INVENTION OF A NEW INDEX FOR THE DETERMINATION OF SEXUAL MATURITY IN FISHES

ANOOP K. DOBRIYAL, KUM KUM RAUTELA* AND A.S. RAUTELA*.
DEPARTMENT OF ZOOLOGY, H.N.B. GARHWAL UNIVERSITY CAMPUS,
PAURI GARHWAL - 246001, INDIA.
DEPARTMENT OF ZOOLOGY, GOVT. (P.G.) COLLEGE, KOTDWAR- 246149, INDIA*.

The paper deals with the interpretation and importance of a newly invented index for the determination of sexual maturity, month and frequency of spawning in fishes. The index is named as Dobriyal Index (D.I.).

Indices are used in the limnological and biological studies for the easy interpretation of a complex data. For the study of maturation and spawning biology, the Gonado - Somatic Index is generally used. Calculation of this (GSI) index involves both the gonad weight as well as the body weight of fish. An increase or decrease in the body weight of fish does not depend only on the maturation of gonads. It may be influenced by the feeding intensity of fish, availability of food items in the environment or environmental and physiological stresses including the spawning. Hence, the Gonado-Somatic Index can not be considered as the best index of sexual maturity. Keeping in mind this genuine fact a new index is developed which is found more suitable and easy for calculating the sexual maturity in fishes. Details of the index are as follows:

Name of Index	Dobriyal Index (D.I.)
Use	Determination of sexual maturity, spawning season and frequency of spawning in fish :
Formula	$D.I. = \sqrt[3]{GW}$
	Where D.I. = Dobriyal Index, GW = average gonad weight of fish in grams (Male or Female) calculated for a particular month or size group.
Importance	(a) Involves only the data related to sexual organs for calculation of index.
	(b) Easy for interpretation and calculation.
	(c) Provides narrow range of index even if the gonad weight is very low or very high. eg. if gonad weight is 0.001 gm, the DI will be 0.1 and if gonad weight is 1000 gm (1kg.) the D.I. will be just 10.0

Interpretation of data : The index was for the first time used with data on a hillstream fish *Garra lamta* (Ham.) collected from the Khoh stream near Kotdwar by Rautela & Dobriyal (1998). The data presented in Table I showed that the D.I. (Dobriyal Index) shows an increasing trend upto June in both the sexes when it was as high as 1.69 in female and 0.66 in males. There was a slight fall in the value during July which is an indicatior of first attempt of spawning by the fish in this month. In August, there was a sharp fall in the value which indicated the heavy spawning in the fish with a single frequency (0.49 for males., 0.47 for females).

Supremacy over GSI : As it has already been discussed that the D.I. involves only gonads for calculating index whereas the GSI involves body weight of fish also which is not only dependent on gonad weight, but also on the feeding intensity, food availability and environmental and physiological stress. As for example if we compare the DI with GSI calculated for *Garra lamta* (Ham.) by Rautela & Dobriyal (1998), the GSI gives no indication of spawning in July, whereas the detailed studies like tabulation of percentage occurrence of fish of various maturity stages

Table I : Dobriyal Index (D.I.) calculated for the estimation of maturity, month and frequency of spawning in a hillstream fish *Garra lamta*. (Rautela & Dobriyal, 1998).

Month	Average monthly wt. of testis (gm)	D.I. (Male)	Average monthly wt. of ovary (gr)	D.I. (Female)
Jan.	0.004 ±0.001	0.16	0.012 ±0.003	0.23
Feb.	0.004 ±0.002	0.16	0.028 ±0.012	0.30
Mar.	0.007 ±0.002	0.19	0.042 ±0.026	0.35
Apr.	0.008 ±0.003	0.20	0.045 ±0.026	0.36
May	0.014 ±0.004	0.36	0.078 ±0.062	0.43
Jun.	0.284 ±0.088	0.66	4.785 ±2.258	1.69
Jul.	0.247 ±0.048	0.63	4.184 ±2.829	1.61
Aug.	0.121 ±0.04	0.49	0.104 ±0.036	0.47
Sep.	0.10 ±0.004	0.22	0.073 ±0.033	0.42
Oct.	0.006 ±0.002	0.18	0.054 ±0.019	0.38
Nov.	0.004 ±0.003	0.16	0.049 ±0.01	0.37
Dec	0.003± 0.001	0.14	0.041 ±0.025	0.35

during different months and availability of spent fish, confirmed that the fish started spawning in July. However, the DI (index) gave a clear indication about fish spawning in July (Fig.1).
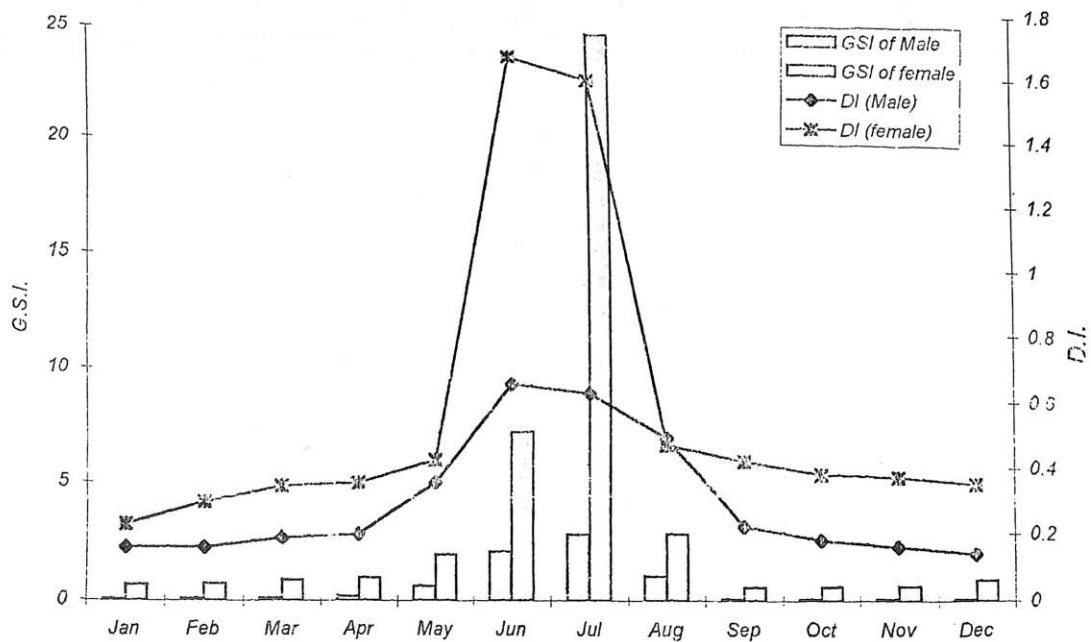

Fig : 1. Comparision of Gonado-Somatic Index (GSI) and Dobriyal index (DI) calcuiated for *Garra lamta* (Ham).

The finding was confirmed when the reproductive capacity (Fecundity) of *Garra lamta* was correlated with body weight and ovary weight. For fecundity and fish weight relationship (Fecundity = -6905 +1684X fish weight), the coefficient of correlation was 0.9037. On the other hand for fecundity and ovary weight relationship (Fecundity = 285.4 + 6058X Ovary weight), the coefficient of correlation was 0.9810. Thus, it is clear that the gonad weight alone gives a better correlation with reproductive capacity than the body weight.

Hence, it was concluded that the new index (D.I.) is a better index to make use for spawning biology studies in fishes.

REFERENCES

RAUTELA, KUM KUM. & DOBRIYAL, A.K. 1998. Studies on the breeding biology of *Garra lamta* (Ham.) from Khoh river (Unpublished data).