FRESHWATER AND MARINE FISH SEED RESOURCES AND NATURAL BREEDING OF FINFISHES

BY

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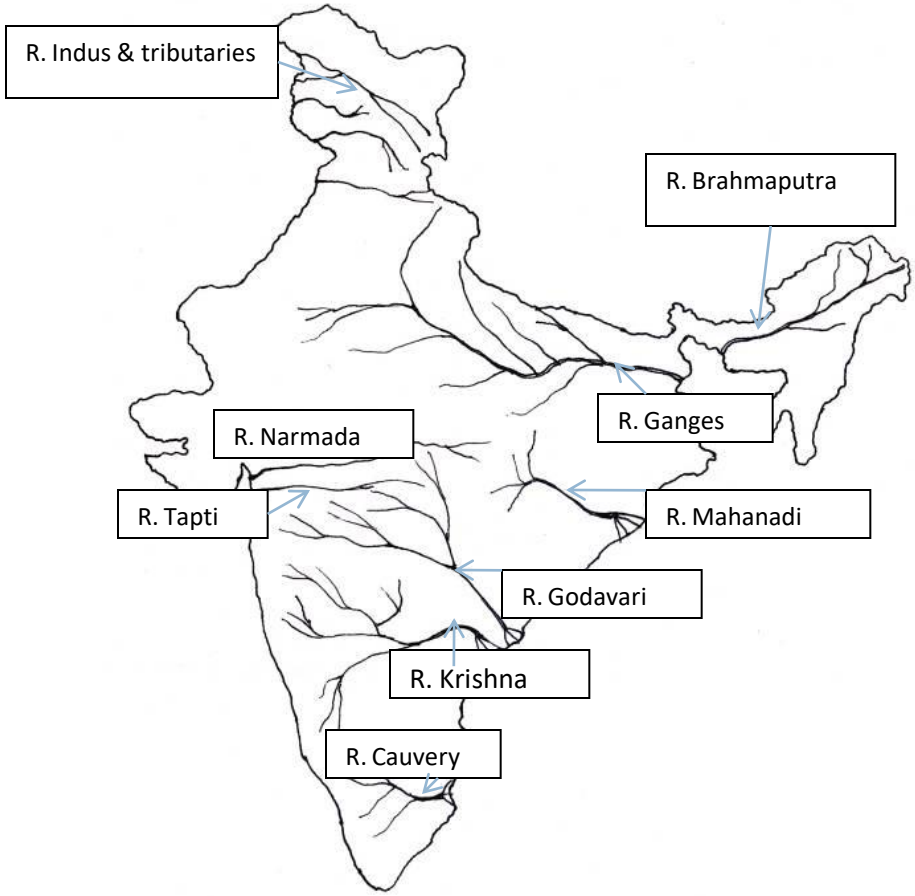
- Rivers - the major source of freshwater
- The Ganga, the Brahmaputra and the Indus river systems in the north and the Peninsular East coast and the West coast river systems in the south are the important natural sources of fish seed



The Ganga river system

- Harbors the richest freshwater fish fauna of India

- Gangetic (major) carps to mahseers and other coldwater fishes of the Himalayas, the hilsa, catfishes etc

The Principal freshwater fishery resources of the Ganga :

- **Indian major carps:** **Mahseer:**
- *Catla catla* *Tor putitora*
- *Labeo rohita* *T. mosal*
- *Cirrhinus mrigala* *T. tor*
- *Labeo calbasu* *Acrossocheilus hexagonolepis*

- **Other carps:** **Larger catfishes:**
- *Labeo pangusia* *Osteobagrus aor*
- *L. dero* *O. seenghala*
- *L .gonius* *Silonia silondia*
- *Cirrhinus reba* *Wallago attu*
- *Pangasius pangasius*
- **Other catfishes:** *Bagarius bagarius*
- *Clupisoma garva* *Rita rita*
- *Eutropiichthys vacha* **Feather backs:**
- *Ailia coila* *Notopterus notopterus*
- *Ompok bimaculatus* *N. chitala*
- *O. pabda*

- **Clupeids:** **Freshwater prawns:**
- *Hilsa ilisha* *Macrobrachium malcolmsoni*
- *Gudusia chapra* *M. birmanicum*
- *Setipinna phasa* *M. lamarei*

