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AMPHIBIANS OF KARLAPAT AND KONARAK-BALUKHAND WILDLIFE SANCTUARIES, ORISSA

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INTRODUCTION

Orissa with its varied topography is a storehouse of biological reserves. The State has a diversified topography that consists of hills, valleys, deciduous, evergreen and scrub forests, and estuarine as well as man-made forests. The forest area of Orissa is about 38% of its geographical area and the whole of the State abounds in natural reserves and wildlife sanctuaries. Whether it be the verdant plains or the hilly terrain, wildlife in Orissa is present everywhere. The diversified ecological niches and environmental settings of Orissa provide an excellent home for a rich and diversified amphibian fauna.

Karlapat Wildlife Sanctuary (19°41' N, 83°09' E) is a small but beautiful sanctuary located about 35 km from Bhawanipatna town in Kalahandi district of south-western Orissa, on the Bhawanipatna-Thuamula-Rampur road. The nearest railhead is the Kesinga Railway Station. This dense patch of lush green dry deciduous forest, covering an area of 147.66 sq km was upgraded to a sanctuary in 1992. The undulating topography of this sanctuary with low hills and vegetated valleys that form part of the Eastern Ghats of Peninsular India, as well as perennial streams and deep-water pools gives it a unique charm. The main vegetation consists of dry deciduous forests and lush green scrub jungles. This supports the wildlife population of this sanctuary which consists of Sambhar, Gaur, Nilgai, Barking deer, Mouse deer, Wild boar, Black-naped Hare, Porcupine, Indian Pangolin, Common Mongoose, Small Indian Mongoose, Leopard, Jungle Cat, Civets, Jackal, Hyena, Indian Wolf, Ratel and Sloth Bear. Besides, this

sanctuary also houses a rich variety of avian fauna and a wide variety of reptiles and amphibians.

There are several villages in or around the sanctuary, viz., Jaccum, Karlapat, Bedkot, Mundguda, Mendiabiri and Jugsahi-patana with small, slow-flowing but beautiful hill-streams cascading down beside them. The Khanduala waterfall situated at the foot of a hill adds to the charm of this sanctuary. The top of this hill is referred to as the abode of Goddess Khandula. The rippling flow of the Patalganga river gives rise to a beautiful waterfall named Phuljharan or Phurlijharan. This is a perennial source of water quenching thirst of many a wild denizen of this forest when the scorching overhead sun parches the landscape.

METHODOLOGY

One survey was conducted from 22nd to 31st August, 2008 by a three-member team from Zoological Survey of India, Kolkata. Due to naxalite problems in the forest area, the team had to stay at the nearest town (Bhawanipatna) and visit the Sanctuary everyday. Due to restrictions by the Orissa Forest Department, collections of specimens were not allowed.

Surveys were conducted daily both during the day and in the evening till late hours by hiring a jeep consecutively for seven days from 23-29 August, 2008. During the daytime all big and small water bodies inside the sanctuary, especially those near the several villages inside the sanctuary were surveyed. Many hill-streams flowing down from the low hills inside the sanctuary were also surveyed.

During the evenings these water bodies and hill-streams were again visited and the amphibians in or

near them were observed using powerful flashlights. The calls of the different species were recorded with an AIWA JS-195 audio cassette recorder and those species which could not be directly observed were identified from their distinct species-specific calls.

OBSERVATIONS

The following amphibians were observed or located in the sanctuary during this short survey:

Family BUFONIDAE

1. *Bufo stomaticus* Lutken, 1862

1862. *Bufo stomaticus* Lutken, *Vidensk. Meddr. Dansk. Naturh. Foren.*, **14** : 305.

Common Name : Marbled Toad (English).

Specimens Examined : 3 ex (1 male and 2 females) from Jaccum and 5 ex (2 males, 1 female and 2 juveniles) from Karlapat.

Size : 28-86 mm (Snout-vent length).

Diagnostic features : Medium-sized toads. Head broader than long, without any bony ridges. Snout rounded, nostril nearer to the tip of snout than the eye. Tympanum distinct, circular or oval and nearly two-third the diameter of the eye. Parotoid glands large, flat and elliptical but not bean-shaped.

Fingers without webs, the first finger is longer than the second. Tips of fingers and toes are swollen. Toes are two-third webbed with two phalanges of the fourth toe free. Both inner and outer metatarsal tubercles present, which are oval with sharp edges. Hind limbs are short, the tibio-tarsal articulation reaches between the tympanum and the eye, when the hind leg is held parallel to the body.

There are several irregular flat warts on the dorsum. Ventrums coarsely granular except the chin and throat.

Colour : Dorsum brownish or olive-gray, sometimes marbled. Ventrums white, belly and lower lip dull whitish. Juveniles are light brown with dark marblings.

Habitat : Drier and semi-arid regions of the Sanctuary, mostly in the plains. Dry deciduous forest areas also preferred but are seen near water bodies during the breeding season. Often found in association with Common Indian toads in the same habitat.

Remarks : The species is not uncommon. Usually solitary, terrestrial and nocturnal but also active during

daytime. Burrows in sandy soil and found under stones and crevices of tree-trunks.

2. *Duttaphrynus melanostictus* (Schneider, 1799)

1799. *Bufo melanostictus* Schneider. *Hist. Amph.*, **1** : 216.

Common Name : Common Indian Toad (English).

Specimens Examined : 6 ex (3 males, 1 female and 2 juveniles) from Jaccum, 9 ex (7 males and 2 females) from Karlapat, 4 ex (1 male and 3 females) from Bedkot, 3 ex (2 males and 1 female) from Mundguda, 5 ex (2 males, 1 female and 2 juveniles) from Mendiabiri.

Size : 35-109 mm (Snout-vent length).

Diagnostic features : Large-sized toads. Head is broader than long with cornified bony ridges. Snout is rounded. Nostril is nearer to the tip of the snout than the eye. Tympanum is distinct, circular or oval, nearly two-third the diameter of the eye. Parotoid glands are large and bean-shaped.

Fingers are without webs, the first finger is equal to or little longer than the second. Tips of fingers and toes are swollen. Toes are partly webbed with more than three phalanges of the fourth toe free. Both inner and outer metatarsal tubercle present. The tibio-tarsal articulation reaches in between the tympanum and the eye when the hind leg is held parallel to the body.

Skin is rough with several black-tipped spiny warts on the dorsum. Ventrums also rough in texture.

Colour : Uniformly grayish or dark brownish with a few yellow or pink coloured spots on the dorsum. Ventrums dull white with a yellowish tinge. Juveniles are black or dark gray on the dorsum but the ventrum is uniform white or speckled with black.

Habitat : Found inside forest areas among leaf-litter, beside rain-water pools and ponds and also along the roadsides. Also hide under logs, stones, in moist holes and huddle together in crevices of tree-trunks.

Remarks : Very common throughout the Sanctuary. Terrestrial and nocturnal, they seem to be well-acquainted with their habitat and return to the same site again and again. Usually solitary but congregate during the breeding season near water-bodies. Highly territorial during this time of the year. Juveniles wander on land during mornings and afternoons, if the air-temperature is sufficiently low. Adults are seen

throughout the year, even in winter months if the temperature does not fall severely. They do not seem to hibernate.

Family MICROHYLIDAE

3. *Microhyla ornata* (Dumeril and Bibron, 1841)

1841. *Engystoma ornatum* Dumeril & Bibron, *Erp. Gen.*, **8** : 745.

Common Name : Ornate narrow-mouthed frog, Ornate Microhylid frog (English).

