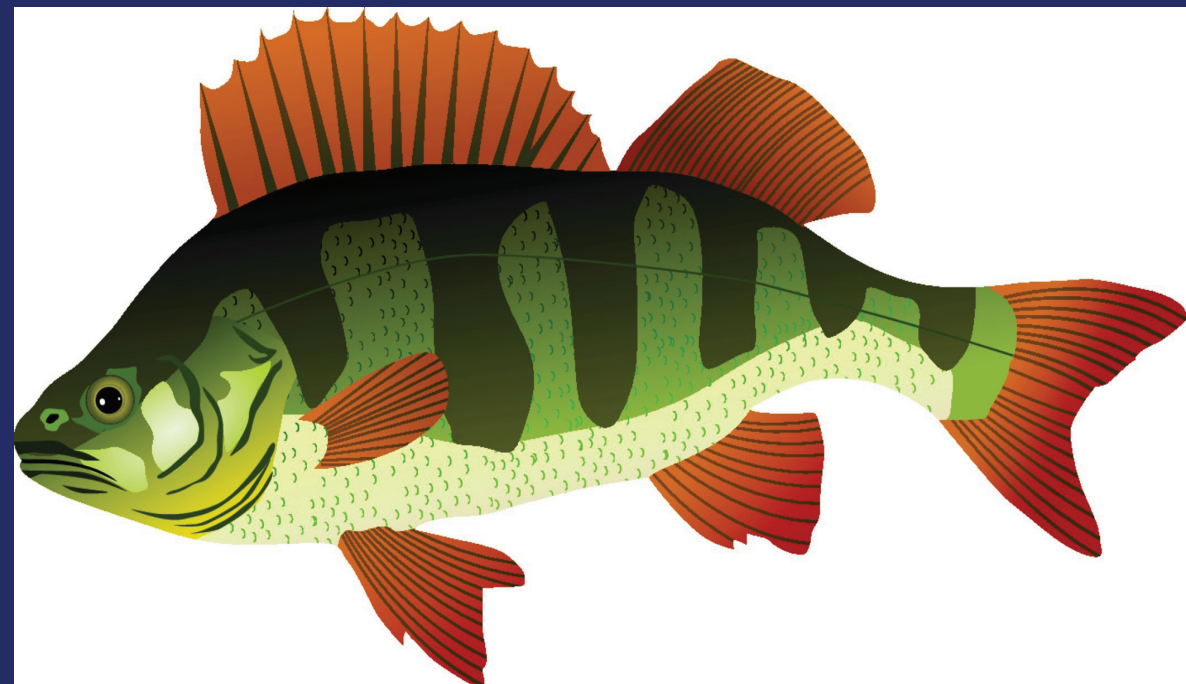


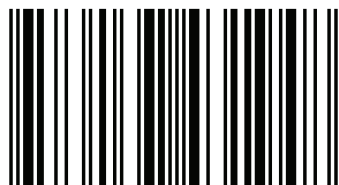
Fishery Science is one of the important subjects in the curriculum of both under and post graduate students of all Indian Universities. The teachers, scientists and students are also actively engaged in research in fishery science. For this purpose the proper methodology is necessary. The present manual is prepared for students and researches.



Kiran Shillewar
Dipti V. Totawar

A Text Book of Fish Seed Production

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978-613-7-43194-8

 **LAMBERT**
Academic Publishing

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Cover image: www.ingimage.com

Publisher:

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International Book Market Service Ltd., member of OmniScriptum Publishing Group

17 Meldrum Street, Beau Bassin 71504, Mauritius

Printed at: see last page

ISBN: 978-613-7-43194-8

Zugl. / Approved by: University

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A Text book of
FISH SEED PRODUCTION

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PREFACE

Fishery Science is one of the important subjects in the curriculum of both under and post graduate students of all Indian Universities. The teachers, scientists and students are also actively engaged in research in fishery science. For this purpose the proper methodology is necessary. Being a fishery science teachers we felt the information required particularly the methodology to study the fish seed production in a consolidated manner. A effort has been made towards bringing out a manual to fulfill the requirement of students and researchers concerned with Fishery Science.

The present manual is prepared for students and teachers as well as researches.

The authors are very much thankful to Dr. D.U. Gawai (Principal, Science College, Nanded), S.L. Jadhav (Librarian, Science College, Nanded).

Criticism and suggestions are always welcome for further improvement of this book.

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Chapter – 1

INTRODUCTION

The life of a fish as a constant struggle with the environment where from it draws is basic requirement it, whoever, adjust itself to the ever-changing factor which are relation favorable, but more often inimical heist verge Constance. Food is basic total vital functions of an individual fish as well as the population with the limited supply of food on the environmental there is bound to be can computation among the individual whose diet requirement are identical. Food, together, with various ecological & physiological conditions determines the migrations of blooms production.

The movements and migration of fish population are primarily in such of favorable grading & Spawning grounds.

Throw various with age, condition fetor and number of obviate factors, water monition of growth at sensitive very of age is fundamental to assessing the retook recuperation of a given stock numbers natural and exploited conditions. The body length of fish try a certain mathematical relationship with its weight and this relationship might change with the different peers in the life cycle and provide some inform atonal the causative fortune bringing about such changes.

Reproductive biology that including breeding periodivty and fecundity when the determination of the periodiaty of strength of the brood which configure the Jeor-classes. Some fish goes on migrating to distant ground to breed. The reprodvetive potential of a population, that determind by its absolute fecundity, for exceeds the rate of surviva to the age at recruitment. Recruitment of srong year clisses into the fishery could afford better catches from the expolittion by the degree of abundance of the stocks which inform is determined both by fishery dependent and independent factors. Overfishing to that leads to decline in yields and diminishing sectors. The evils of overfasting could be eliminate in through the application of management measures that formulated on the basis of studies in to the dynamics of the exploited populations.

Investigations into all the problem in report of feeding growth reproduction dynamics calls for appropriate methodologies. Since the population is a large utility, all observations have to be based on samples. Sampling should representative of the population structure, it should unbiased and made preferable at fixed time interval.

The fishery problem that goes on investigation on the basis of sample taken from the commercial catches and exploratory survey and experimental fishing carried out in a commercial fishing ground, feeding grounds or spawning grounds some of the methodologist shows following way :-

1) FOOD :-

It is known as vital important to every organism as its growth development reproduction and other metabolic activities that are generally dependent on the energy that recruit from the food. Fish are no exception on this and information on their for and feeding habits is very essential for better understanding of their history including growth, breeding and migration and are for the management of commercial important fisheries. Acknowledge of favorable feeding ground of commercial fish shoots is of great practical significant to fisherman to expand their fishing effort profitably.

Thus, the way fish are classified depending on their feeding habits as predators, grazers, strainers, sookers, portions and they ever changes in the structure of their feeding and digestive organs also take place. Hence a study of the food of fish is generally useful for the exterminations of the habits, distribution, migration and associated factors.

Thus the fly depending on the food habit the fish shows the development, growth and naturally breeding capacity. Induced

breeding or hypophysectomy, goes on enhancing the reproductive capacity of fish for better yield.

Thus the breeding behaviour varies in the fish from once in the life time to come in a ten or fourteen year (guila) from India. Major crops breeding is reasonable that coinciding with rain and flood, which are offered grateful opportunity for survival and development for the progeny. Thus endocrine system that acts as the regulatory between environmental events and maturation directly or indirectly the on the other hand and medicine directly or indirectly the require metabolic adjustment in the body, the appearance of secondary sexual characters, during the breeding seasons mobilization of energy potential for gonadal developments and maturation. Breeding behaviour during courtship this timing of reproduction are activities largely by hormones pituitary and gonadal hormones.

Here are try to put forth the formation or the preparation of pituitary hormone, that known as hypophysectomy the method for injury the hormone. And specially discussed about how pituitary hormone affect on or influence, the gonad development for reproduction. Here we will also discuss spawning and fingerlings and the reproductive capacity of fish. We will also show the how transport of these small fry and fingerlings carried out. So it is just a small step to fly to climb the mountain.

Chapter – 2

Introduction of spawn prospecting :-

With going on increasing emphasis on fresh water fish culture. India's requirement method of the collection of carps spawn and the fish trade, which has built up over years in Bengal (Rehman 1946) soon spread to the neighboring states of Orisa, Bihar and Assam (Jan 1951) and the industrial developments at the hands of government agencies as well as private pisciculture, inadequate scientific knowledge in regard to the collection and transportation of fish seed resulted in entering a great loss of numbers.

This is a significant thought unfortunate for that neither the spawn collection nor the method of their collection and measurement are as yet standardized (Barratpore 1965) despite the intensive collection of carp spawn and fry in certain regions of, some rivers a regular survey of such resources has not been made except in a few cases. The CIRRI has helped in the locating new carp seed collection centres from 1949 through 1957; however initiated only in 1964 a pioneering programme of seed prospecting investigation on various river systems with a view to ascertaining factors that are responsible for fluctuation in the population of quality of fish seeds and providing their availability in time and space. The programme envisaged the evolving and standardization of spawn collection nets as well as improving the techniques of collection and measurements of fish feed on an all India basis. It has also been estimated that the riverine seed collection contributed at about 91.67% of Indian total fish seed production of 365,90 crores falls short of requirement of fish seed by 184.69 crores for the present culturable water of 6 lakh/hec. It has been also estimated that as much as 945.59 crores of spawns are required/ yr. To the present culturable (6 lacks) and still unutilized but readily available water for fish culture. If however, an additional 6 lakh/hec. Water area, which needs before being brought under culture are for the fish production. The total deficit

of fish seed in the country will further rise to about 1,30 crores of fish seed.

Beside the requirement of spawn the present culture water need one 165.18 and 82.59 fry and fingerling against production of 21.14 and 9.19 crores respectively (Govt. of India, 1966). The defect in production of fry and fingerlings will be wider if ready available and reasonable water taken into account.

Jorge and sinha (1975), while drafting a 10 yr. aqua cultural plan for India, have estimated that the seed requirement, of reverie spawns to be 3,774 millions in 1979 and 6 thousand millions in 1984. They have also estimated that the requirement of spawn production by bun breeding and induced breeding to be 416 millions by 1979 and 2451 million by 1984. These requirement of spawn from rivers, buns and induced breeding are to be fulfill the stocking needs of 0.468 millions of water area propose to be brought under the traditional and 0.132 millions hec. Under intensive culture and 0.136 million under the fish culture in water by 1984.

In order to meet this huge shortage of fish sed and to achieves self sufficiency on the regional as well as country wid basis, there is a thus need for the location of additional productive riverine fish seed collection centres. Jhaingran (1968) have has revealed the exciting seed resources and method of their exploitation with a suggestion of further development in order meet the growing demand.

Chapter – 3

Fish seed resources :-

The diverse geographical and climatic condition of India goes on reflecting in the river in resources of the country. The different river system of the country, and depending upon their individual ecological conditions such as the flow, depth, temp., substrate and etc. that displays variations in the regard to the distribution and abundance of their fish fauna.

The generally of north, originating Himalaya, glaxis and deep pools of the 3 systems Ganga, Brahmaputra, and Indus. Ganga in know as the largest and contains perhaps, the riches fish water fish fauna in India. The rivers of peninsular in India, as already stated divisible into 2 groups the East coast and west coast river system goes on differ from north not only in that they flow through the deep regions thick forest and inaccessible train, but also in respect of their fauna and its abundances. Except for most significant difference in the rivers of north those of peninsular India on the greater abundance of India major Carps. In the former and poor availability in later which naturally bearing on the production of quality fish seed and potential in the two regions.

Brahmaputra River System :-

The Brahmaputra river system flow in the state of Assam, Nagaland, Tripura and comprises the fast flowing rivers which are rather destitute of the cordially important for major carps (motwani 1959).

