REPRODUCTIVE BIOLOGY IN FISHES

Briefly, reproduction is a process or means whereby a fish can maintain its continual existence mainly by sexual method. This method allows for genetic variation, leads to hybrids and evolution of new species. Three types of reproduction are recognized in fishes.

(a) Bisexual reproduction – involves two individuals male and female. This method is mostly common in fishes.

(b) Hermaphroditic reproduction – occurs in very few fishes e.g. some salmonids and perches and Black bass (*Micropterus* being introduced in Nigeria). In this case, both male and female reproductive organs are present in each individual. In some fishes, there is sex reversal i.e. at any point in time there is either testis or ovary. But it can change when it is necessary, ovary changing to testis and vice versa. The two sex organs do not occur at the same time.

(c) Parthenogenetic reproduction – in fishes, it is appropriately known as Gynogenetic reproduction where sperm penetrates the egg but will not fuse with the nucleus of the egg. It only stimulates the egg.

Reproductive systems include ovaries in female and testis in female. The system also include reproductive ducts. In primitive fishes e.g. jawless fishes (Agnatha), there are no productive ducts, but have gonads only. He gonads are internal, longitudinal and originate as paired in most fishes. In few fishes, the two may become partly fished or fused totally together. In some, one may become degenerate, one functions (Illustrate all these during lecture hours). Gonads are enclosed and suspended in mesenteries called mesorchia and attached to the air bladder. In very rare or abnormal cases, some fishes may have two pairs of gonads. The size, weight and colour of gonads vary depending on the stage of sexual maturity. The weight of gonad is usually expressed as percentage of the body weight of fish. This is known as Gonado-somatic index

(GSI). The GSI in male fish is about 12% or less while in female it is between 30-40%. In terms of colours, the virgin or immature gonads are almost colourless and translucent. But the developing and mature testis, it is usually creamy white and flocculent while the developing and maturing ovaries, colour ranges from yellow through golden yellow to green. The ovaries are usually granular in texture, testis and smooth. The size of granular in texture, testes are smooth. The size of granules depends on the stage of gonads. In outline, the ovary is usually longer than the testis and when they ripen, the ovaries occupy most of the body cavity leaving vary little space for other viscerals. In some fishes especially the catfish Clarias, Synodontis the testis looks wavy or folded in outline. Illustrate the TS of testis.

The structure of sperms varies from species to species. Illustrate with examples of eel, trouts, perch, guppy. Most eggs in fishes are spherical, some are oval in outline e.g. Cichlid, may look like tear-drops e.g. in guppy. Some eggs may have appendages used for anchorage e.g. Shark (Draw). The maximum size of eggs varies from species to species. This is attributed to parental care exhibited by the fish. Fishes which show some care for their egg and young one tend to have large sized eggs and young have tiny or small eggs. Fish with large sized eggs produce fewer numbers of eggs while those produce small sized eggs spawn large number of eggs. The smallness of the eggs is associated with the fecundity or number of eggs produced by the fish. The small sized tends to have higher density of yolk and hatch faster than big sized eggs. The sperm cells are produced in large number in a juicy fluid secreted by the sperm duct. The sperm cells (Spermatozoa) and the sperm duct secretion make up the white fluid called MILT. A drop of milt may contain thousands of sperm cells

Fecundity

Simply, fecundity is the number of eggs produced by a fish. This term has been variously defined by authors e.g. (i) defined as the number of eggs produced by fish at each spawning (number of eggs/spawn) (ii) Number of eggs produced in a season (number of eggs/season) (iii) Number of eggs produced in a year (number of eggs/life time). The first three definitions for fishes which spawn in a year are essentially the same. But, in case of fishes e.g. Tilapias, which spawn between 4 and 14 times in a year, these definitions are not useful. The 4th definition above is more difficult because it is not easy to know the life span of a fish. Therefore, the more convenient definition of fecundity is taken as the number of eggs in the ripe ovary of a fish. As fishery biologist, look for ripe ovary and count number of eggs. This is called total or individual or absolute fecundity of a fish. Relative fecundity is taken as number of eggs in the ripe ovary of a fish per unit weight or length of a fish. Relative fecundity is a more reliable expression of fecundity of a fish for comparative purpose.

Importance of Fecundity (i) used as part of systematic in racial studies (ii) useful in studies of population dynamics and productivity (iii) Preserves species and relative stability both in space and time.

In order to assess fecundity, the stage of gonad development need to be determined e.g. Using Kesteven (1960) key.

Stage I – Gonad appears as a strand lying within the visceral.

Usually, it is impossible to determine sex except by microscopical examination.

Stage II – Enlargement of gonads. Stages I and II are immature.

Stage III – Further increase in size of gonads. The ovary takes on a pale greenish colour whereas testis assumes a cream colour e.g. in Sarotherodon. The stage is maturing.

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Stage IV – Gonads tend to move in the mid-line thus increase in size. No further numbers of eggs can be added. Counting of eggs can start at this stage.

Stage V – Ripe stage. With small taping, few eggs are released.

Stage VI – With taping, the eggs are running. The stage is referred to as running stage of spawning.

Stage VII – Gonads empty

Stage VIII – Recovery stage

Stages IV and V can be used in estimation of fecundity.

How to determine the fecundity of a fish

 Measure length and weight of the fish, preferably when still fresh.

 Take out the ovaries, weigh and then take a sub-sample of 1g or 5g or 10g. Count the eggs. A lens or a binocular microscope can be used in the counting. It may be necessary to take sub-samples from different parts of the ovary and calculate the average number of eggs per unit weight or length of fish.

Multiply the number of eggs in sub-samples by the weight of the ovary to get the total number of eggs in the ovary. This method is known as Gravimetric method. For example –

W – Weight of two ovaries

w – Weight of subsample of ovary

n – Number of eggs in sub-sample

N = n x W (N = total number of eggs i.e. fecundity)

W

The second method is volumetric which utilizes volume of eggs instead of weight of the eggs. Direct enumeration is another method. This is a direct count, very accurate and useful when the

ovary is small and number of eggs is very low. During counting, eggs may damage, it is therefore necessary to harden the eggs before counting. Different technique for hardening eggs, the most convenient method is by using the Gilson's fluid. Put ovaries in the fluid and shake intermittently for 1-2 weeks after which the count could be made. Before preserving the ovary, remove the ovarian walls for the fluid to penetrate into the eggs. Other method is by boiling the ovary, many eggs are gummed together hence break at counting. 70% alcohol or 10% formalin may be used but still stick together and break during counting.

Factors affecting fecundity will be discussed during lecture hours. Endeavour to attend.