Specimens Examined : 5 ex (4 males and 1 female) from Jaccum, 3 ex (all males) from Karlapat, 6 ex (4 males and 2 females) from Bedkot, 2 ex (both males) from Mundguda, 1 ex (male) from Mendiabiri and 2 ex (1 male and 1 female) from Jugsahi-patana.

Size : 18-26 mm (Snout-vent length).

Diagnostic features : Small-sized, stout, active and agile frogs with small arrow-shaped head and bulging eyes. Head broader than long, snout somewhat pointed and projects beyond the narrow mouth. Tongue elliptical. Nostril is nearer to the tip of the snout than the eye. Pupil circular. Tympanum indistinct.

Fingers rather slender and do not bear webs. The first finger is shorter than the second. Tips of fingers are dilated into small discs. Toes are minutely webbed at the base and the tips are dilated into small discs, devoid of grooves. Metatarsal tubercles are distinct, the inner being more well-developed. Hind limbs are moderately long and the tibio-tarsal articulation reaches the eye, when the hind limb is held parallel to the body.

Skin is smooth with a distinct supratympanic fold.

Colour : The body colour matches that of the soil. The dorsum is grayish-brown or reddish-brown with a distinct dark brown diamond-shaped marking on the back, beginning between the eyes, extending to both the upper eyelids, narrowing behind the head and widening above the shoulder, then narrowing again and finally broadening out and sending a stripe to the groin and the thigh. A dark streak extends along the sides from behind the eye to the shoulder. Limbs with dark brown cross bars. Ventrums dull whitish, with throat and chest stippled with brown.

Habitat : Found among moist leaf-litter in both deciduous and evergreen forests all over the Sanctuary.

Remarks : Very common. Can call very loudly and jump a long distance when compared to its small size.

4. *Ramanella variegata* (Stoliczka, 1872)

1872. *Callula variegata* Stoliczka, *Proc. Asiat. Soc. Beng.*, : 111.

Common Name : Variegated Ramanella (English).

Specimens Examined : 2 ex (both males) from Jaccum, 5 ex (4 males and 1 female) from Karlapat, 1 ex (male) from Bedkot, 2 ex (1 male and 1 female) from Mundguda and 1 ex (male) from Mendiabiri.

Size : 22-41 mm (Snout-vent length).

Diagnostic features : Head is broader than long. Snout is rounded, longer than the diameter of the eye and projects beyond the mouth. Nostril is nearer to the tip of the snout than the eye. Inter-orbital space is flat and much broader than the upper eyelid. Tympanum is hidden.

Fingers are rather long with enlarged triangular terminal discs, first finger is shorter than the second but only slightly shorter than the fourth. Toes with rudimentary web and dilated tips. Outer metatarsal tubercle very small and conical but the inner metatarsal tubercle is large and oval.

Skin is smooth but granular near the vent.

Colour : Dorsum brown with yellow marblings or spots, upper surface of the limbs are also with marblings. Ventrums white with no stable pattern. Males have brownish-black throat.

Habitat : All kinds of small temporary rain-water pools inside the forest especially the ones with grasses and emergent weeds.

Remarks : Quite common in the Sanctuary. They can also climb up tree-trunks.

5. *Kaloula taprobanica* Parker, 1934

1934. *Kaloula pulchra taprobanica* Parker, *Trust. Brit. Mus. London* : 86-87.

Common Name : Painted Frog, Indian Painted Frog, Painted Kaloula (English).

Specimens Examined : 2 ex (both females) from Karlapat, 2 ex (male and female) from Mundguda and 1 ex (male) from Mendiabiri.

Size : 25-58 mm (Snout-vent length).

Diagnostic features : Medium-sized, toad-like, colourful burrowing frog. Head is broader than long. Snout is rounded. Nostril is nearer to the tip of the snout than the eye. Tympanum is hidden. Tongue is elliptical.

Fingers are without webs. The first finger is shorter than the second. Tips of the fingers bear short well-developed truncate discs. Subarticular tubercles of the fingers and toes are prominent. Toes are about one-third webbed and bear dilated triangular discs. Inner metatarsal tubercle is well-developed, large and shovel-shaped. Outer metatarsal tubercle is small.

Dorsum is rough with scattered warts. Skin is wrinkled on the belly but granular on the throat and underside of the thighs.

Colour : Dorsum is blackish-brown or grayish-brown with brown or deep red spots and patches margined with black. A dark reddish lateral band runs on each side from the eyes to the groin of the hind feet. The belly is light brownish or white, spotted with grey. Males have black throat during breeding season.

Habitat : Open forests at the edge of the Sanctuary. Breeds in dirty ponds and pools.

Remarks : Not uncommon, the species is very colourful. They are terrestrial, burrowing and nocturnal, emerging from their burrows during the monsoon, sometimes even during the day and are often seen to climb up trees, where they are found in holes in tree-trunks, infested with termites, about one and a half meters above the ground.

6. *Uperodon globulosus* (Gunther, 1864)

1864. *Cacopus globulosum* Gunther, *Rept. Brit. India* : 416.

Common Name : Balloon Frog, Greater Balloon Frog (English).

Specimens Examined : 1 ex (male) from Karlapat, 1 ex (male) from Bedkot and 1 ex (female) from Mundguda.

Size : 40-66 mm (male), 60-84 mm (female).

Diagnostic features : Medium-sized, rotund, toad-like burrowing frogs with small beady eyes. The head is small relative to the body and is broader than long. Snout is rounded. Nostril is equidistant between the tip of the snout and the eye. Inter-orbital width is two to three times the width of the upper eyelid. Tympanum is indistinct. Tongue is oval.

Fingers are without webs, the first finger is shorter than the second. Tips of the fingers are rounded but without any disks. Subarticular tubercles are not so prominent. The hind limbs are short. Toes are with a rudiment of web. Two well-developed, large and shovel-shaped inner and outer metatarsal tubercles are present. The tibio-tarsal articulation does not reach the shoulder, when the hind leg is held parallel to the body.

Skin is smooth, soft and soggy on the dorsum but the wrinkled on the ventrum. Anal region is granular. Supratympanic fold is present.

Colour : Reddish-brown or grey on the dorsum but dirty white on the ventrum with tinges of yellow during the breeding season. Throat is black in the breeding male.

Habitat : Open mixed forest with loose sand and soft gravel, littered with piles of decaying logs infested with termites. Also found on stream-beds having damp soil.

Remarks : Not uncommon but emerges from the under ground only during the breeding season in early monsoon.

7. *Uperodon systoma* (Schneider, 1799)

1799. *Rana systoma* Schneider, *Hist. Amph.*, : 144.

Common Name : Marbled Balloon Frog, Lesser Balloon Frog (English).

Specimens Examined : 1 ex (male) from Bedkot, 3 ex (1 male and 2 females) from Mundguda and 2 ex (both males) from Mendiabiri.

Size : 55-65 mm (Snout-vent length).

Diagnostic features : Toad-like medium-sized burrowing frog with plump body and soft soggy skin. The eyes are relatively bigger than the Greater Balloon frog but the distance between the eyes is less than twice the width of the upper eyelid. Head is wedge-shaped and broader than long. Snout is rounded and equal to the diameter of the eye. Nostril is equidistant between the tip of the snout than the eye. Tympanum is hidden.

Fingers are free of webbing. First finger is shorter than the second. Tips of the fingers do not bear discs. Toes are rather short and webbed at the base. Inner metatarsal tubercle is twice as large as the outer

metatarsal tubercle but smaller than that of the Greater Balloon frog. Hind limbs are short and the tibio-tarsal articulation reaches the shoulder.

Skin smooth but soggy, granular at the anal region and on the underside of the thighs.

