

Report Vol. 37 (3-4). Julio – Diciembre 2010

**AGE AND GROWTH OF THE PERUVIAN WEAKFISH, *CYNOSCION ANALIS*
(JENYNS), STUDIED IN PAITA (5°S), PERÚ. 1979**

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ABSTRACT

This study was done based on the interpretation of otolith growth rings. A total of 538 otoliths from specimens collected in Paita sea (5°S) in 1979 were used. It was made an analysis of the radii of the otolith growth rings to estimate the age and elaborated length-age keys for males, females and both sexes and the growth in length and weight of the Peruvian weakfish is presented.

**AGE AND GROWTH OF THE LORNA DRUM *SCIAENA DELICIOSA*
(TSCHUDI) STUDIED IN CALLAO (12°S), PERU. 1996**

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ABSTRACT

It is determined the age and growth of the lorna drum *Sciaena deliciosa*, on the basis of the interpretation of the otoliths growth rings. In this study, 806 otoliths obtained in specimens collected in waters of the Callao Port (12°S) in 1996, were used. The otoliths were grinded and burned for the visualization of the growth rings. The age-length key for males, females and for both sexes was elaborated. It was obtained the average length per age and is presented the growth in length and weight of the lorna drum.

**AGE AND GROWTH OF THE STRIPED MULLET, *MUGIL CEPHALUS* LINNAEUS, STUDIED IN
CALLAO (12°S), PERÚ. 1996**

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ABSTRACT

It has been done the first study of the age and growth of this neritic species based on the interpretation of otolith growth rings. In this study, a total of 1065 otoliths obtained from specimens collected in Callao sea (12°S) during 1996, were used. It is presented an analysis of the epoch of formation of the otolith growth rings, age and length keys for males, females and both sexes, the growth in length and weight of the striped mullet.

**AGE AND GROWTH OF THE PERUVIAN SILVERSIDE, *ODONTESTHES*
REGIA REGIA (HUMBOLDT) IN PERUVIAN SEA. 2002**

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ABSTRACT

The method used was interpreting growth rings in sagittal otoliths. The specimens were collected in different latitudes in Peruvian sea: Chimbote (9°S), Huacho (11°S), Callao (12°S), Pisco (14°S) and Ilo (17°S), with curtain nets, along the year 2002. The age-length key was elaborated assigning arbitrary date of birth as July 1st and the growth parameters of von Bertalanffy equation were estimated using the non-linear method of Allen. In the analysis of the age structure of catches, five age groups were observed; the groups of 2 and 3 years dominated and together reached 73.2% of the total catch of this species. We also analyzed age-length keys of other authors and re-estimated growth parameters, which are compared with results obtained in this study.

PERIODICITY OF GROWTH RING FORMATION IN OTOLITHS OF PERUVIAN HAKE *MERLUCCIUS GAYI PERUANUS* GYNSBURG

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ABSTRACT

The periodical formation of macrostructures in otoliths of Peruvian hake, using transversal sections, is studied. The sample was composed of 8 hake otoliths (5 female and 3 male) from a demersal scientific cruise executed in austral autumn of 2008, and 13 otoliths (7 female and 6 male) from a cruise of austral summer of 1987. The evidence of a biannual formation of growth rings in Peruvian hake and its apparently endogenous periodicity are discussed.

RELATIONSHIP BETWEEN THE SPATIAL DISTRIBUTIONS OF PERUVIAN HAKE (*MERLUCCIUS GAYI PERUANUS* GINSBURG) AND SOUTHERN EXTENSION OF THE CROMWELL CURRENT

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ABSTRACT

Previous researches suggest that: i) the habitat of Peruvian hake is determined by the Southern Extension of the Cromwell Current (SECC), and ii) hake is spatially segregated by sizes, with adults to the north and juveniles to the south of the range. Based on those assumptions, the present work hypothesizes that variation of SECC intensity determines latitudinal movements of the hake spatially segregated, and as a consequence, it also determines changes in the availability of different age groups to the fishery in the traditional fishing area off Paita. For this, inside a set area (5°S), variations on hake size were related to variation in SECC intensity. As indicator of size structure, the mean length (ML) was used, whereas of SECC intensity the ESCCi is proposed, an index easily and continuous over time, estimated from the remote sensing. Significant correlation between them showed that, in monthly terms, the SECC effectively determines latitudinal movements of hake spatially segregated and the availability of different age groups to the fleet, inside the traditional fishing ground.

