designation by Brygoo (1981). Paralectotype in the Museum National d'Histoire naturelle, Paris (MNHN 5068).

Distribution.—Mahé, St. Anne, Cerf, Long, Round (Mahé), Moyenne, Seche, Isle aux

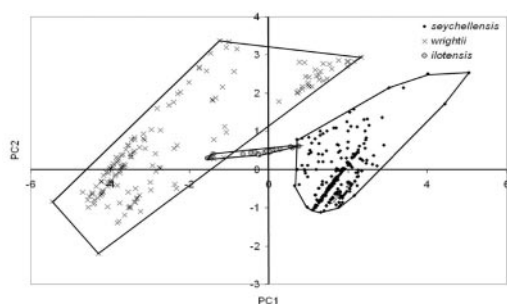


Figure 1. Principal Components of variation in Seychelles *Trachylepis*. 760 specimens are plotted (620 *T. sechellensis*, 120 *T. wrightii* and 20 '*Mabuya wrightii ilotensis*' from the Ilot Fregates population).

Vaches Marines, Conception, Therese, Islette, Silhouette, North, Praslin, Curieuse, Cousin, Cousine, Aride, Booby, Chauve Souris (Praslin), Cocos, Felicite, Marianne, Petite Soeur, Grande Soeur, La Digue, Ilot Fregates, Fregate, Denis, Bird, D'Arros and St. Joseph.

Diagnosis.—A slender, medium sized skink (up to 107 mm SVL, compared to 138 mm in *T. wrightii*); nostril surrounded by nasal (reaches border of the scale in *T. wrightii*); rostral and frontonasal contacting (contact narrow or absent in *T. wrightii*); frontonasals longer than wide (wider than long in *T. wrightii*); narrow posterior part of frontal (broad in *T. wrightii*); dorsal scales with 3-6 keels, 8 in an exceptional population (compared to 6-8 in *T. wrightii*); 32-38 rows of body scales (compared to 39-

40); distinct pale and dark longitudinal stripes on body, at least in juveniles (no stripes in *T. wrightii*).

Description.—Meristic characters are given in Table 4. The snout is relatively short and descends gradually, forming an angle of 15-30° with the lower jaw, and giving an elongate appearance to the head. The frontonasal is in contact with both the rostral and frontal and is slightly longer than wide. The nostril perforates the centre of the nasal and may contact the posterior margin of the nasal, such that the nostril is not completely surrounded by the nasal (as in some individuals in the Seche Island population). The frontal is elongate, posteriorly very narrow, posterior width less than 30% of the anterior width (10-30%) except in the Cousine