The Brahmaputra system

The Principal freshwater fishery resources of the Brahmaputra **:**

- **Major carps:**
- *Catla catla*
- *Labeo rohita*
- *Cirrhinus mrigala*
- *Labeo calbasu*
- **Other cyprinids:**
- *Labeo gonius*
- *L. bata*
- *Danio equipinnatus*
- *Rasbora daniconius*
- *Puntius sarana*
- *P. ticto*
- *Barilius bendalensis*
- *Chela atpar*
- **Clupeids:**
- *Hilsa ilisha*

Catfishes:

Silonia silondia

Osteobagrus aor

O. cavasius

Bagarius bagarius

Mahseers:

Tor putitora

T. progenius

Murrels:

Channa punctatus

C. marulius

C. gachua

Other fishes:

Rhinomugil corsula

Glassogobius giuris

Colisa lalia

The Indus system

- Harbors the exotic rainbow and brown trout, variety of indigenous carps and catfishes

- The trout streams of Kashmir - one of the world's richest sport fishing

The Principal freshwater fishery resources of the Indus :

- **Carps:**
- *Cyprinus carpio*
- *Schizothorax sp*
- *Oreinus lagiostomus*
- *Labeo dero*
- *L. dyocheilus*
- *Puntius conchonius*
- *Crossocheilus latius*
- *Tor putitora*

Catfishes:

Glyptothorax kashmirensis

G.reticulatum

Osteobagrus seenghala

Other fishes:

Botia birdi

Nemacheilus kashmirensis

N. rupicola

N. marmoratus

The East Coast system

- The east coast system in Peninsular constitutes the Mahanadi, the Godavari, the Krishna and the Cauvery
- The Mahanadi has all the Indian major carps common with the Ganga system
- Fish fauna -several carp species, catfishes, murrels, prawns, etc. along with the Gangetic carps from the north
- The tributaries of the Cauvery from the Nilgris have coldwater fishes like trout and tench.

The Principal freshwater fishery resources of the Mahanadi :

Carps:

- *Catla catla*
- *L. rohita*
- *C. mrigala*
- *L. fimbriatus*

Mahseers:

- *Tor mosal*

Catfishes:

- *Osteobagrus seenghala*
- *O. aor*
- *Rita rita*
- *R. chysea*

The Principal freshwater fishery resources of the Godavari :

Carps:

- *L. fimbriatus*
- *C. mrigala*
- *L. calbasu*
- *Catla catla*
- *L. rohita*
- *Hilsa ilisha*
- *Macrobrachium malcolmsoni*

Catfishes:

- *Osteobagrus seenghala*
- *O. aor*
- *Silonia childreni*
- *Wallago attu*
- *Pangasius pangasius*
- *Bagarius bagarius*

The Principal freshwater fishery resources of the Krishna:

Indian major carps:

- *C. catla*
- *L. rohita*
- *C. mrigala*

Other carps:

- *L. fimbriatus*
- *L. kontius*
- *P. sarana*
- *P. dubius*

Catfishes:

Osteobagrus seenghala

O. aor

Wallago attu

Ompok bimaculatus

Murrels:

Channa marulius

C. striatus

The Principal freshwater fishery resources of the Cauvery :

Major carps:

- *C. catla*
- *L. rohita*
- *C. mrigala*
- *L. calbasu*

Minor carps :

- *P. carnatius*
- *L. kontius*
- *C. reba*
- *C. cirrhosa*
- *P. dubius*

Catfishes:

Glyptothorax madrapatanus

Osteobagrus seenghala

O. aor

Wallago attu

Silonia silondia

Other fishes:

Channa marulius

Notopterus notopterus

Tor khudree

The West Coast river system

- Includes the basins of the Narmada and the Tapti
- The other rivers that originate in the Western Ghats possess carps, catfishes, mahseers, murrels, perches, prawns, etc.

The Principal freshwater fishery resources of the Narmada:

Indian major carps:

- *Catla catla*
- *L. rohita*
- *C. mrigala*
- *L. calbasu*

Other carps:

- *L. fimbriatus*
- *L. bata*
- *L. gonius*
- *C. reba*
- *P. sarana*

Catfishes:

Rita pavimentata

Osteobagrus seenghala

O. aor

Wallago attu

Clupisoma garua

O. bimaculatus

Mystus cavasius

Miscellaneous fishes:

Channa sp

Mastocembelus sp

N. notopterus

Tor tor

The Principal freshwater fishery resources of the Tapti:

Indian major carps:

- *L. calbasu*
- *C. mrigala*

Catfishes:

- *Osteobagrus seenghala*
- *O. aor*
- *Wallago attu*
- *Clupisoma garua*

Other fishes:

