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Amphibian diversity of wetlands of Rewa district of Madhya Pradesh with a note on the morphometric characters of *Duttaphrynus melanostictus*

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Abstract
Rewa district is gifted with lot of wetlands significantly Bichhiya, Bihar and Tamas wetland is home of 12 amphibian species under 5 family. Of which 1 species belonged to family Bufonid, 2 species to family microhylid, 1 species to family Rhacophorid, 6 species to family Dicroglossidae and 2 species to Ranidae. Morphometric study was carried out for *Duttaphrynus melanotic*. Significant variation was observed in the morphometric characteristics of *D. melanotic* with its Lectotype. Supratympanic fold was found to be present and parietal ridge is absent in case of specimens of Rewa, while vice versa in Lectotype. Webbing formula found to be $I_{0\text{-}1}II_{0\text{-}1½}III_{1\text{-}3½}IV_{3½\text{-}1½}$ in case of lectotype, where as in the specimens from Rewa it is $I_{1\text{-}1½}$ $II_{1½\text{-}2½}$ $III_{1½\text{-}3½}$ $IV_{3½\text{-}1½}$.

Keywords: Amphibia, wetland, *Duttaphrynus melanotic*

Introductions
Wetlands are one of the world's most productive and important ecosystems. The word 'wet land' tell us that they are lands that are wet. These ecosystems fall somewhere between terrestrial and aquatic categories. They are shallower and more characterized by the presence of vegetation rather than open water. These water bodies are suitable natural habitat and breeding ground for variety of amphibian fauna. Amphibians play a pivotal role in wetland ecosystem as secondary consumers in many food chains. Because of their importance in ecosystem, decline or extinction of their population has significant impact on other organisms along with them. 26% of the world's freshwater amphibian species are considered threatened. Approximately over a 4550 species of amphibians are recorded in the world, including 165 species of caecilians, 390 species of caudate and 3995 species of Anura. About 220 species of amphibians belonging to eleven families are recorded from India. Studies on Anurans of Northeast India were first published by Chanda (1994) [1] and reported 54 species of toads and frogs. Dutta (1997) [2] reported 69 species of amphibian (67 anurans, I gynophobia, 1 caudate) from Northeast region of India. Sen (2004) [3] has published 83 amphibian species from the region. Firoz *et al.* (2000) [4] first recorded polyp dates taeniases from Assam. Choudhury *et al.* (2001) [5] has reported 20 species from Kamrup district of Assam. Borthakur *et al.* (2007) [6]. Has reported four *Fejervarya species* from Assam. The present paper deals with the amphibian diversity of wetlands of Rewa district of Madhya Pradesh with special emphasis on the morphometric characteristics of *Duttaphrynus melanostictus*.

Material and Methods
Rewa is located at 24°32' N 81°18' E. It has an average elevation of 275 meters (902 feet). It is connected by all-weather roads to Allahabad, Mirzapur, Sidhi, Shahdol, Satna, Katni and Sirmour. Rewa town has its own importance on account of its location, where rich mineral deposits are found out of these three main rock formations; mirror sand, iron ore and Limestone are prominent.
Survey was done from March-September 2020 in Bichhiya, Bihar and Tamas wetland. Collections were made randomly and opportunistically and were preserved in 10% formaldehyde for taxonomic study in laboratory. Identification of collected species were done following Chanda (1994) [1], Dutta (1997) [2], Boulenger (1890) [7], Boulenger (1920)

[8], Chanda (2002) [9], Dubois and Ohler (2000) [10]. Nomenclature and taxonomic arrangement in the text follows Frost (2007) [11]. For habitat analysis aquatic macrophytes were collected and identified to its nearest taxonomic group. Morphometry of the specimens was done with a Vernier Caliper. Following measurements were taken-

