

FEEDING INTENSITY OF BIGEYE TUNA, THUNNUS OBESUS (LOWE), IN THE ATLANTIC OCEAN

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SUMMARY

Seasonal dynamics of feeding intensity of bigeye tuna in different areas of the Atlantic Ocean is considered based on studies of stomach fullness indices from the materials for the 1965-1979 period.

RESUME

La dynamique saisonnière de l'intensité trophique du thon obèse dans divers secteurs de l'Atlantique est examinée en se basant sur l'étude des indices du contenu stomacal provenant de l'information obtenu durant la période 1965-1979.

RESUMEN

Se estudia la dinámica estacional de la intensidad de alimentación del patudo en diferentes zonas del Atlántico, en base al estudio de los contenidos estomacales, para el periodo 1965-1979.

The bigeye tuna is one of the major objects of the world tuna longline fishery. The feeding of bigeye tuna and its trophic relations are considered in the papers of some authors (Maximov, 1969; Borodulina, 1974; Valle, Mesentseva, Rodriguez, 1979). However, seasonal intensity of the bigeye tuna feeding in different areas of the Atlantic was studied without due attention. Examination of this aspect may permit to solve some problems concerning the feeding migrations, seasonal distribution, formation of commercial aggregations and more precise definition of population structure of this species.

Materials and Methods

The materials were collected in the course of scientific-research and longline expeditions conducted in the 1965-1979 period. A total of 29661 stomachs was examined. To evaluate the stomach fullness, a nomogram of conversion of food mass weight to the stomach fullness grade, Q, depending on the weight of bigeye tuna was used (fig.1; Chur, 1973). For the analysis the material was separated into areas based on a scheme of break-down by areas used for the analysis of sexual maturation of the bigeye tuna (Gaikov, 1982). Fig.2 presents a scheme of break-down by areas.

Results

In area 2 the feeding intensity of the bigeye tuna increases from January to April when maximum stomach fullness is observed with mean index of fullness of 2. Later, the degree of stomach fullness decreases, and minimum fullness is observed in May-December (fig.3). A similar situation is recorded for area 1 (fig.4). However, due to a lack of material collections on the all the year round basis and insufficient material available for separate months the final conclusions concerning seasonal dynamics of feeding intensity in these two areas cannot be drawn.

In area 3 the most intensive feeding of the bigeye tuna is recorded in April-July and September-October with mean index of

stomach fullness of 1.90-2.33. In August the decrease in stomach fullness up to 1.29 is observed in this area. In area 3 the period of the most intensive feeding of the bigeye tuna coincides with the peak of spawning (Gaikov, 1982), i.e. the best food supply is observed during the massive reproduction. During this period tunas are likely to migrate to area 3 from areas 1 and 2. The food supply and feeding intensity of the bigeye tuna in area 4 are similar to those in area 3. In this area the highest stomach fullness index of 1.43-2.42 is recorded in April-August and October-November (fig.6). The decrease in stomach fullness index to 0.67 is observed in September. The decrease in feeding intensity of the tuna in area 3 in August and in area 4 in September may cause the migrations of the bigeye tuna in the latitudinal direction during the spawning period.

In area 5 a rather high mean stomach fullness index of 1.64-2.05 was recorded within the entire period of observations made in the area between September and April (fig.7). Like in area 3, in area 5 the most intensive feeding coincides with the peak of spawning of the bigeye tuna. The absence of large aggregations of the bigeye tuna in this area between May and August is probably associated with the tuna post-spawning migrations in the southern and southwestern directions up to the Brazilian coast where the tuna appears in great numbers in May-August (Zavala-Camin, 1978). A similarity is also observed between the feeding intensity of tunas from areas 4 and 5 in October-November, although in these areas the bigeye tuna feeding dynamics as a whole differs considerably. This can apparently be attributed to the seasonal dynamics of hydrological regime in the area because in the fall in the Northern Hemisphere following a protracted effect of the south-east trade wind, when the Southern Trade Wind current is most strongly pronounced (maximum speed above 100 cm/sec) in the equator area and spreads deeper than in spring, the intensity of Lomonosov's current sharply weakens; a deviation of axis of current to the south of equator is observed, and the region of its dispersal shifts to 5°W from the São-Tomé Island (Khlystov, 1976). That is to say, just during October-November a barrier, known as Lomonosov's current, being a boundary between the northern and southern populations of the bigeye tuna, relaxes

or partly disappears, and a certain mix between these populations becomes possible at the border of areas 4 and 5 for a short period.