- *Channa sp*
- *Mastocembelus sp*

Other carps:

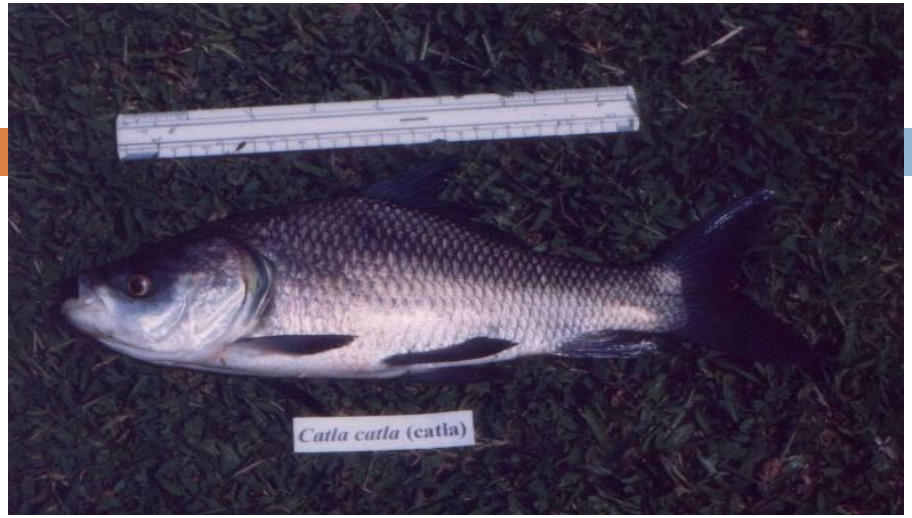
L. fimbriatus
P. sarana
L. boggut
L. bat
Tor tor
C. reba

Other freshwater resources :

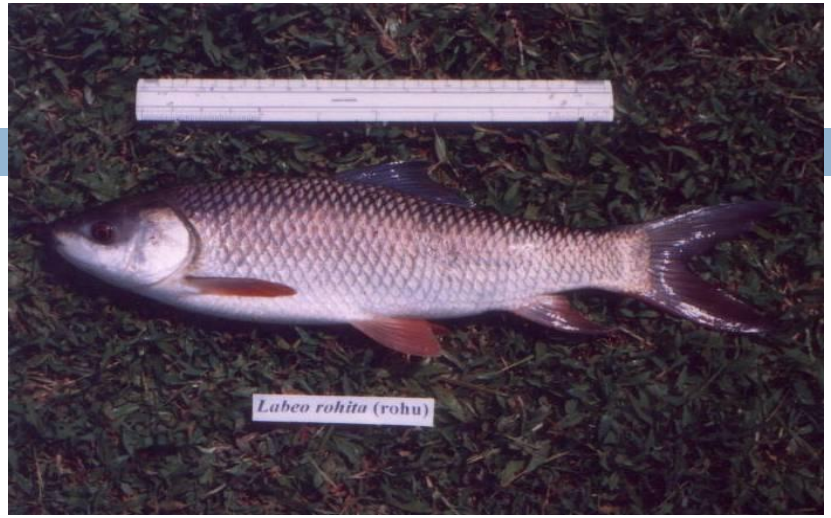
Reservoir fish seed resources

- The reservoirs in Uttar Pradesh and Madhya Pradesh - natural stock of major carps

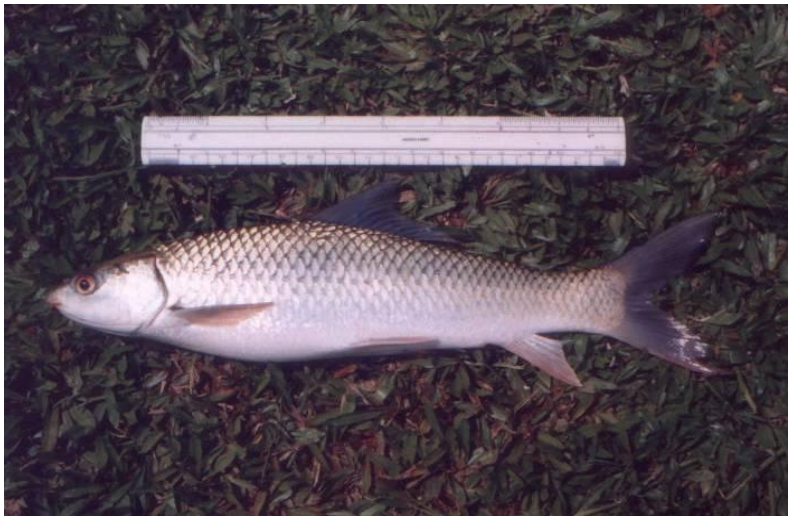
- The reservoirs - do not have a natural stock of major carps. Hence, major carp fingerlings produced elsewhere were brought and released in them.



