The Journal of the Oceanological Society of Korea
Vol. 15, No. 2. p. 108~111, Dec. 1980

MORE RELIABLE LENGTH COMPOSITION AND BIOMASS OF EEL POPULATION IN THE LAGOONS OF ARCACHON BAY

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ABSTRACT

The sampling was made by a kind of trap nets and an electric fishing apparatus in the lagoons of Arcachon Bay. Length frequency distributions obtained by two gears are combined to propose more reliable length composition of the population.

The biomass was estimated by the capture and recapture method in a limited area with electric fishing apparatus, and it was redressed based on the corrected length composition. It showed approximately 638kg/ha in the deeper parts of the lagoons. It suggests that the lagoons of Arcachon Bay contain relatively high density of eels.

INTRODUCTION

Most fish capture methods are selective with respect to species and size of individual, often sex as well. Selection is usually thought of in terms of length, because of its direct relation to other parameters and of its relative easiness to measure. Representativeness of length frequency distribution is one of the most important factors in fish population studies. One sampling method tend to select preferably certain length classes, efficient for smaller or for largest. To avoid this trouble, it is generally recommended to use several different kinds of fishing apparatus in the same water and to exploit the least selective length classes obtained by different gears.

Trap nets are widely used for commercial eel fisheries. They are passive in character and bag type in selection. Thus behaviour charactors of fishes determine the quality of catches and the mesh size of nets secondly modifies the length composition of fishes once entered in the traps.

Electric fishing apparatus attracts recently great attention of hydrobiologist, particularly for eel population studies(McGrath, 1971) for this method is considered to be one of the the least selective of all active fishing apparatus. However, its use still remain in shallow waters and it cannot cover a large area with a given effort.

In this study, a type of trap net and an electric fishing apparatus were used and the least selective classes of each gear were combined to give more reliable length composition of the population. The biomass estimated with electricity was corrected based on the redressed lenth composition.

MATERIALS AND METHODS

Sampling was made in April 1978 in the lagoons of Graveyron in Arcachon Bay(Fig. 1).

Utilized trap net, called "capetchade", is widely employed for eel fisheries in the Mediterranean coast of France. Each capetchade consists of three traps and with a leader. The mesh sizes diminish 32mm, 20mm, 16mm, and 14mm from the wings to the cod end of nets from passing a funnel. More detail descriptions are given by Lasserre (1976). In this study, five capetchades without leader were employed to obtain a general image of the population.

Intensive fishing was done by electric fishing apparatus in a section of lagoons where sampling

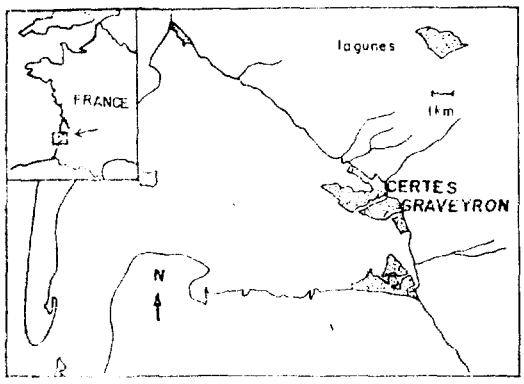

Fig. 1. Lagoons of Arcachon Bay

was made with the capetchades. The apparatus was adjusted by J. Nouguier following the techniques adopted by Gosset (in Lamarque, 1977). This apparatus needs three peoples for operation on the boat. one handles the active electrode, another the dip net, and the third the boat, In the sampling station, with salinity of 28‰ and water temperature of 12°C, the tension of 250 volts and the duty cycle of 10% gave the good results for eel fishing.

Capture and recapture sampling was made, also with electricity, in an area of 69m×15m =0.1035 hectare which was completely isolated by fine meshed nets. The first day, all captured eels were ampulated the extremity of a pectoral fin and released. The next day, captured animals were examined and counted seperating newly captured and recaptured.

All sampled animals were measured in centimeter and weighed in gram.

Length-weight relationship was evaluated using computer program WTLN of N.J. Abramson (Abramson, 1971).

RESULTS AND DISCUSSION

1. Length Composition

The conclusion of the escapement study (Lee and Lasserre, 1979) authorize to consider that eels larger than 37cm can be caught by the capetchades without selection of length. Although covering areas with a capetchade cannot be calculated exactly, five canetchades are considered as sufficient to represent almost correctly the population of the lagoons with respect to length composition. In consequence, catches by the capetchades (column A of the Table 1) will give the reliable information needed for the length composition of fishes larger than 37cm.

As an intensive fishing was made in a limited area with electricity, the catches (column B of the Table 1) may give the image relatively correct. But sampling area was too reduced to represent the population of the lagoons, particularly for the classes of low frequencies.

To propose more reliable structure for all length classes, it is desirable to exploit and combine the least selective length classes. The standardization coefficient was calculated in the classes of 37-41cm, because they contain the animals larger than 37cm and relatively high frequencies. These classes represent the frequencies of 48 for capetchade and 80 for electricity. Their ratio or standardization coefficient, is 80/48=1.67. In column C, the value of column A multiplied by standardization coefficinet to give the catches by capetchade comparable to those of electricity. Finally, column D is obtained by taking the classes inferior to 37-39cm of column B and the classes superior to 39-41 of column C.