In area 6 the feeding of the bigeye tuna was stable during the observation period, and the stomach fullness index of 1.19-1.50 was recorded in July-December (fig.8).

Conclusions

The most intensive feeding of the bigeye tuna is observed in the period and in the areas of massive spawning in the Northern and Southern Hemispheres.

In October-November a short-term partial mix between the northern and southern populations of the bigeye tuna is possible in the area of equator (2°N-2°S; 0-10°W) due to relaxation in the intensity of Lomonosov's current and intensification of the Southern Trade Wind current.

References

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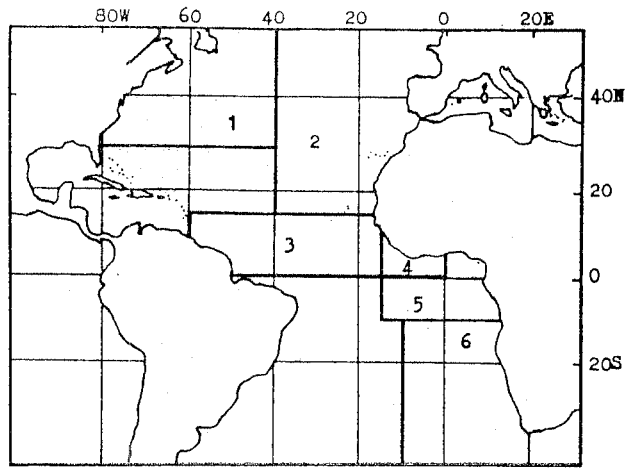


Fig.1 A scheme of break-down by areas.

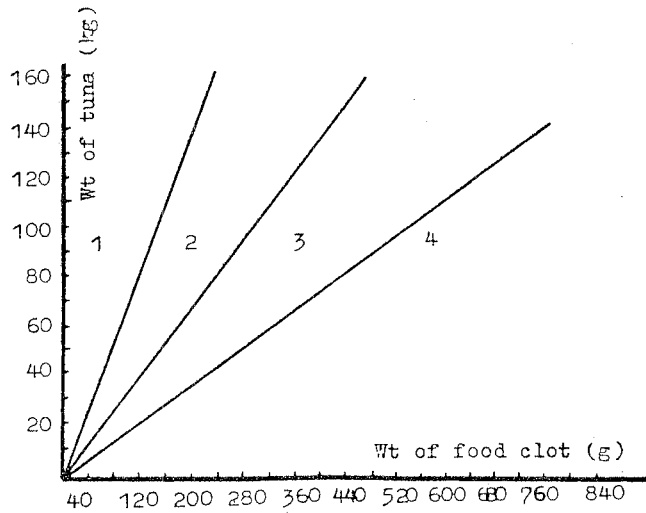


Fig.2 Nomogram of conversion of food mass weight to stomach fullness grade.

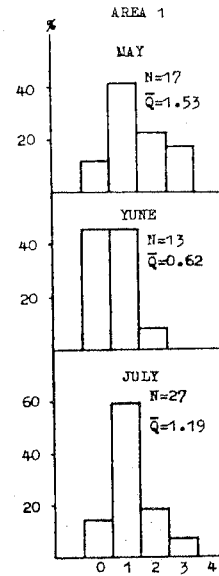


Fig.3 Bigeye tuna stomach fullness in area 1.

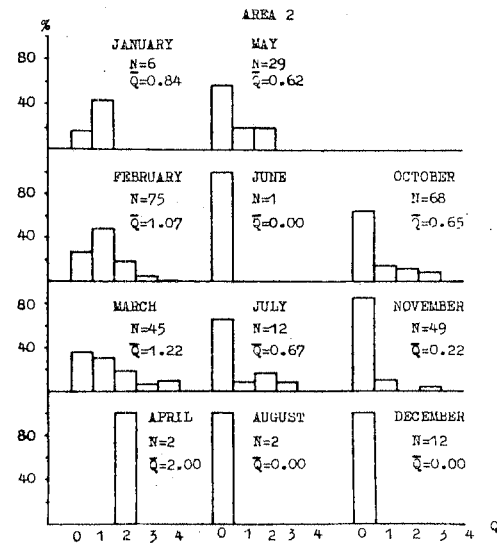


Fig.4 Bigeye tuna stomach fullness in area 2.