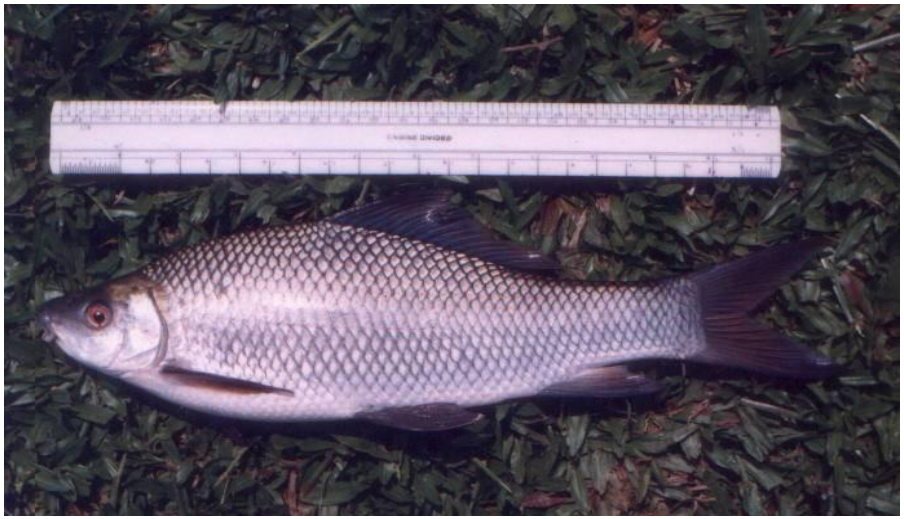
Catla catla



Labeo rohita

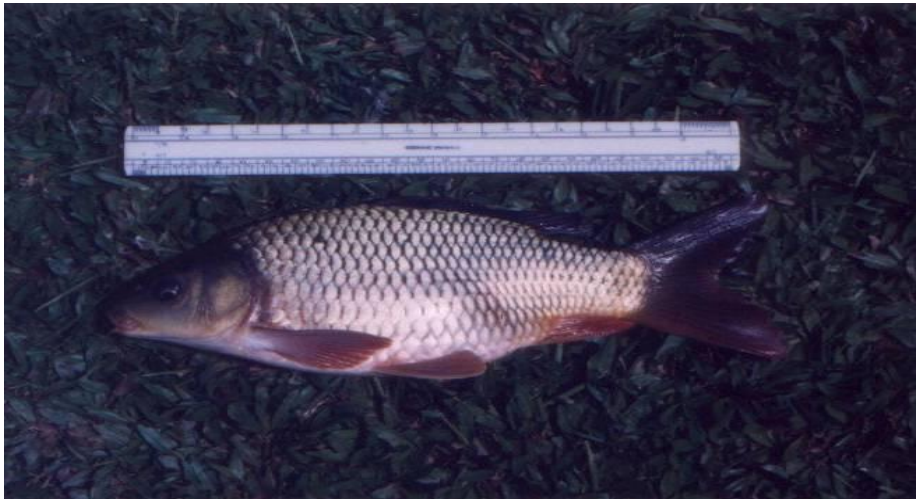


Cirrhinus mrigala



Labeo fimbriatus

Silver carp



Common carp

Grass carp

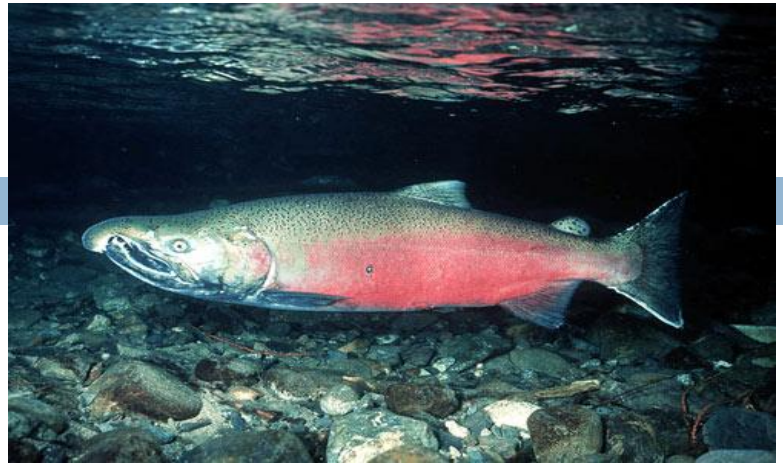
Coldwater fish seed resources

- Optimum temperature - 10-12^{0}C

Trout, salmon and char:

- Trout and salmon - exotic game fishes introduced in India
- Trout species introduced : rainbow trout, brown trout, eastern brook trout, golden rainbow and tiger trout (a hybrid between brown trout x Salvelinus fontinalis)
- Peninsular India - in the Nilgiris and Kodai hills in Tamil Nadu and in the high ranges of erstwhile Travancore in Kerala
- In the Himalayas- Kashmir and Himachal Pradesh, in Garhwal Himalayas, Arunachal Pradesh, Nagaland, Meghalaya and in certain waters of Nepal

Trout



salmon

char

Mahseers:

- One of the world's best game fishes
- Distributed in Himalayas and the Peninsular India
- Seven species of mahseer belonging to the genus *Tor* in India
- They are: *Tor tor*, *T. putitora*, *T. khudree*, *T. nelli*, *T. progenius*, *T. mussullah* and *T. mosal*

Snow trout:

- Snow trout (*Schizothorax* spp.) are believed to have migrated into the lakes and streams of Kashmir from Central Asiatic watersheds
- There are eleven valid species of *Schizothorax*

Mahseers

Snow trout

Hilsa, *Tenulosa ilisha:*

- The anadromous Indian shad, *Tenulosa ilisha* (Hamilton)- commonly known as hilsa or river shad
- One of the most commercially important fish of the country
- Hilsa ascends the freshwater stretch of all the major river systems from sea mainly for breeding, thereby forming a lucrative fisheries in freshwater and brackishwater.
- It's upstream migration has greatly been hampered by the construction of dams, weirs and barrages across the rivers

Marine fish seed resources

The most important fish seed resources are:

- **Milkfish:** Distributed in the Indo-Pacific region; along both the coasts of India. ascends freshwater zones of river
- **Grey-mullets:** Distributed in the Indo-Pacific region
- **Seabass:** Occurs in the tropical and sub-tropical areas of Asia in coastal waters, estuaries and lagoons, including freshwater
- **Pearlspot:** Three species of pearlspot inhabit brackishwater and mouths of rivers in Orissa, Andhra Pradesh, Tamil Nadu, Kerala ands Karnataka
- **Sillaginids:** They are found in the Indo-Pacific region. In India, they occur in shallow, sandy bottoms of shores and bays and also in estuaries
- **Polynemids:** Distributed in the Indo-Pacific region. They occur along both the coasts of India. Primarily inhabit shallow muddy and sandy bottoms of the continental shelf, occasionally entering rivers

Natural breeding of finfishes

- Most are seasonal breeders and their spawning coincides with seasonal changes in environmental factors