Colour : Olive, greenish-yellow or pinkish on the dorsum, marbled or spotted with dark brown resembling a leopard's coat to some extent. Ventrums whitish but throat and belly creamy yellow, mottled with brown. Throat is blackish in breeding males. In older males, the black vocal sac hangs down the chin in the form of a flap. No median line.

Habitat : Scrub and deciduous forests, often found under stones and logs.

Remarks : Not uncommon but emerges only during the breeding season. Calls like the bleating of a goat. Adults feed mainly on termites.

Family DICROGLOSSIDAE

8. *Euphlyctis cyanophlyctis* (Schneider, 1799)

1799. *Rana cyanophlyctis* Schneider, *Hist. Amph.*, 1 : 137.

Common Name : Skittering Frog, Skipping Frog, Skipper Frog, Water frog (English).

Specimens Examined : 5 ex (2 males and 3 females) from Jaccum, 7 ex (5 males and 2 females) from Karlapat, 2 ex (both females) from Bedkot, 3 ex (3 females) from Mundguda.

Size : 30-69 mm (Snout-vent length).

Diagnostic features : Medium-sized pond frogs. Head is broader than long. Snout is rounded. Nostril is equidistant between tip of snout and eye. Tympanum is distinct, nearly equal to diameter of eye.

Fingers are without webs, the first finger is equal to the second. Tips of the fingers are pointed. Subarticular tubercles are less prominent. Toes are fully webbed. Tips of the toes are swollen and rounded. A pointed toe-like inner metatarsal tubercle is present. Outer metatarsal tubercle is absent. Tibio-tarsal articulation reaches between the tympanum and nostril, when the hind leg is held parallel to the body.

Small warts are present on the dorsum. Ventrums are smooth with a single row of porous warts on each flank.

Colour : Dorsum grey, grayish-brown or grayish-black with darker rounded spots and stripes on the

limbs. Ventrums white with black spots. There is a dark-edged white band on the hinder under part of the thighs.

Habitat : Commonest frog found in all types of water-bodies inside the forest especially the permanent ones with standing water. Active throughout the year. They spend most of their time in the water or in the vicinity of water-bodies but may migrate onto land in the summer months when the temporary pools of water dry up.

Remarks : They float passively in water with only the nostrils projecting above the surface but when disturbed, can skip smoothly over the water for some distance and then float above the surface with the hind legs held parallelly.

9. *Fejervarya orissaensis* (Dutta, 1997)

1997. *Limnonectes orissaensis* Dutta, *Hamadryad.*, 22(1) : 1-8.

Common Name : Orissa Cricket Frog (English).

Specimens Examined : 3 ex (males) from Jaccum, 5 ex (2 males and 3 females) from Karlapat, 2 ex (both females) from Bedkot, 4 ex (3 males and 1 female) from Mundguda and 1 ex (male) from Mendiabiri.

Size : Snout-vent length : males (36.2-47.2 mm), females (34.2-53.8 mm).

Diagnostic features : Medium-sized frog with interrupted longitudinal folds on dorsum, smooth ventrum, wider and longer inner metatarsal tubercle and relatively pointed snout. Shorter hind limbs, more rounded finger and toe tips and a greater degree of webbing on the toes.

Head longer than wide, depressed. Snout pointed, extending beyond the mouth, internarial distance broader than the interorbital width. Narial openings dorsolateral. Tympanum distinct, rounded, diameter less than eye diameter with supratympanic fold extending from posterior corner of eye to forelimbs. Vomerine teeth distinct.

Finger and toe tips rounded, slightly swollen. First finger longer than second, third equal to or slightly longer than first. Subarticular tubercles rounded. Fingers not webbed. Hind limbs moderately long, with two metatarsal tubercles. Inner metatarsal tubercle oval and larger than outer metatarsal tubercle. Longitudinal ridge

extending from anterior border of outer metatarsal tubercle to tip of fifth toe. Subarticular tubercles rounded, similar to those on fingers. Webbing of fourth extends less than half way between distal and penultimate subarticular tubercles, that on fifth toe extends beyond distal subarticular tubercle.

Skin on dorsum of head smooth but body covered with interrupted, longitudinal ridges with small rounded ridges towards posterior border of body. Skin on flanks and chin smooth. Skin on belly and proximal ventral surfaces of thigh smooth.

Colour : Dorsum brown, grey or brick red. A V-shaped marking between eyes which is interrupted by a vertebral band, with or without yellowish narrow or wide vertebral band extending from tip of snout to vent. A X-shaped black patch on middle of body, limbs with complete or incomplete dark cross bars. Sides of thigh yellowish white with black speckles, jaw margins with black vertical bars.

Habitat : Found during monsoon on grassy lands near water pools.

Remarks : The species is very common. When disturbed jump into water but immediately returns to the edges. Active at night but hides in grass, below rocks or in small holes near water during the day. Eggs are laid in open temporary rain-water pools, the larvae are free-swimming.

10. *Fejervarya syhadrensis* (Annandale, 1919)
1919. *Rana syhadrensis* Annandale, *Rec. Ind. Mus.*, **6** : 121-125.

Common Name : Syhadra Cricket Frog (English).

Specimens Examined : 5 ex (2 males and 3 females) from Jaccum, 3 ex (2 males and 1 female) from Karlapat, 2 ex (both females) from Bedkot, 4 ex (2 males, 1 female and 1 juvenile) from Mundguda and 2 ex (both females) from Mendiabiri.

Size : 27-32 mm (males) and 29-40 mm (females).

Diagnostic features : The body is spindle-shaped. The head is pointed with the snout very distinctly jutting over the lower jaw. Inter-orbital distance is equal to the inter-narial space. The nostrils are lateral and distinctly closer to the tip of the snout than the eyes. Tympanum is round and hidden, half that of the eye

diameter. Pineal organ is distinctive as a white dot between the eyes.

Finger tips are rounded. The first finger is equal to the second, while the fourth finger is slightly longer than the second. Subarticular tubercles are globular with an oblong oval inner metacarpal tubercle and two additional rounded palmer tubercles.

Toes are webbed with rounded tips. Subarticular tubercles are distinctly smaller than those of the fingers and are rather oval with an oblong inner metatarsal tubercle that is laterally flattened and a very small point-like outer metatarsal tubercle in line with the tarsal fold. A narrow ridge is formed by a series of very small tubercles between the outer metatarsal tubercle and the proximal subarticular tubercle of the fifth toe. The tibio-tarsal articulation reaches between the eye and tip of the snout.

Dorsum is smooth with a few round or slightly oblong tubercles. Glandular folds are shorter with tiny light tubercles in the cloacal and loreal regions, the dorsal part of the lower leg and on the sides of the heel (tarsus). Venter is uniformly smooth.

Colour : Dorsum is grayish to brownish-olive with black irregular spots particularly fused into transverse bands. There are also dark, ring-shaped spots with a paler center and the sides of the body are faintly marbled. A very narrow yellowish-white mid-dorsal line, often interrupted. An inter-orbital band is present.

Fore-limbs are darkly banded and the hind-limbs are dotted on the thighs and striped on the lower leg. Venter of the hand and foot are dark with contrasting pale metacarpal or metatarsal tubercles. Toe webbing is faintly marbled.

Venter is uniformly white with narrow dark bars along the margin of the lower jaw. Males have a blackish-grey and crescent-shaped mark on the throat.

Habitat : Prefers vicinity of water without being really aquatic. They can be encountered far away from water-bodies between trees in Sal forests, near brooks, in open grassland, ools and ditches.

Remarks : Very common. Partly diurnal but only calls nocturnally. During the dry winter months hides in leaf-litter of woods or between buttresses of trees. Males call in the evening and night and are easy to locate.

