1. INTRODUCTION

Catfishes are an important part of the fish fauna in wetlands and many of them are economically important with high nutritive value (Rajagopal and Davidar, 2008). There are about 158 species of inland catfishes from 50 genera and 13 families in India. Diversity of catfish in India is the highest in Northeastern Hills, Gangetic River System and the Western Ghats (Barman, 1994; Thomas et al., 2002). Concern over declining harvests and an obvious reduction in biodiversity of fish species has lead to a more holistic approach to fisheries management and research (Mukherjee, et al., 2002).

Assam, forming 30% of Northeastern Region of India, is known for its ichthyofauna richness and heterogeneity. So far, 185 species belonging to 98 genera under 34 families have been reported from Assam (Sinha, 1994). The rivers Brahmaputra and Barak form the principal drainage of North East India with its numerous tributaries flowing through the different states along with myriads of rivulets and lentic water bodies that harbour diversified fish fauna. Owing to the diversity of topographic and climatic features of North Eastern India, the aquatic resources are rich in fish germplasm (Bhattacharya et al., 2000).

Aquaculture, which involves the cultivation of aquatic life within controlled environments or the commercial production of certain aquatic species by managing the major part of their life history under strict control condition. Culture-based fisheries increase production in natural environment by controlling a part of the life history of certain species and transplanting or releasing their seed or fry into the open waters. Captive breeding and the release of captive bred individuals into the wild are among the techniques used for conservation of rare and endangered fish species (Sarkar et al., 2006). According to Fleming (1994), captive breeding programs have become one of the principal tools used in attempts to compensate for declining fish populations and simultaneously to supplement and enhance yields for fisheries.

The primary concern of any seed production and hatchery system is to produce the maximum number of quality fingerlings from the available brood stock (Marimuthu
and Haniffa, 2007). This is particularly important in the farming of catfish species because of their wild seed collection is very limited due to the absence of seasonal monsoons in India (Vijaykumar et al., 1998). The major impediments in the development of any aquaculture system are the availability of quality fry/fingerlings (Webber and Riordan, 1976). The easy availability of stocking material is always considered important for successful culture of any fish species (Sahoo et al., 2008). Though the collection of natural seed for the purpose may be an alternative, but it is not sustainable for an intensive culture. Again, scarcity of marketable fish as well as seed from the natural ground has been felt in this catfish. So, the seed production in captivity will be the only alternative for obtaining optimum quantity of seed for the purpose through induced breeding operation.

*Ompok pabo* (Hamilton-Buchanan) commonly known as ‘Pabo’ is an Indian freshwater cat fish with good market demands particularly in North-Eastern part of India; where it fetches a higher price than the other cat fishes available in this region. According to Chakrabarty et al. (2009), *Ompok pabda* which is a related species of Pabo has fine flesh with a soft meat texture, good taste and high nutritional value. Like this species, *Ompok pabo* is also a delicious, tasty, nutritious catfish having relatively few bones. In some parts of Assam, the fish is sold at the rate of 450 to 600 rupees per kg. But, it has not received much attention in aquaculture mainly due to non-availability of information regarding breeding and culture technique of this important fish species.

Over the last few decades, its wild population has undergone a steady decline mainly due to over exploitation, loss of habitat, disease, pollution, siltation, poisoning, dynamite and other destructive fishing. Studies on causes of fish depletion in the wetlands of Assam reveals that the destruction of breeding habitat, siltation, encroachment, indiscriminate killing of gravid fishes, over fishing etc. are the main causes responsible for fish depletion in the beels (Sarma et al., 2012). According to Hossain et al. (2006), once easily available in nature, the fish has recently become scare because of many adverse changes in their natural breeding and growing habitats. They revealed that for these reason, catfish fry is very rare in nature. In the IUCN Red
List of Threatened Species (Version 2011.2) the species is categorized as Near Threatened (Ng, and Tenzin, 2010). However, *Ompok pabo* has been declared as an endangered species (Datta *et al*., 2003; NBFG, 2010). So, induced breeding of this endangered fish is urgently needed for the conservation and sustainable management.

