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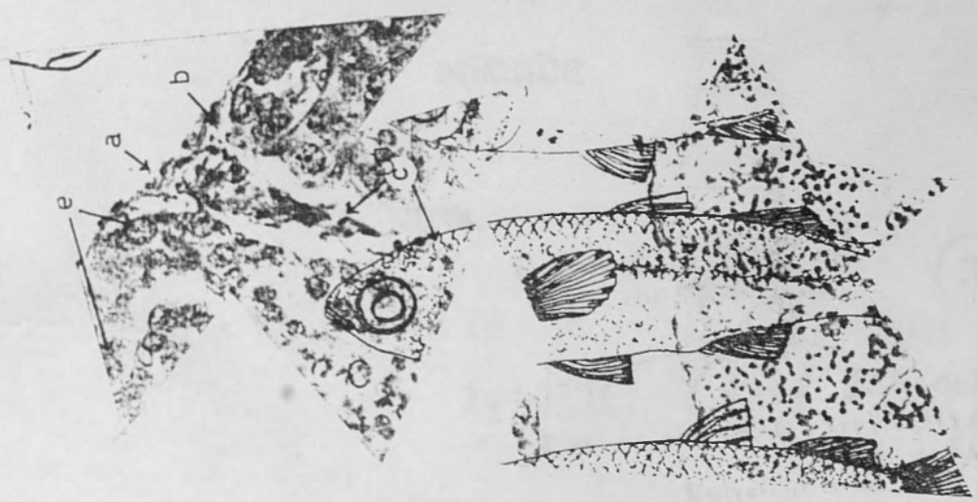


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# UNIVERSITI SAINS MALAYSIA



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# SOME ASPECTS OF THE BIOLOGY AND FISHERY OF THE GREY MULLET LIZA SUBVIRIDIS (VALENCIENNES,1836)

A THESIS SUBMITTED TO THE SCHOOL OF BIOLOGICAL SCIENCES
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ABSTRAK

Pengajian berkenaan sebilangan aspek biologi 'greenback grey mullet,' Liza subviridis yang termasuk taburan, jenis makanan, habit-habit persantapan, pembiakan dan tumbesar telah dilaksanakan di Pulau Pinang untuk memberi maklumat basa untuk perkembangan dan pengurusan perikanan ini pada masa hadapan. Keadaan perikanan mullet yang berwujud di Malaysia Barat juga dianalisiskan.

Kajian pertaburan memperlihatkan bahawa Liza subviridis di-taburkan secara luas di habitat-habitat pinggiran-laut dan kononnya menjadi unggul di hulu anak-anak sungai, kawasan kuala-kuala, paya-bakau dan dataran-lumpur. Toleransnya kepada satu julat luas parameter-parameter persekitaran saperti kegaraman, kandungan oksigen terlarut dan suhu memperlihatkan bahawa ianya satu spesi kuat dan jadi, pertaburannya tidaklah dihadkan oleh parameter-parameter fizikal ini.

Ikan ini ialah pemakan bawahan dan mengingesikan diatom-diatom bentik, alga-alga berfilamen dan detritus organik yang didapati dalam habitat di mana ianya memakan. Diet berubah dari satu jenis persantapan planktonik kepada satu jenis persantapan bawahan sementara ikan bertumbesa dari pos-larva ke dewasa.

Keheterojantinaan dipamirkan dan persenyawaan ialah secara luar. Perbezaan jantina berdasar kepada penelitian gonad-gonad. Enam peringkat kematangan telah diidentifikasikan untuk ikan jantan dan tujuh untuk ikan betina. Peringkat-peringkat itu dibezakan melalui perubahan

makroskopik serta perubahan mikroskopik dalam perkembangan gonad-gonad itu. Kematangan jantina dicapai pada saiz yang agak kecil. Ikan jantan dan ikan betina mencapai kematangan jantina pertama dalam julat saiz sebanyak 9.0 - 10.5 dan 11.0 - 11.5 cm. masing-masingnya dan pada usia-usia sepadan iaitu enam dan lapan bulan. Fekunditi menjulat dari 40,000 - 140,000 telur dalam ikan yang menyukati dari 10.3 - 13.9 cm. Pertalian antara fekunditi, F, dan jarak-panjang, L, boleh disampaikan sebagai

$$F = 1.9044\ L^{4.2998}$$

Peneluran dihadkan kepada satu kala pendek dan tertentu dan kesemuanya ovum-ovum masak dibebaskan dalam satu kejadian tunggal. Tiada musim peneluran yang major boleh dikesan dan peneluran berlaku sepanjang tahun. Kehadiran peringkat-peringkat pos-larva Liza subviridis serta peringkat dewasa yang mempunyai gonad-gonad matang di dalam air pinggiran-laut yang cangkat menunjukkan bahawa ikan mungkin bertelur di air dalam-pantai.

