The Journal of Zoology Studies
We Don't Love Animals, We Live For Them
www.journalofzoology.com

ISSN 2348-5914
JOZS 2014; 1(4): 39-42

Received: 12-08-2014
Accepted: 18-09-2014

"HIBERNATION" - Winter survival approach of Toad

Authors: Suman Pratihar

Suman Pratihar [1,2]
[1.] Bose Institute, Kolkata
[2.] Department of Zoology,
Vidyasagar University,
Midnapore -721102,
West Bengal, India.

Correspondence author:
Suman Pratihar
Department of Zoology,
Vidyasagar University,
Midnapore -721102,
West Bengal, India.
E-mail: pratihar_vu@rediffmail.com

Amphibians are not tremble with winter wind but triumph over the winter with an amazing behavioral adaptation – hibernation. Through winter environment is hostile to their nature and behavior, they are capable to guard over the winter harshness. They emerge from the condition and embark on a new task.

Hibernation is not inevitable to all amphibian species some of them are immune to hibernation. Hibernation is a state of inactivity and metabolic depression in animals, characterized by lower body temperature, slower breathing and lower metabolic rate [1]. Hibernating animals conserve energy, especially during winter when food is short, tapping energy reserves, body fat, at a slow rate. The term hibernation creates frequent confusion among non biologist and sometimes among the biologist. Sleeping must not confuse with hibernation because metabolic depression is not only the criteria to judge such physiological and behavioral adaptation. The matter should be regarded with more attention. Other biochemical parameters along with differential enzyme expression needed to be associated with metabolism to elucidate the phenomenon in proper way.

During pre-winter season they labour for food, shelter where they could stay during winter. They also lay by their energy and jump to a conclusion that they should leaned on the energy during winter. Animals that hibernate include bats, some species of ground squirrels and other rodents, mouse lemurs, the West European Hedgehog and other insectivores, monotremes and marsupials.

Even some rattlesnakes, such as the Western Diamondback, are known to hibernate in caves every winter [1]. Birds typically do not hibernate, instead utilizing torpor. However the Common Poorwill does hibernate. Many experts believe that the processes of daily torpor and hibernation form a continuum. One animal that famously consider a hibernator is the bear, although bears do not go into "true hibernation". Until recently no primate, and no tropical mammal, have been known to hibernate. However, animal physiologist Kathrin Dausmann of Philipps University of Marburg, Germany, and coworkers (2004) that the fat-tailed dwarf lemur of Madagascar hibernates in tree holes for seven months of the year. However, very few studies have been performed to focus the biology of hibernation. Indian common toad, *Duttaphrynus melanostictus* is known to be a very good hibernator. This toad is very common in India and is available in plenty in natural habitat during summer, but is found to be hibernating in mud holes and corner of the rooms during winter.

Fig 1: A photograph showing male and female *melanostictus* species.

Final decision always rest with scientific evidences. Winter harsh environment rebel against cold blooded animals including toad. During that period they searched for new shelter against environmental odds. They took recourse to alter metabolic strategy, enzyme expression and resolved upon to doing the task. Hormonal secretion for metabolic adjustment was pertained to their survival strategy [2]. Augmentation of intracellular antioxidant enzyme was a prelude to their new immunological strategy [3]. More information was needed to make up for the better conclusion for alter metabolic strategy. We also have found that SGOT, SGPT decreased significantly in hibernating toads with a concomitant significant increase in blood cholesterol, and lipase. During hibernation, increased metabolic dependency towards lipids is not only a response to low temperature, but part of circanual homeostatic adjustment [4]. Before jump to a scientific decision we should lean to other experiments. Metabolic depression played a crucial role during the period of hibernation. During this phase metabolic rate decreased by 6% of the basal resting rate of the active animals. In active

animals the metabolic rate was 0.117 ± 0.014 ml O_2g-1h-1 which decreased significantly to 0.110 ± 0.017 ml O_2g-1h-1 during the hibernating period [1]. Another experiment informed that *Bufo spinulosus*, metabolic rate decreased during hibernation by 7.8% (at 50 °C) and 13.6% (at 150 °C) of summer value [5]. Kidney is one of the key organ for animal functioning but during hibernation the kidney function is not consistently adequate to meet the tissue demands for ions specially calcium. Based on the previous documents, along with the result of present study, it may be inferred that hibernation is a complex physiological behavior which trigger primarily with cold temperature and low humidity.