The northan bank tributaries of Brahmaputra are comparatively large with step shallow sandy heeds and array heavy slit charge, while those of the south bans are comparatively deep with mean during channels of flatter gradient and flowing through fin all vial soil, they carry low slit charge flies one of these south bank tributaries viz. river dikhow that a systemic collections of carp eggs was in vogue at Naira in sibsagor district.

The collection used to be made in this fast flowing river with steep bank by fixing two long bombos pods near the bank with a boat field on them across the current A piece of round meshed mosquito netting about 4.6 X 1.8 in dimensions, field to two small bamboo poles at other end sired as the collections gear. The person one at each end of this netting healed it against the current and lifting it up it every after '10 to 15' m inure they collected all egg caught by netting. The parentage of major carp in the collection between poor it would out to be uneconomical and was since 1961 replaced by spawn produced through induced breeding even though fingerlings are still collected at a few centers and the river Brahmaputra in the daring and Goalpara district of Assam poor success in including the catla in breed necessitated the impor of fish fry from the adjuring states.

In order to access properly the potential of the lower Brahmaputra in regard to the availability of quantity spawn pilot pep sting investigation.

Were carried out during May-June 1901 in the district of Kamnap and Goalpera. These investigations has read that major carps. Spawn is available in the lower Brahmaputra and an the profitably exploited in a commercial basis. The centers of Ofering greater potential is Khanamukh and Bomandib in the Goal para district.

The Brahmaputra, being torrential and fleshy due to steep gradient of its tributaries changes its tributaries current pattern try rapidly so much so that within the 14 hours the pattern may goes on changing in a number of rivers system in India where the changes in current and flow pattern are not serial as in Brahmaputra a knowledge of the flow pattern of river in relation to its torturers and the monsoon influx is essential for successful few exploitation of succeed resources.

3) Indus River :-

As we goes on compressed to the Brahmaputra river system the Indus system is rather rich however, only a sell portion of the system that comprising the Beas and the Sutlej and their tributaries is now within India. The network covering the status of Himachal Pradesh, Punjab and Haryana. There is no commercial fishery for the major carp in Himachal Pradesh with the upper reaches of the system there is harboring only the cold water forms. Spawn collection for reverie sources in the erst while Punjab state as unknown till 1963.

Spwan prospecting instigation conducted the C.I.F.R.I. during 1966 led to locate two good spawn collation centre on the Sutlej Lodowal and Giddorpini and one of the Sutlej which could be profitably exploited in future years.

Fry and fingerlings collections which has been only source of fish till now for the east while Punjab state is done at Kanjli and Sultanpur lodi (Kapurthala) and Lodawal (Ludhina) in the Indus system.

4) The Narmada and Tapi river system :-

Spawn collections an right important centers in Madhya Pradesh has been in vogue for sometimes and a survey of the resources in the stretch flowing thought m.p. conducted by Rajan and Kaushik in 1958 and Duhey (1959) shows the area to be rich in the spawan of "Labeo fimbriatus".

The Indian major carps constitute about 20-25% of the total spawn collection from the 'Narmada' in Madhya Pradesh.

A systematic survey of spawn resources of the Narmada river draining the Gujarati state was conducted by the C.I.F.R.I. from 1959 through 1964 with a view to locating new and productive carp seed resources. Productive centres were located at many places in spite of the high major carp content. The considerable unsuitability for commercial operations due to the high food levels reached even during normal floods.

This is significant that the percentage of major carps and that of *C. catla* in particular is sufficiently high at the entree in the lower stretch of the Narmada in Gujarat state than in middle stretch draining Madhya Pradesh. The upper stretch of the river being rocky and unproductive is not suitable for seed collection.

It may be mentioned that the Narmada is the only river in India which is presently exploited for its masher seed regularly during October – January every year where larvae of fry are collected and directly stocked in tanks.

5) The Mahanandi River :-

Mahanandi the largest river of Orissa being the status only major sources of fish has been considerably exploited over the years. The river mainly originates in the Hillstream from its origin where the Hirakund Dam is in Sambalpur district. The stretch between Sambalpur and Cuttack has been intensively surveyed by fishery Department of Orissa and large number of spawn collection centres located most noteworthy of which is Nuapada near Cuttack.

The other less important river of Orissa known for spawn exploited are the Bargarhi, Brahmani, Daya and Subarnarekha all of which like that of Mahanandi itself. Yield spawn of average quality however throughout Orissa.

6) The Godavari Krishna River :-

The Godavari and the Krishna along with tributaries, mainly draining Andhra Pradesh are sufficiently exploited for their fisheries in the deltaic regions, their upper reaches in Maharashtra being destitute of commercial species no spawn collection enterprise worth the name existed so far in the Godavari in Maharashtra. Spawns are prospecting investigation that are conducted by the C.I.F.R.I. during 1965 have, however, held in the lowing a centre at Nanded. Where catla (13.3%) was found to be only major carp, that available in spawn in small quantities.

"Labeo fimbriatus" however dominated amongst the carps. The status at Paithan/ Shahgaph had to be rejected due to nonavailability of major carps spawn.

The deltaic stretches of the two river system however are sufficiently ribbon carps fishery, but the percentage of major carp spawn is only 20.3 in the Godavari at Rajahmundry (Ibrahim, 1901) systematic survey of the spawn resources of the Krishna has not been so far. However investigations, that conducted at Hesarur and Modalighatti in over Jungabhadra and Keldodu on river vedavathi during 1965 revealed that major carps spawn was not available at any of these sites (Borrackprove, 1966).

7) The Cauvery River System :-

The Cauvery learns no comparison in regard to its physical features & fish fauna with any other river in India. While upper reaches, being fast flowing & sufficiently cool, are unsuitable for carp fishery, the middle & lower reaches harbor a fairly good fishery of major crops & indigenous varieties viz-Loheokonfics, Cirrhinus cirrhatus, puntius dubis and puntius cavanaticus.

The Indian major carps (catla, Rohu, Mrighal) which were translated in the Cauvery river also in its tributary, behaving (Hoeneld, 1924) have established themselves and not only

provide a lucrative fishery but are also available in the fry and fingerlings in the deltaic paddy of Thanjavor district.

Ganapati and Alikunhi (1949) reported that the collection of spawn and hatchlings of major crops in large number from the Cauvery, Bhavani and Maysor'. The spawn investigation that conducted by the C.I.F.R.I. during 1965 at Hogenakal and Kulithalai on the Cauvery revealed that *cirrhinus reba* and *Labeo kontius* dominated both the eggs and spawn collection at these centres. While *cirrhinus reba* was known as the dominant species even at moulathurai on the Bhavani, eggs of *Labeo calbasu* in fair numbers and of *cirrhinus mrigala* in stay members were also available at the site (Barrackpore 1966).

SELECTION OF SPAWN COLLECTION SITE :-

Before selecting a suitable site for the collection of spawn in a given stretch of river, a pre monsoon survey is conducted for ascertaining.

1) The topography of the terrain and bank features at and in the vicinity of site to determine the extent of operational areas expected to be available in different floods for operation of nets.

2) The distribution and composition of the fish fauna in the selected stretch of the river, resident or immigrant, for assessing the abundance of major species during the monsoon season.

3) The location of canals, rivulets and “nullahs” along with their confluences with the main rivers; as they might constitute important connecting link between the rivers and the breeding ground.

4) The identity and accessibility of a site. River meandering in plains result in serpentine course with the cutting of oxbow lakes. The bends and curves of various shapes in the rivers course of the show a precipitous, fast corrosion bank on one side, exactly opposite called here Shadow Zone. Both these banks are unsuitable for spawn collection. Better collection sites generally lie on the side of the sloping bank, but at spot where the current just diverges casting off spawn to the sides, also by centrifugal force. At such sites, a large number of spawn collection nets usually are operated.

Chapter – 4

Methods of fish breeding :-

1) Hypophysation

It has been already reported that the bank of India's fish seed supply is derived from river collection which almost inevitably comprises a mixed off lot, and may include uneconomical even predatory forms. Further, as such seed are available at some specific centers located on rivers only, great difficulty is encountered with the transporting them to markets, such a process however, besides involving heavy mortality during transit, is expensive.

Procurement of pure seed of cultivable fishes from a dependable source based on problems in India technique of hypophysation was successfully applied to Indian major crops in 1957-1959 at cuttock substation of "C.I.F.R.I."

Das & Khan (1962), Jhingran (1969), Tripathi & Bhimarch (1972), Shina et. (1974), Moitra & Shankar (1975) have revived the history of hypophysation of fishes.

The present day concept of the role of pituitary in the reproduction in vertebrates, according to At & Pickford (1959), may have said originated from the experiments of Ashchism & Zondck in 1927, who noticed that pituitary gland implant accelerated general development in mice. However the concept of the application of pituitary injection for successful spawning of fish is due to Houssay of Argentina.

Brazil was known first country to develop a technique for hypophysation. Von Ingher & his workers, Mortises, Cardoso, de Azevedo & others, conducted the experiments with the various hormones on the line of Moessay (1930) & waived success in 1934. Since the Brazilian fish culturists have been employed the line technique to obtain seed from indigenous fishes as a part of their routine piscine cultural programme.

The Russian was considered the next to introduce hormones treatment in the fish culture after the Brazil. It was not until 1937 that Gerbilskil (1983) should seed & since then this method is being utilized with the advantage is soviet union for the production of sturgeon eggs in forms situated along the lower Volga & Kulson & other rivers.

In India, the first attempt to induce fishes to spawn was made by khan (1983) in which the employed mammalian pituitary hormones. He successes in inducing ovulation in Chirrhinous migrala.

He as in minis rated 80 to 120 rs. Protein andante with in it into female marginal & Rohu which rendered them easy to strip but eggs could not be fertilized. Chaudhori (1955) was the first to successfully include Esomas donricus to administrating pituitary gland extract from cirrbinas Reba. Ramaswamy and Sandoras (1956-1957) reported successful breeding of catfishes, Heterophstas fossils & clor as barouches during 1955 & 1956 respectively by hormonal injuction. Choudhory & Alikhan in 1957 succeeded in including Labeo rehita Cirrhiascs Mrigala by the breeding them by injection with the corp pituitary extrant.

The technique of breeding of India corp by hypophysation received by Alikurnhi (1969) Chondar (1970). A breef description of the technique of induced breeding corps for the technique of induced breeding by pituitary extranet injection is employed for breeding corps for the formation or production of seed as given below.

The pituitary gland for breeding are collected from gravid fishes of both sexes either belonging to the same species as the recipient or a closely related one. Vorghese it at (1975) found that the gland from marine cat fishes to be equally effective, though the doses are slightly higher than those of corppitutoroes. Bhawmilk at (1979) bred l. rohita by the injecting extract of the pituitary gland weighting 10 to 16 kg of body weight of the recipient corp but found that the gland from marine and the freshwater cat fishes ineffective even at 12 to 20 mg 1 kg body weight of rohu. Glands from the freshwater murrel spe. Tilapia assombica species and

motive brackish water fishes, at very high body weight is also ineffective.

That's why partially purified salmon pituitary gonadotropin (SG-GLOO) induced 72.4% female & Rohita. Spawn are at 5 to 13 mg of extract/ kg body weight of recipient.

The gland that are use prefer convicted from freshly killed fish, but those taken from 5 to 7 days of cold ice preservation specimen have also given successful result. Firstly gland that removed from the fish head by cutting the skull with that of sharp butchers knife forums. In Indian market, where the cut fish heads over of ten available, the gland can be taken out from the posterior end of the cranium through foramen magnum after clearing the brain tissue.

Then pituitary gland immediately after collection kept in the absolute alcohol for the dehydration. After 24 hours the alcohol is changed for further dehydration & defeating. The glands are then weighted and preserved in fresh alcohol in dark colored phials stored either at room temperature or in refrigerator. The weight of glands may vary from 7.0 to 18.8 mg in rohu weighting 1.0 to 3.6 kg & 3.0 to 22.8 mg in marginal (0.3 to 3.5 kg in weight).