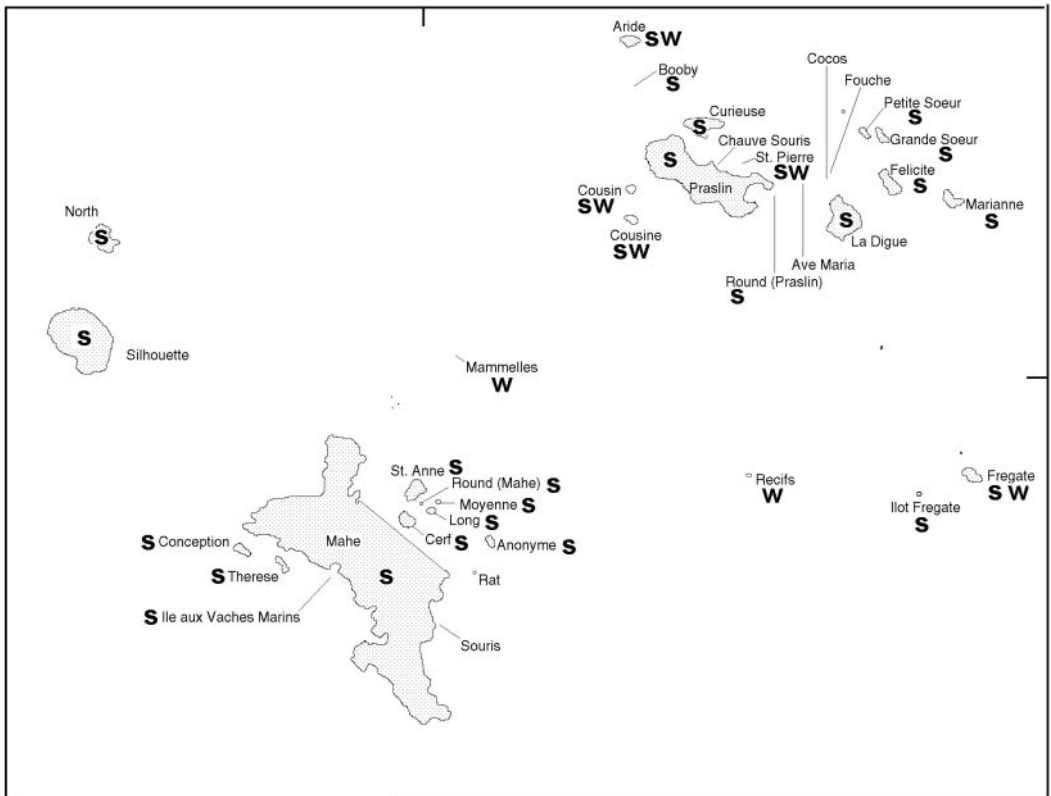


Figure 2. Map of the granitic Seychelles island with *Trachylepis* populations. S = *Trachylepis sechellensis*; W = *T. wrightii*.

Table 2. Principal Component factor loadings showing the high loading of snout length.

	PC1	PC2
Eigenvalue	6.2829	0.8365
Proportion	0.785	0.105
Cumulative	0.785	0.890
SVL	-0.349	-0.441
scales	-0.356	0.301
head L	-0.355	-0.392
head D	-0.322	0.192
LJ depth	-0.362	0.313
snout	-0.325	-0.548
eye	-0.375	0.278
eye-ear	-0.381	0.222

and Ilot Fregates population where they are 40 and 60% respectively. There are normally two paired frontoparietals partially separated by the interparietal, rarely these three scales are fused into a single large scale or the interparietal is absent.

Dorsal scales are cycloid with three well developed median keels and up to three indistinct ones on each side. Ventral scales have three weakly developed keels. There are 34-39 mid-body scale rows. There are 16-22 scales beneath the 4th toe of the fore-limb and 26-32 on the 4th toe of the hind-limb.

The limbs are well developed. Forelimbs are 30.8-34.4% (mean 32.9%) of SVL, hind limbs 41.2-49.2% (mean 45.3%). The length of the original tail is 148-197% (mean 172%) of SVL.

Colour.—Colour varies significantly with island population. The basic colour is light coppery brown with a darker lateral stripe from behind the eye to above the hind leg, fading into the pale sides of the tail. This stripe is slightly darker than the background colour on Cousine but is a distinctive dark brown on Mahé, Long, St. Anne, Cerf, Moyenne, Aride and Silhouette. It may be bordered dorsally by a fine white line. A pale broad lateral stripe is present from the nostril to the inguinal region

Table 3. Discriminant function values showing the importance of head shape and scale count in distinguishing the *Trachylepis sechellensis* and *T. wrightii*.

	<i>sechellensis</i>		<i>wrightii</i>	
<i>N</i> = 369	<i>N</i> Correct = 369		Proportion Correct = 1.00	
	<i>sechellensis</i>		<i>wrightii</i>	
Squared Distance Between Groups				
<i>sechellensis</i>	165.356		0.000	
<i>wrightii</i>	0.000		165.356	
Linear Discriminant Function for Group				
Constant	-933.8		-1419.8	
SVL	-0.3		-0.5	
scales	38.3		42.1	
head L	2.2		3.4	
head D	2.0		4.6	
LJ depth	151.7		225.6	
snout	1.0		-0.5	
eye	14.2		21.3	
eye-ear	-8.6		-7.4	

of the hind leg, passing below the eye, through the middle of the ear and above the fore leg. This continues as a lower lateral white stripe from fore to hind limb. These pale stripes are separated by stripes of the dark background colour. There may be a scattering of pale or dark scales over the body. The ventral surface of the body and limbs is white or yellow. The toes may be spotted coppery brown and white. There is a bluish tint to the flanks caused by two blue spots on each scale. There are dark spots down the tail. Modified colour patterns are found on several islands (Table 1), with extreme reduction of stripe patterns on Isle aux Vaches Marines and Ilot Fregates where all colours are obscured by dark pigment.

TRACHYLEPIS WRIGHTII (Boulenger 1887)

Figs. 3b, 4, 6.