SVL: From tip of snout to the vent distance.
SL: From eye to snout tip distance.
EN: From eye to nostril distance.
NS: From nostril to snout distance.
ET: From eye to tympanum distance.
INS: Distance (Interspace) between nostrils.
IOS: Distance (Interspace) between eyes.
UE: Maximum width of upper eyelids.
ED: Diameter of the eye (horizontal).
HTYD: Horizontal tympanum distance.
VTYD: Vertical tympanum distance.
HL: Head Length- distance from tip of the snout to angle of jaws.
HW: Head Width- width of the head at the angle of the jaws.
HD: Head Depth- depth of the head at the angle of the jaws.
FL: From the insertion of the forelimb to the tip of third finger.
F3D: Greatest diameter of the disc of the tip of the 3rd finger.
IMC: Length of the inner metacarpal tubercles (Palmer tubercles=PT).
OMC: Length of the outer metacarpal tubercles.
Nuptial pad: Pad formation on the base of the forelimbs of male during breeding season.
LL: Length of hind limb, from it insertion to the tip of the longest toe.
TBL: Distance between surface of knee to the surface of heel with both tibia and tarsus flexed.
TBW: Tibia width- maximum width of the tibia.
T4D: Greatest diameter of the disc of the 4th toe.
IMT: Length of the Inner Metatarsal Tubercles.
OMT: Length of the Outer Metatarsal Tubercles.
SAT: Subarticular tubercles, present/absent.
SNT: Super numerary tubercles, present/absent.
TTA: Tibiotarsi articulation points reach when the leg is adpressed to the body.
VR: Vomerine teeth- present/absent.
IVR: Inter Vomerine Ridge.
Pupils: Round/Oval/Elongated.
Nostril: Dorsal/Dorsolateral/Lateral.
Tounge Papilla: Yes/NO.
Toung: Entire/Bifid.
Tarsal fold ridge: Yes/No.
Fingertip: Pointed/Blunt/Dilated.
Pre orbital ridge: Yes/No
Post orbital ridge: Yes/No
Tympanic ridge: Yes/No
Parietal ridge: Yes/No
Frontal ridge: Yes/No
Distance between parotid gland and eye:
Length of parotid gland:
Distance between parotid gland:
Breadth of the parotid gland:
Shape of parotid gland:
Color of the skin on dorsal and lateral part of the head and body

Results and Discussion

From the study twelve amphibian species under 5 families are recorded. Of which 1 species belonged to family Bufonidae, 2 species to family microhylid, 1 species to family Rhacophorid, 6 species to family Dicroglossidae and 2 species to Ranidae (Table-1).

Table 1: Amphibian species occurring in the wetlands of Rewa district with their common name and conservation status.

Amphibian Sp	Common name (Assamese)	Conservation status
Bufonidae		
Duttaphrynus melanotic	Chuk bhekuli	LC
Microhylid		
Microhyla ornate	Paruwa beng	LC
Uperodon globulosus	Belun beng	LC
Rhacophorid		
Polyp dates terahenries	Pat beng	LC
Dicroglossidae		
Euphylctis cyanophytes	Pani beng	LC
Fejervarya pierrei	Haru Bamun beng	LC
Fejervarya limnocharis	Uisiringa beng	LC
Fejervarya teraiensis	Do	LC
Hoplobatrachus tigerinus	Bamun beng	LC
Hoplobatrachus crassus	Chagoli beng	LC
Ranidae		
Humerana humeralis	Dangor doloni beng	LC
Hylarana taipehensis	Saru doloni beng	LC

Note: LC = Least concerned

Amongst all the species, the abundance of *Haplobatrachus tigerinus*, *Euphylctis cyanophlyctis*, *Uperodon globulosus*, *Bufo melanosticus*, *Polypedates teraiensis* and *Fejervarya pierrei* were higher in the study area than the other amphibian species. As we lack previous data comment on the decline of the species from the study area cannot be ascertain.