At the time of injection of breezes the required of glands are taken out of the phials and the alcohol allowed to evaporate. The gland then macerated with a tissue homogenizer either in distilled water or 0.3% saline. Further, dilution is usually made by adding the some filled to render the rital solute at the rate of 0.2 ml per kg weight of breeds. Usually the volume of dose not exceed 1 ml. the gland suspension is then centralized and the supernant fluid is drawn into hypodermic by ring for injection.

Lbrahim and Choudhari (1966) have desired a method for preserving pituitary extract in glycerine. In this method, a known quantity of pituitary gland after homogenizing as distilled water, is diluted with 1/3 of the total volume of extract calculated by desired concentration the suspension is kept under refrigeration for 24 hours pure glycerin as then added to make up to total xo, volume of extract (i.e. 2 ml glycerin). Then extract is again kept in the refrigerator for another 24 hours. It allowed to centrifuged and

supernatant fluid transferred into ampoules for further use. The advantage of this method is that it permits hormones extracted from a large number of glands at a time.

Ensuring hormone potency per unit volume of the extract & soving time in the preparation of injection dose. Glycerine extract is found to retain its potency from 9 to 11 days at room temperature under lower temperature.

Two males per female by weight are given a second case each of 2-3 mg/kg weight at the time of second injection to the female if spawning is not effected.

Both the injection males and females are kept together in a breeding "hapa" for spawning. Slight alternation in doses may be made depending on the stage of maturity of the breeders as well as on environmental factors.

Intramuscular injection of pituitary extract is administered with a hypodermic syringe. With BD needles no. 22 for fishes weighing 1.0 to 3.0 kg needle no. 19 for foregone and needles no. 24 for smaller spanners, at the equal pended or shower region near the base of the Dorsal fin.

Both the injection males and female was kept together in a breeding hapa for spawning.

HAPA :- A breeding hapa boxed – shaped depth container provided with a cover. Add slides of a hapa are closed excepting one through which spanners can be introduced or taken out. The open corners also can be closed after the introduction of breeding hapa's, made of fine – meshed mosquito net cloth, are of varying dimensions and used for breeding fishes of different size groups.

The breeding hapa are fixed to bamboo in pond' channel, river or any watershed. About 13 to 23 of hapa should remain above the water surface while the bottom should not touch the muddy pond bed.

Rip males with milt oozing freely for ceding gently pressed and the female with soft bilging rounded abdomen and with the reddish vent are selected for breeding purpose. A male "Indian major carp" can easily be distinguished from the female during the breeding season by the roughness of dorsal surface of its pectoral fins compared to smooth are always preferred. In order to maintain their breeders in a healthy condition. They are often fed with the mast red oil cake and the rice bran at the rate of 1% of their body weight for a few months prior to breeding season. The stoking rate of the breed fish in pond is 1000 to 2000 kg/ha. It has been absolved that the female breeders especially culta occasionally give a denture appearance of a fully ripe female, but on being cut open the fish may be found contain excess fat on their body cavity with immature gonads. According to Badami & David (1964) culta attain the sexual maturity and respond to pituitary injection when fed on the rice bran alone, but not on mustered oil cake.

Gupta et al. (1979) recommended feeding the brood fish at 2-3% of the body weight with a nature of ground – nut oil cake and rice bran (1:1w/w) fortified with vitamin E (Ephynal-Aplha Tocophery Acetate) at 5mg/kg of the body weight of fish/day since it result in a higher gonadosomatic index, size and complete spawning of on hypophysation leading to the production of larger numbers of eggs.

Recently, Singh et al. (1979) observed that proper brood care in case of silver carp by aeration of pond or supply of fresh oxygenated water to the brood fish result in the prolog nation of the spawning period. The authors aerated the pond water by diesel pump. During May and June 1979 and later by on air compares or during July to September and bred the fish from August to October through administration of pituitary extract injection.

The accumulation of mesenteric fat in grass carp feeding exclusively on hydrilla and its possible inhibitory effect on gonodial maturity, has also been confirmed in Malacca fish from (Malacca 1965). Fat deposition can be controlled in grass carp by starving them for period of one month or by feeding them with Napier greens. However this also been reported that continuous starvation naturally effects gonodial maturity. According to

elements and gront 16 day of feeding to regain the original condition. When the fleshes are given ration only for their maintenance, their glands do not develop in the excepted manner.

The Indian major carps, normally breeding once a year either naturally or though hypophysation during monsoon, were induced to breed twice within an interval of about 2 months. Almost equal quantities of egg were obtained at each of the two spawning, there by doubling the production of spawn. Subsequent to fish having spawned in the breeding hapa, the fertilized eggs are water-hardened after the embryo have commenced twitching movments, are transferred from the breeding to a hatching hapa. The hatching hapa is fixed inside a pand.

Sometimes heavy mortality occurs due to sudden rise of temperature and adverse physic-chemical conditions of water in pand clear water without weal bloom gives a satisfactory result.

The hatching technique is the some as described under the hendh breeding. Eggs are spread uniformly all over majority of eggs hatch out within 14 to 18 hours after fertilization. Hatching escape to outer hatching hapa though the holes of inner hapa. The egg cages & had eggs are left in the inner hatching hapa which is removed after all the eggs have hatched out.

Human Chorionic Gondotropin (CHCG) :-

Human chorionic gondotropin (HCG) is a Glycoprotein harmone which is produced by the placenta in the pregnant woman. During early pregnancy the Harmon appears in the urine is large quantities.

When this injection to mature fish, the hormone is known to cause release of gamets (sperm & ova).

It is thought that its action of inducing sperm, and ovulations a joint action, synergistically with the maculating pituitary hormone. When HCG is injected singly it is not so effective as when its injection together with pituitary gland extract.

In india, use of HCG in induced breeding of fish stated due late in 1980's.

Both Indian and Chines carps have yelled good result. This universally becoming popularly I fish form in west Bengal, Haryana and Madhy Pradesh. INFAR (India) Ltd. Has brought out a product wonder the name of summach which is essentially HCG. This cheap as comprised to the pituitary gland extract and has a long shaft life wise.

The product is grinded in distilled water (1 gmin 0.2 net) and mixture is centrifuged. The spearmint is used for injection.

DOSE :- 1st injection is given to the female for priming which is followed by the second injection given simultaneously to both the female and the male. The first dose is smaller. The second dose is given together with the pituitary gland extract. The dose is weight dependent of course for the best result, fully ripe breeder and forever weather condition are must.

A number of new generation drugs are now available as on alternative to the pituitary gland extract in hypophysation. Some of these druge can be provided cheaply & hence can replace the pituitary extract.

However many these are still in the experimental stage awaiting for their commercial use future strategy depends upon their effectiveness & feasibility of application upon their commercial serve.

Administration of the drug through diet is performed over administration by injection. Some important drugs are enumerated below.

- 1) Ovaprim (salmon, gonadotripin RH)
- 2) Sumacch (HCG) & Synohorin
- 3) Pimozide & (LH-RH-A)
- 4) Doc. A
- 5) Anti oestrogen tamoxifer (on anti androgen).

The preparation of ovaprim by salamon gand otrap RH and domperidon.

It is available in view since 1988 is extensively used. In India, food result have been achieved with this Utter Pradesh, Andhra Pradesh, West Bengal, Bihar, Assam, Mandhy Pradesh, Karnataka, Kerala, Orissa and Maharashtra. This to be known that much before these pituitary gland extract. Production or the formation of egg from raha achieved by due of pituitary extract is 1.15 lakh but by the use of oviprism this increased to 1.41 lakh. This known as weld known production of syndal ltd. Canada and distributed in India by Gloxes Indian ltd. Bombay for sammach as written was known product of chorionic gonadutrapin & mammatian hypophysical extract.

Primozone is a dopamine antagonist having ovulatory releof LH-Rh A. this quite effective an India major corps. The LHRH (L-Luternising hormone releasing hormone) and its analoge (LHRH-A) are very effective on backish water fish. They are cheapot, at present the preparation are short lived. Their application shall await production of long acting preperotions.

DOCa (II-Desoxacosternoe - acetate) is another veru effective drug which has been tried on cat fish. Clarius and heteropneustas. They are a bit different in the sense that they not only cause ovuation that may also commercial use is realed out because of high cost.

Anlioestrogen tamocifen (I_Ip Beta – dimethyl) has given a good react an coho salmon especially when administration in conjunction with a primary bring out early ovulation, under ther experimental research, it has still not been used for commercial purpose.

Chapter – 5

FACTORS CONCERNED WITH INDUCED BREEDING :-

Environmental factors that are like light, temperature, water condition, meteorological conditions and etc are known to play important role in estimating the release of pituitary gonadotropic hormones within the organisms and their by controlling reproduction of fish.

1) LIGHT :-

Light is known as one of the important factor that controlling the reproduction of fishes. Early maturation spawning of fish as a result of enhanced photoperiodic regimes have been reported in 'Nastriops brifrerds' (Havrington 1980 snf 1957) *Enneacanthas obseas*.

(Harrington, 1956) contrary to that there are also observation on delayed maturation and spawning of some species of fish in now then latitudes for example, *Salverivus fonfinalis*, *Salmogirdnerii*, *Onchorhynbus rhodures*, contains the early maturity on under experimental conditions of short light periovels and delayed maturation under long light period.

In India *Cirrhinus reba* is onservred to attain early maturity when subjected to artificial day length longer than natural when at the low temperature of the wistomonths at about 19-20c. the resumption of gonads in this species delayed and spawning condition can be maintained up to November. The prolongation of the spawning period is important from interview point of piscicueore.

These status eval that the requirement of light of activation of reproduction or reproductive cycle very from species to species and from place to place, as the day length and temperature differ depending on the latitude of the species converged.

2) TEMPERATURE :-

The role of environmental temperature on the sexual maturation and breeding of fish has been studied by several investigations. All

observation shows that there are optimum temperature ranges for induced breeding of cultivated fishes and critical temperature, limit, above and below which fish will not reproduce. However, certain Testis can made to ripen below the critical temperature by the administration of the gonodiotrapin, could advance the maturation of cycle corpio by 1/2 months by increasing the temperature of water injecting pituitary gland extract.

Low temperature is observed by to accelerate the earlier phase of maturity but goes on supporting later ones 10 “fondles confidants”, to delay. The sexual maturity in “Tilapia species” the low temperature retards the rate of sexual regression in hypophy sectomisedmale” fondants confluent” and when transferred to warm temperature it accelerates the rate of past spermatogonial regression and stimulates the rate of spermatogonial mitosis.

Worn temperature plays a primary role in stimulating the maturation of the rate of gonads in a number of fishes and also accelerates sperm nation. Thus is seems that temperature has (1) a direct effect on gonads (2) an indirect effect on the gonads regulating their ability to respond to the pituitary stimulation and (3) effect on pituitary synthesis and release of gonadatropins.

The Indian major carps are observed to breed within a range of temperature varying from 24 to 31 degree Celsius. Beyond this range, as the experiments rises higher fish do not spawn. Alikunhi controlled at 28 degree on the laboratory and observed that the fish spawned successfully when the temperature ranges is 1.8 to 2.3 degree Celsius higher. Ibrahim at (1968) reported that induced spawning of 391 sets of catla, rohu and marginal accused in a wide range of temperature from 26.5 to 35.0 degree Celsius during 1964 to 1966.

Thus these authors did not find any correlation between the water temperature and the percentage of spawning success in induced breeding.

When fish gives a effective dose of pituitary, spawn successfully even when there is substantial increase or decrease in water temperature. They are in agreement with cements (1967). Who states that pituitary injections to some extent by pass the

environmental variable of temperature, light and rain. Verghese (1969) obtained successful breeding and spawning in *Cirrhina reha* that has attained the early maturity under the influence of outgically controlling light and temperature and by increasing the water temperature from 25 to 29 degree Celsius at the time of injection and then allowed the water cool towards spawning time. It seems that pituitary injection at higher temperature in addition to repining the sexual product, may import the necessary nervous stimuli for spawning and the subsequent lower temperature may provide a favorable external environmental for ensuring maximum fertilization and embryonic development.

