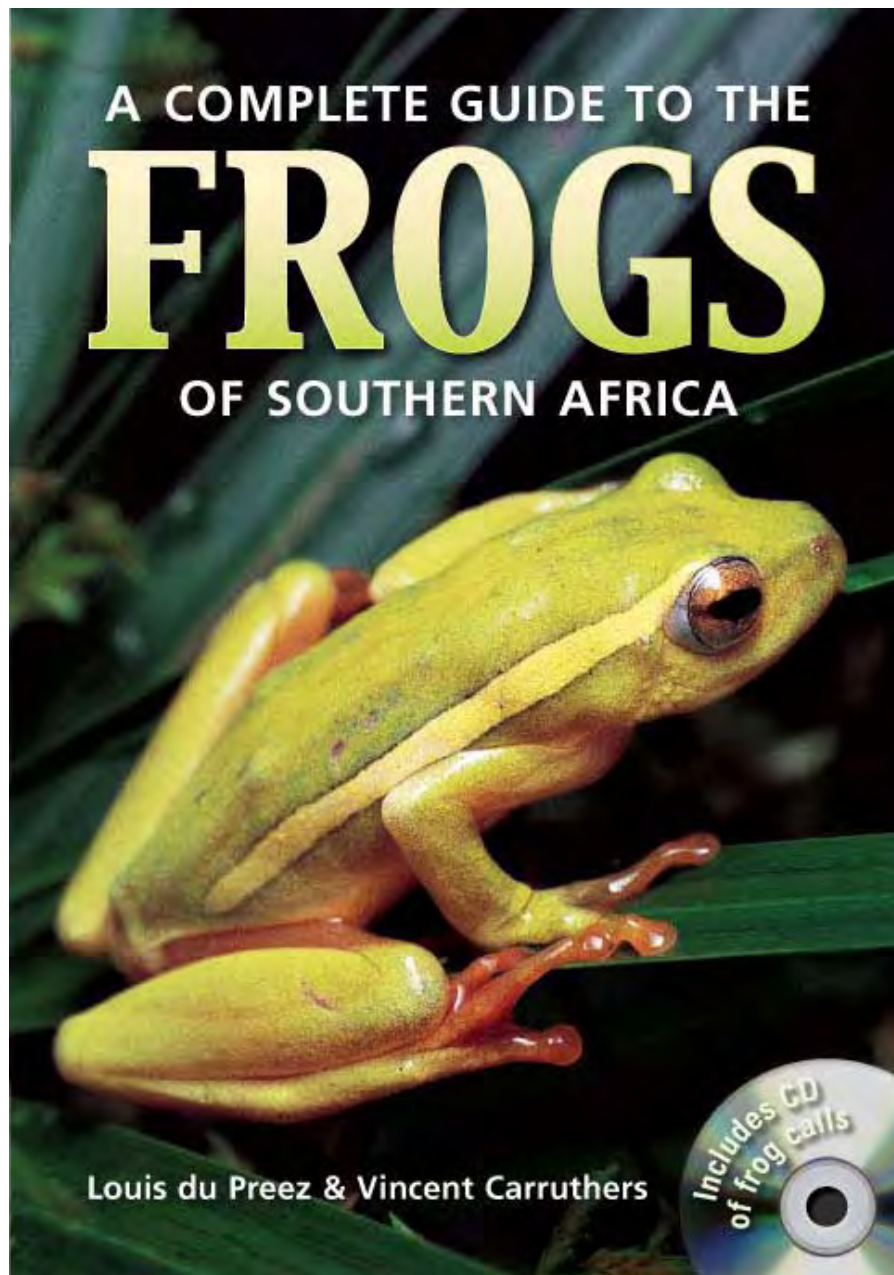


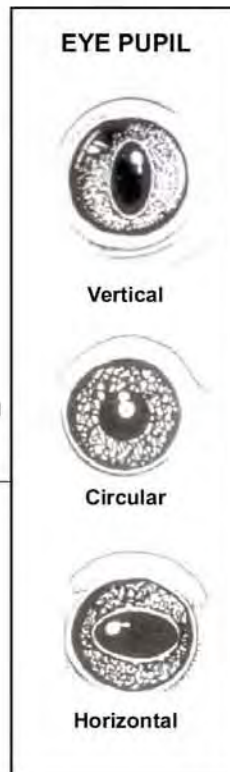
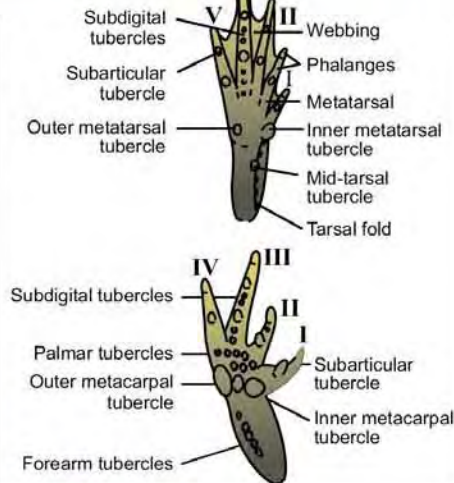
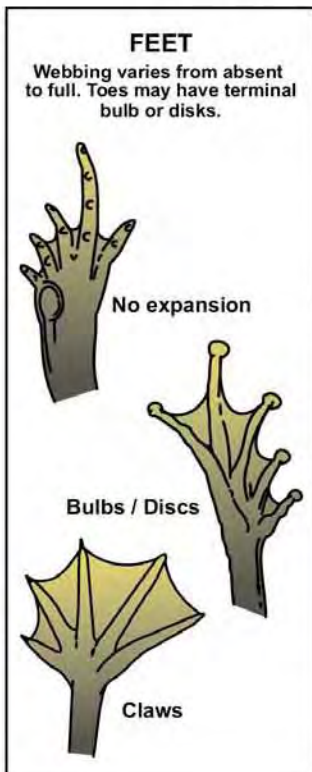
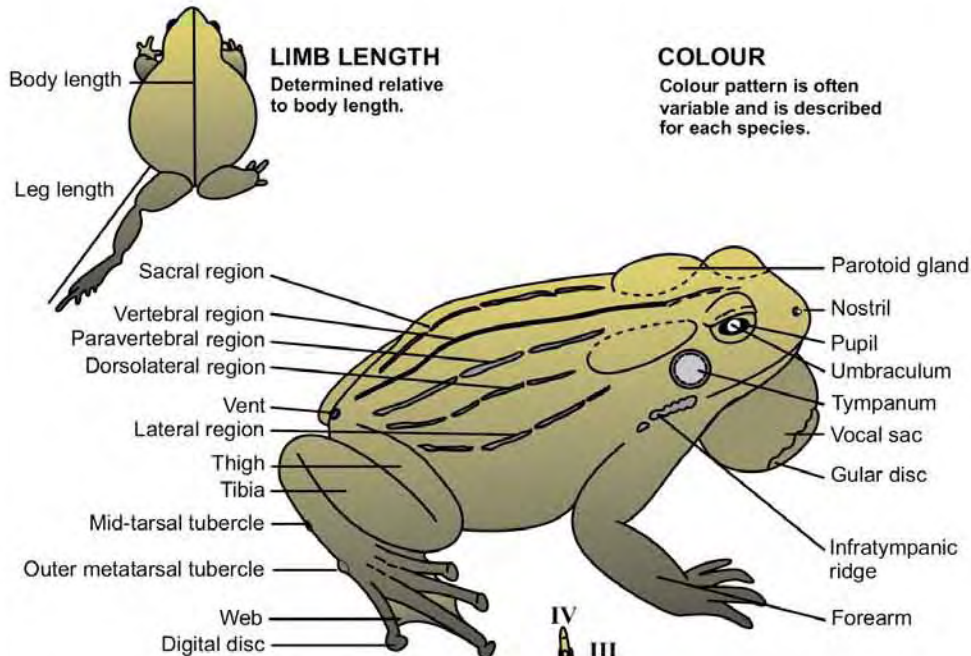
Keys to tadpoles and frogs

