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A New Subspecies of Common Skittering Frog *Euphlyctis cyanophlyctis* (Schneider, 1799) From Balochistan, Pakistan

MUHAMMAD SHARIF KHAN
Herp Laboratory 15/6 Darul Sadar North Rabwah 35460, Pakistan

Abstract.- A new subspecies of wide ranging frog *Euphlyctis cyanophlyctis* is described from northwestern highland of Pakistan and compared with its congeners.

Key words: *Euphlyctis*, Ranidae, Anura, Balochistan.

INTRODUCTION

Southeast Asian frog *Euphlyctis cyanophlyctis* extends right from Thailand in the southeast Asia to Arabian peninsula in the Middle East. It is the only wide ranging thoroughly aquatic, littoral and most frequent frog found resident in almost every water body throughout its range. It is widely distributed in plains and northern and western submountain regions of India and Pakistan (Daniel, 1975; Khan and Tasnim, 1987; Khan and Mufti, 1995). Its unique habit of skittering on water surface fascinates equally an amphibiologist as well a casual observer, and was first recorded by Mogul Emperor Babar (1483-1530) in his autobiography (Beveridge, 1987).

In August 1982, I collected several specimens of *Euphlyctis cyanophlyctis* from Quetta, Mastung and Khuzdar (Khan and Ahmed, 1987). Later several specimens of this species were collected from around Kalabag, District Mianwali, northwestern Punjab, Pakistan (Khan, 1986). Recently, a collection from Dera Ismael Khan southeastern NWFP was studied in laboratory, and found to differ from the description of *E. cyanophlyctis*. When compared with *E. c. ehrenbergii* it was found to have unique morphology hitherto unknown to science. Present paper describes the morphology of the new form.

TAXONOMIC CONSIDERATIONS

Boulenger (1920) distinguished seven species groups in frogs of genus *Rana* from south Asia, Papua, Melanesia and Australia. He placed *Rana hexadactyla* lesson, 1834 and *R. cyanophlyctis* Schneider 1799 in species group *Ranae hexadactylae* on the basis of the presence of a prominent, digitiform metatarsal tubercle, extensively webbed toes, relatively smaller fourth toe, deeply clefted tongue and persistence of larval lateral line system in adult. Deckert (1938), during his work on the osteology of ranids, found that *R. hexadactyla* and *R. cyanophlyctis* differ from other ranids in scapular and sternal morphology, so he placed these species in genus *Dicroglossus* Günther 1860. Dubois (1974) followed Deckert's view, however, a year later (1975) he preferred to place these frogs in genus *Euphlyctis* Fitzinger, 1843.

Peters (1863) described the Arabian population of *E. cyanophlyctis* as a new taxon *E. ehrenbergii* on the basis of its larger body size and light to dark green patternless dorsum. Balletto *et al.* (1985) have further shown that *E. ehrenbergii* has smaller tympanum which is more removed from eye as compared to its south Asian congener *E. cyanophlyctis*, and has two varieties: one with strongly verrucose dorsum covered with large obtuse warts and conspicuous porous granular glands, in life dorsum is dark olive brown or olive-green with yellow, belly is blotched with brown. The second variety has smooth uniform dark brown dorsum with white ventrum.

Several morphological variations have been reported in this frog throughout its range. Nikolsky (1899) distinguished Seistan population as a distinct race *E. c. seistanica*, on the basis of longer snout and smaller tympanum (Eiselt and Schmidtler, 1973). De Silva (1958) reported three colour varieties in Sri Lankan population of this frog: *typicus* with dorsum brown or olive with dark spotting or marbled, a pair of blackish streaks on the hinder side of thighs, ventrum speckled with black; *fulvus* with yellowish body having indistinct dark blotches; *flavens* with green dorsum. Dubois (1976) reported a pair of

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mutant frogs with black eyes from Nepal.

Variations in the number of tooth rows and extra keratinized surfaces in oral disc of tadpoles (Khan, 1991; Khan and Mufti, 1995) and differences in adult morphology of *E. cyanophlyctis*, from different localities throughout its range validate its partition into races. A parallel case can be cited of partition of wide ranging saw-scale viper *Echis carinatus* into several races (Khan, 1993).

Abbreviations used

BMNH, British Museum Natural History, London; CAS, California Academy of Sciences, California, USA; MSK, Herp Laboratory, 15/6 Darul Sadar North, Rabwah 35460, Pakistan (authors personal collection).