11. *Hoplobatrachus crassus* (Jerdon, 1853)

1853. *Rana crassa* Jerdon, *J. Asiat. Soc. Beng.*, **22** : 531.

Common Name : Jerdon's Bull Frog (English).

Specimens Examined : 2 ex (both males) from Jaccum, 3 ex (1 male and 2 females) from Karlapat, 1 ex (female) from Mundguda, 2 ex (1 male and 1 female) from Mendiabiri.

Size : 40-86 mm (Snout-vent length).

Diagnostic features : Moderately large-sized flabby-shaped frogs. Head is little broader than long. Snout is generally pointed and projects beyond the mouth. Nostril is equidistant between the tip of the snout and the eye. Tympanum is distinct, nearly equal to the diameter of the eye.

Fingers are without webs, the first finger is longer than the second. Subarticular tubercles are not very prominent. Hind limbs are comparatively shorter, the tibio-tarsal articulation reaches in between the tympanum and the eye, when the hind limb is held parallel to the body. Toes are entirely webbed but deeply notched, with two phalanges of the fourth toe free. Tips of the toes are not pointed. A strongly compressed, shovel-shaped inner metatarsal tubercle is present. Outer metatarsal tubercle is absent.

Skin on the back and limbs is highly granular with some interrupted warts. 6-14 glandular longitudinal folds are present on the back. Ventrums smooth.

Colour : Greyish or greenish-brown with darker stripes or patches on the back. Ventrums whitish with black spots or deep brown stripes on the throat.

Habitat : Spend the day hiding inside crevices on elevated banks of ponds and ditches. They are found during breeding season in temporary rain-water pools.

Remarks : The species is quite common, found along with the Indian Bull frogs. They are terrestrial, nocturnal and also burrow in the ground.

12. *Hoplobatrachus tigerinus* (Daudin, 1803)

1803. *Rana tigerina* Daudin, *Hist. Nat.*, **1** : 42.

Common Name : Bull Frog, Indian Bull Frog (English).

Specimens Examined : 4 ex (3 males and 1 female) from Jaccum, 2 ex (both males) from Karlapat, 1 ex (female) from Bedkot, 2 ex (1 male and 1 female) from

Mundguda and 3 ex (2 males and 1 female) from Mendiabiri.

Size : 40-154 mm (Snout-vent length).

Diagnostic features : Large-sized frogs with smooth skin and longitudinal glandular folds on the back. Head is longer than broad. The snout is somewhat pointed and projects beyond the mouth. The nostril is equidistant between the tip of the snout and the eye. Tympanum is distinct, nearly equal to the diameter of the eye.

Fingers are without webs, the first finger is longer than the second. Tips of fingers and toes are not sharply pointed. Toes are fully webbed but the web does not reach the tip of the fourth toe. The fifth toe is with an outer fringe of web. Subarticular tubercles of the fingers and toes are not very prominent. Inner metatarsal tubercle is short and blunt. Outer metatarsal tubercle is absent. Hind limbs are comparatively long, with the tibio-tarsal articulation reaching the nostril, when the hind limb is held parallel to the body.

Dorsum smooth with longitudinal glandular folds. Ventrums smooth with no porous warts on the flanks. Supratympanic fold present.

Colour : Dorsum yellowish or olive-green with darker leopard-like spots. A yellowish median stripe runs from the tip of the snout to the vent. Ventrums whitish. Limbs are black-barred or spotted.

Habitat : Found among grasses, bushes and on the leaf-litter of the forest floor. Hide inside hollows at the edge of ponds and ditches. Aestivate inside burrows or under heaps of leaves. Seen frequently on the edges of ponds during breeding season into which they leap headlong at the least sign of danger.

Remarks : Very common species. Solitary creatures, which aggregate only during the breeding season. In the non-breeding season, they are difficult to locate but with the appearance of the rainy season their highly resonant call can be heard throughout the night.

13. *Sphaerotheca breviceps* (Schneider, 1799)

1799. *Rana breviceps* Schneider, *Hist. Amph.*, **1** : 140.

Common Name : Indian Burrowing Frog (English).

Specimens Examined : 2 ex (both females) from Jaccum, 1 ex (male) from Karlapat, 1 ex (male) from Bedkot, 2 ex (1 male and 1 female) from Mundguda.

Size : 28-52 mm (Snout-vent length).

Diagnostic features : Stout medium-sized toad-like burrowing frogs. Head is broader than long. Snout is short and rounded, not projecting beyond the mouth. Nostril is equidistant between the tip of the snout and the eye. Tympanum is distinct, more or less half the diameter of the eye.

Fingers are without web. The first finger is longer than the second but equal to the third. Tips of the fingers are swollen but not disc-like. Hind limbs are very short. The tibio-tarsal articulation only reaches upto the shoulder when the hind-limb is held parallel to the body. Subarticular tubercles are well-developed. Toes are slightly webbed with more than three segments of the fourth toe free. A highly developed, large, shovel-shaped inner metatarsal tubercle is present. Outer metatarsal tubercle is small.

Skin is smooth on the dorsum but granular on the belly and underside of the thighs. Sometimes there are small glandular skin folds on the back.

Colour : Dorsum is yellowish-brown or grayish with dark spots or markings. The ventrum is pinkish white and the throat is brownish. Limbs are with irregular dark cross-bars. The underside of the thighs are dark brown with yellowish spots. A yellow median streak is often present.

Habitat : Terrestrial, nocturnal and subterranean, found near water-bodies only during the rainy season for short periods of time, often in association with the Balloon frogs (*Uperodon sp.*).

Remarks : Although the species is not very uncommon, they are seen only at the onset of the monsoon when they come out of their burrows and the males croak near temporary pools of water, usually after a heavy shower.

14. *Sphaerotheca rolandae* (Dubois, 1983)

1983. *Tomopterna rolandae* Dubois, *Alytes.*, **2**(4) : 163-170.

Common Name : Roland's Burrowing Frog (English).

Specimens Examined : 2 ex (both males) from Bedkot, 1 ex (female) from Mundguda and 1 ex (male) from Mendiabiri.

Size : 28-45 mm (Snout-vent length).

Diagnostic features : Small-sized, stout and sluggish burrowing frog. The snout is short and blunt and the

tympanum is distinct. The inner metatarsal tubercle is large and shovel-shaped helping it to dislodge the soil and burrow into the ground. There is a small spur-like extension on the heel. Males have a single external vocal sac.

Colour : Generally pale brown to grayish-yellow, the back is marked with broad and symmetric brownish-black patches. A thin white vertebral stripe is frequently present.

Habitat : Wet stream beds where it buries itself in the sandy bank. Calling males stay close to the water.

Remarks: Uncommon and secretive species, spending most of its time underground. Mostly seen during the nights, especially after the rains. Prefer ants and beetles as food.

Family RANIDAE

15. *Hylarana malabarica* (Tschudi, 1838)

1838. *Rana malabarica* Tschudi, *Classif. Batrachia.*, **3** : 80.

Common Name : Fungoid Frog (English).

Specimens Examined : 1 ex (male) from Mundguda and 1 ex (male) from Mendiabiri.

Size : 55-71 mm (Snout-vent length).

Diagnostic features : Medium-sized terrestrial frog. Snout is obtuse, projecting slightly beyond the mouth. Tympanum is large, equal to the diameter of the eye.

First finger is longer than the second. Tips of the fingers and toes are swollen but not enlarged into discs. Toes feebly webbed with two or three phalanges of the fourth toe free. Subarticular tubercles on fingers and toes are prominent. Inner and outer metatarsal tubercles are distinct. Tibio-tarsal articulation reaches the eye when the hind limb is held parallel to the body.