Extracted from:

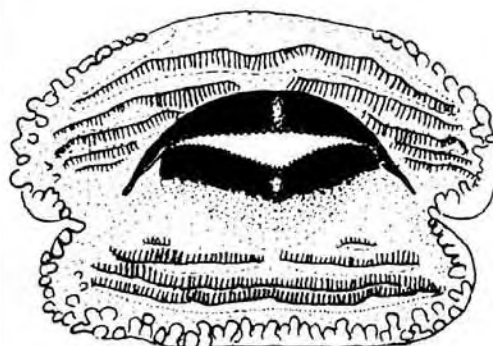
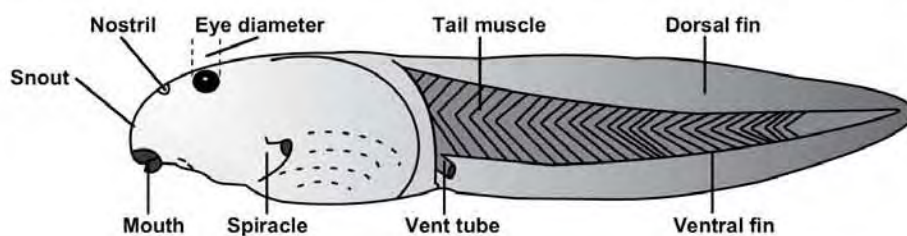
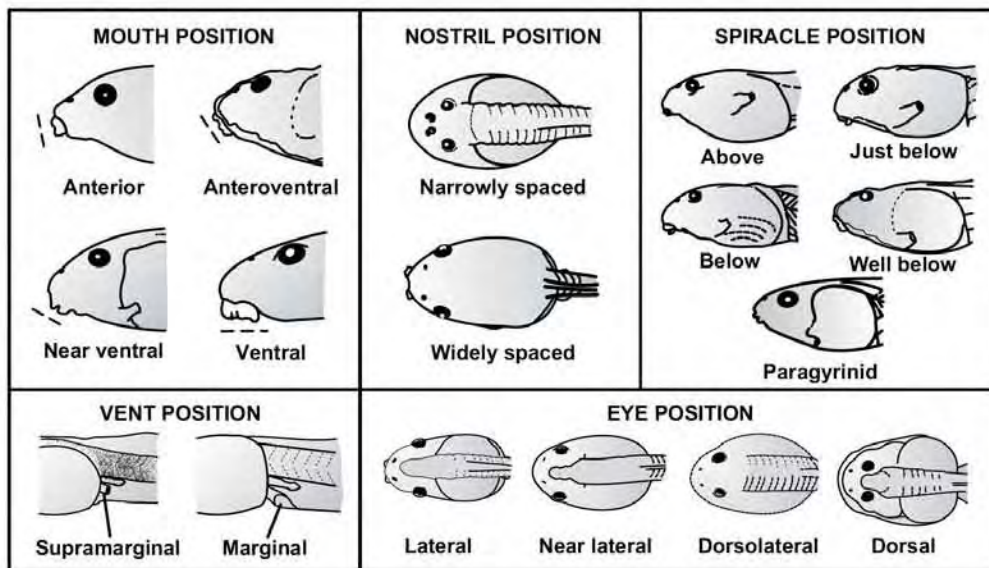
*Du Preez, L.H. & Carruthers, V.C. (2009)
Complete guide to Frogs of Southern Africa.
Random House Struik, Cape Town.*



CHARACTERS FOR IDENTIFYING ADULT FROGS



CHARACTERS FOR IDENTIFYING TADPOLES



The LTRF formula here is: 5(2-5)/4(1-2), indicating that there are five rows in the upper jaw, of which rows 2-5 are divided, and 4 rows in the lower jaw, of which rows 1 and 2 are divided.

JAW SHEATHS



Delicate



Moderate



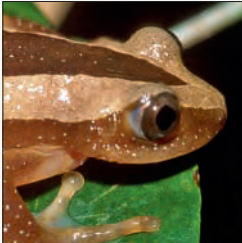
Massive

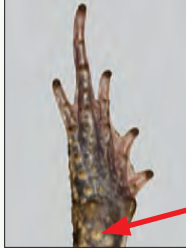
FIELD KEY TO THE GENERA OF ADULT FROGS

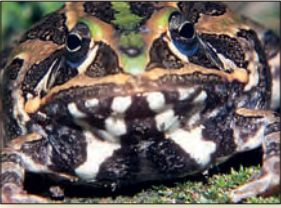
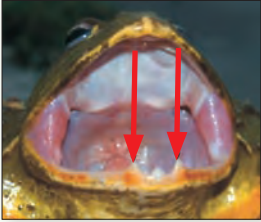
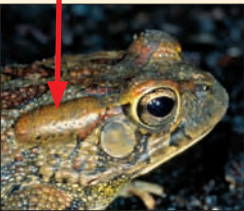
The first part of this field key deals with adult frogs (as opposed to tadpoles), and enables identification to the generic level only, except in those instances where the genus contains only one species, which is then named.

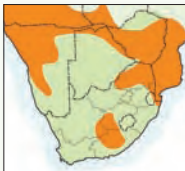
KEY TO FROG GENERA

1		a. Hard claws on 3 toes of each foot Platannas <i>Xenopus</i> pp.328–337		b. No hard claws on the toes 2
2		a. Pupil vertically elongated in bright light 3		b. Pupil circular or horizontally elongated in bright light 10
3		a. Adhesive terminal discs on fingers or toes (may be no wider than the toe in some instances) 4		b. No adhesive terminal discs on fingers or toes 7
4		a. Terminal discs on fingers spatulate (squared off at the tip) 5		b. Terminal discs on fingers, not squared off at the tip 6
5		a. Known from the extreme north of the Eastern Cape, KwaZulu-Natal and Mpumalanga Natal Cascade Frog <i>Hadromophryne natalensis</i> pp.196–199		b. Known from the Western Cape and western part of the Eastern Cape Ghost Frogs <i>Heleophryne</i> pp.200–213

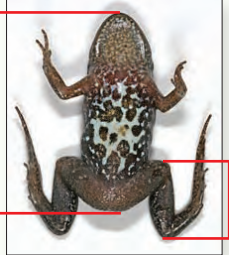
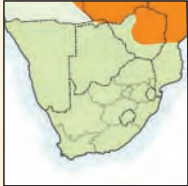
6	a. Red or pinkish coloration in the groin  Red-legged Kassina <i>Kassina maculata</i> pp.274–275	b. No red or pinkish coloration in the groin  7
7	a. Tympanum clearly visible  Tree Frogs <i>Leptopelis</i> pp.88–101	b. Tympanum concealed  Leaf-folding Frogs <i>Afraxalus</i> pp.222–235
8	a. Snout pointed with hard tip  Shovel-nosed Frogs <i>Hemisus</i> pp.214–221	b. Snout rounded without hard tip  9
9	a. Dark longitudinal bands split down the centre  Rattling Frog <i>Semnodactylus wealii</i> pp.278–279	b. Dark longitudinal bands solid  Bubbling Kassina <i>Kassina senegalensis</i> pp.276–277
10	a. Adhesive terminal discs on fingers or toes  11	b. No adhesive terminal discs on fingers or toes  13

11	 a. Terminal discs on fingers T-shaped Kloof Frog <i>Natalobatrachus bonebergi</i> pp.388–390	 b. Terminal discs on fingers not T-shaped 12
12	 a. Tympanum conspicuous Southern Foam Nest Frog <i>Chiromantis xerampelina</i> pp.458–459	 b. Tympanum hidden Reed Frogs <i>Hyperolius</i> pp.236–271
13	 a. Inner metatarsal tubercle massive and flanged for digging 14	 b. Inner metatarsal tubercle absent or small and not flanged 18
14	a. Leg length shorter than body  15	b. Leg length longer than body  16
15	a. Cloaca opening facing backwards and not surrounded by skin folds  Rain Frogs <i>Breviceps</i> pp.102–133	b. Cloaca opening deflected downwards and surrounded by skin folds  Highland Primitive Rain Frog <i>Probreviceps rhodesianus</i> p.135