Type specimens.—Lectotype in the British Museum (Natural History) (BMNH 1946.8.3.72); lectotype designation by Brygoo (1981). Two paralectotypes in the British Museum (Natural History) (BMNH 1946.8.3.71, 1946.8.3.73).

Table 4. Meristic characters and colour pattern for *Trachylepis sechellensis* and *T. wrightii* (categorised from Table 1). SVL given as minimum-mean-maximum.

Island	Species	Adult SVL	Scale rows	Scale keels		Colour
				range	mode	
Mahé	<i>sechellensis</i>	53.9-62.3-88.1	37-40	3-6	3	1
	<i>wrightii</i>	115.3-117.1-120.7	40	5	5	5
Ile aux Vaches Marines	<i>sechellensis</i>	86.2-89.2-92.1	38	6	6	8
	<i>sechellensis</i>	65.4-77.9-82.4	37-39	3-4	3	1
Cerf	<i>sechellensis</i>	51.2-64.1-65.5	35-38	3-5	3	1
Moyenne	<i>sechellensis</i>	52.5-69.9-77.3	36-38	4-5	4	1
Long	<i>sechellensis</i>	67.8-77.9-82.5	37-38	4	4	1
Seche	<i>sechellensis</i>	75.1-91.2-94.3	34-37	3-5	4	2
Therese	<i>sechellensis</i>	77.2-79.9-81.2	36-38	3-5	4	1
Conception	<i>sechellensis</i>	68.2-79.1-81.1	35-37	3-5	4	1
Mammelles	<i>wrightii</i>	87.2-115.5-128.4	39-40	4-5	4	7
Silhouette	<i>sechellensis</i>	50.4-79.8-104.0	35-36	3-4	3	1
North	<i>sechellensis</i>	69.9-75.7-77.2	35	3-4	3	1
Praslin	<i>sechellensis</i>	51.3-70.0-80.1	34-35	3-5	4	1
St. Pierre	<i>wrightii</i>	92.8-104.2-110.0	40	3-6	4	5
Curieuse	<i>sechellensis</i>	69.5-77.4-80.1	34-37	3-5	4	1
Cousin	<i>wrightii</i>	61.0-124.9-138.1	40	3-6	4	5
	<i>sechellensis</i>	67.9-87.6-98.2	35-37	4	4	4/7
Cousine	<i>wrightii</i>	88.9-109.3-130.2	40	6-8	7	5
	<i>sechellensis</i>	72.2-80.1-85.3	35-38	4-5	4	1
Aride	<i>wrightii</i>	72.5-110.0-136.7	40	6-7	7	5
	<i>sechellensis</i>	63.3-79.5-91.6	37-39	3-5	5	1
Booby	<i>sechellensis</i>	77.3-80.1-83.4	38	6	6	2
Grande Soeur	<i>sechellensis</i>	65.9-80.2-85.4	36	3-4	3	3
Petite Soeur	<i>sechellensis</i>	65.5-68.4-70.2	35	3-4	3	1
Felicite	<i>sechellensis</i>	79.2-86.3-88.9	34	5-6	5	1
Recifs	<i>wrightii</i>	70.2-82.1-89.9	40	4-5	4	6
Ilot Fregates	<i>sechellensis</i>	78.4-98.1-106.7	36	6-8	6	8
	<i>sechellensis</i>	73.8-75.6-79.2	34-37	3-4	4	1
Fregate	<i>wrightii</i>	70.7-107.3-121.1	39-40	3-6	4	5
Bird	<i>sechellensis</i>	69.9-70.2-76.1	37	5	5	4
Denis	<i>sechellensis</i>	65.5-69.9-70.2	36-38	4-5	4	4
D'Arros	<i>sechellensis</i>	66.9-77.9-85.3	35-38	4-5	4	1
St. Joseph	<i>sechellensis</i>	65.4-72.4-81.2	35-38	4-5	4	1

Distribution.—Recorded from Mahé, Isle aux Vaches Marines, Mammelles, St. Pierre, Cousin, Cousine, Aride, Marianne and Fregate. Now absent from Isle aux Vaches Marines and Marianne; the Mahé record is questionable.