BIOLOGICAL FISHING RESEARCH CARRIED OUT IN THE TUMBES REGION, PERU. 1996-2005

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ABSTRACT

The Oceanographic characteristics of Tumbes sea are special, compared with the rest of the Peruvian sea, due to the strong influence made by the presence and dynamics of the Guayaquil Gulf on this part of Peruvian sea, which has tropical characteristics, including the southern limit of Pacific mangroves. It determines the existence of aquatic fauna quite diverse and specialized. During the study period (1996 - 2005), the total hydrobiological resources, were unloaded in six places and reached 189,554.3 metric tons. The most important species were the fishes: the Pacific drum, *Larimus* spp. (14.8%), the Pacific thread herring, *Opisthonema* spp. (10.4%) and the Peruvian hake *Merluccius gayi peruanus* (8.2%). The highest tonnage unloaded was received in La Cruz cove (62,566.6 t; 33,3%), with a maximum of 31,143.3 t recorded in the year 1999. Fishing is artisanal and it is exclusively targeted for direct human consumption. The extraction is realized with different types of boats and fishing gear. The artisanal fishing fleet of Tumbes Region is very old, with inadequate implementation of equipment and fishing gear and do not have any maintenance system on board. Foreign seiner boats recorded the highest catches (57.9%). The growth of fishing effort was notorious in the 10 years of study; the number of fishermen and boats increased, but the main coastal ports and coves do not have any preservation infrastructure, ice production and marketing of hydrobiological products. The organization of artisanal fishermen of the Tumbes Region comprises five unions, two guilds, three associations and one cooperative. Among the measures to regulate fisheries, two periods of closure have been implemented to protect reproductive stages of shrimp and crab mangroves, mainly in the summer season. The ecdysis phase of mangrove crab in late winter and early spring is protected. For shrimp, this rule has been supported by a technical report issued by the IMARPE. The average annual SST fluctuated between 28.3 °C (1998) and 25.6 °C (2000). The average annual precipitation accumulated ranged from 74.8 mm (1996) to 2,365.8 mm (1998).

THE BLACK SHELL, *ANADARA TUBERCULOSA* (SOWERBY), IN THE MANGROVES OF TUMBES, PERÚ. FEBRUARY 2007

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ABSTRACT

In this study 190 biological stations were established; 25 tidal channels and seven islands in the ecosystem mangrove were evaluated. The largest number of individuals was found in Zarumilla area (with 11 tidal channels and 5 islands). The sex ratio was 1♂:1.3 ♀, with high percentage of juveniles (35 to 40 mm VL, average 38.5 mm); 75.7% of individuals measured less than the minimum size extraction (45 mm VL). The analysis of maturity showed gonad males "in development" (stage II) and females "developed" (stage III). *Anadara tuberculosa* showed an allometric growth, with a yield of 41.7% of fresh body weight. The population was estimated in 5,357,383 individuals; 65% of these specimens were found in Zarumilla area. It was determined a population density of 1.3 individuals/m². In the case of the ark shell *A. similis*, a density of 0.65 individuals/m² and a population of 2,238,683

individuals were estimated. The associated fauna consisted of four species of bivalves, which coexist with *A. tuberculosa*. The maximum values of air temperature (32.9 °C) and sea surface temperature (33 °C) were reported in Zone 2 (Bay of Pizarro). On average, the higher salinity was in Zarumilla (30.881 psu), while the lowest was in Corrales area (18.168 psu), because of the mixing of freshwater of Tumbes river with marine water. In the estuary Cherrez due to low salinities recorded (< 7.0 psu), bivalves were not found; and because the anoxic conditions in the mud, that emitted strong odours of hydrogen sulphide, no shrimp was recorded. The highest concentrations of nutrients (phosphates, nitrites and nitrates) were found in Zarumilla.