DESCRIPTION

Euphlyctis cyanophlyctis microspinulata, new subspecies
(Fig. 1)

Rana cyanophlyctis Boulenger, 1920. *Rec. Indian Mus.*, **20**: 14; Khan, 1986; Khan and Ahmed, 1987.

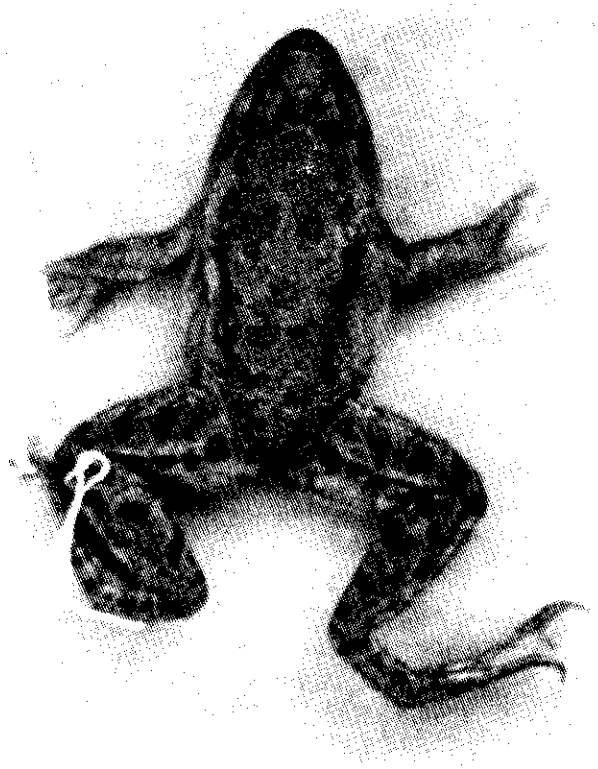

Fig. 1. *Euphlyctis cyanophlyctis microspinulata* subsp. nov., Holotype BMNH 1990.8 (MSK 0603.82), dorsal side.

Type locality

Khuzdar (southeast Kalat Division, Balochistan, Pakistan; lat. 27° 53'N, long. 66° 36'E).

Holotype

BMNH 1990.8 (MSK 0603.82) (Fig. 1) adult female, from side pool of a stream on the southwest of Khuzdar (southeast Kalat Division, Balochistan, Pakistan; lat. 27 53'N, long. 66 36'E), coll. M.S. Khan, 20 August, 1984.

Paratypes (22)

BMNH 1990.9 (MSK 0609.81, MSK 0610.81, MSK 0613.81, MSK 0614.81), CAS 170531 (MSK 0615.81), MSK 0616.81, MSK 0617.81 All male and MSK 0612.81 female, same data as for holotype, except collected on 19 August, 1981. MSK 0607. 84, MSK 0608.84 males, MSK 0601.84, MSK 0602.84, MSK 0604.84, MSK 0605.84, MSK 0606.84, MSK 0629.84 and MSK 0630.84; females, same data as holotype, except collected on 3 March 1984; MSK 0277.82 an adult female, from Lohra Nadi, on West of Bolan Medical College, Quetta, Balochistan, Pakistan, M.S. Khan, 18 August 1982; MSK 145.86, an adult female, from side pool of Jhelum River, near Jhelum City, Punjab, Pakistan, M.S. Khan, 24 May 1986; MSK 263.95, an adult female from Lotus lake, Shakarparian, Islamabad, Pakistan, Mr. Lumir Govozdik, Palacky University, Olomouc, Czech Republic, 16 August, 1995.

Diagnosis

Medium sized *Euphlyctis*, head longer than broad, upper jaw protruding; canthus indistinct, loreal oblique, snout longer than upper eyelid; naris dorsal, crescentric transversely enlarged, nearer to snout than eye, rim raised from snout surface and posteriorly produced into a distinct brown tipped post-narial papilla; dorsum smooth with scattered longitudinally enlarged tubercles interspersed with minute spinules, tubercles more concentrated on coccyx and lower half of tibia, where spinules are borne on small tubercles. Fingers and toes covered with minute spinules (Fig. 2) and tipped with small discs. Inner metatarsal tubercle curved inward, its length equals its breadth at base, not digitiform, with thickened outer border.