16	a. Pair of white Y-shaped marks on a dark throat  Ornate Frog <i>Hildebrandtia ornata</i> pp.302–303	b. No white Y-shaped marks on a dark throat  17
17	a. Two tooth-like projections in the lower jaw  Bullfrogs <i>Pyxicephalus</i> pp.410–417	b. No projections in the lower jaw  Sand Frogs <i>Tomopterna</i> pp.432–449
18	a. Ventral skin granular  19	b. Ventral skin smooth  25
19	a. Conspicuous tarsal fold (elevated skin ridge along tarsus)  20	b. No conspicuous tarsal fold  22
20	a. Conspicuous parotoid glands behind the head  21	b. No parotoid glands  Red Toad <i>Schismaderma carens</i> pp.190–192

21	a. Dark patches arranged in more or less symmetrical pairs on either side of the vertebra  Typical toads <i>Amietophrynus</i> pp.136–155	b. Dark patches randomly distributed over the dorsum  Van Dijk's Toads <i>Vandijkophrynus</i> pp.172–183
22	a. Hourglass dorsal pattern  Squeakers <i>Arthroleptis</i> pp.80–87	b. No hourglass pattern on dorsum  23
23	a. Found only in the southwestern Cape mountains (winter-rainfall area)  Mountain Toadlets <i>Capensibufo</i> pp.184–189	b. Found north of the southwestern Cape mountains (summer-rainfall area)  24
24	a. Parotoid glands prominent and forming a continuous 'platform' with the top of the head  Forest Toads <i>Mertensophryne</i> pp.193–195	b. Parotoid glands not prominent and never forming a continuous 'platform' with the top of the head  Pygmy Toads <i>Poyntonophrynus</i> pp.156–171

25	a. Black or very dark with red or pink markings  Rubber Frogs <i>Phrynomantis</i> pp.281–289	b. Coloration not as in a.  26
26	a. No webbing between toes  27	b. Webbing between toes  29
27	a. Ventral surface with dark rounded patches, sometimes fused or elongated  Cacos <i>Cacosternum</i> pp.362–385	b. Ventral surface immaculate, marbled or speckled  28
28	a. Found only in the Eastern Cape and KwaZulu-Natal  Chirping Frogs <i>Anhydrophryne</i> pp.338–345	b. Found only in the Western Cape  Moss Frogs <i>Arthroleptella</i> pp.346–361
29	a. 2 (occasionally 3) pale bars stretching from below eye to upper lip  Montane Marsh Frog <i>Poyntonina paludicola</i> pp.391–393	b. No bars as in a.  30

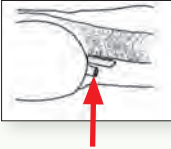
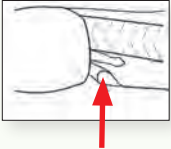
30	 a. Shank (tibia) length (a) less than half body length (b) 31	b. Shank (tibia) length (a) more than half body length (b)  32
31	 a. Found only in the Western Cape Micro Frog <i>Microbatrachella capensis</i> pp.386–387	 b. Found only north of the Limpopo River Golden-backed Frogs <i>Hylarana</i> pp.450–455
32	 a. Small tubercle midway along tarsus Puddle Frogs <i>Phrynobatrachus</i> pp.290–299	 b. No tubercle midway along tarsus 33
33	a. 6 or more continuous parallel skin ridges stretching from behind the eyes down the length of the back  Grass Frogs <i>Ptychadena</i> pp.304–327	b. If present, ridges on back discontinuous or fewer than 6  34
34	 a. At least 3 phalanges of longest toe free of webbing Stream Frogs <i>Strongylopus</i> pp.418–431	 b. Less than 3 phalanges of longest toe free of webbing River Frogs <i>Amietia</i> pp.394–409

FIELD KEY TO THE FAMILIES AND GENERA OF TADPOLES

The following field key deals with the tadpole stage of frogs. In some instances, it is possible to determine identification of a specimen to family level only – these are contained in the first part of the tadpole field key. Those tadpoles that can be identified to genus level are covered in the second part of the key.

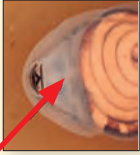
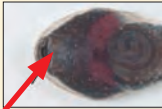
KEY TO TADPOLE FAMILIES

1	a. No jaw sheaths, labial tooth rows or oral papillae  2	b. Oral disc present and usually keratinized jaw sheaths, labial tooth rows and oral papillae present  3
2	a. Mouth with a fold in the lower lip, lacking tentacles and one medial spiracle  Rubber Frogs Microhylidae <i>Phrynomantis</i> p. 282	b. Mouth a horizontal slit with tentacles at the sides, and a spiracle at each side  Platannas Pipidae <i>Xenopus</i> p.329
3	a. More than 7 lower tooth rows; papillae all around oral disk without gaps; no upper jaw sheath  Ghost Frogs Heleophrynidae p.77	b. Less than 8 lower tooth rows; gap in upper jaw papillae; upper jaw sheath present  4
4	a. A broad gap in lower jaw papillae; vent median and marginal  Toads Bufonidae p.77	b. Gap in lower jaw papillae absent or small; vent on right side of fin  5
5	a. Connective tissue extending anteriorly, dorsally and ventrally beyond the tail muscles  Shovel-nosed Frogs Hemisotidae (part) <i>Hemisus</i> p.215	b. Tail fin not obscured by connective tissue  6
6	a. Two undivided lower labial tooth rows  7	b. Not as in a.  10

7	 a. Vent supramarginal and dextral Reed Frogs Hyperoliidae (part) p.78	 b. Vent marginal and more or less dextral 8
8	a. Tadpole with proportionally very long, shallow tail and numerous white-tipped tubercles covering the body and front third of tail; found in seeps on Western Cape mountains  Marsh Frog Pyxicephalidae (part) <i>Poyntonia paludicola</i> pp.392–393	b. Tail not exceptionally long and no white-tipped tubercles covering the body and the front third of the tail; not found in the Western Cape  9
9	a. Internarial distance > 10x nostril diameter  Puddle Frogs Phrynobatrachidae <i>Phrynobatrachus</i> p.291	b. Internarial distance < 6x nostril diameter  Grass Frogs Ptychadenidae p.78
10	 a. 1 upper labial tooth row present or row absent Reed Frogs Hyperoliidae (part) p.78	 b. More than 1 upper labial tooth row 11
11	a. Narrow medial gap in lower jaw papillae; not found in Western Cape  Foam Nest Frogs Rhacophoridae <i>Chiromantis</i> pp.456–459	b. Not as in a.  12
12	 a. Internarial distance > 10x nostril diameter 13	 b. Internarial distance < 6x nostril diameter 14
13	a. Long finger-like papillae bordering lower jaw; 4 labial tooth rows in lower jaw  Shovel-nosed Frogs Hemisotidae (part) <i>Hemisus</i> p.215	b. Papillae bordering lower jaw not long and finger-like; 3 labial tooth rows in lower jaw  Tree Frogs Arthroleptidae (part) <i>Leptopelis</i> p.89
14	a. Prominent black spots covering body and fins  Golden-backed Frogs Ranidae <i>Hylarana</i> p.451	b. Not as in a.  African Common Frogs Pyxicephalidae (part) <i>Leptopelis</i> p.78

