The amphibians—frogs, salamanders and caecilians—stem from an ancient lineage of organisms and they play essential roles, both as predators and prey, in the ecosystems of the world. These include 6260 species of 48 families and the total number of anurans is 5532 species (GAA-2009). Amphibians are important ecological components of both aquatic and terrestrial habitats. Within the last decade, amphibians have the dubious distinction of being in the global spotlight owing to worldwide declines (Barinaga 1990, Wyman 1990, Wake 1991, Griffiths and Beebee 1992).

Suggested causes of declines include various human-induced processes, including habitat loss or degradation (Reh and Seitz 1990, Griffiths and Beebee 1992, deMaynadier and Hunter 2000, Turtle 2000), acid deposition (Freda 1986, Horne and Dunson 1994), climate warming (Wyman 1990, Pounds et al. 1999), increases in UV radiation (Blaustein et al. 1994), spread of toxic substances (Sparling et al. 2000, 2001), introduction of predators (Funk and Dunlap 1999, Lawler et al. 1999), and pathogens (Carey and Bryant 1995, Jancovich et al. 1997, Morrell 1999, Daszak et al. 2001). These declines raise the global eyebrow because amphibians are indicators of ecosystem health (Wake 1991). Among vertebrates they are distinctive in many ways. For biological assessments, they are especially promising because of their capability of linking wetlands with surrounding landscapes.

The notes on the Indian Herpetology were prepared by Jerdon (1870). Anderson (1871) studied on some of the reptiles of India. Stoliczka (1872) made
observations on the Indian Batrachians. Boulenger (1890) worked on the fauna of British India, including Ceylon and Burma. The exploration work in the Northeastern India was started by Annandale (1905) on the ranid larvae from northeastern India. Boulenger (1919) observed and made description on three new batrachias from Garo hills, Assam. Chanda (1994) compiled the amphibians of northeast India. Ao et al. (2003) nineteen new records from neighbouring state of Nagaland. Various other workers mentioned elsewhere has contributed to the enrichment of our knowledge of amphibian distribution in North East India.

The Eastern Himalayan region is one of the biodiversity hotspot regions. Inventorisation and a proper survey in different amphibian habitats are very essential to gather the diversity of amphibians, distribution and habitat ecology.

This thesis is the result of the investigation carried out on different prospects like amphibian diversity in and around the Loktak lake, and the ecology study of the torrential frog, *Amolops formosus* (Gunther, 1876). This includes certain water parameters of the stream during breeding season, sexual dimorphism of the species under investigation, food spectrum and detailed early life history stages.

The survey work was taken up in various amphibian habitats both lentic and lotic systems in and around the Loktak lake, a Ramsar site, a wetland of international importance of Bishenpur district of Manipur. In the present study extensive surveys in the inaccessible areas were taken up. The species are from different habitats, ponds, bank of lake, paddy field, ditches, forest floors and torrential streams. The study resulted in recording of 25 species of 5 families. Out of these 10 species are new records for the state. Chanda (2002) recorded 14 species; Sen (2004) compiled
17 species from the state. It is found that the study area abounds a suitable breeding ground of diverse group of frogs.

Environmental contamination is one of several factors implicated in declines and may have particularly important effects on sensitive developmental stages. Clark and Lazerte (1987) have shown that a slightly higher pH precedes embryo development but the enzymes that induced hatching are inhibited, trapping the fully developed embryo in the egg capsule.

Ao and Bordoloi (2002) have studied breeding habitats of the amphibians of Nagaland and categorised it into five habitat types. Water chemistry variables are not significant predictor of the presence or absence of amphibians rather, some non-chemical characteristics and nature of the surrounding habitats were also important predictor of their distribution. Stream water is generally fast moving and is less prone to pollution compared to stagnant water.

During the period of investigation, certain physico-chemical parameters of the stream during two successive breeding season (April-September) were analysed. The physico-chemical analysis have shown that the habitat is characterised by high dissolved oxygen content (9.24-10.94) mg/l, comparatively less free CO$_2$ (4.0–6.5) mg/l and the pH of the lotic water was between (5.5–7.0). In the present study, the physico-chemical parameters of the breeding habitat recorded will give knowledge about the amphibian habitat and this data can be utilised for selection of breeding habitat for a particular species.