Dorsal skin smooth or granular with a distinct dorsolateral glandular skin fold from above the tympanum to the groin, along the flanks. A shorter skin fold terminating in a rectal gland below the tympanum or continued as a line of glands along the flanks. Ventrums granular on belly and the underside of the thighs.

Colour : Dorsum bright orange-red or yellowish-red from the tip of the snout to the vent, distinctly separated from the black of the flanks along the side of the snout, upper eyelid and dorso-lateral fold. Upper

lid white and this colour may extend along the line of the glands on the side. Ventrally uniform white or spotted or marbled with black. Throat and chest often brownish black or black. Legs brown or black barred or marbled with yellowish white.

Habitat : Found in Sal forests where it hides under leaf-litter but to some extent semi-arboreal.

Remarks : Species is uncommon. The crimson colour on the back resembles red bark fungus hence the name fungoid frog. Obliterative pattern of the rest of the body breaks the outline, merging the frog into the background. A powerful fungoid odour is also given out under excitement, which smells like burnt rubber.

Family RHACOPHORIDAE

16. *Polypedates maculatus* (Gray, 1834)

1834. *Hyla maculata* Gray, *Indian Zoology*, 1 : 82.

Common Name : Common Tree Frog, Common Indian Tree frog (English).

Specimens Examined : 3 ex (2 males and 1 female) from Jaccum, 2 ex (1 male and 1 female) from Karlapat, 1 ex (male) from Bedkot, 2 ex (both females) from Mundguda and 1 ex (male) from Mendiabiri.

Size: Snout-vent length: 35-65 mm (male), 50-85 mm (female).

Diagnostic features : A medium-sized narrow-waisted tree frog with slender elongated limbs and goggling eyes. Head broader than long, skin on head free with a bony arch. Snout obtusely pointed and projects a little beyond the mouth. Nostril nearer to the tip of the snout than the eye. Inter-orbital space broader than the upper eyelid. Tympanum distinct almost equal to the diameter of the eye. Supratympanic fold present.

Fingers with rudimentary web, the first finger is equal to the second. Subarticular tubercles distinct. Tips of fingers and toes dilated into flattened, spherical and horse-shoe shaped adhesive disks. Toes nearly fully webbed, with two segments of the fourth toe free. Inner metatarsal tubercle present. Tarso-metatarsal articulation reaches between the nostrils and eye when the hind leg is held parallel to the body.

Skin smooth above but granular on the belly and underside of thighs. Sacral vertebrae form a pair of distinct elevations on the back, when the frog is at rest.

Colour : Colouration is highly variable and sometimes depends on the colour of the habitat. Colour varies from brownish, yellowish, grayish or whitish on the dorsum, sometimes with darker spots or patches. Venter white, a dark brown marking extends from the nostril on both sides of the head, covering the eye, down the flanks right upto the middle of the belly. The limbs are cross-barred and the lower side of the thighs marbled with round yellow or brown spots or a purplish network.

Habitat : Moist deciduous forest in trees, bushes, shrubs and in the breeding season sometimes on the ground beside ponds, ditches etc.

Remarks : A very common tree-frog seen on trees and bushes about 1-6 meters above the ground level in all areas of the Sanctuary. Lays eggs in hanging foam-nests near water in which the tadpoles fall and develop.

17. *Philautus* sp

Common Name : Bush Frog (English).

Specimens Examined : 1 ex (male) from Mendiabiri (SVL : 24.7 mm), 1 ex (female) from Munguda (SVL : 28.4 mm) and 1 ex (female) from Jugsahi-patna (SVL : 29.6 mm).

Size : Snout-vent length : 24.7 (male), 28.4-29.6 mm (female).

Diagnostic features : A small-sized slender bush frog with a narrow waist. Head wider than long and obtusely pointed, projecting beyond mandible. Mouth extending upto eye. Vomerine teeth absent. Tongue large, elongate, smooth, bifid and free posteriorly. Nostril nearer to the tip of the snout. Inter-orbital distance about twice the width of the upper eyelid. Tympanum concealed. A very distinct supratympanic fold present.

Finger tips dilated into small, rounded and flattened disks. Largest digital disk is on finger III. Fingers unwebbed. Tips of toes dilated into flattened disks which are wider than on the fingers. Webbing on toe IV less, not upto subarticular tubercle on inner side.

Dorsum of body and upper eyelids with minute scattered conical tubercles. Throat and pectoral region smooth, below pectoral region to inguinal area slightly tubercular. Undersurface of thighs smooth. Cloacal opening postero-ventral, slightly below upper level of thighs.

Colour : Dorsum pale brownish with two dark brown lines from the posterior border of the eye to the mid-body. Upper eyelids and supratympanic fold deep brown. Hind limbs with dark brown and yellow cross bands. Venter dull white, belly with minute black dots.

Habitat : Found on bushes about 1-1.5 meters above the ground.

Remarks : A rare bush frog inhabiting the hilly regions of the Sanctuary beside hill-streams, where they are found on bushes. Call is typical of other *Philautus* sp consisting of several tik-tik-tik sounds emitted at regular intervals.

DISCUSSION

Karlapat Wildlife Sanctuary in Kalahandi district of south-western Orissa consists of low hills which are part of the Eastern Ghats. The topography is undulating, covered with dry deciduous and scrub jungles in between which are lush green vegetated valleys through which flow perennial streams. The soil is red lateritic. This protected area supports a wide diversity of wildlife, a rich variety of avifauna and numerous reptiles as well as amphibians.

The amphibians consist of toads (Family Bufonidae with 2 genera and 2 species), burrowing Frogs (Family Microhylidae with 4 genera and 5 species), semi-aquatic frogs (Family Dicroglossidae with 4 genera and 7 species), terrestrial Frogs (Family Ranidae with 1 genus and 1 species) and tree and bush Frogs (Family Rhacophoridae with 2 genera and 2 species). The semi-aquatic and burrowing frogs are the most numerous while the toads and tree frogs are common. The terrestrial and bush frogs are rare. We observed a total number of 172 examples of amphibians belonging to 17 species under 13 genera and 5 families.

AMPHIBIANS OF KONARAK-BALUKHAND WILDLIFE SANCTUARY

INTRODUCTION

Konarak-Balukhand Wildlife Sanctuary is situated in Puri district of Orissa. It is a coastal sanctuary, starting about 14 km from Puri, near the town of Beleswar & stretching for about 25 km along the coast upto Chandraprabha.

It consists of two Ranges: Konarak Wildlife Range and Balukhand Wildlife Range. The two Ranges are

separated by the Kushabhadra river, which almost separates the Sanctuary into two equal halves.

The Range Office of Konarak Wildlife Range is at Konarak. Other important places in this Range are Chandraprabha, Ramchandi, Bali-Kapileshwar, Tikuna etc. There is a watch-tower in this range near Chandraprabha.

The Range Office of Balukhand Wildlife Range is at Beleswar. Other important places in this Range are Balighai etc.

The total area of the Sanctuary is 71.72 sq km which was established in 1984. The vegetation consists mainly of Casuarina, Anacardium, Neem, Tamarind, Cashew and Karanja etc.

The major Wildlife reported from the Sanctuary are: Blackbuck, Spotted Deer, Wild Boar, monkey, squirrel, Jungle Cat, Jackal, Hyena, Black-naped Hare and mongoose besides a variety of birds and reptiles.

METHODOLOGY

One survey was conducted from 28th March to 5th April, 2008 by a three-member team from Zoological Survey of India. As there are no forest lodges inside the Sanctuary, the team had to stay at the nearest town (Konarak) and visit the sanctuary everyday. Due to restrictions by the Orissa Forest Department, collection of specimens was not allowed.