KEY TO TADPOLE GENERA

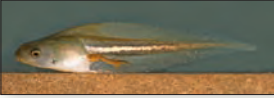
BUFONIDAE

1	 a. Raised horseshoe flap of skin dorsally on the body behind the eyes Red Toad <i>Schismaderma carens</i> p.192	 b. No raised flap of skin dorsally on the body 2
2	 a. Eyes and nostrils surrounded by doughnut-shaped ring of tissue Chirinda Toad <i>Mertensophryne anotis</i> pp.193–195	 b. No ring of tissue around eyes and nostrils 3
3	 a. Tail more than twice as long as the body Mountain Toadlets <i>Capensibufo</i> p.185	 b. Tail less than twice as long as the body 4
4	 a. Dorsal and ventral fin margins nearly parallel; tail tip bluntly rounded Van Dijk's Toads <i>Vandijkophrynus</i> (part) p.173	 b. Tail fin with distinct curvature dorsally and ventrally; rounded tip 5
5	 a. Eye to nostril distance > eye length Van Dijk's Toads <i>Vandijkophrynus</i> (part) p.173	 b. Eye to nostril distance < eye length 6
6	 a. No pigmentation over the gular region; nostril diameter > half eye length Pygmy Toads <i>Poyntonophrynus</i> p.157	 b. Pigmentation extends over the gular region, at least posteriorly; nostril diameter < half eye length Typical toads <i>Amietophrynus</i> p.139

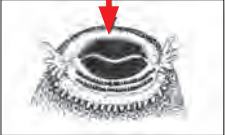
HELEOPHRYNIDAE

1	 a. Jaw sheath present in the lower jaw only Cascade Frog <i>Hadromophryne</i> p.196–199	 b. Jaw sheaths absent; tail fin not very deep Ghost Frogs <i>Heleophryne</i> p.201
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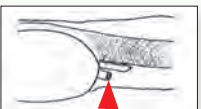
HYPEROLIIDAE

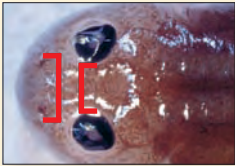
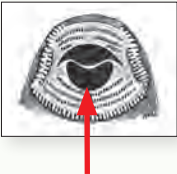
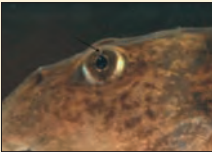
1	 a. Keratinised jaw sheaths massive and keratinised; tail fin very deep 2	 b. Jaw sheaths moderately built; tail fin not very deep 3
2	a. Prominent silver stripe along the tail shaft  Ratling Frog <i>Semnodactylus wealii</i> p.279–280	b. No silver stripe along tail shaft  Kassinas <i>Kassina</i> p.273
3	a. Upper labial tooth row absent  Leaf-folding Frogs <i>Afraxalus</i> pp.223–224	b. 1 upper labial tooth row  Reed Frogs <i>Hyperolius</i> pp.237–239

PTYCHADENIDAE

1	a. Upper labial tooth rows absent  Ornate Frog <i>Hildebrandtia ornata</i> p.303	b. Upper labial tooth rows present  Grass Frogs <i>Ptychadena</i> p.305
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PYXICEPHALIDAE

1	a. Narrow medial gap in lower jaw papillae; vent paragyrid; found in low-lying coastal Western Cape  Micro Frog <i>Microbatrachella capensis</i> p.387 2	b. No gaps in lower jaw papillae; vent not paragyrid; not restricted to Western Cape  2
2	a. Vent supramarginal  3	b. Vent marginal  4

3	 a. Distance between outer margins of nostrils < distance between inner margins of the eyes Cacos <i>Cacosternum</i> p.363	b. Distance between outer margins of nostrils > distance between inner margins of the eyes  Kloof Frog <i>Natalobatrachus bonebergi</i> pp.388–389
4	a. Lower jaw sheath pigmented to the base  Stream Frogs <i>Strongylopus</i> (part) p.419	b. Lower jaw sheath pigmented along the edge  5
5	a. Ocular elygium present  6	b. Ocular elygium absent  7
6	a. Terminal fifth of tail dark  Stream Frogs <i>Strongylopus</i> (part) p.419	b. Terminal fifth of tail not dark  River Frogs <i>Amietia</i> (part) p.395
7	a. First two of labial tooth rows in upper jaw continuous; jaw sheaths feebly serrated; tadpoles gregarious  Bullfrogs <i>Pyxicephalus</i> p.411	b. Usually only the first labial tooth row in upper jaw continuous; jaw sheaths with distinct serrations; tadpoles not gregarious  8
8	a. Tail not as high as body; spiracle not constricted; prominent spur on developing foot  Sand Frogs <i>Tomopterna</i> p.433	b. Tail as high or higher than body; spiracle constricted; no spur on developing foot  River Frogs <i>Amietia</i> (part) p.395

SQUEAKERS

KEY TO SPECIES

ADULT

- 1 Large inner metatarsal tubercle on the heel **Shovel-footed Squeaker** *A. stenodactylus* (p.82)
Inner metatarsal tubercle inconspicuous or absent **2**
- 2 Found in KwaZulu-Natal **Bush Squeaker** *A. wahlbergi* (p.86)
Found elsewhere **3**
- 3 Found in caves and sinkholes in eastern Zimbabwe mountains **Cave Squeaker** *A. troglodytes* (p.84)
Found in woodland or swamps and other non-speleological habitats
..... **Dwarf Squeaker** *A. xenodactyloides* (p.85)

TREE FROGS

KEY TO SPECIES

ADULT

- 1 Terminal discs on toes no wider than the width of the digit **2**
Terminal discs on toes wider than the width of the digit **3**
- 2 Found east of the KwaZulu-Natal Drakensberg **Long-toed Tree Frog** *L. xenodactylus* (p.100)
Found northwest of the Vaal and Pongola rivers **Bocage's Tree Frog** *L. bocagii* (p.90)
- 3 Dark backwards-pointing triangle on head **Broadley's Tree Frog** *L. broadleyi* (p.92)
Any other pattern **4**
- 4 Inner metatarsal tubercle smaller than the smallest toe **Natal Tree Frog** *L. natalensis* (p.98)
Inner metatarsal tubercle larger than the smallest toe **5**
- 5 Fingers with very little or no webbing **Brown-backed Tree Frog** *L. mossambicus* (p.96)
Fingers with moderate webbing, reaching or passing inner tubercle of outer finger
..... **Yellow-spotted Tree Frog** *L. flavomaculatus* (p.94)

TADPOLE

- 1 Ocular elygium present *L. natalensis* (p.98)
Ocular elygium not present **2**
- 2 Found through the coastal lowlands along the east coast north of Durban; discs on toe tips visible in five-toes stage *L. mossambicus* (p.96)
Found in the foothills of the Natal Drakensberg; no discs on toe tips visible at any stage
..... *L. xenodactylus* (p.100)

RAIN FROGS

KEY TO SPECIES

ADULT

- 1 Found in the Western and Northern Cape or southern Namibia **2**
 Not found in the Western or Northern Cape or southern Namibia **7**
- 2 Distinct facial mask from eye to armpit **3**
 Facial mask absent or indistinct **5**
- 3 Subarticular tubercle on hand double **Namaqua Rain Frog *B. namaquensis*** (p.122)
 Subarticular tubercle on hand single **4**
- 4 Found in sandy soils in coastal region of southwestern Cape **Sand Rain Frog *B. rosei*** (p.126)
 Facial mask absent or not conspicuous **Cape Mountain Rain Frog *B. montanus*** (p.118)
- 5 Fleshy webbing between toes giving foot a paddle-like appearance **Desert Rain Frog *B. macrops*** (p.116)
 Webbing absent **6**
- 6 Underside plain purplish-brown; dorsum plain grey or brown **Plain Rain Frog *B. fuscus*** (p.112)
 Underside mottled brown and cream; dorsum granular brown with cream patches
 **Cape Rain Frog *B. gibbosus*** (p.114)
 Underside plum-coloured with white dots; dorsum reddish or cream with numerous black granules
 **Strawberry Rain Frog *B. acutirostris*** (p.106)
- 7 Underside plain purplish brown; dorsum plain grey or brown; found in coastal bush west of Port Elizabeth **Plain Rain Frog *B. fuscus*** (p.112)
 Other than above **8**
- 8 Tympanum visible **Plaintive Rain Frog *B. verrucosus*** (p.132)
 Tympanum not visible **9**
- 9 Outer toe longer than its width **10**
 Outer toe equal to, or shorter than, its width **11**
- 10 Found in Afromontane forest in Limpopo Province **Northern Forest Rain Frog *B. sylvestris*** (p.130)
 Found in open savanna or grassland **Power's Rain Frog *B. poweri*** (p.124)
 or **Mozambique Rain Frog *B. mossambicus*** (p.120) Distinguishable only by the call
- 11 Underside plain white except for gular region and occasional small spots
 **Bushveld Rain Frog *B. adspersus*** (p.108)
 Underside stippled or marbled **12**
- 12 Found in northern KwaZulu-Natal (Zululand) **Whistling Rain Frog *B. sopranus*** (p.128)
 Found in southern KwaZulu-Natal midlands **Bilbo's Rain Frog *B. bagginsi*** (p.110)