Description of holotype

MSK 0603.84, an adult female, snout-vent length 57 mm; head longer (21.8 mm) than broad

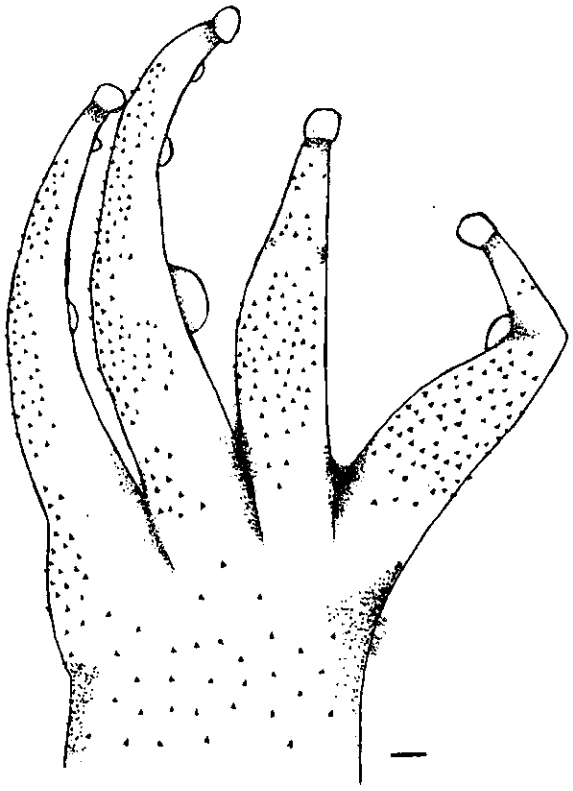

Fig. 2. *Euphlyctis cyanophlyctis microspinulata* subsp. nov., spinules of fingers (scale = 1 mm).

(21.1 mm); in lateral profile, snout round projecting beyond mouth, longer (8.3 mm) than horizontal diameter of eye (7.7 mm). Upper jaw with minute papillae along its margin. Canthus indistinct, loreals gradually sloping on sides. Naris dorsal, antero-dorsally directed, raised from the snout surface, rim brownish crescentric, with a distinct brownish post-narial papilla, close to tip of snout (3.7 mm) than eye (4.1 mm), distance between naris (2.6 mm) smaller than breadth of upper eyelid (4.4 mm). Tympanum distinct, round, vertical diameter (5.1 mm) horizontal eye diameter (7.7 mm). Rather indistinct supratympanic fold from behind mideye to anterior of insertion of forelimb, narrowly separated from tympanum.

Vomers oval, oblique lying between inner ends of choanae, anteriorly separated by distance equaling the breadth of one choanae, posteriorly by a distance equalling 1/4th of the length of vomer, a pair of posteriorly directly long vomerine teeth. Lower jaw with a prominent median tooth like projection, fitting in a corresponding depression in front of upper jaw. Maxillary teeth in single row. Tongue narrow, not bulging laterally, distally produced into lateral acutely pointed longer lobes and a median broad smaller lobe, forming U-shaped notch with lateral lobes.

Supratympanic fold feeble, from behind mideye to anterior of insertion of forelimb, almost abutting with tympanum.

Forelimbs moderately strong, medium sized. Fingers long slender, straight, tipped with small discs, first slightly longer than second, 3, 4, 1, 2 in order of decrease in size; a prominent subdigital tubercle between first and second phalanx, fourth finger with an additional tubercle between first and second phalanx, fourth finger with an additional tubercle between second and third phalanx. Slight web along sides of the fingers connected through slight web at palm. Metacarples connected through thin tuberculated. No metacarple tubercle.

Hindlimb moderately long (80 mm), tibio-tarsal articulation reaches to a point between eye and naris and metatarsal base to the tip of snout; when thighs are bent at right angle to the body, distance between heels equals length of tarsus; tibia longer (28.6 mm) than thigh (27 mm), its broadest part less than thrice the tibial length. Toes long, slender, fourth longest (29.6 mm), toe tips slightly swollen. Toes entirely webbed, web extending to the middle of the sides of toe tip. First and fifth metatarsals joined through thin web, distinct fringe of web along their outer borders, including the inner metatarsal tubercle. Inner metatarsal tubercle as long (2.8 mm) as its breadth at base, with round broad thick free edge. The cutaneous fringe along 5th toe extends to tarsometatarsal joint were it is thicker and curves outwards giving impression of a small outer metatarsal tubercle. Subdigital tubercles under toes small, except 4th toe which has three, all other have single. Tarsal is triangular with an indistinct tarsal ridge.

Dorsum more or less smooth, few scattered individual minute tubercles tipped with sharp spinules, mostly concentrated in the coccygeal area, where arranged in longitudinal rows, scattered tubercles on belly latrum. Spinulated tubercles on upper and forelimbs, thigh, tibia and tibiotarsus. Fingers and toes dorsally heavily spinulated (Fig. 2).