OTHER FACTORS :-

A part from light and temperature, rain – water and weather conditions are observed to be important factors for induced breeding of fish.

Successful spawning in majority of fishes has been induced on cloudy and rainy days, especially after heavy showers. The corps are found to breed at a firstly wide range of PH and dissolved oxygen contempt. The Chinese corps that have more or less similar breeding temperature, can also be induced breed under condition at per to spawning of Indian major corps.

The regulations of gonads-stimulating hormones by the pituitary initiate by environmental stimuli are mediated through hypothalamic centers. The nourobeersatory product are way of nerve fishes which in bony fishes, innervate the hypophysis.

Seasonal changes in the secretary activity of hypothalamic nuclei in teleports are found correlated with the reproductive cycle. Fountain and leloup (1964) have received the problems and conduced that here are several evidence showing the existence of a control extrude by the hypothalamus on the thyrotrophic and gonad tropic function of pituitary in fish, but further experiment are very necessary to establish its precise mechanism of action.

Chapter – 6

HYPOPHYSATION :-

No chemical standardization of fish pituitary gonadotropins has so far been done. The proper dose of gonadotrapin to be administration for successful breeding of fish roughly carried at by actual experimentation in predicator instant depending on the sizes and sexual maturity of recipient species and the potency of glands employed. To overcome these difficulties, the Brazillions proposed the use of a fish unit in which the suspension of an entire gland is injected. A gland weighting 1 to 2, g from an adult, 25 to 30 cm long and weighting 400 to 800 g is provisionally considered as one fish unit.

Russians were the first to develop hypogeal essay for the activity of fish gonadotropins. They found that cal the vaunt, to be a satisfactory test fish for assaying gonadetrapsins.

The principal merit of the hypophysation technique in fish culture is that it provided a dependable are rises sources of pure seed of the species dependable and rises source of pure seed of the species dependable furnishes a partial tool for successive breeding and hypophysation.

The mission of future researches should be realize the objective in practice with maximum efficiency and expending, and it should be in hypophysation of fibbes.

1) The firmest need is the isolation and determinations of active ingredient of pituitary hormones of chemical purity responsible for breeding of different species of fishes. (gonadetraptic hormones). Such a development may lead to the synthesis of fish gonad tropic hormone. To synthesis chemically pure gonad tropic hormone of fish pituitary in terms of measurable potency will, indeed, be a scientific feat of great distination.

2) The problems 1) above when successfully tackled will also throw conclusion light on the question of the physic chemical elevation not only of fishes but to the entire vertebra group.

- 3) There is a need to acquire through understanding of the physicochemical condition of natural fish pituitary gonadotropins in relation to season, age and sex development of the donor species.
- 4) Suitable media should be developed for preserving and storing pituitary extract of known potency for future use as this would help in setting pituitary bank.
- 5) It is necessary to understand that cytogenetically fish maturity and ovulation brought about by the administration of pituitary hormones as well as the procedures of resurrection which may lead to more satisfactory solution of the ovarian desorption.
- 6) Search for effective fish pituitary substances, between natural and synthetic should be vigorously continued so as this reduce the increasing demand for pituitary gland.
- 7) At present, there is no satisfactory method for measuring the potency and dosage of natural fish pituitary hormone the method adapted give only approximate result. There is no one can understand donor nor any standard test fish for the determination of the potency of pituitary hormone by bioassay. There is no any biological and chemical variables involved that the elevation of bioassay techniques still poses a challenge.
- 8) Like above all problem little is known at present of the effect of different type of natural food and artificial food on the growth of fish. Maturity and fecundity of various cultured species of fish. The same is true of the effects of nutrition on growth species become more extensive. The fish reaching early maturity and the female showing high fecundity with healthy variable ova are indispensable ingredients of breeding programme.
- 9) The role of food on the development of pituitary itself need through investigation. The role of light & temperature in stimulating maturation of maturity for prolonged period need elevation. The cause of fish breeding in nature has been composed to a spontaneous symphony of several finally attended nature factors. Played in wild nature, the fish former does get the benefit of it. He find it necessary to make the fish breed at a place of his

choice. Thus he does, either by force (strapping) or by the latest technique of providing some in documents (hormonal stimuli).

10) The hypophysation work it is necessary to acquire independence from the vagaries of nature for successful ovulation high possible fertilization hatching & healthy development. This will provide security against field in fish condition for breeding due to dependent on vagaries of nature such as early or delayed monsoon & high temperature.

11) selective breeding for stock important of a given species of cultivable fish & hybridization for incorporating in the progeny, desirable, parental or new qualities of high conversation value, fast growth nutritive value palatability mutation, recently & etc. are started earlier, reach dividends from hypophysation. While hybridization by trial & error may lead to practical result in field, it would be necessary to understand genetically the process of hybridization so as to evolve pure breeding throws & have pre.

IDENTIFICATION OF EGGS, SPAWN, FRY & FINGERLINGS OF CULTIVABLE FISH OF INDIA :-

Identification of regeneration of different species from a mixed collection of fish seed are vital importance for a selective stocking of ponds in order to avoid wasteful culture of economics species. Work on the life history of carp. in done by Khan (1925) Ahmad in (1944 & 48) Mukharjee in (1945) & like other such fish it was totally based on the life history stage or by the followed the development of eggs or of pro & past larval of different forms collected from river & bundh.

The identification of eggs, spawn fry & fingerlings based on available knowledge of literature that summarized as follows.

NAMES	DIAMETER	SHIPPT	COLOUR	SPECIES
Non - Flowing	1) 5.3 to 6.5	Round	Yalki ight-red	Catla Catla
	2) 5.5	Round	Brownish	Cirrhinus Mrigal
	3) 5.0	Round	Redaish	Labeo Calbasu
	4) 3-4	Round	Bluish	Labeo calhasu
a) Danaelhesive	5) 4.5	Round	Bluish	Labeogoni
	6) 3.8	Round	faint-pale-bluish	Labeo Puntius
	7) 3.5	Round	Bluish-pale-bluish	Labeo fimbriates
	8) 2.1-2.3	Round	Segemented with numerous oil globlu which coalescelator to form a large oil gloubhue.	Hills Hilsa

Cont...table

NAMES	DIAMETER	SHIPPT	COLOUR	SPECIES
b) Adhesive ajnon - filaments :	1) 1.5 * 1.3	Oval	Grenish	clorits batraches
	2) 1.5	Round	greenish	heter opneustes fashis
	3) 1.2 - 1.5	Round	yellowish	klawago culta.
	4) 3.5	Round	yellowish	notopteras notaptetive
	5) 6.5	Round	yellowish	N.chitala
	6) 2.0	Round	Light-brown	
3) Danaelhesive	1) 4.5	Round	pate-transporants arge oil globute	Rhinomugis Corsula
	2) 3.8	Round	goldnomber	Channa Punetates
	3) 3.5	Oval	Amber	C.striates
	4) 1.5 - 1.7	Round	Amber	C.marullus
	5) 0.7	Round	Transperent	Anabas tertudines

Table - Identification of corp spawns into Desirable species.

Length 5.0 to 5.5 :-

- 1) Yolk sac absent, age pigmented, mouth formed, undesirable dorsal fin differentiated and with or without fin support.
- 2) Yolk sac vestigial, disappearing mouth undesirable formed embryonic fin-folds continuous.
- 3) Yolk sac narrow, anteriorly, embryonic finfold undesirable continues eye pigmented.
- 4) Yolk sac wide anterior, embryonic finfold. Desirable continues, eye pigmented mouth formed.

Length of 5.61 :-

- a) Yolk sac disappearing rudimentary or abort.

Embryonic fin-folds discontinuous, rudiments undesirable of dorsal fin with or without fin rays indicated mouth formed, eye pigmented.

Yolk sac wide or narrow anteriorly, embryonic fin-folds mouth formed eyes pigmented.

Length of 6.51 to 7.5m :-

Yolk absent dorsal fin with rays with differentiated, requirements of anal fin visible, embryonic fin-folds.

Yolk sac rudimentary or absent, dorsal fin indicates but without fin supports, embryonic fin-folds continuous anal fin not indicated, mouth formed, desirable

Eyes pigmented.

Chapter – 7

INDUCED BREEDING OF CARPS

1) PREPARATION OF THE PITUITARY EXTRACT FOR INJECTING :-

For the preparation of extract the pituitary gland is removed from some donor fish for best results, the donor fish should be a fully ripe fish in advanced stages of the maturity just prior to spawning period.

The donor fish may be freshly caught or preserved in the unit use. The common carps (cyprinous corpio) is a chosen donor for most countries it breeds through the year & there for more individual are available round the year also this fish gives relatively layer gland. The gland does not show species in the recipient fish, although glands from some or related species as the recipient tubes are more effective.

The method of removal of glands are principally two :-

- 1) Removal of gland through forms magnum. The former magnum is the first exposed on the fish head by removing vertebral ports adhering to the skull. Pat is removed from above the brain parts by means of forceps first are now inserted into the former magnum dorsally to the brain. The anterior part of the brain is now detached and the remaining brain is carefully lifted out through the Forman magnum. The pituitary gland is located & carefully removed.
- 2) Removal of gland by dissection of head, using a sharp butchers knife, portion of the scope (brain) is chopped off in and cut with one stroke. Fat surrounding the brain is now removed with the help of cotton. Olfactory & optic nerve are now served, and the brain is lifted up and removed. Locate the gland. The gland may

comes along with the brain, cavity often covered with a membrane. In any case, the gland is carefully removed after separating it from the membrane or the brain power. The gland must not be damaged or torn. The first method is easier and less time-consuming. Also it is more economical because the cut head may be still sold out after removal of the gland. The second method is not preferred because it renders fish-head useless for sale as the operation brings about complete mutilation. The pituitary gland after removal is preserved for future use. The gland may be immediately frozen & stored in frozen condition in a refrigerator. In Russia the gland is preserved in acetone 50 p (10c) an easier, method, not requiring use of alcohol and store it at room temperature. The gland, however may also be used in fresh condition for preparation of extract. The preserved pituitary gland is measured in a homogenous with the this water then the extract is freed of separated particles by means of centrifugation. This is then diluted with 0.5% sodium chloride solution. The extract is now ready for use. However, if the extract is to be preserved for the future use. It is preserved differently. In place of sodium chloride solution, glycerin is used and the extract preserved either at room temperature or in a refrigerator (for longer period or storage). Other method of preservation of the extract includes use of propylene & the tricolored acid in place of glycerin. Then the extract is administered into the body border with the help of hypodermic syringe either intramuscular or intra peritoneal.

2) SELECTION BREEDING :-

The proper selection of breeders is the key to success in induced breeding. The breeders should be healthy. Firstly ripe and of medium size. They should preferably come in to the age group ranging from two to four year and a weight ranging from one to five kg. large sized breeder are avoided for difficulty in the handling. Fully ripe male shows roughness on pectoral fin when its bally, and its unit is swollen, protruding and pinkish in colour.

It is wiser practice to keep a really adequate stock of potential breeders. For this, a few months before under core, and fed in supplementary food such as, bran-oil cake mixture.

3) INJECTIONING THE BDREEDERS DOSAGE AND POTENCY OF EXTRACT :-

To ensure a higher percentage of fertilization during induced spawning this necessary that there is a synchronization between evolution and milt shedding. This is different to achieved with or in the showed. For intra-personal injections, the sites chosen are the bases of paired fins. The preliminary injection is generally gives at noon and the second one in the evening. However, the injection may be given at any other time as wild.