Diagnosis.—A large, heavy bodied skink (up to 138 mm SVL, compared to 107 mm in *T. sechellensis*); snout descending steeply, meeting the lower jaw at an angle of 40° (usually 25° in *T. sechellensis*); nasal divided by nostril (surrounds nostril in *T. sechellensis*); rostral and frontonasal narrowly contacting or separate (contact broad in *T. sechellensis*); frontonasal wider than long (longer than wide in *T. sechel-*

lensis); frontal broad posteriorly (narrow in *T. sechellensis*); dorsal scales with 6-8 keels (compared to 3-6); 39-40 rows of body scales (compared to 32-38); no distinct stripes on body (*T. sechellensis* has longitudinal stripes, at least in juveniles).

Description.—Measurements are given in Table 4. The snout is relatively long and deep, forming an angle of 30-40° with the lower jaw. The frontonasal is wider than long and is in contact with the frontal but is separated from, or in only narrow contact with, the rostral. The nostril is elongate, wider ventrally and divides the nasal into two parts. The anterior part of the

nasal is triangular, curving upwards anteriorly. The frontal is relatively broad, narrowed posteriorly but the posterior width is at least 30% of the anterior width (30-70%). There is a pair of frontoparietals partially separated by the interparietal.

Dorsal scales are cycloid with 6-8 keels (6 prominent). Fewer keels are found on some individuals from Mamelles and Fregate. There are 39-40 midbody scale rows. The gular and ventral body scales are cycloid. There are 17-20 scales beneath the 4th toe of the fore-limb and 26-30 on the 4th toe of the hind-limb.

The limbs are well developed although proportionately slightly shorter than in *T. sechellensis*: forelimbs are 28.0-32.2% (mean 30.0%) of SVL, hind limbs 40.8-46.6% (mean 43.5%). The tail is 129-152% (mean 144%) of the snout-vent length.

Colour.—Colour varies significantly between island populations. The basic colour is dark coppery brown with a random speckling of white and light brown scales. The dark areas are concentrated on the flanks but not developed into stripes. White speckling is heaviest on the lower flanks and legs. Ventral body and leg colour is off-white. On Aride, a faintly paler dorsolateral band is present on the flanks.

DISCUSSION

Trachylepis sechellensis and *T. wrightii* are easily distinguished on most islands, although some populations appear superficially to be intermediate (e.g., on Booby, Ilot Fregates) and many of the characters used to distinguish *T. sechellensis* and *T. wrightii* appear to be size related. Size and build vary between different islands although *T. wrightii* is always the larger, heavier species. There is no significant difference in the SVL for *T. sechellensis* populations that occur sympatrically with *T. wrightii* or alone (t -test $t = 1.431$, $P_{2,32} > 0.05$).

Trachylepis sechellensis has a proportionately flatter head and longer snout than *T. wrightii*. This is most apparent when the two taxa coexist; small *T. sechellensis* have much longer snouts than same sized *T. wrightii* but there is no significant difference in this character for adults. Similarly *T. sechellensis* heads are flatter than *T. wrightii*, but in isolation large *T. sechellensis* reach the *T. wrightii* head depth. This may indicate resource partitioning, with *T. wrightii* forcing *T. sechellensis* into the more specialised flatter headed form. Similar differences in head sizes and shapes have been reported for other lizards with different trophic niches (Rand 1967; Carpenter & Ferguson 1977; Schoener 1977; Stamps 1977; Carothers 1984; Verrastro 2004).

Competition is most severe for juveniles as little resource partitioning is possible; *T. sechel-*

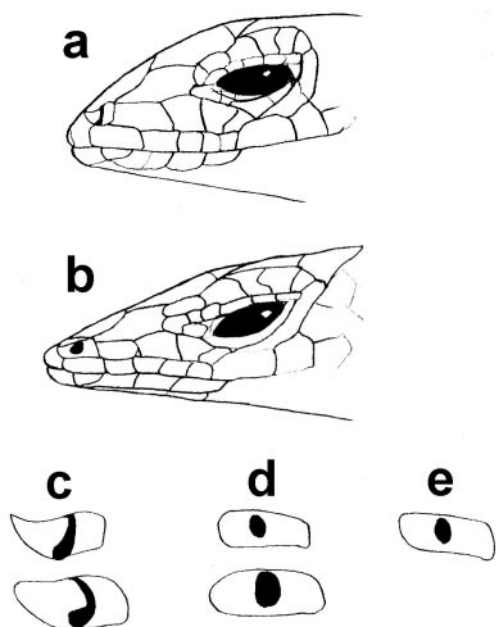


Figure 3. Head scalation of Seychelles *Trachylepis*. a) *T. wrightii*; b) *T. sechellensis*; c) variation in nasal scales of *T. wrightii*; d) variation in nasal scales of *T. sechellensis*; e) nasal scale of Ilot Fregates *T. sechellensis*.