Colour (in formalin preserved material)

Dorsum light grayish brown, with double row of broken light brown oblique blotches breaking on sides of body into heterogeneous irregular pieces.

Fewer larger blotches on thigh and shank breaking on sides in smaller irregular pieces. Ventrum whitish with slight indication of faded dark reticulum along sides of thighs.

Tadpole

Large, total length 50-58mm (Stage 35-40, compared to Khan's, 1965, table of normal development), body length 21-24. Oral disc essentially as that of *E. cyanophlyctis cyanophlyctis* (Fig. 3, 1, Khan and Mufti, 1994), except that labial palps are more lateral and broadly interrupted along the post oral labium, no lateral group of smaller papillae enclosed by posterior lateral labial palp. A lateral brownish cornified ridge between post-oral beak and the inner tooth row of posterior labium, on each side (Fig. 3).

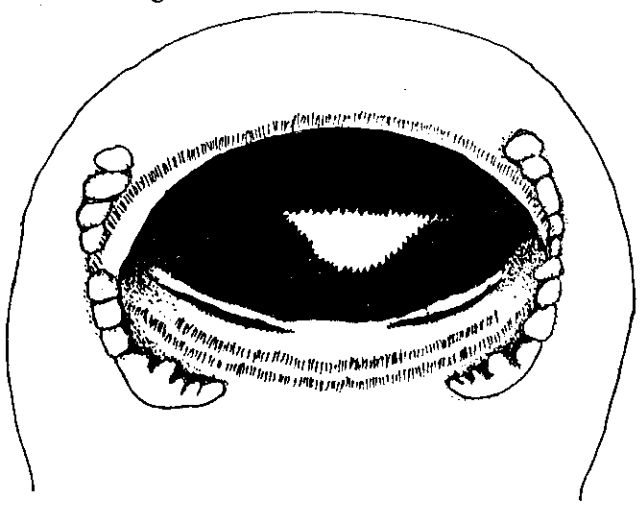

Fig. 3. *Euphlyctis cyanophlyctis microspinulata* subsp. nov., oral disc of tadpole.

Variation

No appreciable variation is noted in the type series of the new subspecies *E. c. microspinulata,* except normal variation in size of tympanum, eye and limbs depending on snout-vent length variations. However, females collected from Lohra Nadi, Quetta are larger, heavier and have leather-brown smoother dorsum as compared to males which are grayish and more tuberculated with scattered spinules.

Sexual dimorphism

Females are larger (SVL 52-63) than males (41-45, have broader and longer head, larger eyes and tympanum more tuberculated dorsum; tubercles are larger and elongated, belly with distinct transverse striations. A distinct slit for vocal sac at the middle of lower jaw on each side, differentiates males from females, moreover males have broader and stronger forearm, generally first finger is angularly bent at penultimate joint, have less wortier dorsum with round tubercles belly surface is smoother.

Table I.- Range of normal meristic variations in type series of new subspecies *Euphlyctis cyanophlyctis microspinulata.*

Character	Khuzdar and Quetta		Dhok Partal	
	Male	Female	Male	Female
Snout-vent length	41-43	52-63	41-45	50-57
Tibial length	22-23	25-30	21-24	26-30
Diameter				
horizontal eye	5-6	5-7	5-6	6-7
vertical tympanum	3-4.5	4-5	3-5	3-5
Head				
length	14-17	18-23	15-17	17-23
breadth	15-18	15-22	15-18	16-26
Space				
internarial	1-2	2-3	1.7	2-3
interorbital	1-2	2-3	2-3	2-3
Upper eyelid				
length	5-6	6-7	5	6-7
breadth	2-3.5	4	3-4	3-4
Snout length	6-7.5	7-8.5	6-7.8	7-8.3
Snout to naris	2-4	3-6	3-4	3.4-6
Naris to eye	3	3-5	2.5-5	3-5
Length of				
arm	22-23	27-33	23-24	27-33
hand	10-12	12-14.5	10-12	12-14
leg	61-71	69-90.5	62-71	69-90
foot	21-26	23-30	21-26	23-30
tarsal	30-33	27-39	31-34	27-38
inner metatarsal tubercle	2-3	3-4	2-3	3-4

Comparison with congeners

Presence of spinules on body and especially on fingers of breeding males are characteristic of subgenus *Paa* of genus *Rana* (Dubois, 1975, 1976; Dubois and Khan, 1979; Khan and Tasnim, 1989). Neither *Euphlyctis c. cyanophlyctis* nor *E. c. ehrenbergii* is known to have nuptial pads or spinules on fingers and body (Peters 1869;

Table II.- Morphological comparison.