4) SPAWNING IN BREEDING HAPA :-

After the breeding our injection with pituitary extract, a set of breeding is released into the breeding hapa. The hapa is cage of fine setting. Rectangular in shape and is bad an fear bonbons, polecat each preferred for the purpose, asides meshes will allows a good circulation for the water, and will also net let the laid eggs and milt escape through the meshes. The hapa is so held in water that about zoom of its height remain above water lead. The roof can opened or closed.

Spawning takes place within 300 hours following the second dose. It turns out to be mid-night if the second injection was given in evening. A successful induced breeding result in a spawn of fertilized eggs. Fertilized eggs appear transparent, pearl like where as the unfertilized eggs opaque and whiffing a set of breeders having one male and one female. Therefore the common practice is to use a set consisting of one female and two males.

Determination of correct dosage of pituitary extract to be given to the breeder is very important through a different matter. Dosages generally depends on the size and state of maturity of the recipient as well as upon the state of maturity of the donor of the gland.

It is to be found that the potency of the gland is influenced by the size, the age, the state of sexual maturity of the donor fish as also the size of gland itself. Great difficulty as encountered because this nearly matter to ascertain the state of maturity of fish

from external examination usually the female gives a preliminary dose of 2 to 3 mg of the gland per kg of the body weight of the recipient fish. Males may also give preliminary dose but this generally not called for it the males is already in a state of quick mill-oozing. Then after an interval of time (about 6 hours) a second dose of 5 to 8 mg of the gland per kg of body weight of the recipient fish is administrated to the female. Simultaneously the males are injected with the first dose 2-3 mg per kg of the body weight of the recipient fish. A third dose is generally not required the dosage is preferred in quantities from 0.1 to 1.0 ml at a time.

For intra-muscular injection the fish is lead on its side had in a bond net and the needle is inserted either in a tie could region examine Chinese corps *H.motitrix* and *C.ideva* are found to be equally encouraging at various centres, via. Had pastor form poona, Gujarat from jasper (UP) and Cuttack etc. the method that require for hypophysationer indirect breeding written causer, that shows following some characteritics.

- 1) the pituitary gland are generally stored in absolute alchol at ordinary temperature or in refrigerator.
- 2) The extract of glands are presented in glycerin in which they retain potency upto 2 months.
- 3) Dosage that employed is usually followers first stimulating dose followed by 5 to 8 mg per kg of body weight for the male as the only dose at the time of the second dose to the female.
- 4) A set of one female with two male is used.
- 5) Breeding hopa have an average size as $2.4 * 1.2 * 0.9m$ for average breeders (weighting upto 4kg.)
- 6) Hatching hopa have average measurement of $2 * 1 * 1 * m$ for outer hopa and $1.75 * 0.75 * 0.5m$ for innerance.
- 7) Hatching twees place in case of Indian major carps in 15 to 19 hours at 26-3 degree Celsius.

INDUCED BREEDING OF FISHES (MAJOR CARPS) :-

Induced breeding of fishes through pituitary hormones particularly of the major carps-bath indigenous and exotic species has been made practicable, in Indian conditions, capering great opportunities for the progress of fish culture. The expertise technique know how and training are available to make the method simple, economical and easy to learn for mass scale adaption by the fish culturists of the countryside. Thanks are due to the pioneer workers in voles is it over a period of about 25 years. Some of whom are listed below.

Khan in 1937 in carbines mingle Choudhary in 1955 an rhomb fonts.

Rama swamy and Sunder raj in 1956-57 an “Calories halrachub, Meteropnenustes fassils.

Choudhary and alikunhi in 1957 an labeo rohitta, cirrhinus mrigala. Induced breeding has been successfully applied in the case of Indian major carps for obtaining spawn for the commercial ranging. In 1973, the spawn obtained from induced breeding amounted at 10g million as against 1705 million reverie spawns. The cost of expenditure in obtaining induced breed spawn was calculated at Rs.30/- per lakh spawn in 1970, which meant that it was quite cheaper than the reverie spawn, induced breeding is currently gaining important in composite fish culture as well. Because the experimental results of induced breeding for the attempt are of to small pituitary banks to meet the ever growing demand for pituitary gland or its extract from fish cultures from different pairs of country.

Constant researches are going on to make improvement on method and on output in induced breeding, technique applicable to Indian conditions substituent's for the pituitary hormones are also being preempted to case pressure on pituitary gland and hence an door fish. Likewise a second induced breeding is also being successfully attempted after about two months of the forts induced breeding in the care of Indian major carps.

5) MASS BREEDING (MODERN HATCHERY) :-

Breeding behavior varies in the fishes from one in life time (uncorhynches) to once in year (many major carps and most of other fishes) or month (Lebistes) or once in ten to fourteen years (Anguilla). For the Indian major carps, breeding is a seasonal (once in a year) for concluding with rain and flood which offers great opportunity for serial and growth or development of the regency. Endocrine system acts as a regulatory link between the environmental events and maturation and release of gametes in the required metabolic adjustments in the body on the other hand, appearance of secondary sexual character during the breeding season, of the every positional for the general development and maturation reproduction, breeding behavior of Indian major corps is a cyclic phenomenon which is famed with onset of rain and flood. The environmental uses, fowl in temperature rise in turbidity of the water flows that simulate the secretion of pituitary hormones by mediation of specific sensory centers in the brain (hypothalomes.)

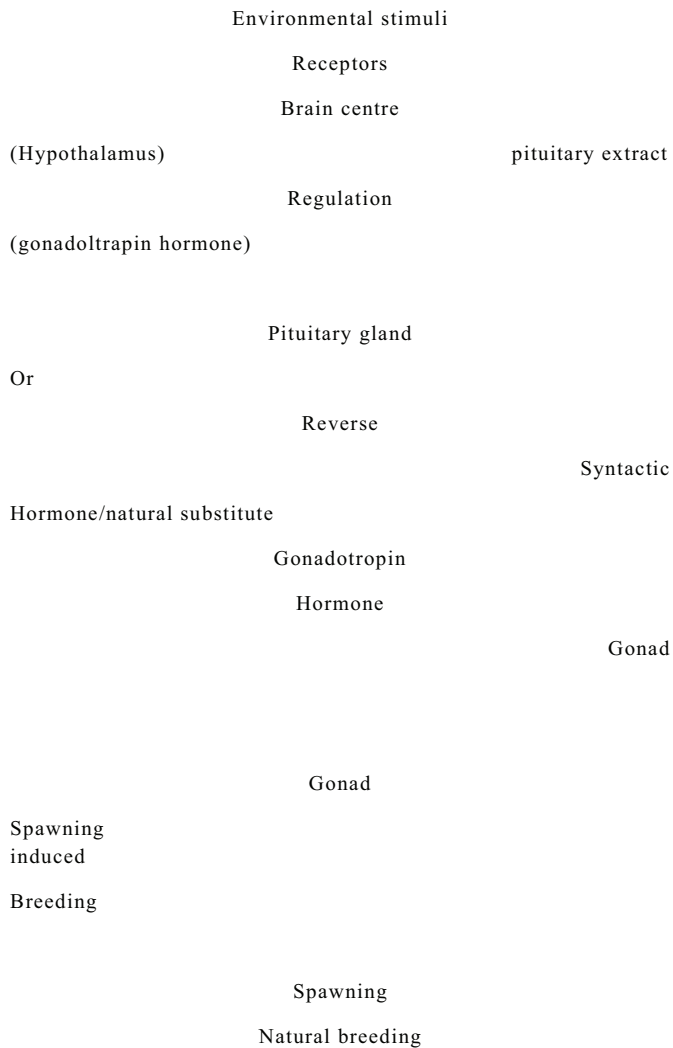
Presence of the opposite sex may also provide a stimulating cue. The circulating pituitary hormones (GTH & GRM) offset the body metabolism and gonads. Then the gonads goes on secreting gonad tarpons under the central of gonadutropin hormone of the pituitary gland (GTH & GRM) and the gonadotropin of the vertebrate plan.

The primordial gonad in fish is undifferentiated in both the sexes, male and females. During later development the gonad, differentiates into sets, or ovary under the influence of the hormone according to the genetic make up of the sex (and xy) which tend to moscullnize or geminate the sex.

These once the fish is sexually major gonad maturation (continuous or periodical) is follows under the control of pituitary gonad interactions androgens (testosterone) are steroid sex hormones of the males which are responsible for spermatogenesis influencing the interstitial cells. Statoi cell and spermatogonia spermatogenesis is thus under hormonal influence. Androgens accelerate the rate of spermatogenesis.

Ovary that also goes on influenced by hormones. Oestrogens influence oogenesis and every structure as well as vitellogenesis. Oestradiol is secreted by ovary structure as well as vitellogenesis. Oestrogens may be produced by granulosa cells. Follicle lute (pre and post-adulatory) and interstitial gland cells. During oogenesis acolytes are surrounded by cells that forming a follicles developing in the germinal epithelium soon get embedded in the stroma as they mature.

Then the breakdown of germinal vesicle occurs so that mature acolyte is liberated and is ready for the fertilizations. Mature eggs only ovulated. If the ovulated if the evolution does not occur, mature egg only undergoes breakdown internal resorption. A mass of cells may be formed as pre and post adulatory corpus luteum. An antral follicle or an ovulated follicle respectively. The post ovulation form appears as luteal mass by following way we shows the event in natural breeding and in induced breeding.



Breeding require a perfectly timed relationship between male and female for the release of eggs and sperm extrinsic factors (temperature phenomenal rain, flood help in sun cherinzation of reproductive cavity of the two sexes for a successful spawning. During outlet pairing the sexes come else and attempting at holding each other to facilitate external fertilization. Specific cover ship behavior and an sex hormones release may also contribution towards this end. Longevity & mobility of sperms as well as maturity of eggs are crucial in spawning breeder fish has milt or eggs running so much that can slight pressure on hilly of the fish milt let the gamers gaze at genial opening.

Fish gonaelotropin steroid is quite problematic what is clear that a brain pituitary gland gonad axis is at work hypothamos water of the brain secretes GnRH of mammals ties secretion is inflexed by environmental factors the GNRH that stimulates the pituitary gland to secure the GTH (gonadotrophic hormones) the pituitary gland does two main functions are as fallows.

a) one of other hand, it has lionizing effect that is it promotes release of geometers form the ripe testes or the ovary, as the case may be in addition the GTH also contracts the developments of secondary sexual characters the developments of gonadotroptric zone in the pituitary gland is under genetic control & may also depends upon the prior secretion of GnRH in the hypothalamus.

The gonads produce sex hormones called gonadotropins testosterone is identifies in the testis as well as in the plasma but progesterone if found only in plasma. The tester one induces increases in the rate of spermatogenesis. The lending curs of testis produces progesterone under the influence of the GTH by the time test or one level has defined. Third one progesterone which is responsible for sperm nation & reverse the milt ovary produces estrogens (oestradaiol) which may or may not effect agensis that they control vit cogeneous. This is known as steroid hormone is respond able for the maturation & also inducing the hormones (MTH). It also induces breakdown of the germinal versed and reserve of the mature ova (ovulation) synthesis of oestradiol and

progestane is reciprocal, the level has following define of the former.

VITELLOGENESIS:- The primary oocytes, during maturation and ever goes growth by the disposition of yolk. This is called vitellogenesis which process is under the influence of steroid hormones estradiol estrone is produced in the granulosa cells by conversion of the test one under the action of aromatase enzyme. The hormone estradiol goes on circulating in the blood and affect hepatic cells of liver. The vitellogenic gene of the hepatocytes are cultivated for gene expression initiating transcription and translation. Eventually vitellogenesis a York protein precursor is produced in the liver cells vitellogenesis are water in the blood and reach the ovarian follicle where it is picked up by pinocytes and that incorporated into oocyte and deposited.

The previtellogenic oocytes has a prominent nucleus such as the Golgi bodies, ER, ribosome, besides and mitochondria. It also shows the presence of lipid inclusion the oocyte surface is surrounded by a single layered follicular epithelium or granulosa. Between these two lies an actuator zona pellucida. A thick lamina interferes between concern to fishery biologist to know its causes and significance so as to control it for increasing production in the fish culture.