It must be pointed that the fish distribution is not homogenous in the lagoons. Following to depth, the lagoons can be distinguished as two: shallower part with mean depth of 0.6m and deeper part of 1.5m. Length frequency distribution obtained in different depth showed that smaller eels are found in shallower waters, while larger animals occur in deeper waters. Sampling was realized in the deeper parts, smaller animals had low frequencies, also in the sample with electricity (Table 1). Therefore,

Table 1. Comparison of length frequency distributions obtained by the capetchades and by the electric fishing apparatus

length	A	B	C	D
11~ 13		1		1
13~ 15		9		9
15~ 17		9		9
17~ 19		10		10
19~ 21		20		20
21~ 23		15		15
23~ 25		30		30
25~ 27	1	15	1.7	15
27~ 29	1	32	1.7	32
29~ 31	1	45	1.7	45
31~ 33	5	46	8.3	46
33~ 35	8	75	13.3	75
35~ 37	16	64	26.7	64
37~ 39	25	45	41.7	45
39~ 41	23	35	38.3	38.3
41~ 43	24	22	40.0	40
43~ 45	23	5	38.3	38.3
45~ 47	15	8	25	25
47~ 49	6	3	10	10
49~ 51	5	2	8.3	8.3
51~ 53		2		
57~ 59	1		1.7	1.7
59~ 61	3		5	5
67~ 71	2	2	3.3	3.3
95~ 97	1		1.7	1.7
97~ 99	2		3.3	3.3
111~113	1		1.7	1.7
total	162	496		592.7

Remarks: A; capetchade B; electicity C; A·80/48 D; B-corrected

column D of Table 1 represents the length composition of the population in the deeper parts of the lagoons, at least for larger animals.

2. Estimation of the biomass

The results of capture and recapture method are as follows:

date	catches	fish marked	recaptures
April 22		M=263	
April 23	C=148		r=78

Rate of exploitation r/M=0.30 and r/C have the high values. Population number and its confidence limits can be, therefore, calculated as follows (Ricker. 1975):

The population number (N) is:

$$N=\frac{MC}{r}=499$$

Limits with 95% confidence of $1/N$ are:

$$\frac{1}{N}=\frac{r}{MC}\pm 1.96\sqrt{\frac{r(C-r)}{C^3M^2}}$$

One obtained the confidence interval of the number of fishes of the population:

$433<N<589$

Aa sampling with electricity was done in a limited area, the estimated biomass can not be generalized for the lagoons. Based on the result of the corrected length composition in the prior section, the mean number of fishes for 0.1035 hectare correspond to $499\times 593/496=596$ for the deeper parts of the lagoons, or 5758 individuals per hectare.

Length-weight relationship was $W=0.1275\times 10^{-2}L^{3.0948}$ for 177 individuals, where W=weight in gram and L=length in centimeter. Applying this relationship to the frequencies of column D of the Table 1, the biomass correspond to 638 kg/ha. This value is about two times greater than the biomass calcuated based on the length composition with electricity (301kg/ha).

When the standardization coefficient is calculated from the length classes of 37-43: $(45+35+22)/(25+23+24)=1.42$, the density in number and in weight are 5504 individuals and 577kg/ha respectively.

In the shallower parts of the lagoons of Certes, 220kg/ha was catchable by the capetchades in the same season (Lee and Lasserre, 1979). The lagoons of Certes, situated just north side of Graveyron (Fig. 1), is very similar to Graveyron in structure and ecological conditions. Accounting the selectivity of capetchade, the deeper parts of the lagoons contain the eels more than two times than the shallower parts.

Available data is very few for the comparison of the biomass of sedentary yellow eels, *Anguilla anguilla* (Tesch, 1977). But it appears that the eel stock is relatively high in the lagoons of Arcachon Bay. It is thought partly because the ecological conditions are well fitted for the growth of the eel and partly because the stock is not exploited except the migrating silver eels (Lee, 1978).

CONCLUSION

Capetchade contain the eels larger than 37cm with least selection of length. Electic fishing is considered least selective gear of all active fishing methods. But in this study, the sampling area was too limited to represent the length composition of the populatin, particularly for the classes of low frequencies. To propose more relable length composition, the catches obtained with two gears combined after calculation of standardization coefficient in the classes of 37-41cm. This is done by taking the frequencies of the classes inferior to 37-39cm of the catch by the electricity and those superior to the classes of 39-41cm of the capetchade.

The biomass estimated with electricity was redressed based on the corrected length composition. It represents 638kg/ha, in the deeper parts of the lagoons. It suggests that the lagoons of Arcachon Bay contain relatively high density of eels.

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N.B.: This paper is a part of thesis of "Dectorat de Troisième Cycle", presented to University of Sciences and Techniques of Languedoc, France, in July 1979, and titled "Dynamique des population d'anguilles, *Anguilla anguilla*(L), des langunes du Bassin d'Arcachon."