TYPICAL TOADS

KEY TO SPECIES

ADULT

- 1 Red infusions on upper legs 2
No red infusion on legs 5
- 2 Pairs of dark markings on snout and between eyes leave a pale cross-shape on head
..... **Guttural Toad** *A. gutturalis* (p.142)
No pattern as above 3
- 3 Snout sharply pointed; elongated parotoid glands extending dorsolaterally **Lemaire's Toad** *A. lemairii* (p.144)
Body shape not as above 4
- 4 Foot longer than 40% of body length **Eastern Olive Toad** *A. garmani* (p.140)
Foot shorter than 40% of body length **Western Olive Toad** *A. poweri* (p.152)
- 5 Dark markings on eyelids fused into a bar between eyes **Raucous Toad** *A. rangeri* (p.154)
Dark markings do not form a bar between eyes 6
- 6 Found north of the Orange and Tugela rivers; parotoid glands flat and inconspicuous
..... **Flat-backed Toad** *A. maculatus* (p.146)
Found south of the Orange and Tugela rivers; parotoid glands conspicuous 7
- 7 Found in the Western Cape **Western Leopard Toad** *A. pantherinus* (p.148)
Found in the Eastern Cape **Eastern Leopard Toad** *A. pardalis* (p.150)

TADPOLE

A. lemairii – tadpole is unknown.

- 1 Pigmentation over anterior part of tail covers upper two-thirds 2
Pigmentation over anterior part of tail covers more than three-quarters 4
- 2 Lower part of tail muscle unpigmented at least for the anterior three-quarters *A. rangeri* (p.154)
Lower part of tail muscle only unpigmented for the anterior two-thirds 3
- 3 Tadpole from the Western Cape coastal region, west of Cape Agulhas *A. pantherinus* (p.148)
Tadpole from the Eastern Cape coastal region, east of Knysna *A. pardalis* (p.150)
- 4 Pigmentation extends over posterior region of throat; oral disc not full width of head *A. gutturalis* (p.142)
Pigmentation extends over throat, posteriorly and anteriorly; oral disc full width of head..... 5
- 5 Four labial tooth rows in lower jaw *A. maculatus* (p.146)
Three labial tooth rows in lower jaw; third row shorter *A. poweri* (p.152) or *A. garmani* (p.140)

PYGMY TOADS

KEY TO SPECIES

ADULT

- 1 Underside with prominent black blotches that tend to fuse ... **Southern Pygmy Toad** *t* (p.170)
Underside pale or with small black spots that do not fuse 2
- 2 Confined to low-lying eastern parts of Mozambique **Beira Pygmy Toad** *P. beiranus* (p.158)
Not found in low-lying eastern parts of Mozambique 3
- 3 Confined to central and northwestern parts of Namibia 4
Not found in central and northwestern parts of Namibia 6
- 4 Surface of snout granular **Damaraland Pygmy Toad** *P. damaranus* (p.160)
Surface of snout smooth 5
- 5 Tympanum distinct **Dombe Pygmy Toad** *P. dombensis* (p.162)
Tympanum obscured **Hoesch's Pygmy Toad** *P. hoeschi* (p.166)
- 6 Tympanum distinct **Northern Pygmy Toad** *P. fenoulheti* (p.164)
Tympanum obscured **Kavango Pygmy Toad** *P. kavangensis* (p.168)

TADPOLE

Unknown for most species.

VAN DIJK'S TOADS

KEY TO SPECIES

ADULT

- 1 Found north of the Limpopo River **Inyanga Toad** *V. inyangae* (p.180)
Found south of the Limpopo River **2**
- 2 Yellow coloration on the upper side of feet **Cape Sand Toad** *V. angusticeps* (p.176)
No yellow coloration on the upper side of feet **3**
- 3 Found in Namaqualand west of 20°W and north of 32°S **4**
Found elsewhere **5**
- 4 Dorsal pattern russet-red with green blotches **Paradise Toad** *V. robinsoni* (p.182)
Dorsal pattern not as above **5**
- 5 Tarsal fold massive **Karoo Toad** *V. gariensis* (p.178)
Tarsal fold flat or slightly ridged **Amatola Toad** *V. amatolicus* (p.174)

TADPOLE

- 1 Known only from the Amatola Mountains *V. amatolicus* (p.174)
Found elsewhere **2**
- 2 Known only from the Inyanga Mountains between Zimbabwe and Mozambique. *V. inyangae* (p.180)
Found elsewhere **3**
- 3 Nostrils smaller than eye lens; about 20% of lower jaw sheath deeply pigmented
..... *V. angusticeps* (p.176)
Nostrils larger than eye lens; more than 25% of lower jaw sheath deeply pigmented..... **4**
- 4 Nostril diameter one-third of eye length; abdomen sparsely pigmented..... *V. gariensis* (p.178)
Nostril diameter half of eye length; abdomen darkly pigmented *V. robinsoni* (p.182)

MOUNTAIN TOADLETS

KEY TO SPECIES

ADULT

- Tympanum present **Tradouw Mountain Toadlet** *C. tradouwi* (p.188)
- Tympanum absent **Rose's Mountain Toadlet** *C. rosei* (p.186)

TADPOLE

- 1 Known from Cape Peninsula and mountains southwest of the Breede River Valley *C. rosei* (p.186)
Known from mountains north and east of the Berg and Breede River Valleys *C. tradouwi* (p.188)

GHOST FROGS

KEY TO SPECIES

ADULT AND TADPOLE

- Known only from Table Mountain **Table Mountain Ghost Frog** *H. rosei* (p.212)
- Known from the Elandsberg range near Port Elizabeth **Hewitt's Ghost Frog** *H. hewitti* (p.204)
- Known from the Robertson Pass in the east to the Kareedouw Mountains in the west **Southern Ghost Frog** *H. regis* (p.210)
- Known from the area east of Montagu along the Langeberg to the Gouritz River **Eastern Ghost Frog** *H. orientalis* (p.206)
- Known from the Cederberg range, south and east of the Breede and Berg rivers **Cape Ghost Frog** *H. purcelli* (p.208)
- Known from the Cederberg range, north and west of the Breede and Berg rivers **Cederberg Ghost Frog** *H. depressa* (p.202)

SHOVEL-NOSED FROGS

KEY TO SPECIES

ADULT

- 1 Found south of Limpopo Province **2**
 - Found in Limpopo Province and north of the Limpopo River **3**
- 2 Dorsum mottled light and dark brown, without distinct yellow spots **Mottled Shovel-nosed Frog** *H. marmoratus* (p.220)
 - Dorsum with distinct yellow spots on a plain dark background **Spotted Shovel-nosed Frog** *H. guttatus* (p.218)
- 3 Dorsum mottled light and dark brown **Mottled Shovel-nosed Frog** *H. marmoratus* (p.220)
 - Dorsum dark with small yellow, orange or white spots **Guinea Shovel-nosed Frog** *H. guineensis* (p.216)

Occasionally specimens of *H. guineensis* occur with irregular marbling. These specimens are indistinguishable from *H. marmoratus* in the field.