OBSERVATIONS

The following amphibians were nevertheless observed in the Sanctuary during this short survey:

Family BUFONIDAE

1. *Duttaphrynus melanostictus* (Schneider, 1799)
1799. *Bufo melanostictus* Schneider. *Hist. Amph.*, **1** : 216.

Common Name : Common Indian Toad (English).

Specimens Examined : 7 ex, one each from Konarak, Chandraprabha, Ramchandi, Bali-Kapileshwar, Tikuna, Beleswar and Balighai.

Size : 35-109 mm (Snout-vent length).

Diagnostic features : Large-sized toads. Head is broader than long with cornified bony ridges. Snout is rounded. Nostril is nearer to the tip of the snout than the eye. Tympanum is distinct, circular or oval, nearly two-third the diameter of the eye. Parotoid glands are large and bean-shaped.

Fingers are without webs, the first finger is equal to or little longer than the second. Tips of fingers and toes are swollen. Toes are partly webbed with more than three phalanges of the fourth toe free. Both inner and outer metatarsal tubercle present. The tibio-tarsal articulation reaches in between the tympanum and the eye when the hind leg is held parallel to the body.

Skin is rough with several black-tipped spiny warts on the dorsum. Ventrums also rough in texture.

Colour : Uniformly grayish or dark brownish with a few yellow or pink coloured spots on the dorsum. Ventrums dull white with a yellowish tinge. Juveniles are black or dark gray on the dorsum but the ventrum is uniform white or speckled with black.

Habitat : Found inside forest areas among leaf-litter, beside rain-water pools and ponds and also along the roadsides. Also hide under logs, stones, in moist holes and huddle together in crevices of tree-trunks.

Remarks : Very common throughout the Sanctuary. They are terrestrial and nocturnal. Usually solitary but congregate during the breeding season near water-bodies. Juveniles wander on land during mornings and afternoons, if the air-temperature is sufficiently low. Adults are seen throughout the year. They do not seem to hibernate.

Family MICROHYLIDAE

2. *Microhyla ornata* (Dumeril and Bibron, 1841)

1841. *Engystoma ornatum* Dumeril & Bibron, *Erp. Gen.*, **8** : 745.

Common Name : Ornate narrow-mouthed frog, Ornate Microhylid frog (English).

Specimens Examined : 4 ex, one each from Ramchandi, Tikuna, Beleswar and Balighai.

Size : 18-26 mm (Snout-vent length).

Diagnostic features : Small-sized, stout, active and agile frogs with small arrow-shaped head and bulging eyes. Head broader than long, snout somewhat pointed and projects beyond the narrow mouth. Tongue elliptical. Nostril is nearer to the tip of the snout than the eye. Pupil circular. Tympanum indistinct.

Fingers rather slender and do not bear webs. The first finger is shorter than the second. Tips of fingers are dilated into small discs. Toes are minutely webbed at the base and the tips are dilated into small discs.,

devoid of grooves. Metatarsal tubercles are distinct, the inner being more well-developed. Hind limbs are moderately long and the tibio-tarsal articulation reaches the eye, when the hind limb is held parallel to the body.

Skin is smooth with a distinct supratympanic fold.

Colour : The body colour matches that of the soil. The dorsum is grayish-brown or reddish-brown with a distinct dark brown diamond-shaped marking on the back, beginning between the eyes, extending to both the upper eyelids, narrowing behind the head and widening above the shoulder, then narrowing again and finally broadening out and sending a stripe to the groin and the thigh. A dark streak extends along the sides from behind the eye to the shoulder. Limbs with dark brown cross bars. Ventrums dull whitish, with throat and chest stippled with brown.

Habitat : Found among leaf-litter all over the Sanctuary.

Remarks : Very common. Can call very loudly and jump very much when compared to its small size.

3. *Kaloula taprobanica* Parker, 1934

1934. *Kaloula pulchra taprobanica* Parker, *Trust. Brit. Mus. London* : 86-87.

Common Name : Painted Frog, Indian Painted Frog, Painted Kaloula (English).

Specimens Examined : 2 ex from Beleswar and Balighai.

Size : 25-58 mm (Snout-vent length).

Diagnostic features : Medium-sized, toad-like, colourful burrowing frog. Head is broader than long. Snout is rounded. Nostril is nearer to the tip of the snout than the eye. Tympanum is hidden. Tongue is elliptical.

Fingers are without webs. The first finger is shorter than the second. Tips of the fingers bear short well-developed truncate discs. Subarticular tubercles of the fingers and toes are prominent. Toes are about one-third webbed and bear dilated triangular discs. Inner metatarsal tubercle is well-developed, large and shovel-shaped. Outer metatarsal tubercle is small.

Dorsum is rough with scattered warts. Skin is wrinkled on the belly but granular on the throat and underside of the thighs.

Colour : Dorsum is blackish-brown or grayish-brown with brown or deep red spots and patches margined with black. A dark reddish lateral band runs on each side from the eyes to the groin of the hind feet. The belly is light brownish or white, spotted with grey. Males have black throat during breeding season.

Habitat : Open scrub forests of the Sanctuary. Breeds in dirty pools.

Remarks : Not uncommon, the species is very colourful. They are terrestrial, burrowing and nocturnal, emerging from their burrows during the monsoon, sometimes even during the day and are often seen to climb up trees, where they are found in holes in tree-trunks.

4. *Uperodon systoma* (Schneider, 1799)

1799. *Rana systoma* Schneider, *Hist. Amph.*, : 144.

Common Name : Marbled Balloon Frog, Lesser Balloon Frog (English).

Specimens Examined : 3 ex, one each from Chandraprabha, Ramchandi and Balighai.

Size : 55-65 mm (Snout-vent length).

Diagnostic features : Toad-like medium-sized burrowing frog with plump body and soft soggy skin. The eyes are relatively bigger than the Greater Balloon frog but the distance between the eyes is less than twice the width of the upper eyelid. Head is wedge-shaped and broader than long. Snout is rounded and equal to the diameter of the eye. Nostril is equidistant between the tip of the snout than the eye. Tympanum is hidden.

Fingers are free of webbing. First finger is shorter than the second. Tips of the fingers do not bear discs. Toes are rather short and webbed at the base. Inner metatarsal tubercle is twice as large as the outer metatarsal tubercle but smaller than that of the Greater Balloon frog. Hind limbs are short and the tibio-tarsal articulation reaches the shoulder.

Skin smooth but soggy, granular at the anal region and on the underside of the thighs.

Colour : Olive, greenish-yellow or pinkish on the dorsum, marbled or spotted with dark brown resembling a leopard's coat to some extent. Ventrums whitish but throat and belly creamy yellow, mottled with brown.

Throat is blackish in breeding males. In older males, the black vocal sac hangs down the chin in the form of a flap. No median line.

Habitat : Scrub forests, often found under stones and logs.

Remarks : Not uncommon but emerges only during the breeding season. Calls like the bleating of a goat.

Family DICROGLOSSIDAE

5. *Euphlyctis cyanophlyctis* (Schneider, 1799)

1799. *Rana cyanophlyctis* Schneider, *Hist. Amph.*, 1 : 137.

Common Name : Skittering Frog, Skipping Frog, Skipper Frog, Water frog (English).

Specimens Examined : 6 ex, one each from Konarak, Ramchandi, Bali-Kapileswar, Tikuna, Beleswar and Balighai.

Size : 30-69 mm (Snout-vent length).

Diagnostic features : Medium-sized pond frogs. Head is broader than long. Snout is rounded. Nostril is equidistant between tip of snout and eye. Tympanum is distinct, nearly equal to diameter of eye.