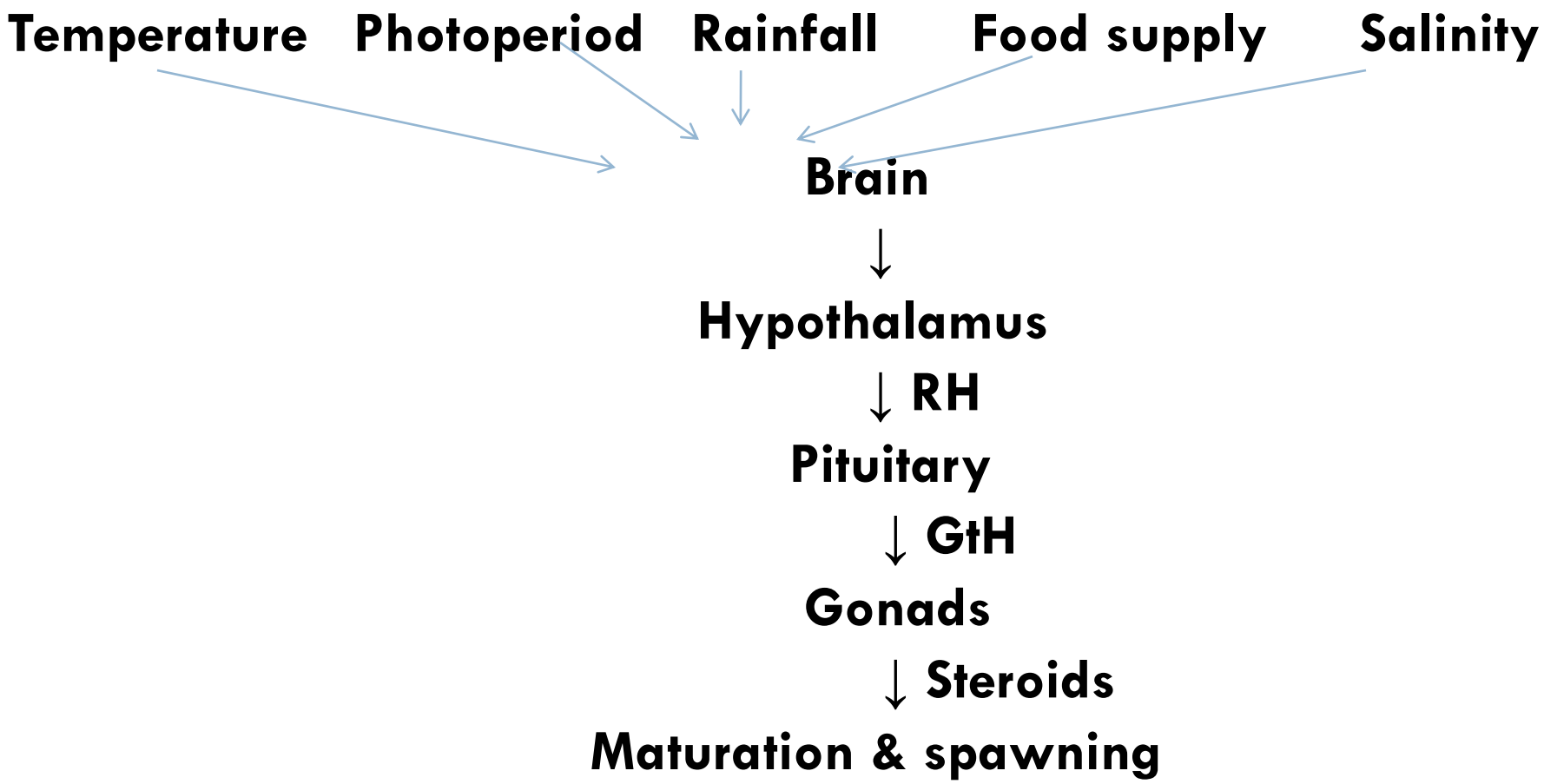
- In response to environmental stimuli, the hypothalamus secretes a hormone termed as releasing hormone (RH)

- The Nucleus Lateralis Tuberis (NLT) of the hypothalamus responds to an electrical signal from the brain by secreting RH at the end of the axon; thus an electric signal becomes a chemical one (bridging the gap between nervous/neural and hormonal information)

- The arrangement of these neurons/axons is unique in teleosts, their axon directly end on gonadotropic cells in the adenohypophysis, but do not secrete their hormones into a portal blood system

- However, the effect of RH is to stimulate the production of GTH and its subsequent release into the vascular system of the adenohypophysis

- GTH is then carried in the general blood circulation to the gonads which in turn secrete steroids which are required for final maturation and spawning. The chain of events leading from the reception of environmental stimuli to maturation and release of gametes are as follows:


Temperature
Photoperiod
Rainfall
Food supply
Salinity
Brain
↓
Hypothalamus
↓ RH
Pituitary
↓ GtH
Gonads
↓ Steroids
Maturation & spawning

Feedback mechanism

- The level of Gonadotropins (GtH) is regulated by a process called feedback mechanism

- A. Pituitary/Hypothalamus ⟷ GtH → Gonadal steroids

- It is believed that the release of GtH is adjusted through a system of negative feedback, in which centres in the pituitary/hypothalamus are responsive to the level of circulating gonadal steroids

- A rise in the level of sex steroids brings about a decrease in GtH secretion; with the result the steroid release again falls to the appropriate level

- A drop in the steroid level has the opposite effect (a decrease in the steroid level brings about an increase in the level of GTH)

- In special cases, an antiestrogen or antiandrogen competes with endogenous gonadal steroids for binding sites in the P-H axis so that GtH is released regardless of the level of steroids

- A negative feedback system becomes then a positive one and results in an artificially elevated level of gonadal steroids. So both the GtH and gonadal steroids continue to rise and the pathway becomes positive

- B. Pituitary/Hypothalamus → GtH → Gonadal steroids