Character	*E. c. microspinulata* subsp. nov.,		*E. c. ehrenbergii* (Boulenger, 1920)		*E. c. cyanophlyctis*	
	Male	Female	Male	Female	Male	Female
Snout-vent length	41-45	50-63	60-66	75-92	40-47	45-62
Tibial length	21-24	25-30	29-30	39-41	21-24	24-31
Diameter						
horizontal eye	5-6	5-7	6-7	8-9	5-6	5-5.6
vertical tympanum	3-5	3-5	4-6	6	4-5.5	4-5.8
Head						
length	15-17	17-23	21-21.5	23-24	14-15	15-21
breadth	15-18	16-23	22-23	26-27	15-16	17-23
Space						
internarial	1.7-2	2-3	2-2.4	2-3	1-1.5	2-2.6
interorbital	1-3	2-3	2-3	3-3.8	2-3	2-3
Upper eyelid						
length	5-6	6-7	6-6.5	6-6.5	5-6	5-6
breadth	2-4	3-4	4-4.2	4-4.2	3-4	3.5-4
Snout length						
Snout to naris	2-4	3-6	3-4.4	3.1	3-4	3-6
Naris to eye	3	3-5	4	5-6	3.5-4	5-6
Length of						
arm	23-24	27-33	29-33	36-39	22-24	26-34
hand	10-12	12-14	14-16	18-18	10-12	13-14
leg	62-71	69-90	81-82	91-103	61-72	69-91
foot	21-26	23-30	27-30	34-35	21-25	23-31
tarsal	31-34	27-38	14-15	18.7	31-34	26-38
inner metatarsal tubercle	2-3	3-4	2-3.5	3-4	2-3	3-4

Boulenger, 1920; Eiselt and Schmidtler, 1973; Minton, 1966; Mertens, 1969; Daniel, 1975; Balletto *et al.*, 1985). *E. c. microspinulata* and *E. c. cyanophlyctis* differ from *E. c. ehrenbergii* by their smaller size (snout-vent length: male 41-45, female 50-63 as compared to 56-57 and 66-68, Balletto *et al.*, 1985; 57-66 and 75-92, Boulenger, 1920), more tuberculated dorsum moderately distinct tarsal ridge, absence of frontal pineal ocellus on head, long post-narial papilla given from the posterior narial corner which in *ehrenbergii* is a thick small blob arising from the middle of the outer border of naris, usually first finger longer than second, tadpoles smaller 58-60 mm in total length. Moreover, *E. c. ehrenbergii* has longer maxillary teeth, tongue with cylindrical shorter lobes, while in female tongue is flatter and thinner with longer flattened lobes; however, in *E. c. microspinulata* tongue is thicker, with cylindrical short obtusely tipped lobes, interlobe area is broader. The transverse striations seen on the surface of abdomen of *E. c. ehrenbergii* are absent in both sexes in *E. c. cyanophlyctis* and *E. c. microspinulata*. Their tadpoles are smaller (40-45mm) as compared to that of *E. c. ehrenbergii*, which is about twice longer (115mm). However, *ehrenbergii* and *microspinulata* tadpoles share certain characters distinguishing them from *cyanophlyctis* (Khan and Mufti, 1994, Fig. 3,A), have a transverse dark brown concretion between postoral part of beak and first tooth row on each side, labial palps are shorter which do not flare laterally, bunches of smaller papillae between palps

are absent and the labial papillae do not extend along posterior labium.

Euphlyctis c. microspinulata is distinguished from its congeners by the presence of microscopical spinules scattered on body and limbs; elongated dorsal tubercles which are more prominent and concentrated on posterior half of body and lower half of shank; thicker narial papilla arising from middle of the outer border of narial rim; first finger longer than second; Oral disc of tadpole similar to that *E c. ehrenbergii.*

ADDITIONAL MATERIAL EXAMINED

Euphlyctis ehrenbergii BMNH 1976. 1729-1730, Wadi Garan, near Jeddah, Saudi Arabia; BMNH 1978.888-889, Wadi Hiswa, 18 ° 02'N, 40 ° 20'E, Saudi Arabia, elevation 800m.

Tadpole, BMNH 1979.920, Al Jamamun, 21 ° 38'N, 39 ° 48'E, Saudi Arabia.

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