So far breeding biology is concerned; success has been achieved in induced breeding of many freshwater catfishes at captive condition in India. The Asian catfish *Clarias batrachus* was successfully bred and reared in captivity by different workers (Cheah, 1990; Goswami and Sarma, 1997; Das, 2002; Mahapatra, 2004; Hessain *et al*., 2006; Sahoo *et al*., 2007; Sahoo *et al*., 2008). Captive breeding of *Ompok pabda* has also been carried out successfully in different parts of India (Aktheruzzaman *et al*., 1993; Kohinoor *et al*., 1997; Bhowmik *et al*., 2000; Mukherjee & Das, 2001; Mollah, 2003; Chakrabarty & Chakrabarty, 2005; Sarkar *et al*., 2005; Mahmood, 2006; Chakrabarty *et al*., 2006; Hussain, 2006; Chakrabarty *et al*., 2007; Roy *et al*., 2007; Chakrabarty *et al*., 2008; Rahman *et al*., 2008). The Indian butter-catfish *Ompok bimaculatus* which is also an endangered species was artificially spawned to propagate its existing population (Choudhury, 1962; Sridharan *et al*., 1998). Haniffa and Sridhar (2002) conducted an investigation on induced spawning of *Heteropneustes fossilis* using HCG (Human Chorionic Gonadotropin) and synthetic hormone ovaprim. The extraordinary breeding habits of the catfish *Mystus aor* (Hamilton) and *Mystus seenghala* (Sykes) were studied by Raj (1962).

1.1 Systematic position:

The catfish genus *Ompok* Lacepede, 1803, consists of medium-sized silurid fishes found in inland waters throughout South and Southeast Asia. The genus is traditionally diagnosed by the presence of a short dorsal fin with 4 rays, strongly forked caudal fin, subcutaneous eye that is set immediately posterior to the mouth rictus and two patches of palatal teeth (Ng, 2008). There are seven species of the genus *Ompok* widely distributed in the Oriental region (Talwar & Jhingran, 1991). Among these seven, only four species are of Indian origin (Table-1.1). It may be mentioned that except *Ompok malabaricus* other three species are found more or less in Assam.
Table 1.1 Different *Ompok* species found in Indian region

<table>
<thead>
<tr>
<th>No.</th>
<th>Scientific Name</th>
<th>English name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Ompok bimaculatus</em> (Bloch, 1797).</td>
<td>Indian butter-catfish</td>
</tr>
<tr>
<td>2</td>
<td><em>Ompok pabo</em> (Hamilton-Buchanan, 1822).</td>
<td>Pabo catfish</td>
</tr>
<tr>
<td>3</td>
<td><em>Ompok pabda</em> (Hamilton-Buchanan, 1822).</td>
<td>Pabdah catfish</td>
</tr>
<tr>
<td>4</td>
<td><em>Ompok malabaricus</em> (Valenciennes, 1839).</td>
<td>Goan catfish</td>
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</tbody>
</table>

1.1.1 Synonymy:

*Silurus pabo* Hamilton-Buchanan, 1822, *Fishes of Ganges*: 153, 375, pl. 22, fig. 48 (type locality: Brahmaputra river).


1.1.2 Classification:

- **Group**: Pisces
- **Phylum**: Chordata
- **Subphylum**: Vertebrata
- **Superclass**: Gnathostomata
- **Class**: Osteichthyes
- **Subclass**: Actinopterygii
- **Division**: Teleostei
- **Subdivision**: Euteleostei
- **Superorder**: Ostariophysi
- **Order**: Siluriformes
- **Family**: Siluridae
- **Genus**: *Ompok* Lacepede, 1803
- **Species**: *pabo* (Hamilton-Buchanan, 1822)

1.2 Morphology:

Body is elongated and compressed. Length of head 5 to $5 \frac{1}{4}$ of caudal fin $8 \frac{1}{2}$, height of body 5 to $5 \frac{1}{2}$ in the total length. Eyes moderate in size, its lower edge below level
of cleft of mouth. Eye diameter 4 to 4 1/2 in the length of the head, 1 1/4 diameter from the end of snout. Mouth large and oblique; teeth in villiform bands on jaws; teeth on vomer in two short, transverse patches. The lower jaw slightly in advance of the upper; the width of the gape of the mouth equals half the length of the head. Barbels two pairs; maxillary pair short and extend slightly beyond posterior border of eye, the mandibular barbels very short and about equal to eye diameter. The dorsal fin situated in the commencement of the second third of the length of the body. Anal fin long, inserted well behind dorsal fin. Pectoral fin as long as the head behind the angle of the mouth. Pectoral spine moderately strong, usually feebly serrated on its inner edge. Caudal fin deeply forked, its lobes pointed. Color in life, silvery grey above, lighter below, with a dark shoulder spot.