TADPOLE

- 1 Six labial tooth rows in upper jaw and three in lower; two rows of papillae bordering lower jaw; posterior half of tail usually dark *H. guttatus* (p.218)
- 2 Five labial tooth rows in upper jaw and four in lower; one row of papillae bordering lower jaw; posterior half of tail not darker *H. marmoratus* (p.220) or *H. guineensis* (p.216)

LEAF-FOLDING FROGS

KEY TO SPECIES

ADULT

- 1 Larger than 30 mm with pale upper tibia **Greater Leaf-folding Frog** *A. fornasinii* (p.230)
Smaller than 30 mm with dark-coloured or patterned tibia **2**
- 2 Found in the Eastern or Western Cape **Knysna Leaf-folding Frog** *A. knysnae* (p.232)
Not found in Eastern and Western Cape **3**
- 3 No dark bands on the tibia **Natal Leaf-folding Frog** *A. spinifrons* (p.234)
Dark bands, with or without lighter stippling, on the tibia **4**
- 4 Found north of the Limpopo and Save Rivers **5**
Found south of the Limpopo and Save Rivers **6**
- 5 Dark transverse band extending across full width of tibia **Delicate Leaf-folding Frog** *A. delicatus* (p.228)
Dark transverse band not extending across full width of tibia ... **Snoring Leaf-folding Frog** *A. crotalus* (p.224)
- 6 Underside without spines **Golden Leaf-folding Frog** *A. aureus* (p.226)
Spines on underside, notably in throat region **Delicate Leaf-folding Frog** *A. delicatus* (p.228)

Because of the close interspecies similarity in this genus and the variation within each species, the outcome from the keying process must be thoroughly checked against other diagnostic factors, including – if possible – the call.

TADPOLE

- 1 One continuous labial tooth row in the lower jaw *A. fornasinii* (p.230)
Labial tooth rows absent **2**
- 2 Known only from the coastal region between Groenvlei (Western Cape) and Covie (Eastern Cape)
..... *A. knysnae* (p.232)
Known northwards from Cintsa Bay (in eastern part of the Eastern Cape) **3**
- 3 Two rows of papillae in lower jaw *A. spinifrons* (p.234)
- 4 A single row of papillae in lower jaw *A. aureus* (p.226) or *A. delicatus* (p.228) (not separable)

REED FROGS

KEY TO SPECIES

ADULT

- 1 Body elongated, snout pointed and projecting well beyond lower jaw 2
 Body not elongated, snout not pointed nor projecting well beyond lower jaw 4
- 2 Usually two pairs of light longitudinal lines on dorsum
 **Bocage's Sharp-nosed Reed Frog** *H. benguellensis* (p.244)
 Mid-dorsal line of spots and one pair of light longitudinal lines usually on dorsum 3
- 3 Occurs west of 25° latitude (northern Botswana and northern Namibia) **Long Reed Frog** *H. nasutus* (p.254)
 Occurs east of 25° latitude (Zimbabwe, northern Mozambique and coastal KwaZulu-Natal)
 **Sharp-nosed Reed Frog** *H. acuticeps* (p.240)
- 4 Confined to central, northern or western Zimbabwe, northern Botswana and northern Namibia 5
 Confined to eastern Zimbabwe and coastal and lowland Mozambique and South Africa 6
- 5 Green to brown; dark brown to black dorsolateral band; confined to central and northern Zimbabwe
 **Margined Reed Frog** *H. marginatus* (p.248)
 Red or brown bold vermiculations to uniform red; confined to northern Botswana and Caprivi Strip
 **Angolan Reed Frog** *H. parallelus* (p.256)
 Lime-green spots on bright green or yellow background; confined to western Zimbabwe
 **Laurent's Reed Frog** *H. rhodesianus* (p.264)
- 6 Males green or grey; yellow lateral band from snout to flanks; female purple-brown; yellow horseshoe mark on snout continues into dorsolateral dots or band; snout rounded; lowlands of KwaZulu-Natal and Mozambique **Argus Reed Frog** *H. argus* (p.242)
 Ivory to light brown; pale dorsolateral band; confined to coastal Western Cape
 **Arum Lily Frog** *H. horstockii* (p.246)
 Black, white, red and yellow longitudinal stripes; northern KwaZulu-Natal, Swaziland, Mpumalanga, Limpopo Province and southern Mozambique; feral population around Cape Town
 **Painted Reed Frog** *H. marmoratus taeniatus* (p.250)
 Irregular mottled patterns of yellows, browns, orange and black; coastal KwaZulu-Natal from Port Edward to St Lucia **Painted Reed Frog** *H. marmoratus marmoratus* (p.250)
 Pale spots on a dark background; KwaZulu-Natal south coast to Tsitsikamma
 **Painted Reed Frog** *H. marmoratus verrucosus* (p.250)
 Brown with prominent white dorsolateral bands edged in black; lowland Mozambique north of Beira
 **Mitchell's Reed Frog** *H. mitchelli* (p.252)
 Translucent green; white dorsolateral band; coastal Mozambique north of Beira
 **Parker's Reed Frog** *H. parkeri* (p.258)
 Males brown with dark-edged light dorsolateral stripe; female brilliant yellowish-green; coastal KwaZulu-Natal lowlands from Kingsburgh to St Lucia **Pickersgill's Reed Frog** *H. pickersgilli* (p.260)
 Translucent green, with small black spots; small; lowlands from Cebe in Eastern Cape northwards
 **Water Lily Frog** *H. pusillus* (p.262)
 Green or olive-brown; yellow dorsolateral band; Port Elizabeth northwards to southern Mozambique and inland to Nelspruit **Yellow-striped Reed Frog** *H. semidiscus* (p.266)
 Pale beige-yellow with dark, dense reticulations fusing to form a uniform black; confined to forest-savanna of eastern Zimbabwe and central west Mozambique **Swynnerton's Reed Frog** *H. swynnertoni* (p.268)
 Uniform lime-green or yellow; translucent green; lowlands from Port Edward northwards
 **Tinker Reed Frog** *H. tuberilinguis* (p.270)

TADPOLE

- 1 Outermost labial tooth row in lower jaw, more than half as long as adjacent row 2
Outermost labial tooth row in lower jaw, less than half as long as adjacent row 3
- 2 Posterior fifth of tail dark grey or black; black pigment along dorsal and ventral limits of tail muscles
..... *H. pusillus* (p.262)
Not as above *H. acuticeps* (p.240)
- 3 Posterior region of tail dark grey or black *H. marmoratus* (p.250)
Posterior region of tail not darker than rest of tail 4
- 4 Longitudinal axis of tail and margin of upper and lower fins dark with dense pigmentation, forming broad stripes;
known from coastal KwaZulu-Natal and Mozambique *H. tuberilinguis* (p.270)
Broad stripe on middle of tail muscles with thin black line along uppermost and lower most margin of tail
muscle; known from coastal southern and Western Cape *H. horstockii* (p.246)

Tadpole identification not possible through key for: *H. argus*, *H. benguellensis*, *H. marginatus*, *H. mitchelli*, *H. nasutus*, *H. parallelus*, *H. parkeri*, *H. pickersgilli*, *H. rhodesianus*, *H. semidiscus* and *H. swynnertoni*

KASSINAS

KEY TO SPECIES

ADULT

- 1 Bold, dark longitudinal vertebral and paravertebral bands **Bubbling Kassina** *K. senegalensis* (p.276)
Large circular spots with pale borders **Red-legged Kassina** *K. maculata* (p.274)

TADPOLE

- 1 Two interrupted labial tooth rows in the lower jaw; no gap below in row or oral papillae; dorsal fin starts off gradually on top of the head from a position behind the eye *K. senegalensis* (p.276)
Two interrupted labial tooth rows, plus a very short third labial tooth row in the lower jaw; dorsal fin starts out with a steep angle on top of the head from the level of the eye *K. maculata* (p.274)