Gonadal development and maturation in carps :-

The major the progress of gonad development in the carp can be characterized as following.

The gonad development that is very important for the reproductive purpose and getting good result.

It is known that major carps are the gonochoristic i.e. they have two sexes, male and female having testis and ovary reproductively however the gonad development is of two different types. In some carps such as *Catla* & *Labeo*, the gonads of both the sexes initially are undifferentiated. In other such as cyprinids carps the gonads from the very beginning are differentiated into primordial testis and ovary, as the case may be however the differentiated of

the gonads into testis and ovary is discernible after 20 weeks of fertilization.

Indian major carps that attained the sexual maturity in a year being reheated to the monsoon rains. The maturation of gonads is cyclic. It get start in November, become rapid in march onwards and complete by July. Reception of gonads takes place. August to October, to complete the cycle

The consist follows mataphological changes may be noticeable during gandal maturation and granulose and the vesculorized thee. The vital vacate is stance recognized by conspicuous cortical alveoli and yolk deposition which extract for its growth and large size. Yolk across as protein and fatty glonals. Or granolas and an outer theca. A basal lamina also exist in between the egg surface and the follicular well lies a zone puducida (Zona radita).

The theca is known to be made up of the connective tissues collage and hypotrophy their gland cells. This also known vascarrised and sappiest with nerves.

ATRESIA AND CORPERA LUTEA :-

Artesia is known as one of the degenerative development process of the ovary, affecting the coccyges at any stage of their maturation. Pre or past spawning fish ovary has it occurring rather commonly. Thus not all eggs in fish ovary become normally mature and yolk to be ovalated. Railure in the ovulation lead in the formation of artesian of such eggs the process is called vitellogenic artesian. Vitellogenic artesian is more common then that of the previtelloghnic artesian. The two process are different but out come of there is the some i.e. artistic egggers aloes to ovary in its reproductive sanction. From the fishery stand point artesian will have a negative effect on the fecundity (reproductive potential) of the fish and hence it is a mature desorption which may be onvertiently described as stage I to vi for the ovary.

Immature ovary :- (a) stage I – Ovary is very small and ribbon like. It is colourless and transparent. Stage II – slightly larger and swollen the ovary is ribbon like it reaches half the length of the abdominal cavity and it is transparent.

Stage III – the ovary is look like and opaque. It extends more than half the length of the abdominal cavity.

Maturing and Ripping ovary :- a) Stage IV - Large Ovary extending two- third of the abdominal cavity. Eggs are visible in the ovary to the necked eyes. Stage V- Ovary nearly fills the abdominal cavity. Eggs are rip nearly reaching maximum diameter.

Ripe Ovary :- stage VI- Eggs appear translucent and attain maximum diameter. Eggs are also separated from each other and to run out on application of pressure on the abdominal portion.

Spent Ovary :- Stage VII – only some eggs remaining the ovary following ovulation. The empty ovary eventually collapses blood capillaries indulge it.

Note - thus from above description we will emphasize and try to put forth that more physiologically and physiological condition of the ovary effect on the reproductive capacity of fishes as well as on productive of spawns.

Physiology of induced breeding :-

Induced breeding make use of the following principles of the physiology of breeding.

- 1) any exogenous hormones or during which has luteinizing effect will cause early release of gametes from a rip gland.
- 2) sex pheromones may be used to promote timed release of gametes.
- 3) Stimulation of rain and rapid water flow may also promote timed release of gametes.

The first is the most important element while also second and third play a helping role. A Chinese fish breeding tank is so designed is

to meet the above requirement for the successful induced spawning. It is a concrete circular tank with slapping bottom having an exist leading to hatching pit. The cell carries a number of water inlets which are so fixed as to give peripherally inclined jet of water producing a circular motion of water of sufficient flow strength. Then pair of breeder injected with the pituitary extract are placed which meet second and third principal stated above.

Sex hormones which are water-born are available since the breeder held together in the tank few days ahead of the actual induced breeding.

Fish pituitary gland extract human chorionic gonadotropin hormone (HCG)LHRH – analogue synthetic new generation drugs are all being extensively tried for induced breeding. The local popularity that a hormone or drug may receive will depend upon its availability its cost and its easy technique. It may be remembered that physiologically speaking these hormones their analogues and maturity but simple to induce synchronized release of milt and ovulation.

A small priming doze proceeding the main dose is generally required. Once desorption of eggs has begun, the administration of hormones/ drugs will be ineffective.

A diagrammatic outline of the Chinese hatchery tank shown by the following figure.

Chapter – 08

Breeding Habit :-

The Chinese breeding tank more clearly and fashionably shown in plate no.---

Breeding Habit :- The important culture fishes according to their breeding habit may be grouped into the three distinct categories as fishes which are bred in ponds ex. – *Cyprines carpio*, *Tilapia massombica*, *osphronences grimy*, *channa species*.

b) these fishes do not ordinarily spawn in ponds but breed in flooded river and adjoining areas e.g. *Catla Catla*, *labeo rohita*, *Cirrhinus mrigala*, *labeo calbasa*, *hypophthalmic moltrix* and etc.

c) these fishes which mainly inhabit the sea or brakish water and which neither spawn in ponds nor could be induced so for to spawn successfully there in eg. *Chanas chanos*, *lates calcori* for *mugil species*. The breeding requirements of important cultured species are rather complex and our knowledge of the optimum conditions for their spawning is still fragmentary. Major corps that are well known as breed naturally in rivers and certain reservoirs and in artificially constricted bandh type tanks where fluviatile large scale of natural spawning of carps across in flooded section of rivers during the south-west monsoon months. In some river during north-east monsoon as well spawning ground that are lasted middle reaches of rivers where flood water under vast adjoining riparian lands.

Bundh breeding:-

It is known as a special type of the prehensile and torch or impoundments where reverine condition are stimulated during monsoon months. Majority of bandh type tanks, where major carps are known to breed are located in the district of midnepur and Bankera in “West Bengal” and round now going in chattaper district in madhy Pradesh. Thus the band after heavy shower, receive large quantities of rainwater washing from their extensive catchments and provide large seawall marginal areas which serves as spawning ground for the fish. Bandh have been described in

detail by mookerjee (1944). Bandhas that are classified into two types via personal bandh is that are after designated as the wet bandh and a seasonal one called Dry bandhs.

Wet Bandhs :-

It is known as one of the type of bandh. It is known or designated as the pernisanal bandh, so that they are known as wet bandh.

A typical mildanpure type of wet bandh is a personal banda that situated in the slope of a vast catchment of and waiting terrain, with properemba kmert having an inlet towards the high catchement area and outlet at the opposite lower end. During summer, the deeper portion of banda water containing major carp breeder. After a heavy shower, fresh water from the catchment area fishes in the form of streamlets, locality called chaise in midnapore. The major portion of bandh gets submerged with water. The excess flowing our through out the outlet known bulans.

The shadow area of bandh, where the fish actually spawn are called “moons”. The outlet is protected by a bamboo favoring known as Cheri. The flow of water through the outlet can be controlled by the cheers with straw and mud.

Dry bandh breeding (detail information) :-

A dry band are known as shadow depression that encloses depression on the three sides by an earthier embracement, which impands fresh rain-water from the outchement areas during the monsoon season. Dry bands that are also located in the midnepure- and bankura district of west Bengal and around now going in chhatupur district of Madhy Pradesh.

The initial success that are achieved by the department of fishery, government of Madhy Pradesh, during in 1959 in the formation or the Development of bandh breeding of corps in sunor ‘Talliya’ led to the construction of many more dry bandh with improved the deepest portion of the bandh for complete drainage and one or two waste weirs for overflow of excess water. In this case apart form

bandh it self, a dry bandh unit that consisting of the storage pond for the stocking of breeders, in observation post with the arrangement for the stocking necessary equipment and a set of cemented batchers. (Measuring 2.4*0.3) with a regular supply of water for handling a large number of eggs at a time. In some cases, the cmbakement is pea stone masonry with a small sluice gate and a portion of the embankment it self serves as the waste weir.

Spawning in both wet and dry bandhs usually occurs after can finesse heavy shower for days, when large quantities of rain water rushes into the bandh. In dry bandh, a selected number of major carps breed in the ratio of 1 female to 1 male (1:1hg weight) are introduced. At first, smaller-sized mature fish get stimulated to breed and in order to spawn, that migrate either to the shadow areas of bandh, itself or those adjoin it. Bigger fishes spawn near to the same area. Spawning occurs over hard or sandy soil and even on the rocky embankments.

Through it is to be known that fish breed at any spot in the bandh, it may be advantageous to prepare the spawning ground at different level in which could get flooded at different water level in the bandhs.

In recent years, about 10-20% of breed stock introduced for spawning in a dry bandh, I Madnapurs and Barkura districts (West Bengal) is injected with pituitary extract or genadetrapin hormone. It has been experienced that the “induced breeding by this technique.

This structure of bandh has also undergoes some changes in that instead of collecting fresh water in the bandh prepare and the water is stored in the bandh prepare and the water is stored in a reservoir located at a higher elevation. A series of small bandhs with inlet and other out that are constructed hallow the reservoir. The bandhs can these to filled with the rain water as and when desired and the breeding operation that are undertaken without waiting for the bandh to filled as a fresh with rain water.

Sinha at (1975) have been reported that the natural spawning of both grass corps and silver corps in a dry bandh of Bankura district” where they were able to spawn the two species without

stripping. They consider dry bandh to be one of the reliable means for mass breeding of Chinese carps to meet the increasing demand of their seed.

The spawning behavior of major carps has been described by the Dubey & Twi (1966) and alkali. The fish at first indulge in "courtship". The chose the female dating about in the water. The ratio of males and females at the spot of breeding may vary.

According to other scientists "Ghosh and Ghos' 2 to 3 males to one female is the usual ratio. Khan (1924) studied and stated that female is often chased by three or more males but the reverse has also been observed by him. If a male is separated from its partner its has been beard to produce gutlord sound calling for the other partner. During the act of breeding female is help by the males, the leader bending its rounq the female, calling of male may be behind the dorsal fin of female splashing of water, and number of seales. May get dislodged while some fish may even sustain other miner injuries. The court ship as short lived. The coiling of two partners that goes o existing pressure end the abdominal portion of the mating pairs that resulting in the extrusion of ova and exudation of milt. According to scientists Ghosh and Ghosh (1922), the extract of extrasies of ova and milt depends upon the fish of water into or out of the bandh; the grater the fish more complex the extrasion. Add eggs are not said at one place and at one time but at intervals during when the pair keep moving.

Fertilization in major carps is external. The fertilized eggs the abondoded by the parents and depending on the location of spawning ground either drift to the edges in a shallow water giving the latter a characterstic pole white appearance, thus the way when spawning is over a thick blanket eggs it self behind on the spawning site.

In case of reverine breeding, they swim aimlessly for a while and commerce their journey along with resending water. Many are left behind, trended amidst shadow pots and paddles and ultimately dies.

No single factor can problem be observed to spawning of major carps in the rivers and bandh one type of tanks. The act of spawning involves the completion.

According to hora, Hussain and Khanna (1958) heavy monsoon flood, capable for inducting vas shallow area which form the breeding gonad of fish, stimulating pawn and is derived to be a primary factor respond able for swanking.

It is also be observed that the flooding in the early phase of “South West Monsoon in necessary and the fish donate spawn, it rains are delayed.

Observation of scientist proves that the rise in the water lead which may be caused naturally of artificially to bring out spawning.

Collection and for their treatment for spawn :-

Soon after spawning is over, the eggs are collected with the help of nets made up of mosquito netting cloths(mocha) and released for hatching either in pit or in doable waved hatching haps or cement hatcheries. The hatching pits are excavated on the bank with arrangement for the sappy of water each pit of this size contain at about 900.000 to 2,200,000 eggs of which 2.5% to 2.5% hatches successfully.