The current study finds that sexual dimorphism of overall size as reflected by SVL in our data is obvious from visual inspection. Sexual dimorphism in SVL demonstrates similar results of the entire samples. For the entire species sample the
females are significantly larger except in NS distance i.e. nostril to snout distance and the tympanum distance. It is important to note that no significant dimorphism has been observed in the coloration of the body of *Amolops formosus* (Gunther, 1876).

Analysis of the food habit of the adult during breeding season is important in view of the diet composition of the poorly studied torrent frogs. Wadekar (1963) observed that orthoptera, dermaptera, hemiptera formed chief item of diet of *Rana tigerina*. Strong selections for relatively large prey such as beetles (coleoptera) and orthoptera by larger frogs have been studied by Hirai (2002).

In our study it is observed that spiders were exploited irrespective of frog body size and forms the major food item. This result is perhaps related to the soft morphology of these prey animals (Hirai, 2002).

In the present study it is observed that this species feed on different size group of different prey. It is found that this frog consumes varied food items belonging to four different class and twelve orders. The orders are Odonata, Plecoptera, Orthoptera, Dermaptera, Dictyoptera, Hemiptera, Lepidoptera, Hymenoptera, Coleoptera, Araneae, Decapoda and Mesogastropoda.

They are found to prey on small size group of spiders that is about 25.5% of the total food examined as well as large size group such as Orthoptera (15.7%), Dermaptera (15.7%), Coleoptera (9.8%), Dictyoptera (7.8%) and Hymenoptera (5.9%) etc. Food selection of male and female were found to be same.

Unlike other lentic anurans, the normal developmental study has been done on stages available in the habitat and monitoring them till completion of the life cycle. The earliest stages (Gosner, 1960) of recorded tadpoles were from stage 25.
The progressive development continues from stage 26-38 with increase in total size and differentiation of the limb structures.

From stage 27 to 31 limb development takes place with modification of foot. From stage 32 toe differentiation starts as first incurvation of first toe is seen. By this time oral disc differentiation heads towards completion with formation of clear keratodont rows.

Stage 38 is found to have complete larval structure with fully developed keratodont rows and oral structures and prominent individual toes. In the present investigation detailed morphological study of stage 38 tadpoles has been included. At Stage 40 formation of webbing is observed. Degeneration of the mouthparts begins at stages 40 or 41, independent of the genus (Gosner; 1960), and the resorption of tail and cloacal tail piece (stage 41; Gosner, 1960), linked to metamorphosis.

At stage 42 it is observed that the forelimb emerges, keratodont row falls off and from this stage regressive development of tadpole structure takes place. There is a decreasing trend in the SVL, TL and TH. At stage 46, the tadpole metamorphoses into a froglet.

*Amolops* species occupy mountain streams that are more vulnerable to the affects of climate change (Liu *et al.*, 2000). The lotic systems of northeast India are found to be congenial habitats for *Amolops*. So far, *Amolops marmoratus, Amolops formosus, Amolops assamensis, Amolops viridimaculatus, Amolops gerbillus* have been recorded from different streams of northeast India, Arunachal Pradesh (Pawar and Birand, 2001; Bordoloi *et al.*, 2002); Assam (Sengupta *et al.*, 2008); Nagaland (Ao *et al.*, 2003); Shillong (Sahu, 1994).
In the present study morphological characters of *Amolops formosus* (Gunther, 1876) has been compared with female of 3 species viz. *Amolops marmoratus*, *Amolops viridimaculatus*, *Amolops gerbillus* and 1 male species, *Amolops monticola*. A table has been prepared that gives the detail of the differences observed and these characters could be key characters for their identification. Important diagnostic characters observed are width and length of head, shape of the snout, inter-orbital space, shape and position of nostril and tympanum, position of vomerine ridge, presence and absence of supernumerary tubercles and presence and absence of dermal fringe along the toes. The comparison was included as a part of our investigation because it is difficult to identify a species in the field.

The information gathered on the torrent species will fill the gap in our knowledge of habitat data that has been gathered over the years on frogs of Eastern Himalayan region as most of the studies have been done on lentic habitats (Ao, 2001 on *Hyla annectans*, Kumar, 1982 on *Rana cyanophlyctis* etc.).

The findings reported in the present work gives an idea of the amphibian diversity from lentic and lotic habitats of the study area. This will add to the knowledge of amphibian fauna reported from the state of Manipur. This study also gives an idea about the habitat data, sexual dimorphism, food spectrum, and life history stages of *Amolops formosus* (Gunther, 1876).