Fingers are without webs, the first finger is equal to the second. Tips of the fingers are pointed. Subarticular tubercles are less prominent. Toes are fully webbed. Tips of the toes are swollen and rounded. A pointed toe-like inner metatarsal tubercle is present. Outer metatarsal tubercle is absent. Tibio-tarsal articulation reaches between the tympanum and nostril, when the hind leg is held parallel to the body.

Small warts are present on the dorsum. Ventrums are smooth with a single row of porous warts on each flank.

Colour : Dorsum grey, grayish-brown or grayish-black with darker rounded spots and stripes on the limbs. Ventrums white with black spots. There is a dark-edged white band on the hinder under part of the thighs.

Habitat : Commonest frog found in all types of water-bodies inside the Sanctuary. They are active throughout the year. They spend most of their time in the water or in the vicinity of water-bodies but may migrate onto land in the summer months when the temporary pools of water dry up.

Remarks : They float passively in water with only the nostrils projecting above the surface but when

disturbed, can skip smoothly over the water for some distance and then float above the surface with the hind legs held parallel.

6. *Euphlyctis hexadactylus* (Lesson, 1834)

1834. *Rana hexadactyla* Lesson, *Balang. Voy. Indian* : 331.

Common Name : Green Pond Frog (English).

Specimens Examined : 1 ex (male) from Tikuna.

Size : 84 mm.

Diagnostic Features : A large-sized dark-green aquatic frog. Head is almost as long as broad. Snout is flat and rounded or very slightly pointed, hardly projecting beyond the mouth. Nostril is nearer to the tip of the snout than the eye. Tympanum is distinct, nearly equal to the diameter of the eye.

Fingers are without webs, the first finger is equal to or longer than the second. Subarticular tubercles are feebly prominent. Tips of the fingers and toes are pointed. Toes are fully webbed. There is a strong dermal fringe on the outer toes. An elongated and digit-like, pointed inner metatarsal tubercle present. Outer metatarsal tubercle absent. Skin is smooth above, longitudinal glandular folds absent on dorsum. A supratympanic fold is present.

Granules and warts are present on the back, throat, belly and under the thighs. Two rows of large porous warts along the flanks.

Colour : Dark-green or bright grass-green on the dorsum, with a yellow median streak. Ventrums and flanks are white or yellowish white. Throat yellow.

Habitat : Found floating in an old village-pond with dense green floating vegetation.

Remarks : Very uncommon. The colour of the body merges with the vegetation so that they can easily camouflage and protect themselves from aerial and aquatic predators.

7. *Fejervarya orissaensis* (Dutta, 1997)

1997. *Limnonectes orissaensis* Dutta, *Hamadryad.*, **22**(1) : 1-8.

Common Name : Orissa Cricket Frog (English).

Specimens Examined : 5 ex, one each from Konarak, Ramchandi, Tikuna, Beleswar and Balighai.

Size : Snout-vent length : males (36.2-47.2 mm), females (34.2-53.8 mm).

Diagnostic features : Medium-sized Ranid frog with interrupted longitudinal folds on dorsum, smooth ventrum, wider & longer inner metatarsal tubercle and relatively pointed snout. Shorter hind limbs, more rounded finger and toe tips and a greater degree of webbing on the toes.

Head longer than wide, depressed. Snout pointed, extending beyond the mouth, internarial distance broader than the interorbital width. Narial openings dorsolateral. Tympanum distinct, rounded, diameter less than eye diameter with supratympanic fold extending from posterior corner of eye to forelimbs. Vomerine teeth distinct.

Finger and toe tips rounded, slightly swollen. First finger longer than second, third equal to or slightly longer than first. Subarticular tubercles rounded. Fingers not webbed. Hind limbs moderately long, with two metatarsal tubercles. Inner metatarsal tubercle oval and larger than outer metatarsal tubercle. Longitudinal ridge extending from anterior border of outer metatarsal tubercle to tip of fifth toe. Subarticular tubercles rounded, similar to those on fingers. Webbing of fourth extends less than half way between distal and penultimate subarticular tubercles, that on fifth toe extends beyond distal subarticular tubercle.

Skin on dorsum of head smooth but body covered with interrupted, longitudinal ridges with small rounded ridges towards posterior border of body. Skin on flanks and chin smooth. Skin on belly and proximal ventral surfaces of thigh smooth.

Colour : Dorsum brown, grey or brick red. A V-shaped marking between eyes which is interrupted by a vertebral band, with or without yellowish narrow or wide vertebral band extending from tip of snout to vent. A X-shaped black patch on middle of body, limbs with complete or incomplete dark cross bars. Sides of thigh yellowish white with black speckles, jaw margins with black vertical bars.

Habitat : Found during monsoon on grassy lands near water pools.

Remarks : The species is very common. When disturbed jumped into water but immediately returned to the edges. Active at night and hides in grass, below rocks or in small holes near water during the day.

8. *Fejervarya syhadrensis* (Annandale, 1919)

1919. *Rana syhadrensis* Annandale, *Rec. Ind. Mus.*, **6**: 121-125.

Common Name : Syhadra Cricket Frog (English).

Specimens Examined : 6 ex, one each from Konarak, Chandraprabha, Ramchandi, Tikuna, Beleswar and Balighai.

Size : 27-32 mm (males) and 29-40 mm (females).

Diagnostic features : The body is spindle-shaped. The head is pointed with the snout very distinctly jutting over the lower jaw. Inter-orbital distance is equal to the inter-narial space. The nostrils are lateral and distinctly closer to the tip of the snout than the eyes. Tympanum is round and hidden, half that of the eye diameter. Pineal organ is distinctive as a white dot between the eyes.

Finger tips are rounded. The first finger is equal to the second, while the fourth finger is slightly longer than the second. Subarticular tubercles are globular with an oblong oval inner metacarpal tubercle and two additional rounded palmer tubercles.

Toes are webbed with rounded tips. Subarticular tubercles are distinctly smaller than those of the fingers and are rather oval with an oblong inner metatarsal tubercle that is laterally flattened and a very small point-like outer metatarsal tubercle in line with the tarsal fold. A narrow ridge is formed by a series of very small tubercles between the outer metatarsal tubercle and the proximal subarticular tubercle of the fifth toe. The tibio-tarsal articulation reaches between the eye and tip of the snout.

Dorsum is smooth with a few round or slightly oblong tubercles. Glandular folds are shorter with tiny light tubercles in the cloacal and loreal regions, the dorsal part of the lower leg and on the sides of the heel (tarsus). Venter is uniformly smooth.

Colour : Dorsum is grayish to brownish-olive with black irregular spots particularly fused into transverse bands. There are also dark, ring-shaped spots with a paler center and the sides of the body are faintly marbled. A very narrow yellowish-white mid-dorsal line, often interrupted. An inter-orbital band is present.

Fore-limbs are darkly banded and the hind-limbs are dotted on the thighs and striped on the lower leg.

Venter of the hand and foot are dark with contrasting pale metacarpal or metatarsal tubercles. Toe webbing is faintly marbled.

Venter is uniformly white with narrow dark bars along the margin of the lower jaw. Males have a blackish-grey and crescent-shaped mark on the throat.

Habitat : Prefers vicinity of water without being really aquatic. They can be encountered far away from water-bodies between trees, in open grassland, pools and ditches.

Remarks : Very common. Partly diurnal but only calls nocturnally. During the dry winter months hides in leaf-litter of woods or between buttresses of trees. Males call in the evening and night and are easy to locate.

9. *Hoplobatrachus tigerinus* (Daudin, 1803)

1803. *Rana tigrina* Daudin, *Hist. Nat.*, **1** : 42.

Common Name : Bull Frog, Indian Bull Frog (English).

Specimens Examined : 3 ex, one each from Ramchandi, Tikuna and Balighai.