RUBBER FROGS

KEY TO SPECIES

ADULT

- 1 Two broad paravertebral reddish bands running from snout over eyes to flanks
..... **Banded Rubber Frog** *P. bifasciatus* (p.288)
Reddish spots or blotches on dorsum but no solid bands **2**
2 Asymmetrical irregular patches on dorsum **Marbled Rubber Frog** *P. annectens* (p.286)
Small reddish spots, roughly in two dorsolateral bands **Spotted Rubber Frog** *P. affinis* (p.284)

TADPOLE

- P. affinis* – tadpole is unknown.
1 Spiracle close to posterior end of trunk; dorsum silvery with black vertebral line *P. bifasciatus* (p.288)
2 Spiracle about 75% from mouth along the body; dorsum mottled silver and black *P. annectens* (p.286)

PUDDLE FROGS

KEY TO SPECIES

ADULT

- 1 Webbing prominent – less than 2½ phalanges of longest toe free **2**
 Webbing reduced – more than three phalanges of longest toe free **3**
- 2 Pair of elongated, usually chevron-shaped, skin ridges in shoulder region
 **East African Puddle Frog** *P. acridoides* (p.292)
 Warts may be oval but do not form an elongated ridge **Snoring Puddle Frog** *P. natalensis* (p.296)
- 3 Abdomen heavily spotted or speckled, at least posteriorly **Small Puddle Frog** *P. parvulus* (p.298)
 Rear half of abdomen immaculate **Dwarf Puddle Frog** *P. mababiensis* (p.294)

TADPOLE

- 1 Single labial tooth row in the upper jaw; jaw sheaths very narrow; a row of widely spaced, very long papillae bordering lower jaw *P. mababiensis* (p.294)
 More than one labial tooth row in the upper jaw; jaw sheaths moderate; no extra long papillae bordering lower jaw..... *P. natalensis* (p.296) and *P. acridoides* (p.292) (not separable)
 P. parvulus – tadpole cannot be identified by key (p.298)

GRASS FROGS

KEY TO SPECIES

ADULT

- 1 Two dark bands on back of thigh continuous and passing below vent; underside usually speckled **Speckled-bellied Grass Frog** *P. subpunctata* (p.322)
One dark band on back of thigh continuous and passing below vent; underside not speckled **Dwarf Grass Frog** *P. taenioscelis* (p.324)
Dark bands may be present on thigh but not continuous passing below vent; underside usually not speckled **2**
- 2 Snout paler than rest of body **3**
Snout not paler than rest of body **4**
- 3 Distance from nostrils to snout tip less than internarial distance **Plain Grass Frog** *P. anchietae* (p.306)
Nostrils to snout tip more than internarial distance **Sharp-nosed Grass Frog** *P. oxyrhynchus* (p.316)
- 4 Foot length longer than lower leg (tibia) length **5**
Foot length less than tibia length **6**
- 5 Outer metatarsal tubercle absent; distance from nostrils to snout tip equal to internarial distance **Mascarene Grass Frog** *P. mascareniensis* (p.312)
Outer metatarsal tubercle present; distance from nostrils to snout tip less than internarial distance **Guibe's Grass Frog** *P. guibei* (p.308)
- 6 Internarial distance less than snout-nostril distance **Udzungwa Grass Frog** *P. uzungwensis* (p.326)
Internarial distance equal or more than snout-nostril distance **7**
- 7 Outer metatarsal tubercle absent; webbing extensive, less than two phalanges of longest toe free of web **Striped Grass Frog** *P. porosissima* (p.318)
Outer metatarsal tubercle present; webbing reduced with more than two phalanges of longest toe usually free of web **8**
- 8 Paravertebral folds from head to midback continuous **Broad-banded Grass Frog** *P. mossambica* (p.314)
Paravertebral folds from head to midback interrupted **9**
Pale skin ridge from snout over upper jaw to base of arm continuous **Mapacha Grass Frog** *P. mapacha* (p.310)
Pale skin ridge from snout over upper jaw to base of arm broken ... **Schilluk Grass Frog** *P. schillukorum* (p.320)

TADPOLE

- 1 One labial tooth row in upper jaw; sometimes a very short second row **2**
Two labial tooth rows in upper jaw **3**
- 2 Two rows of papillae bordering lower jaw; outer row widely spaced, with long papillae; deepest position in fin about 66% from body *P. porosissima* (p.318)
One row of papillae bordering lower jaw; deepest position in fin about 40% from body ... *P. anchietae* (p.306)
- 3 One row of papillae behind the oral angle; area around eyes pigmented *P. taenioscelis* (p.324)
Multiple rows of papillae behind the oral angle; area around eyes not pigmented *P. oxyrhynchus* (p.316)

Tadpoles not known well enough to be identified by means of a key: *P. guibei*, *P. mapacha*, *P. mascareniensis*, *P. mossambica*, *P. schillukorum*, *P. subpunctata* and *P. uzungwensis*

PLATANNAS OR CLAWED FROGS

KEY TO SPECIES

ADULT

- 1 No subocular tentacle **Cape Platanna** *X. gilli* (p.330)
Subocular tentacle present **2**
- 2 Subocular tentacle at least half as long as diameter of eye **Müller's Platanna** *X. muelleri* (p.334)
Subocular tentacle shorter than half as long as diameter of eye **3**
- 3 Underside immaculate or mottled with grey **Common Platanna** *X. laevis* (p.332)
Underside dark yellow with dark grey speckles or blotches **Peters' Platanna** *X. petersii* (p.336)

TADPOLE

- 1 Unpigmented band running from each eye, sideways and backwards; oral tentacles shorter than body width *X. gilli* (p.330)
No unpigmented band running sideways from eyes, oral tentacles as long as, or longer than, body width..... **2**
- 2 Distance between nostrils less than 1½ times nostril width; oral tentacles twice body width *X. muelleri* (p.334)
Distance between nostrils more than 1½ times nostril width; oral tentacles as long as body width **3**
- 3 Inner margin of nostrils and area between nostrils with dark pigmentation *X. laevis* (p.332)
Inner margin of nostrils and area between nostrils not darkly pigmented *X. petersii* (p.336)

CHIRPING FROGS

KEY TO SPECIES

ADULT

- 1 Ventral surface white without markings..... **Mistbelt Chirping Frog** *A. ngongoniensis* (p.342)
Ventral surface with dark mottling or speckles **2**
- 2 Found in the Eastern Cape west of the Mbashe River **Hogsback Chirping Frog** *A. ratrayi* (p.344)
Found in KwaZulu-Natal or the Eastern Cape east of the Mbashe River
..... **Natal Chirping Frog** *A. hewitti* (p.340)

MOSS FROGS

KEY TO SPECIES

- 1 Outer metatarsal tubercle well developed **2**
Outer metatarsal tubercle not well developed **3**
- 2 Restricted to Cape Peninsula **Cape Peninsula Moss Frog** *A. lightfooti* (p.354)
Restricted to Klein Swartberg at Caledon **Rough Moss Frog** *A. rugosa* (p.356)
Occurs from Paarl Mountain to Cape Agulhas **De Villiers's Moss Frog** *A. villiersi* (p.360)
- 3 Skin ridge present from angle of mouth to base of arm **4**
No skin ridge present from angle of mouth to base of arm **Landdroskop Moss Frog** *A. landdrosia* (p.352)
- 4 Restricted to Limietberg, Watervalsberg and Slanghoek mountains **Bainskloof Moss Frog** *A. bicolor* (p.348)
Restricted to Groot Winterhoek Mountains **Northern Moss Frog** *A. subvoce* (p.358)
Restricted to Kleinriviersberg and Babilonstoring Mountains **Drewes's Moss Frog** *A. drewesii* (p.350)

CACOS

KEY TO SPECIES

ADULT

- 1 Confined to the Western Cape and Namaqualand 2
Found east of the Western Cape and Namaqualand 5
- 2 Huge blister-like warts low down on back **Cape Caco** *C. capense* (p.366)
No blister-like warts low down on back 3
- 3 Underside with discrete, small grey or black spots **Flat Caco** *C. platys* (p.376)
Underside with big blotches that tend to fuse 4
- 4 Pale triangle between eyes and snout **Namaqua Caco** *C. namaquense* (p.370)
No pale triangle between eyes and snout **Karoo Caco** *C. karooicum* (p.368)
- 5 Bold reticulated pattern of golden-brown blotches on creamy yellow background
..... **Poynton's Caco** *C. poyntoni* (p.378)
Back variable but not a reticulated pattern 6
- 6 Large prominent black blotches that tend to fuse on abdomen **Rhythmic Caco** *C. sp. A* (p.382)
Small grey or black spots or blotches 7
- 7 Blotches on the underside concentrated anteriorly; abdomen immaculate 8
Blotches on the underside concentrated posteriorly 9
- 8 Subarticular tubercles prominent **Bronze Caco** *C. nanum* (p.372)
Subarticular tubercles small **Mountain Caco** *C. parvum* (p.374)
- 9 Pale line on back of thighs from heel to heel **Striped Caco** *C. striatum* (p.380)
No pale line on back of thighs **Boettger's Caco** *C. boettgeri* (p.364) and **KwaZulu Caco** *C. sp. B* (p.384)

TADPOLE

A key to the tadpoles in this genus cannot be resolved because of variation and complexity.