lensis are forced to specialise with long snouts as heavier bodied *M. wrightii* are likely to dominate interspecific encounters. Proportions of eye and eye-ear distance are not significantly different. In effect, small *T. sechellensis* have disproportionately long heads (dominated by the snout), but this pattern is reversed above 60 mm snout-vent length. Ilot Fregates and Bird Island *T. sechellensis* have notably deep heads.

Wide frontonasals are typical of *T. wrightii*; those in *T. sechellensis* tend to be long or equally proportioned. This is simply an expression of the long snout in *T. sechellensis* and is not a discrete character. The nostril is normally surrounded by the nasal in *T. sechellensis* whilst in *T. wrightii* the nostril divides the nasal. Relatively large nostrils cause partial division



Figure 4. Seychelles *Trachylepis* on Aride Island: *T. wrightii* top, *T. sechellensis* bottom (photo: R. Gerlach).

in *T. sechellensis* from Seche, Grande Soeur, Petite Soeur and Bird islands. The lack of division in '*T. wrightii ilotensis*' from Ilot Fregates is one of the main characters that identifies this population as *T. sechellensis*.

Trachylepis sechellensis has smoother scales (3-5 prominent keels) whilst *T. wrightii* has 6 keels. Some *T. wrightii* are relatively smooth (Mamelles = 4(-5), Fregate = 3-4(-6), Cousin = 3-4(-6); Recifs = 4(-5)) and some *T. sechellensis* are relatively rough (Booby = 6; Ilot Fregates = 6; Bird = 5). This does not appear to be related to any other character or biogeographical aspect. The number of mid-body scale rows appears to be highly conservative in *T. wrightii* (39-40 rows), with no intra-island variation observed. For *T. sechellensis* there is considerable variation which is not related to SVL or location. All samples fall within the range 34-38, except for three from Mahé which have 39 scales. The presence or absence of *T. wrightii* has no detectable effect on *T. sechellensis* scale counts. Subdigital scale counts show no geographical patterns and are not notable except that *T. sechellensis* is more variable than *T. wrightii*.

Colouration is highly variable across the range of both species. There is a general tendency for



Figure 5. *Trachylepis sechellensis* juvenile on Mahé island.

smaller skinks to be more brightly patterned and this tendency is seen in the adults of the two species, with *T. sechellensis* being striped and *T. wrightii* being irregularly blotched. This may, therefore, be little more than a cryptic patterning of smaller skinks (and thus the smaller species) being more brightly coloured than larger ones. No striped populations have been ascribed to *T. wrightii*. A dark band is detectable in at least some *T. wrightii* from Recifs, Cousin and Fregate. It is notable that the *T. sechellensis* full stripe pattern is mainly restricted to islands with *T. sechellensis* only. Grey spotting on the gular and neck regions of *T. sechellensis* is found only in islands near Praslin (Cousin, Cousine, Praslin, Grande Soeur) and Bird islands. Spotting is also present on the neck of *T. wrightii* on Mamelles and grey is especially notable on the flanks of the Recifs population; islands without *T. sechellensis*. Widespread dark pigment is present on *T. sechellensis* on Isle aux Vaches Marines and Ilot Fregates.

The Ilot Fregates population described as *T. wrightii ilotensis* is recognisable as *T. sechellensis* on the basis of its scale numbers and nostril position. In 2003 individuals on the island were easily recognisable as *T. sechellensis*, in contrast to the intermediate appearance of



Figure 6. *Trachylepis wrightii* on Aride island (photo: H. Burgess).