Size : 40-154 mm (Snout-vent length).

Diagnostic features : Large-sized frogs with smooth skin and longitudinal glandular folds on the back. Head is longer than broad. The snout is somewhat pointed and projects beyond the mouth. The nostril is equidistant between the tip of the snout and the eye. Tympanum is distinct, nearly equal to the diameter of the eye.

Fingers are without webs, the first finger is longer than the second. Tips of fingers and toes are not sharply pointed. Toes are fully webbed but the web does not reach the tip of the fourth toe. The fifth toe is with an outer fringe of web. Subarticular tubercles of the fingers and toes are not very prominent. Inner metatarsal tubercle is short and blunt. Outer metatarsal tubercle is absent. Hind limbs are comparatively long, with the tibio-tarsal articulation reaching the nostril, when the hind limb is held parallel to the body.

Dorsum smooth with longitudinal glandular folds. Ventrums smooth with no porous warts on the flanks. Supratympanic fold present.

Colour : Dorsum yellowish or olive-green with darker leopard-like spots. A yellowish median stripe runs

from the tip of the snout to the vent. Ventrums are whitish. Limbs are black-barred or spotted.

Habitat : Found among grasses, bushes and on the leaf-litter. Hide inside hollows at the edge of ponds and ditches. Aestivate inside burrows or under heaps of leaves. Seen frequently on the edges of ponds during breeding season into which they leap headlong at the least sign of danger.

Remarks : Very common species. Solitary creatures, which aggregate only during the breeding season. In the non-breeding season, they are difficult to locate but with the appearance of the rainy season their highly resonant call can be heard throughout the night.

10. *Sphaerotheca breviceps* (Schneider, 1799)
1799. *Rana breviceps* Schneider, *Hist. Amph.*, **1** : 140.

Common Name : Indian Burrowing Frog (English).

Specimens Examined : 2 ex from Ramchandi and Balighai.

Size : 28-52 mm (Snout-vent length).

Diagnostic features : Stout medium-sized toad-like burrowing frogs. Head is broader than long. Snout is short and rounded, not projecting beyond the mouth. Nostril is equidistant between the tip of the snout and the eye. Tympanum is distinct, more or less half the diameter of the eye.

Fingers are without web. The first finger is longer than the second but equal to the third. Tips of the fingers are swollen but not disc-like. Hind limbs are very short. The tibio-tarsal articulation only reaches up to the shoulder when the hind-limb is held parallel to the body. Subarticular tubercles are well-developed. Toes are slightly webbed with more than three segments of the fourth toe free. A highly developed, large, shovel-shaped inner metatarsal tubercle is present. Outer metatarsal tubercle is small.

Skin is smooth on the dorsum but granular on the belly and underside of the thighs. Sometimes there are small glandular skin folds on the back.

Colour : Dorsum is yellowish-brown or grayish with dark spots or markings. The ventrum is pinkish white and the throat is brownish. Limbs are with irregular dark cross-bars. The underside of the thighs are dark brown with yellowish spots. A yellow median streak is often present.

Habitat : Terrestrial, nocturnal and subterranean, found near water-bodies only during the rainy season for short periods of time.

Remarks : Very uncommon, they are seen only at the onset of the monsoon when they come out of their burrows and the males croak near temporary pools of water, usually after a heavy shower.

Family RHACOPHORIDAE

11. *Polypedates maculatus* (Gray, 1834)

1834. *Hyla maculata* Gray, *Indian Zoology*, **1** : 82.

Common Name : Common Tree Frog, Common Indian Tree frog (English).

Specimens Examined : 6 ex, one each from Konarak, Chandraprabha, Ramchandi, Tikuna, Beleswar and Balighai.

Size : Snout-vent length: 35-65 mm (male), 50-85 mm (female).

Diagnostic features : A medium-sized narrow-waisted tree frog with slender elongated limbs and goggling eyes. Head broader than long, skin on head free with a bony arch. Snout obtusely pointed and projects a little beyond the mouth. Nostril nearer to the tip of the snout than the eye. Inter-orbital space broader than the upper eyelid. Tympanum distinct almost equal to the diameter of the eye. Supratympanic fold present.

Fingers with rudimentary web, the first finger is equal to the second. Subarticular tubercles distinct. Tips of fingers and toes dilated into flattened, spherical and horse-shoe shaped adhesive disks. Toes nearly fully webbed, with two segments of the fourth toe free. Inner metatarsal tubercle present. Tarso-metatarsal articulation reaches between the nostrils and eye when the hind leg is held parallel to the body.

Skin smooth above but granular on the belly and underside of thighs. Sacral vertebrae form a pair of distinct elevations on the back, when the frog is at rest.

Colour : Colouration is highly variable and sometimes depends on the colour of the habitat. Colour varies from brownish, yellowish, grayish or whitish on the dorsum, sometimes with darker spots or patches. Venter white, a dark brown marking extends from the nostril on both sides of the head, covering the eye, down the flanks right up to the middle of the belly. The

limbs are cross-barred and the lower side of the thighs marbled with round yellow or brown spots or a purplish network.

Habitat : In trees, bushes, shrubs and in the breeding season sometimes on the ground beside ponds, ditches etc.

Remarks : A very common tree-frog seen on trees and bushes about 1-6 meters above the ground level in all areas of the Sanctuary. Lays eggs in hanging foam-nests near water in which the tadpoles fall and develop.

DISCUSSION

Konarak-Balukhand Wildlife Sanctuary is a coastal strip in Puri district of Orissa with vegetation like Casuarina, Anacardium, Cashew and Karanja. The soil is dry and sandy which supports few wildlife, some avifauna and reptiles. Amphibian species are sparse and are mainly those that breed in small temporary rain-water pools that form with the monsoon rains.

Amphibians consist of toads (Family Bufonidae with 1 genus and 1 species), burrowing Frogs (Family Microhylidae with 3 genera and 3 species), semi-

aquatic frogs (Family Dicroglossidae with 4 genera and 6 species) and 1 genus and 1 species of tree frog (Family Rhacophoridae). The burrowing and semi-aquatic frogs are the most diverse. A total of 45 examples of amphibians belonging to 11 species under 9 genera and 4 families were observed or located in Konarak-Balukhand Wildlife Sanctuary.

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1. Board proclaiming Sanctuary



2. A motorable road thru Balukhand WLS



3. Wild cashew trees in Balukhand WLS



4. Cashew undergrowth habitat for Sitana lizards



5. Keya trees in Balukhand WLS



6. Road to watch-tower



7. Watch tower



8. A pool in Balukhand WLS



9. Searching for frogs in Balukhand WLS



10. Narrow-mouthed Frog (*Microhyla ornata*)



11. Burrowing Frog (*Sphaerotheca breviceps*)



12. Pond at Ramchandi (habitat of many frogs)



13. Green Pond Frog (*Euphlyctis hexadactylus*)



1. Low hills of Karlapat WLS



2. Scrub forests of Karlapat WLS



3. Hill-stream of Karlapat WLS



4. Forested stream inside Karlapat WLS



5. Skittering Frog (*Euphlyctis cyanophlyctis*)



6. Tree-frog (*Polypedates maculatus*)



7. Bull Frog, (*Hoplobatrachus tigerinus*)



8. Bush frog (*Philautus* sp)



9. Jerdon's Bull Frog (*Hoplobatrachus crassus*)



10. Painted Frog (*Kaloula taprobanica*)



11. Variegated Frog (*Ramanella variegata*)



12. Burrowing Frog (*Sphaerotheca rolandae*)



13. Balloon Frog (*Uperodon globulosus*)



14. Marbled Balloon Frog (*Uperodon systoma*)