RIVER FROGS

KEY TO SPECIES

ADULT

- 1 Found north of Limpopo River **2**
Found south of Limpopo River **3**
- 2 Tympanum less than half diameter of eye **Inyanga River Frog *A. inyangae*** (p.402)
Tympanum more than half diameter of eye **Common River Frog *A. angolensis*** (p.396)
- 3 One or fewer phalanges of longest toe free of webbing **4**
One and a half or more phalanges of longest toe free of webbing **5**
- 4 Head width half length of body **Maluti River Frog *A. umbraculata*** (p.404)
Head width less than half length of body **Cape River Frog *A. fuscigula*** (p.400)
- 5 Found at high altitudes in Drakensberg-Maluti range **6**
Found other than at high altitudes in Drakensberg-Maluti range **7**
- 6 Dorsal skin very warty **Phofung River Frog *A. vertebralis*** (p.408)
Dorsal skin smooth **Drakensberg River Frog *A. dracomontana*** (p.398)
or **Common River Frog *A. angolensis*** (p.396) (these two species are morphologically indistinguishable)
- 7 More than two phalanges of longest toe free of webbing **Van Dijk's River Frog *A. vandijki*** (p.406)
Two or fewer phalanges of longest toe free of webbing **Common River Frog *A. angolensis*** (p.396)

TADPOLE

- 1 Elygium or umbraculum present on eye; tadpole from high-lying parts of the Drakensberg **2**
No elygium or umbraculum present on eye, tadpole not from high-lying parts of the Drakensberg **4**
- 2 Dorsal tail fin starts directly behind body ***A. dracomontana*** (p.398)
Anterior part of dorsal fin very low **3**
- 3 Anterior third of dorsal tail fin very low or absent; spiracle well below ***A. umbraculata*** (p.404)
Anterior quarter of dorsal tail fin very low or absent; spiracle below ***A. vertebralis*** (p.408)
- 4 Seven labial tooth rows in lower jaw and six or seven in upper jaw ***A. vandijki*** (p.406)
Three or four labial tooth rows in lower jaw and four in upper jaw **5**
- 5 Tail fin broad, reaching deepest point at point two-thirds down tail; tapers to a rounded tip ***A. inyangae*** (p.402)
Tail fin long, reaching deepest point shortly after middle; tapers to a pointed tip **6**
- 6 Fin rises gradually from body; three labial teeth rows in lower jaw; tail tip not darker ***A. angolensis*** (p.396)
Fin rises steeply from body; four labial teeth rows in lower jaw; tail tip often darker ***A. fuscigula*** (p.400)

BULLFROGS

KEY TO SPECIES

ADULT

- Upper jaw with irregular pale vertical bars **African Bullfrog** *P. edulis* (p.416)
Upper jaw without irregular pale vertical bars **Giant Bullfrog** *P. adspersus* (p.414)

TADPOLE

- Two uninterrupted labial tooth rows in upper jaw *P. adspersus* (p.414)
Three uninterrupted labial tooth rows in upper jaw *P. edulis* (p.416)

STREAM FROGS

KEY TO SPECIES

ADULT

- 1 Longitudinal pale and dark lines or bands on dorsum **2**
Dorsum pale or with scattered blotches **3**
2 Two bold, dark brown to black paravertebral lines on a pale background
..... **Striped Stream Frog** *S. fasciatus* (p.422)
Light brown to olive-grey with longitudinal, broken, dark brown to black stripes or bands
..... **Banded Stream Frog** *S. bonaespei* (p.420)
3 Confined to Namaqualand **Namaqua Stream Frog** *S. springbokensis* (p.428)
Does not occur in Namaqualand **4**
4 Facial mask not prominent **Clicking Stream Frog** *S. grayii* (p.424)
Facial mask prominent **5**
5 Webbing reduced; three to four toes free of web **Chimanmani Stream Frog** *S. rhodesianus* (p.426)
Webbing moderate; fewer than three toes free of web **Plain Stream Frog** *S. wageri* (p.430)

TADPOLE

- 1 Tail higher than body; dorsal fin mottled; dorsal fin extending onto body; tail tip pointed
..... *S. fasciatus* (p.422)
Tail not higher than body; dorsal fin not mottled; dorsal fin not extending onto body **2**
2 Ocular elygium present on eye; distal part of fin usually dark *S. wageri* (p.430)
Ocular elygium not present on eye; distal part of fin usually not dark **3**
3 Usually one divided and two undivided labial tooth rows in lower jaw **4**
Usually three undivided labial tooth rows in lower jaw **5**
4 Two undivided and one divided tooth rows in upper jaw; more than one row of papillae laterally in lower jaw
..... *S. rhodesianus* (p.426)
One undivided and three divided tooth rows in upper jaw; one row of papillae in lower jaw
..... *S. springbokensis* (p.428)
5 Body oval-shaped in dorsal view *S. grayii* (p.424)
Body pear-shaped in dorsal view *S. bonaespei* (p.420)

SAND FROGS

KEY TO SPECIES

ADULT

- 1 Glandular elevations below tympanum not fused to form a continuous ridge **Cape Sand Frog *T. delalandii*** (p.438)
Glandular elevations below tympanum fused to form a continuous ridge **2**
- 2 Prominent glandular ridge from eye, over tympanum, to base of arm **Natal Sand Frog *T. natalensis*** (p.444)
No glandular ridge from eye, over tympanum, to base of arm..... **3**
- 3 Subarticular tubercle under first finger double **Knocking Sand Frog *T. krugerensis*** (p.440)
Subarticular tubercle under first finger single **4**
- 4 Each dark blotch on dorsum surrounded by ring of rounded warts **Beaded Sand Frog *T. tuberculosa*** (p.448)
Warts scattered on dorsum **5**
- 5 Less than two phalanges of the fifth toe free of web **Russet-backed Sand Frog *T. marmorata*** (p.442)
More than two phalanges of the fifth toe free of web **6**
- 6 Known only from Khorixas in Damaraland in northern Namibia; tympanum prominent **Damaraland Sand Frog *T. damarensis*** (p.436)
Not restricted to Khorixas in Damaraland; tympanum obscured **Tremelo Sand Frog *T. cryptotis*** (p.434)
or **Tandy's Sand Frog *T. tandyi*** (p.446) (morphologically and geographically indistinguishable)

TADPOLE

Key to the tadpoles in this genus cannot be resolved because of variation and complexity.

GOLDEN-BACKED FROGS

KEY TO SPECIES

- Dorsum edged with pale line but without skin ridges **Darling's Golden-backed Frog *H. darlingi*** (p.452)
- Dorsal pattern edged with skin ridges from eye to groin **Galam Golden-backed Frog *H. galamensis*** (p.454)
- The tadpole of only one species is known **Galam Golden-backed Frog *H. galamensis*** (p.455)