museum specimens. Comparison of all the available specimens reveals that squamation has remained constant over the past 70 years but head proportions have changed. In 1935 the snout formed 43-46% of the head length (mean 43%, $N = 3$). In 1954 this had not changed significantly 42% ($N = 2$), but in the current population the snout forms only 28-32% of the head length (mean 31%; $N = 20$) despite no notable change in overall size (Fig. 8). The 1935 and 1954 data are based on only 5 specimens, which is insufficient to demonstrate a statistically significant trend. However, the apparent changes correspond to historical changes in sea-bird numbers. In 1954 Ridley & Percy (1958) noted that tern populations on Ilot Fregates were substantial as a result of “Careful and wise management, in that no eggs, even of Noddies to whom the close season does not apply, are taken after 15th July”. They also noted that “There are a few lizards but they do not appear to be as serious predators here as elsewhere” in contrast to Aride and Mamelles. Since then poaching has been significant and tern numbers have declined considerably. There are no accurate data but subjective estimates (Table 5) indicate at least a 90% decrease in the size of the tern colony. These changes are comparable to those reported for limb propor-



Figure 7. *Trachylepis sechellensis*, Ilot Fregates island form, previously assigned to *Mabuya wrightii ilotensis*.

Table 5. Estimates of tern abundance in 1944-55 (Ridley & Percy 1958) and 2000 (Skerrett *et al.* 2001) and changes in skink populations in 1946 (Vesey-Fitzgerald 1947) and 2000 (new data) (abbreviations: S = *Trachylepis sechellensis*, W = *T. wrightii*).

Island	Ground nesting terns (sooties and noddies)		Skinks		Recorded changes
	1944-55	2000	1946	2000	
Ilot Fregates	30,000	±0	W	S	Tern decline, W replaced by S
Aride	80,000	368,000	S, W	S, W	Tern increase
Bird	8,300	710,000	-	S	Tern increase, S colonisation
Seche	2,000	?	S	S	Small decline in terns
Isle aux Vaches Marines	1,050	±500	W	S	Small decline in terns, W replaced by S
Booby	50	±100	?	S	—
Recifs	?	10,000	W	W	—
Cousin	1,000	1,000	S, W	S, W	—
Cousine	?	900	S, W	S, W	—
Mamelles	3,000	?	W	W	Small decline in terns

tions in *Anolis* lizards in the Bahamas (Losos *et al.* 1994).

The convergence of some populations of *T. sechellensis* with the *T. wrightii* morphotype is apparent on Booby, this island's *T. sechellensis* being 60-80% of the body size of *T. wrightii*. They are also close in colour, build and head shape; juveniles initially have the distinctive *T. sechellensis* stripe pattern which becomes increasingly fragmented and spread out as they grow, but does not approach the true *wrightii* pattern. On Bird Island *T. sechellensis* is converging on *T. wrightii* with reduced coloration and an intermediate build. This is particularly notable as the species was introduced to Bird Island sometime between 1908 and 1938 (recorded by Vesey-Fitzgerald 1947). Thus this strong convergence has appeared in 64-94 years, unlike the geographically close Denis Island population which remains typical of *T. sechellensis*.

The morphological patterns found in Seychelles *Trachylepis* suggest that a repeat colonisation and extinction has resulted in the observed distribution of the species. *Trachylepis wrightii* is a specialist associated with sea-birds and all populations of this species may be closely related (as indicated by

their low variability in scale patterns and counts). Two populations are known to have been lost in recent times, following loss of sea-bird colonies (Marianne in the mid-1800s and Isle aux Vaches in the 1980s). The Marianne record of *T. wrightii* is supported by a museum specimen (MNHN 5252 collected in 1878) but the Isle aux Vaches record is in literature only (Vesey-Fitzgerald 1947). Both of these islands are relatively small (94.7 and 4.7 ha respectively) and the failure to locate *T. wrightii* on them in recent years can be considered as reliable evidence of population extinction. In both cases *T. sechellensis* has subsequently colonised the islands. In the case of Isle aux Vaches, breeding terns have returned and the sea-bird associated specialist niche has been recreated; *T. sechellensis* has adapted accordingly, becoming a heavy bodied, dark form. The same process can be seen on Bird Island and may also explain the convergence towards *T. wrightii* on Seche and Booby islands. The absence of *T. wrightii* on these islands may be due to undetected extinctions in the 1800s.

Comparison with historical records reveals several interesting points. In the late 1940s the distribution of *Trachylepis* skinks in Seychelles was recorded (Vesey-Fitzgerald 1947) coinciding with surveys of sea-bird populations

(Ridley & Percy 1958). At this time it was noted that Seychelles skinks were present on almost all islands (with the exceptions of Isle aux Vaches Marines, Mamelles, Recifs and Ilot Fregates, although the voucher specimens confirm that the latter is due to misidentification) and *T. wrightii* was present on Isle aux Vaches Marines, Mamelles, Aride, Cousin, Cousine, Recifs and Ilot Fregates (by misidentification). Present day data confirm this distribution with the exception of the re-identification of the Ilot Fregates population and the replacement of *T. wrightii* on Isle aux Vaches Marines by *T. sechellensis*. Although data on seabird populations are subjective estimates and are not directly comparable they do indicate notable changes in seabird populations over this time period.