A bobble walled hapa which is fixed in bandh itself consulting of an outer hapa measuring 192cm x 91cm x 91cm and an inner one measuring 152cm x 76cm x 46cm. the former generally are used hapa that made up of ordinary clotha and latter of round meshed mosquito neeting. These hapa are laid out in perfectly horizontal position and within the outlet end.

The hatching which pass out of inner happa to the outer are retained three for three day for conditioning before – walled hapa is estimate to range form 32 to 50 % the provision of cement hachuring near the dry bandhs in Madhya Pradesh has been aided in improving the serval of hatching to 97%. A cement hatchery of mandhy Pradesh has other time more capacity then double – walled hapa and it for more than letter methods.

Scouting of Spawn :-

Spawn that are collected from rivers from river or wet bandh, beside comprising a mixture of numerous species usually has large – seized associate, many of which are predaceous. The spawn is therefor sieved through a round – meshed mosquito netting cloths on to a Maslin to the suspended in water in order to separate the different spec based opportunity on the dissolved oxygen requirement a method for segregating the spawn of Chinese corps, into a constituents species is repotted to be in a vogue in chino (in 1950) one scientist alikati carried out wether the Indian major corps could also be separated species wise in their spawn stage according to difference. It any in their dissolved oxygen requirement, by crowding the spawn (5 to 7 min length) and told glass jars oxygen depletion in wate was hastened. These author reported that the 101 of ordinary pand water with an initial dissolved oxygen cotenant of 6.0ppm about 25000 corps spawn there of about 1 ½ hours without any apparent distress. When the dissolved oxygen valve when decline to 1.9ppm some spawns huge to show distress and start crowding at the surface with the rest near the bottom crowding goes on continuously when the dissolved oxygen descends to 1.0 ppm and free carbon dioxide valve rise to 8.9ppm with the further fall in dissolved oxygen content, how ever all spawn are found rising to the surface. These when a considerable number of a spawn are clouded at the surface due to lock of sufficient dissolved oxygen in water, they are carefully skimmed off and separately in fresh water.

This goes on repeating till the entire collection is separated from 4-5 laks and then random samples from each lot are reared separated for 15 days to determine species composition. It is found that while “75 to 85%” of the marginal spawn present are skimmed off in the first two test the same also occurs price “61 to 75% economic species. The majority of calla spawns (62 to 96%) can be removed in the test two lusts along with 25 to 49% uneconomical spawn. “Labeo rohita” was not present in sufficient number in the collection sampled for effective slumming.

Chapter – 09

INDUCED BREEDING IN INDIAN MAJOR CARPS

By collection of pituitary Glands :-

The success of induced breeding depends mainly on the quality of donor fish for pituitary gland and recipient fish (breeders) which receive the pituitary extract collected from donor fish. The pituitary gland is located on the ventral side of the brain. The glands are killed fish. These can also be obtained from fish that preserved in ice for 10 days. However, spoiled fish are not suitable as the pituitary gland lose their potency due to enzymatic cyclone. While taking out the gland, the dorsal side of the head is chapped with a butchers knife, the gland is then located and removed by a pair of forceps.

The fish pituitary gland has many advantages this pituitary gland of one species is usually active in unrelated species (b) out of season spawning oiled be induced (c) fresh withal preserved cretonne derived or the frozen lonely as well as their glycol extract, slime suspension and water extract are equally effective and as there is no qualitative assurance in the pituitary of male and female donor fish.

The collected gland if not used fresh are immediately preserved in air tight glass stoppers brown vial containing absolute alcohol are placed in cool dark place at room temperature servile times for dehydration and deflecting of pituitary glands. Alternatively, the glands may be frozen or acetondried.

Acetone Drying of Pituitary Gland :-

Pituitary glands are first dehydrated in four changes of cold acetone within 12 hrs after the removal. Drying vitals should be kept fail of acetone, so that moisture from the air will not condense on the inside walls of the vials and dilute the acetone. Then glands are then allowed to air dry. Air pituitary glands may be stored in a

desist water with calcium chloride. Acetone dried corps glands have been found to be viable was after “10 years”.

Reparation of pituitary extract :-

To the formation or proportion of pituitary extract, required qualities of alcohol preserved glands are dried in filter paper and weight accurately in a chemical methods. The weight of one collected and dried gland may be around 10 mg in a corp weighing about 10 kg. the gland are macerated in a tissue homogenous or with a little distilled water or 0.3 percent common salt solution. Subsequently this diluted with same medium to get a extract with a concentration of 100 mg of gland/0.1 mv. Cholestol and sea some oil could for extract preparation. Then prepared solution is centrifuged at about 1000 ppm for five minutes and aspirant extract is taken for the use. The difficulty of preparation of the extract every now and then, the extract can be prepared in bulk and prepared in glycerin (one percent of extract and two parts of glycerin). vivid or nomad glycerin – preserved pituitary extract have a more uniform potency then those prepared using or distilled water.

In the formation of pituitary extract various item are used as shown following.

SELECTION OF BROODERS :-

The selection of brooders prerequisite for the successful breeding. The male and female breeders are selected and stocked separately in a fertilized pond at the rate of 1000_2000/ho, a few months prior to the commonencement of the actual breeding. They are walled by the groundnut oil cake and also rice bran in the ratio of 1:1 at the rate of 1-2% of the total body weight.

Indian major corp, eace weighting1.5-5kg are prepared for breeding. The development of roughness on the surface of the dorsal surface of pectoral fin during breeding season in the males. And the smoothness in pectoral fin in female would distinguishing males from females. Further, in ripe male, ooze out rely in the abdominal portion is gently presented.

The ripe female has a soft shooled abdominal portion and swollen reddish vent. However whatever in the water has been found to be more reliable for deleting. The rate of gonadal maturation in female breeders. A whatever is L-shaped fine polythene tube or a glass tube which is inserted in the oviduct through the vent of the female to raw a small quantity of eggs for microscopic examination. It is also goes desirable to see that breeder are carefully handled while watching or transportation, since injured breeder do not spawn went hormonal injection.

Injection of pituitary extract in Indian Carps:-

The success of induced breeding depends mainly on the coincidence of the time of the treatment with the suitable period of the sexual cycle of fish. If the pituitary extract of the same species is used, then it is called “homoplastic” and if the pituitary gland of the different species of the same family or related family is used, then it is called as “heteroplastic”. Selected breeder are collected on a hand net as weighted. The quantity of pituitary gland required is calculated on the basis of weight of breeders and the suspension is accordingly. The recipient caught with the minimum disturbances is kept wrapped inside a handset which is then placed on a soft cushion. Then the extract is injected is intramuscular at any of the site such as base of pectoral fin, orcil of the pelvic fin below the dorsal or lateral side of the caudal penducle. Quantity of the extract required is at about .5 to 2 ml for breeders weighing up to 10kg. A gentle message on the injected part may help in the uniform disposal of the extract. Through intramuscular injection preferred, optional injection may also be followed. Invariably a 1ml hypodermic syringe graduated to 0.1 ml division is employed. Clinical needle no 24,22 and 19 are used for breeder of 21 kg 1-3kg respectively. The extract close of the pituitary extract depends on the weight of the recipient fish and is given to doses viz, preparation or provocative dose of 2-3 mg/kg of ist body weight and a second dose or resolving dose of 5-9 mg/kg body weight. The four hour after the dose. The first male in other hand, is given only a single dose of 2-3mg/kg of body weight at the time of the second dose of female.

BREEDING :-

After injection, the male and female breeders are introduced into the breeding having the ratio of 2:1 the breeding hapa is a rectangular meshed mosquito net death end sure of a 2*1*1 m with a top ever which opens in one side where it can be secure tied after the introduction of the breeder. The breeding hapa is fixed in the pand with the help of bomboo podes at the corners. Instead of breeding hapa a small contrite spawning pand of 10*3 k/cm can also be used. Such a pand should have with a speed of 0.2 to 0.5 m/sec has bee found to be ideal for stimulating the parent fish to spawns.

The breeders in the hapa exhibit minor sex play. A time of spawning the female of water the female is held in a sort of grip by the males, and then males fixes over the females which goes liberating eggs in a stream. Simultaneously the males oozes its melt end the eggs are thus fertilized. The spawning normally takes place after 5-6 hours and factors take low temperature (25-30 degree selectees) rain water, slightly dazdling and cool weather may influence the spawning does not take place with in the time mentioned above a third end higher dose then the second dose is administrated to the females 10-12 hourse after the second injection.

It has been found that the Indian major corps could be induced to spawn twice in the same season, within internal of two months. The breeders after the first spawning are fed with groundnut oil cake and the rice-bran in the ration of 1:1 at 2-5 pedant body weight. When favorable ultimate conditions occurs they mature and ready for spawning.

The average fecundity rate of Indian major corps has been estimated at about 2 lakh eggs/kg body weight. The fertilized egg of Indian major corps are the transparent end non-adhesive, and their size rents from 3 to 5mm. in about 10 hours those eggs get water burdened end swollen and are removes. The unfertilized eggs which are opaque are rejected.

Hatching :-

The hatching hapa comprises two rectangular endasures, the inner (1.75*0.79*0.45) made generally two masquitonut cloths and the outer. The fertilized at about (50,0000) are informally spread an the stretched bottom of inner end sure. Suing a bamboo poles. The eggs hatch out in 15-18 hours. At a temperature of 26-30 degree siliceous and hatchlings (spawns) escapeto.

HATCHERY AND IT'S MANAGEMENT :-

Diwredi and Zauidi (1983) have traced the evolution of fish and hatchery system in Indian. These are ranges from simplest hatching pits to the most modern ecohatcheries.

1) HATCHERY PITS :-

The earliest course of hatching pits eggs used in the bund breeding type. Breeding system of Bengal compared pits

Often of the dimension of 3x2x1m, but shows the variable according to need pits used to be dug currently in vogue by carp breeders in bund type breeding system.

At present, however they are interconnected and have irrigation and draining facilities.

2) CHITAGONG TYPE HATCHERY PITS :-

This are known as similar to hatchery pits stated above except that they are each provided with a double – walled (innermosquitonetting material and other muslin cloth) cloth lining. The outer cloth is kept a few inches above the earthen bottom of the hatchery pits.

3) EARTHEN POT HATCHERY :-

This is also one of the earliest type of hatchery pits, in association with bund type breeding system. It comprised earth pots that arranged at different level on draining into the other kept at lower level. This furnished a flowing current of water, that

cooled by surface Eva operation of the porous ear then spots, in which the carps eggs hatched.

4) DOUBLE WALLED HAPA :-

The double walled hatching “hapa” is one of the commonest device to serve as an outer door hatchery. In stable either in pond or in the river, up to 1,00,0000 eggs can be hatched on the inner mosquito net wall of hapa, of the dimension of 1.75x0.75x0.9m. the hatching wiggle through the meshes of the inner wall and collect them sleeves in the outer whole – cloth enclose. Survival is much higher, when the hatching hapa is installed in gently or fast flowing canal or a river because of superior exchange of water.

5) FLOATING HAPA :-

Identically in principal to the double walled hatching “hapa” floating hapa is mounted on frames to which floats are secularly whole so that contrivance becomes drift able. The floating hapa has the advantage that it can be used on rocky substrates, often found in reservoirs, and can be towed to deeper water to obtain better exchange of water and hence aeration between inside and outside the hapa.

6) TUB HATCHERY :-

This is the first introduce in the poorer breeding center in M.P. this hatchery furnish running of water to hatch eggs in galavanised iron tubes with adjusted levels such that water flows by gravity, through the inter connecting siphons. Each tube of the size constantly bathed in a gently water current.

7) CEMENT CISTERN HATCHERY :-

It use at serial now going dry bundha in M.P. and generally situated below dam sites, each cemented cisterns commonly measure 2.4m x 1.6m x 0.45m and has its own inlet and outlet that situated at different levels at the apposite end of the cisters.