Macrophytes form an important component of the amphibian breeding ground of wetland. These marshy macrophytes occurring in the wetland can be distinctly categorized into free-floating e.g., *Salvinia oblong folia, Eichhornia crassipes, Trapa bispinous, Lemma minor, Ceratopsis thallictroides*; free and submerged e.g., *Potamogeton pectinatus, Ceratophyllid demersum, Limnophila heterophylla*; anchored submerged e.g., *Hydrilla verticilata, Vallisnaria spirales*; anchored and floating e.g., *Marsilea minuta, Nymphaea nouchali, Nelumbo nucifera, Myriophyllum indicum*, emergent amphibious e.g., *Rumex nepalensis, Polygonum orientale, Alternanthera sessiles, Hypericum japonicum, Juncus effusus, Ranunculus reptans, Hydrocotyle javanica, Cyperus platystylis, Scirpus articulatus, Fimbristylis scirpoides, Eleusine indica, Sagittaria segitifolia*; marshy and amphibious e.g., *Ammania baccifera, Commelina benghalensis, Ipomoea aquatica, Jussiaea repens*, etc. Presence of about twelve species from this wetland shows that these habitats are congenial breeding grounds of toads and frog.

Morphometry of d. melanostictus from rewa district

Medium in size (SVL= 69.94). Head is much wider than length (HL: HW= 0.75). Snout rounded, not protruding, its length shorter than head length (SL: HL= 0.35). Nostril rounded, closer to the snout (EN: NS= 1.46). Vomerine ridge is absent. Parotid glands are present and are kidney

shaped. Cranial ridges are present. Fingers are long and rather thin. Relative length of the fingers, shortest to longest: F1<F2<F. Leg one and half times longer than the tibia (TBL: LEG= 0.31). Relative length of toes shortest to longest: T1<T2<T5<T3<T4. Webbing formula is $I_{1-\ 1½}II_{1½-2½}III_{1½-3½}IV_{3½-1½}$. Tibio tarsus articulation reaches the parotid gland.

Comparison between duttaphrynus melanotekites specimens of rewa district and lectotype

There are lot of morphological differentiation observed between the D. melanotic of study area with the Lectotype (Table-2).

Table 2: Comparison between the Lectotype of *D melanotic* and specimens from Rewa

	Lectotype	Rewa
Supratympanic ridge	Absent	Present
Parietal ridge	Present	Absent
Fingers	II<IV<I<III	II<IV<I<III
SAT	Present	Absent
Webbing formula	$I_{0-1}II_{0-1½}III_{1-3½}IV_{3½-1½}$	$I_{1-1½}II_{1½-2½}III_{1½-3½}IV_{3½-1½.}$

Supratympanic fold absents in case of lectotype. On the other hand, it is present in case of specimens of Rewa. In case of specimens from Rewa parietal ridge is absent, while it is present in the lectotype of *Deazapurines melanotic*. In the lectotype relative length of fingers, shortest to longest: II<IV<I<II<IV, sub articular tubercles (SAT) prominent. On the other hand, it is I<II<IV<III sub articular tubercles absent in case of specimens from Rewa. Webbing formula $I_{0-1}II_{0-1½}III_{1-3½}IV_{3½-1½}$ in case of lectotype, whereas in the specimens from Rewa it is $I_{1-1½}I_{1½-2½}III_{1½-3½}IV_{3½-1½}$.

These morphometric divergences can be addressed by considering abiotic factors and climatic barriers (Cei, 1962) [12] since the larval development such as body size of ectotherm is significantly affected by water temperature and pH (Atkinson, 1994 & 1996, Rasanen *et al.* 2003) [13-15]. Morphological differentiation due to warmer water temperature was also noticed in *Rana sylvatica* (Berven, 1990 and Berven, *et al.* 1990) [16, 17] and *Rana cascade* (Blouin and Brown, 2000) [18]. The present variation of *D. melanotic* with the lectotype are in agree with the above proposition. However genetic analysis of the same can only shed some light on the variation of *D. melanotic* group in Madhya Pradesh.

Fig 1: *Duttaphrynus melanostictus*

Conclusion

The wetlands of Rewa district support considerable numbers of amphibian populations. The abiotic and biotic condition of the wetlands is suitable breeding ground for amphibian fauna. Extensive and long-term field surveys will no doubt significantly add few more to the present list. The morphological differentiations of *D. melanostictus* of the study area with the Lectotype in the present study convey the need of genetic analysis of the species.

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