1.3 Natural geographical distribution:
Generally, catfishes dwell in diverse habitats such as upland streams, large river channels and seasonal floodplain lagoons with broad feeding niches that include detritivores, benthic insectivores and piscivores (Winemiller and Winemiller, 1996). *Ompok pabo* has a wide geographical distribution covering northern India, Pakistan, Bangladesh and Myanmar (Talwar and Jhingran, 1991). In India, it is mainly found in Ganga, Yamuna and Brahmaputra river system (Nath and Dey, 2000). According to Mukherjee *et al.* (2002), *Ompok pabo* dwells and breeds in the rivers and reservoirs and in connected water sheds during floods. So far *Ompok* genus is concerned, little information is found regarding distribution and habitat of these fishes. *Ompok pabda* has a wide geographical distribution covering Afghanistan, the Indus plain and adjoining hill area of Pakistan, the North East states of India in Bihar and West Bengal (Chakrabarty *et al.*, 2009). Open beels/mauns connected with the rivers are common habitats of these species. Pabda is commonly found in natural water bodies *i.e.* haors, baors, rivers, beels and floodplain of Bangladesh (Datta *et al.*, 2003).

1.4 Review of Literature:
So many studies have been performed related to breeding biology as well as larval rearing of different species under the genus *Ompok*. But, a little information is
available on the breeding and culture practices of *Ompok pabo*. (Dey, 1876; CSIR, 1962; Mukherjee et al., 2002).

1.4.1 International status:
Mollah (2003) conducted five experiments on *Ompok pabda* viz. i) optimization of pituitary gland (PG) extract and Human Chorionic Gonadotropin (HCG) dosages for induced breeding of *Ompok pabda*, ii) effects of different feeds on the larvae, iii) feeding frequency effect, iv) stocking density effects on larvae and fry respectively under laboratory conditions, v) effects of different feeds on growth and survival of fry in grow-out ponds. Datta *et al.* (2003) studied on chromosomes of *Ompok pabda*. Siddiqua *et al.* (2000) studied histology of spermatogenesis in *Ompok pabda*. Another experiment was carried out in nine earthen nursery ponds of Bangladesh Fisheries Research Institute, Mymensingh, Bangladesh Rahman *et al.* (2008).

1.4.2 National status:
Captive breeding of *Ompok pabo* was carried out in West Bengal (Mukherjee *et al.*, 2002). Captive breeding of this fish was also carried out in Central Inland Freshwater Aquaculture (CIFA), Bhubaneswar (Bhowmik *et al.*, 2000). The Regional Aquaculture Research Centre of Central Institute of Freshwater Aquaculture (CIFA) at Kalyani, West Bengal, India has been successful in breeding and mass seed production of Pabda (*Ompok pabda*), so that the fingerlings can be produced locally for grow out culture to overcome the constrain of procurement of seed from wild sources (Chakrabarti *et al.*, 2009). Induced breeding of *Ompok bimaculatus* was successfully accomplished and captive populations of 548 individuals were maintained at St. Xavier College, Palayamkottai (Sridhar *et al.*, 1998). Vijayakumar (2010) conducted an experiment on an endangered Indian catfish *Ompok malabaricus* to conserve the species through captive breeding operations.

1.4.3 Regional status:
The catfish *Ompok pabda* was successfully bred during May-June, 2007 at Ulubari Fish Seed Farm under Department of Fisheries, Govt. of Assam by inducing with ovatide at different doses (Roy *et al.*, 2007). In an another investigation, Goswami
and Barthakur (2007) has carried out an experiment on induced spawning and embryonic development of *Ompok bimaculatus* (Blotch), a target species of Regional Fish Live Gene Bank established in the Gauhati University campus, Guwahati under UGC (SAP) DRS Programme.

However, a little information is available regarding induced breeding and nursery rearing of *Ompok pabo*. There is no any suitable hatchery technique for breeding of this species in captive condition. To save this endangered species from extinction in near future, a proper breeding methodology is the need of the hour. Keeping the importance of the above facts, the present investigation has been undertaken to develop a suitable and economically viable technology for mass seed production of *Ompok pabo* in a controlled nursery rearing system under agro-climatic condition of Assam. The present investigations have been primarily focused on the following objectives:

**1.5 Objectives:**
- To study the microhabitat of *Ompok pabo* in the existing pockets of the Brahmaputra valley of Assam.
- To develop an induced breeding protocol of this species along with its breeding biology.
- To study the embryological development of the species.
- To study the effects of certain feeds on growth and survival of the hatchlings in nursery pond.