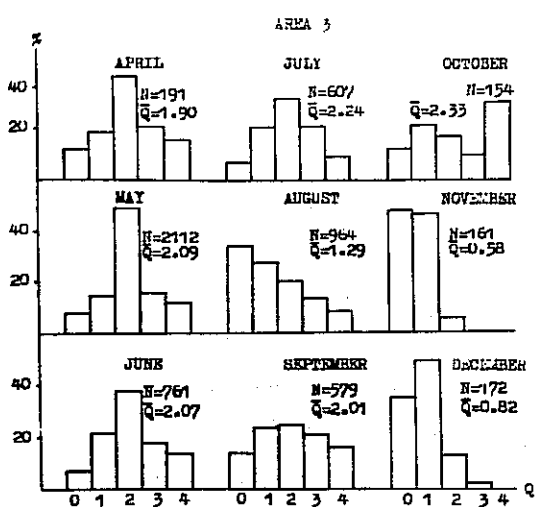


Fig. 5 Bigeye tuna stomach fullness in area 3.

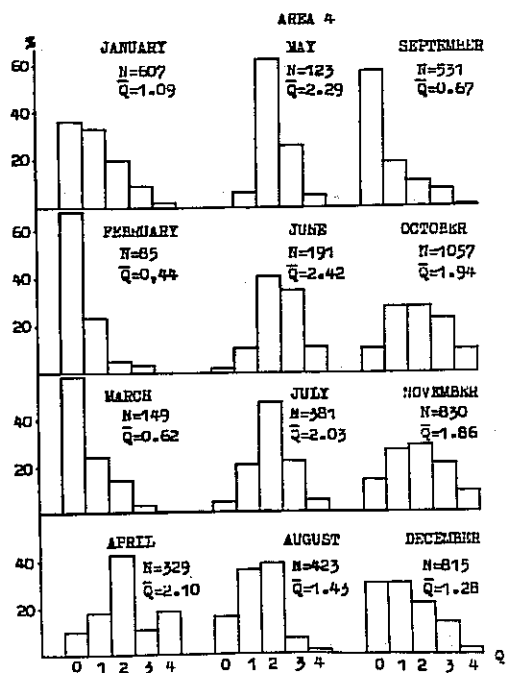


Fig. 6 Bigeye tuna stomach fullness in area 4.

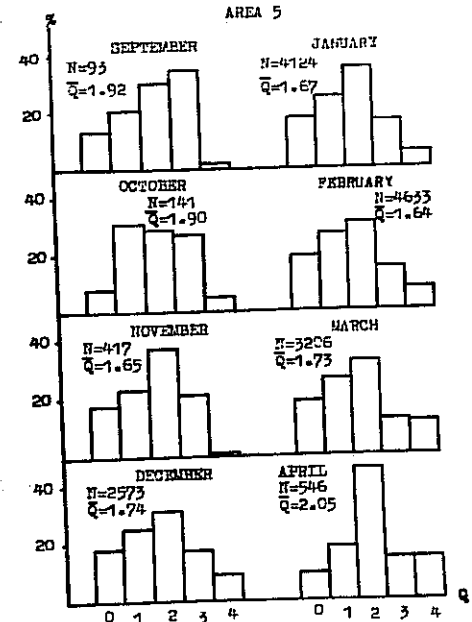


Fig. 7 Bigeye tuna stomach fullness in area 5.

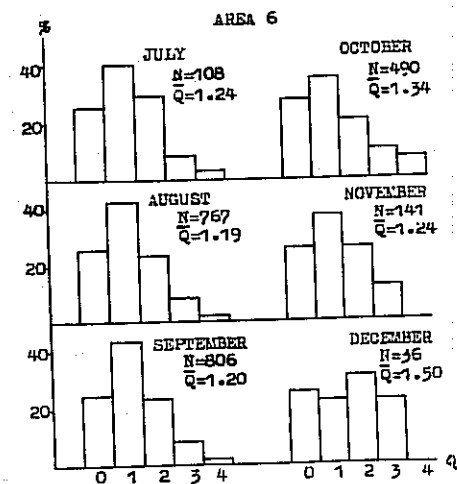


Fig. 8 Bigeye tuna stomach fullness in area 6.