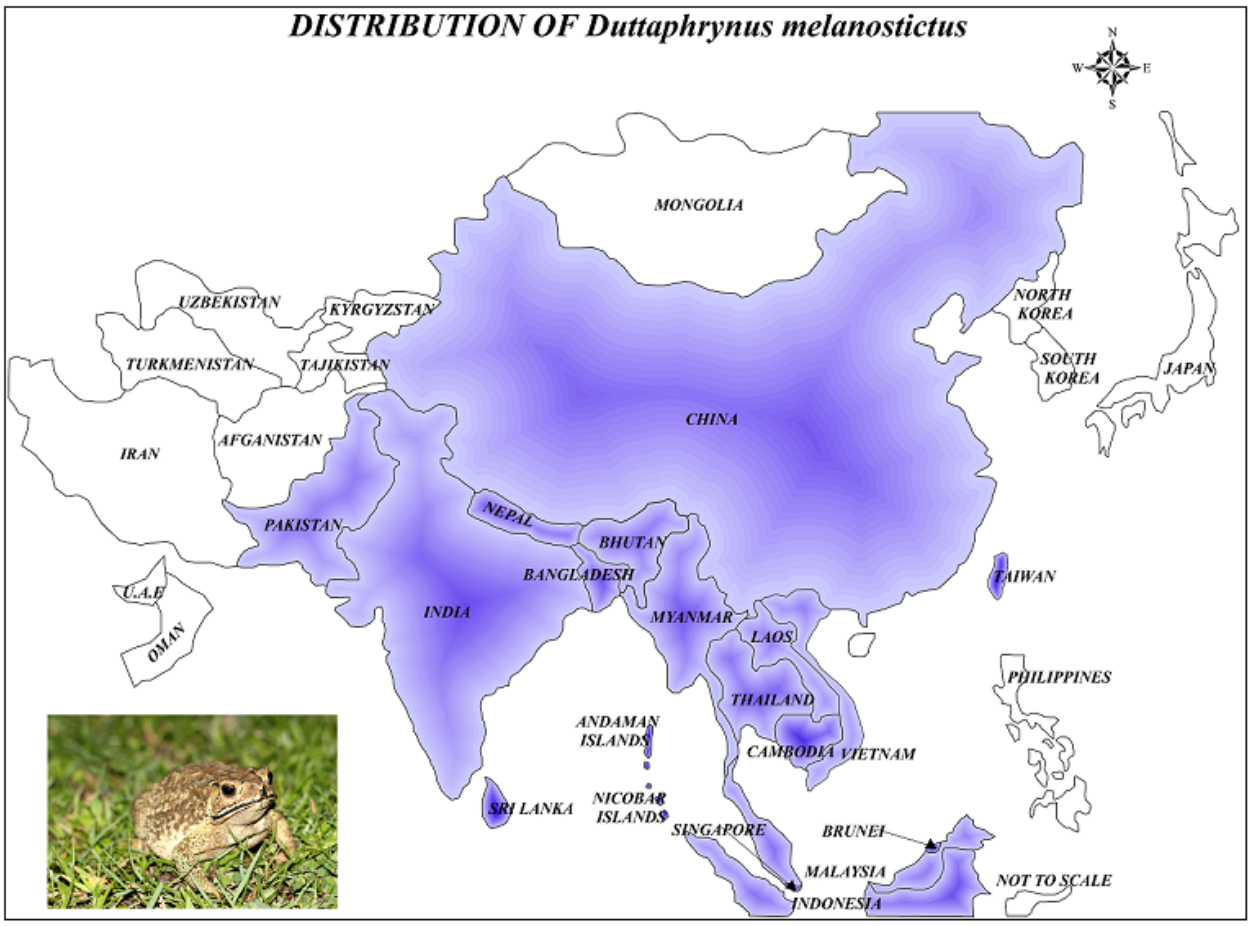

Fig 2: Distribution map of *Duttaphrynus melanostictus*

In the present study haemoglobin concentration was significantly reduced this probably due to reduced metabolic rate and oxygen consumption. No other haemoglobin deformities have been found in the band patterns of haemoglobin electrophoresis. The oxygen need for aerobic oxidation in tissue was reduced so that the main oxygen carrier, haemoglobin in blood was also reduced during the hibernating phase. On the other hand bilirubin, the end product of haemoglobin metabolism was also significantly increased during hibernation. Baker and Breukelen also found similar results in the hibernating golden mantled ground squirrel [6]. The reduced haemoglobin concentration and increased bilirubin concentration may have significant physiological consequence that could aid in survivorship of hibernation. Plasma protein fraction was also analyzed and it was found that gamma globulin (antibody) expression was also increased from 2.7% to 3.3% during the hibernating period [7]. The recurring nature of metabolic rate depression as a survival strategy of animals suggest that the regulation of metabolic arrest has some fundamental principles and mechanisms that are expressed not only in all cell types of an individual's but are also conserved across the phylogenetic lines.

Acknowledgement:
Author would like to thank Nirupam Acharyya (Department of Remote sensing and GIS, Vidyasagar University) and Sandeep Das (KFRI, Kerala).

References

1. Pratihar S, Kundu, J. Life in cold lane. Lambert Academic publication, Germany. 2011.
2. Pratihar S, Kundu, J. Seasonal variation of serum cholesterol and thyroid hormone levels associated with hibernation in Indian common toad, D*uttaphrynus melanostictus* (Schneider, 1799). Russian Journal of Herpetology 2009a; 16:253-255.
3. Pratihar S, Kundu, J. Augmentation of intracellular antioxidant enzyme activities during hibernation in the Indian common toad, *Duttaphrynus melanostictus* (Schneider, 1799). Hamadryad 2010a; 35:96-100.
4. Pratihar S, Kundu, J. Metabolic changes during hibernating period in Indian common toad, *Duttaphrynus melanostictus* (Schneider, 1799). Journal of Applied and Natural Science 2009b; 1:44-46.
5. Naya DE, Veloso C, Sabat P, Bozinovic F. The effect of short- and long-term fasting on digestive and metabolic flexibility in the Andean toad, *Bufo spinulosus*. J Exp Biol. 2009; 212(14):2167-75.
6. Baker JA, Frank VB. Bile constituents in hibernating golden-mantled ground squirrels (*Spermophilus lateralis*). Comparative Hepatology 2009; 8:2.
7. Pratihar S, Kundu, J. Hematological and immunological mechanisms of adaptation to hibernation in common Indian toad *Duttaphrynus melanostictus*. Russian Journal of Herpetology 2010b; 17: 97-100.

Pratihar S. HIBERNATION – Winter survival approach of Toad. Journal of Zoology Studies. 2014; 1(4):39-42.

****