THE PEARL OYSTER, *PTERIA STERNA* (GOULD), IN TALARA, PERÚ. APRIL 2007

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ABSTRACT

Between April 14th and 23rd, 2007, a prospection was conducted to find the biological, the natural banks, distribution and concentration as well as environmental conditions of pearl shell (*Pteria sterna*) in 120 stations on the coast of Talara. Its population was reported 2.6 to 20 m deep. The population showed stratification by size, the smaller were found at shallow depths, stratum II (5 to 10 m), while the larger sizes in stratum III (10 to 20 m). The population density for the entire area was 0.9 individuals/m² evaluated. The highest densities were observed at Punta Arenas, the stratum III was the most representative. The yield of the part edible (thallus) was of 1:14.7. The associated fauna was represented by mollusks, crustaceans and echinoderms, highlighting the bivalve *Ostrea megodon* and the gastropods *Bursa nana* and *Thais callaoensis*; among crustaceans *Teleophrys cristulipes* and *Petrochirus californiensis*, and echinoderms. To the north and center of Talara were recorded prevalence of Subtropical Surface Water (SSW) and a weak influence of Equatorial Surface Water (ESW) in the south. The highest concentrations were associated with isotherms of 16.5 to 17 °C, isohalines of 35.100 to 35.150 ups, oxygen content of 2 mL/L; phosphates, 1.4 to 1.6 ug-at/L; nitrite between 0.3 and 0.4 ug-at/L; nitrates and silicates, 14 ug-at/L.

THE OYSTER *CRASSOSTREA IRIDESCENS* (HANLEY) IN TUMBES, PERU. SPRING 2007

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ABSTRACT

A total of 213 bio-oceanographic stations were established in three depth strata: I (0 to 5 m), II (5 to 10 m), III (10 to 15 m). The oyster *Crassostrea iridescens* was found at depths between 1.9 and 7.0 m, the range of sizes was 11 to 228 mm valvae length; there was high percentage of juvenile and seeds in the central littoral (Bonanza - Sandy Florida); the largest proportion of small oysters were placed at shallow depths (stratum I) and large sizes were located in stratum II; but it was not found in stratum III. The average yield per ton of total weight of the bivalve was 88.5 kg of meat; in the south (Lavejal - Punta Sal) greater numbers of mature individuals were found; this gonad status raised the yield to 99.2 kg/t. The relative density throughout the assessment area was 0.2 oyster/m²; the banks

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in Punta Sal Chica recorded densities of 1 to 12 specimens/m², the maximum density was recorded in stratum I, with 0.5 oysters/m². The associated fauna included molluscs (mainly the bivalves *Barbatia rostrata*, *Lithophaga hastasia*, and the gastropod *Crepidula aculeata*), crustaceans (*Pisidia magdalenensis*) and echinoderms. The slope of the continental shelf is higher in the south and is dominated by sandy sediments and rocky type-gritty. The oysters were distributed in rocky areas throughout the assessment area between the isotherms of 23.7 and 26.9 °C and isooxygen of 4.45 to 5.11 mL/L. It was no relationship between resource density and concentration of dissolved oxygen, or nutrients other than nitrate in the south.

THE MANGROVE CRABS *UCIDES OCCIDENTALIS* (ORTMAN) IN TUMBES, PERU. SPRING 2007

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ABSTRACT

A total of 172 biological stations were established, we evaluated 24 tidal channels and eight islands. The highest number of crabs found in the area of Zarumilla, (with 52.2% of the total in 11 tidal channels and five islands). The sex ratio was 2,0♂:1,0♀. Commercial size (≥ 65 mm, cephalothorax width) was found in 65.1% females and 88.1% males; a high proportion of males and females ripeness would prepare for the summer spawning. *Ucides occidentalis* showed a positive allometric growth rate. We determined a relative density of 2.5 individuals/m², estimating a population of 77.06 million crabs. The maximum temperature was 38.0 °C and the water was 32.4 °C, the highest salinity value calculated was 34.028 psu, dissolved oxygen reached a maximum of 5.67 mL/L, on average; in the great most of the tidal channels the values were within the limits established in the General Water Law (GWL). Among the nutrients, silicates exhibited the highest values and the nitrite the lowest.

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