The casters are often arranged in rows. Water flows by gravitational force and each cisters can be hatch about 3 crores of eggs at a time.

8) TRANSPORT IN POLYTHIN JAR HATCHERY :-

This is identical to Bhwomicks glassjar hatchery except that breakable hatching. Glass jar are replaced by 27cm height and of 10cm diameter transport plaything containers each of 2 lit. capacity here, each hatchery jar is provided with an inlet and outlet pipes and escape of eggs from jar is further prevented by an inner mosquito netting containers of 1 lit capacity.

9) GALVENSED JAR HATCHERY :-

This hatchery that resembles Bhwomiks glass jar hatchery except that the hatchery glass jar are replaced by galvanized iron jars. Each jar shows cylindrical portion and conical portion (10cm long). This jar are fitted. On an angle of frame work each also accommodated a galvanized iron conduit, to carry the hatching from the jar to the spawners. The spawnery made up of bricks and cement and provided with hooks on the inner wall to tie a Hapa on it. The rate flow of water is 11/min. the galvanized jar hatchery is cheaper than that of glass jar hatchery or polythin jar hatcheries and more suitable for Indian ruler setting.

10) PLASTIC BUCKET HATCHERY :-

This comprises the two parts – an alter buck that provided to accommodated a perforated aluminimum bin egg vessel. A galvanized ‘S’ shaped inlet at the bottom and two outlet at the top.

The hatchery may be regarded as an abrogated version of bhowomicks glass jar and shrijurs bin hatchery.

11) HANGING DIP NET HATCHERY :-

The hatchery unit that comprises conical 1/16 cloth dip net (65 diameter) that provided with 50m brass at the bottom of each dip net. Such dip net are hung in the hatchery tank of size 3.3m x 1m x 1m. the rate of flow of water is 1 to 1.5 m/min during hatching an about 1 cores developing eggs can be contained each. After hatching, the hatching pass through the meshes of the dip net and get collected into cinster where they are allow to remain for 3 days before being transported to nursery pond. Such dip net hatchery unit is installed in the Kanshalygong a fish from of the state Orissa.

Jar Hatchery :-

The existing practice of hatching eggs of carps in cloth hapa may at times lead to heavy caosualities of eggs and spawn due to the natural harzards. Further a heavy recurring expenditure is likely to be involved every year owing to the covering and tearing of the cloth hopas the hatching percentage in the cloth hapa as is also invariably low.

Keeping all these in mind, a jar hatchery is devised. A jar deranged for the hatching off fin eggs is made up of transparent a ceryclic plastics sheech.

The height of the jar is about 50cm and its diameter 15cm and the capacity is 10 liters. The top of a fin net of cushion. Just below the with three is an outer (spawn) several jars can be arranged recording to the need and connected with a water recruiting system. Water from an upper reasererviror of a water recirculation system flow rate is regulated so as to have renewal of 10 volume of water from the jar in an hours. The water from the bottom upwelled from different jars is collected by a main tube which firstly drains into the lower reservoir.

Temperature of the circulating water is regulated by a thermostat alternatively a hatchery complex may also be up with simple the spawning to keep the water-cool and oxygenate. Then the spawn are allowed to remain in the spanner for about three key when they are ready for the stocking in the nurseries.

The jar hatchery besides its higher stocking capacity also ensures the good survival rate of hatching which is found to be above 90% against 50% in the conventional hopa. For the production of million of seed fish at a time a multi-jar unit with high power and greater water sources has to be set-up. Recently it has been found that the marine cat fish pituitary gland has also been tried successfully to induce breeding of Indian major carps, the use of human chorionic gonadotropin hormone as a stimulating does ..

This is due to fact that the chorionic gonadotrophin behaves primary is a luteinizing hormones, which is believed to be responsible for the growth and maturation of gonads in fish.

Similarly, uylh67 for pituitary is also effective in the spawning of cat fish. The induced breeding technique is certainly a profitable venture and may provide an additional income to the fish farmer for example a female marginal weighting about 2kg may yield four lakhs of eggs, and it 90% of eggs hatch out and 50% of spawns survive the number of spawn available for marketing could be 1,00,000. At the rate at about Rs.200/100. At the rate about income is likely to Rs.36000. in the case of Chinese running water system shown is following plate.

About 30,000 water hindered eggs (five in hours) are introduced gently in hatchery jar of 10 lit capacity. In the conventional hatching hopa of 2*1*1m size with 2000 liter capacity. Only 50,000 eggs are introduced for hatching. During incubation the flow of wateriest as regulated that the eggs are stirred gently without using any damage. A flow rate 500-700 ml/min and 1 liter/min may be maintained for keeping the eggs of Indian major carps and Chinese carps respectively more water flow requested for the Chinese carps to due to high specific gravity of their eggs.

The hatching emerging from the eggs within 15 hours index temperature range of 25-26 degree Celsius float by virtue of their low density. It the rate of water flow is a fine meshed mosquito cloth conduct into the spawnery, which is fine meshed mosquito cloth net fairly could water. An over head shower is also

productive to spray water over crops fingerlings is at about Rs.400/1,00/- fingerlings.

Further more the induced breeding techniques could be a good average for large scale seed fish production to meet the over growing demand.

Chapter – 10

TRANSPORT OF SEED AND BROODERS

The morality of seed fry and fingerlings whom may be updated during transpirations mainly due to the depletion of dissolved oxygen and accumulation of gases like ammonia and carbon dioxide in the medium of seed fish carries. These gases are lethal as they may reduce the oxygen carrying capacity of the fish food. For example if the concentration of dissolved free ammonia exceeds 2ppm the seed fish especially that of carps may die. However the lethal limit owing to carbon dioxide in the fish reported that fry of more than 40mm size may die at 15ppm of carbon dioxide in the fish depends on the level of dissolved oxygen level of less than 1ppm on the other hand such fry die only at 200ppm if the dissolved oxygen is around 2ppm.

The traditional way of seed fish transport in the earthen parts still exists in some parts of our country. The method, however has servable drawbacks such as (a) the earthen pots are likely to break in transit (b) fingerlings may be goes on injuring owing to the shaking of pots (c) possible if only short distance and short duration and (a) frequent changes in the medium (water) may also result in the mortality of seed fish owing to difference in the water quantity. Considering modern methods in which seed fish are transported in closed metal container with oxygen packed medium have now been propounded.

Technique of transport :-

1) Traditional method :-

In this method when pots of about 15 liters capacity that are used for the transportation of seed fish. The pot is first filled about two-thirds with the water of the spawning ground. The pot is aerated dissolved oxygen of the water to ensure maximum survival rate of seed fish should be between 7.5 and 8.5 mg/l and 4.5ppm respectively. After filling the pot with water at about 50,000 spawn are introduced. It is advisable to the conditions the spawn in the

hopa for at about three days without feeding prior to transportation other wise the extract may pollute the water in the couter pot leading to the death of seed fish. Earthier past are carried mentally on bamboo slings. To avoid the mortality of seed fish due as phyxition water is changed once in every five hours, depending however and the number of spawn in the pot and duration of transport.

b) Transport in closed containers :-

In the technique bred fish over transported by rood rail or air in plastic huges filled with water and compressed air, packed in metal containers. Metal container. Metal conditions made of aluminum, galvanized iron, and tin are mainly used.

Tin of 40 to 25cm could be covalently employed. Polythene hugs measuring 65*45 cm are checked first by infixing the bag with the little air and immersing them in container with water. Leaking or damaged bug produce air bubbles in wave. Every bag thus checked is than kept in a fin container and at about one-third of its capacity (8 liters) it is filled with the aerated pand water. The fry or fingerlings starved for one day and well collimated are then carefully.

A tube from the oxygen cylindrical is then allowed into the bag and the portion of the bag at about 10cm from the top is twisedand a string is kept ready for typing. The oxygen is then drawn in from the cylinder through the tube until two third of the bag are inflected or the top of the inflected condition is obtained the string is tied round and the tines closed, such packed tines are kept in a cool place until they are transported to the fish culture sites.

To ensure badger survival rate, the tins should be transported during evening or the early in the morning. If the culture slits are distant, the tins in transit may be kept cooled by the covering with water soaked gunny bags.

Recent investigation are investigation made on the corp fry have shown that they could be on the tied for transpiration for ensuring the better survival rate. The very purpose of ones then sting the seed better which may lead to the longer period of their survival is to minimize the concentration of toxic gases like ammonia and the carbon dioxide in the medium by lowering the metabolic rate of the seed fish. Carbonic acid has been found to be the best ones thrice because compared to other anesthetic such as avinaldine and MS222 this only cheeps but also safe and easy to use. Seed fish have been found to survive for double the time of unonesthtttised seedfish besides ensuring better survival rate (90%) the carbonic. Acid ones the station is to be done as fallows to about eight liters of water in the polythene bags containing fry 8ml of 7% sodium bicarbonate solution containing fry, 9ml of 7 percent sodium bicarbonate solution and 9ml of 4% sulpheric acid are added so as to produce a 500 ppm concentration of carbonic acid.

Once carbonic acid is formed the bag with once the tied seed fish should be immortally filled with oxygen. in order to eliminate the torque ammonia a frame the medium and safeguard the see fish from morality any of the following abstracts added in the medium during transportation.

- a) Synthetic ambulate resin
- b) Pulverized earth
- c) Formality
- d) clin optilolite (which when added in a concentration of 10-40 g. liter is found to be reduce the ammonia to about 50% during 24 hours transport).

It is also found that addition of the sodium phosphate which act as a buffer at a rate of 2gn/4% of the medium may bring about a forever able P^H if the medium for seed fish during transit.

Transpiration of trout eggs :

The fertilized eggs and 24 hours hardened egg of cold water fish especially tinsure could be transported by providing them in moist cotton would end placed in plastic backed trans shipping trout eggs, cardboard crotons of 20*30*20* cm. size with inner Styrofoam landing are used inside there hours, porous bag containing at about 4000 eggs are sand wished between an upper lower moist sponge or cotton pad. Above the upper pad a polythene bag containing as about 1kg broken ice kept for maintaining low temperature.

Basis for estimating quantity of seed fish as a standard

The number of seed fish to be put in a enclosed and oxygen packed number container for the transport may very according to the type and size of the seed fish made of transport duration of transport and the environmental temperature.

The simple formulas to find out the numbers of seed fish for transportation in the container with water but without oxygen is given below.

$$N = \frac{(8.2 \times 30)}{0.2 \times 6} = 150$$

Where we know,

No – dissolved oxygen in ambient water.

V = volume of water in liters.

C = rate of oxygen consumption by the individual seed fish in mg/kg/hr.

H = period of transportation in hours.

For example if the water volume is so liters and its ambient oxygen content is 8ppm. Weight of the individual seed fish is 1mg rate of oxygen content is 8ppm weight of the individual seed fish is 1mg. rate of oxygen consumption 200 mg/kg/hr and the period of transport in six hours the number of seed fish for transportation will be

$$N = \frac{(8.2 \times 30)}{0.2 \times 6} = 150$$

Transport of brooders :

Breeder have to be transported without shock injurer. This may be done using open concaves carries (1x1.25m) or in spotless closed end form. Lined containers with compressed air. It is always better to dip hatch to the breeders in any of the antiseptics or entibibites, such as ethylene blue (1ppm) ueriflavines (10ppm) copper sulphate (0.5ppm) profession permangant (3ppm) chloromyetin (8-10ppm) or sodium chloride (3%) so as to protect them against infections bacteria funge and etc. further before the transport or transportation, the breeders have to be tranquilized using any one of the following anesthetics.

- a) MS 222 (trichina methane sulphate – 0.1ppm)
- b) Sodium amatol (50-170ppm)
- c) tertiary amyl alcohol (0.05%)
- d) Phenyl ethanol (0.01-0.05%)

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