The replacement of *T. wrightii* by *T. sechellensis* on Isle aux Vaches Marines is not surprising given the proximity of a large population of *T. sechellensis* on Mahé. However, the appearance of a new population of *T. wrightii* on St Pierre is unexpected. This island was visited by A. Gardner in the 1980s who did not record any *Trachylepis* there. In 2000 typical *T. wrightii* were abundant and obvious. The nearest islands to St. Pierre support *T. sechellensis* but not *T. wrightii*. The nearest populations of *T. wrightii*

are on Aride, Cousin and Cousine and one of these is probably the source of the St. Pierre population. These changes indicate that movement between the islands is frequent and such colonists are either absorbed into existing populations or excluded by the already existing competitor. Only when an island is unoccupied by *Trachylepis* (e.g., St. Pierre) or has suffered a recent extinction (e.g., Isle aux Vaches Marines) can a detectable colonisation occur. These findings highlight the dynamism of some insular taxa and have implications for the conservation of island metapopulations.

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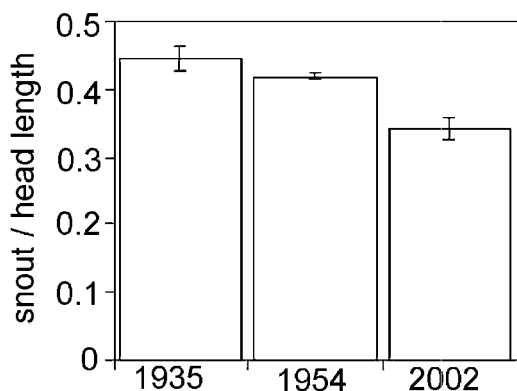


Figure 8. Change in snout proportions of the Ilot Fregates *Trachylepis sechellensis* population since 1935

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APPENDIX 1

Museum specimens examined. Abbreviations: BMNH - Natural History Museum, London; MNHM - Museum nationale d'Hisotire naturelle, Paris; NPTS - Nature Protection Trust of Seychelles; NRM - Swedish Museum of Natural History

T. SECHELLENSIS: BMNH: 1937.24.24-6 (Mahé); 1938.7.1.28 (Petite Soeur); 1938.7.1.21-3 (Seche); 1953.1.12.38 (Grande Soeur); 1953.1.12.39 (Felicite); 1953.1.12.46-9 (Denis); 1976.205-14 (La Digue); 1976.1215-27 (Cousin); 1976.1230-2 (Mahé); 1976.1911.16 (Cousin); 1976.1920, 22 & 25 (Praslin); BMNH 1976.1927-8 (Curieuse); 1976.1932-3 (Praslin); 1977.2183-5 (D'Arros); MNHN: 2810-1 (no locality); 2945-6 (no locality); 5068 (no locality); NPTS: Cr1997.15 (Mahé); Cr2000.7 (Silhouette); Cr2001.06 & 10 (North); un-numbered (Cousine); NRM: 4015 (Praslin); 4016 (Long); 4017-9 (Mahé); 4020-1 (Cousine); 4022 (Fregate)

T. WRIGHTII: BMNH: 1937.7.24.18-21 (Mamelles); 1938.7.1.16-20 (Recifs); 1938.8.3.37-40 (Fregate); 1946.8.3.71-3 (no locality); 1956.1.15.28-40 (Mamelles); 1956.1.15.41-66 (Aride); 1976.1233-4 (Cousin); 1976.1939-45 (Cousin); MNHN: 1403 (no locality); 5252 (Marianne); 5574 (no locality); NPTS: un-numbered (Aride); NRM: 4005 (Mamelles); 4008 (Cousine); 4009 (Mahé); 4010 (Cousine); 4011 (Fregate)

'*MABUYA WRIGHTII ILOTENSIS*': BMNH 1956.1.14.99 (Ilot Fregates); NRM: 4006 (4006:13 holotype; Ilot Fregates).

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