Perkembangan pos-larva boleh dibahagikan kepada peringkat-peringkat pos-larva, juvenil awal, juvenil lewat dan dewasa. Sisik-sisik ctenoid berkembang pada jarak-panjang jumlah 30 - 35 mm; pola-pola pigmentasi berubah dari titik berusingan kepada titik terbaur yang menggaris-kasarkan sisik pada kira-kiranya 15 mm. jarak-panjang jumlahnya; tulang praorbital menjadi gerigi dari jarak-panjang jumlah 11 mm; dan kelopak mata beradipos mula berbentuk pada jarak-panjang jumlah 30 mm.

Tumbesar boleh diwakili melalui persamaan von Bertalanffy yang dihisabkan sebagai

$$l_t = 20.7429\ (1 - \exp\ (-0.0035)\ (t - 14.7059)).$$

Saiz maksimum yang boleh dicapai dihisab sebagai 20.74 cm. Pertalian jarak-panjang-berat mungkin disampaikan melalui satu persamaan tunggal

$$\log W = 2.8184 \log L - 1.4751.$$

Perangkaan tangkapan memperlihatkan bahawa perikanan mullet telah merosot secara drastik sepanjang lima tahun silam. Alatan-alatan utama yang digunakan dalam perikanan ialah pukat-pukat tarik dan pukat-pukat insang. Satu kemusiman dipamirkan dari bulan Oktober ke bulan Disember. Negeri-negeri utama yang menghasilkan mullet ialah Perak, Pulau Pinang, Johor dan Selangor.

Beberapa pengkajian biologis yang dilaksanakan atas Liza subviridis menunjukkan kemungkinan pemusnahan habitat-habitat pinggiran-laut oleh kecemaran dan program penebusgunaan darat sebagai sebab utama untuk kemerosotan perikanan mullet itu. Untuk mencegahi kemerosotan perikanan mullet itu adalah disarankan bahawa mullet diperkenalkan sebagai satu spesi kultur dalam sistem kolam air payau serta sistem kolam air tawar. Potensial kultur mullet dan pengkajian lanjutan atas peneluran yang diindusikan dan aspek-aspek kultur juga dibincangkan dengan rujukan kepada penemuan yang di dalam tesis ini.

## ABSTRACT

Studies on some aspects of the biology of the greenback grey mullet, *Liza subviridis*, including distribution, food types, feeding habits, reproduction and growth were conducted in Penang to provide baseline information for future development and management of the fishery. The existing condition of the mullet fishery in West Malaysia was also analysed.

Distribution studies show that *Liza subviridis* is widely distributed in the coastal habitats and seems to predominate in the lower reaches of streams, estuarine areas, mangrove swamps and mud-flats. Its tolerence to a wide range of salinity, dissolved oxygen content and temperature shows that it is a hardy species and its distribution is therefore not limited by these physical parameters.

The fish is a bottom feeder and ingests benthic diatoms, filamentous algae and any organic detritus that is present in the habitat in which it feeds. The diet changes from a planktonic to a bottom feeding type as the fish grows from the post-larva to the adult.

Heterosexuality is exhibited and fertilization is external. Sexual differentiation is based on examination of the gonads. Six maturity stages have been identified for the male and seven for the female. The stages are differentiated by macroscopic as well as microscopic changes in the development of the gonads. Sexual maturity

is attained at a relatively small size. Male and female fish attain first sexual maturity in the size ranges of 9.0 - 10.5 and 11.0 - 11.5 cm respectively, and in the corresponding ages of six and eight months. Fecundity ranges from 40,000 - 140,000 eggs in fish measuring 10.3 - 13.9 cm. The relationship between fecundity, F, and length, L can be expressed as

$$F = 1.9044\ L^{4.2998}$$

Spawning is restricted to a short and definite period and all ripe ova are released within a single act. No major spawning season can be detected and spawning occurs all the year round. The presence of post-larval stages of Liza subviridis as well as adults with sexually mature gonads in shallow coastal waters indicate that the fish probably spawns in inshore waters.

Post larval development can be divided into the post-larva, early juvenile, late juvenile and adult stages. Ctenoid scales become developed at 30 - 35 mm total length, pigmentation patterns change from the distinct spot concentrations to diffused dots outlining the scales at about 15 mm total length, the pre-orbital bone becomes serrated from 15 mm total length and the adipose eyelid starts to form at 30 mm. total length.

Growth can be represented by the von Bertalanffy equation which was calculated to be

$$l_t = 20.7429\ (1 - \exp\ (-0.0035)(t - 14.7059))$$

The calculated maximum size attainable is 20.74 cm. The length-weight relationship may be expressed by a single equation,

$$\log W = 2.8184 \log L - 1.4751$$

Catch statistics shows that the mullet fishery has declined drastically over the last 5 years. The main gears used in the fishery are the seine nets and gill nets. A seasonality is exhibited from October to December. The chief mullet producing states are Perak, Penang, Johore and Selangor.

The various biological studies conducted on Liza subviridis point to the possibility of the destruction of coastal habitats by pollution and land reclamation programmes as the primary cause of the decline of the mullet fishery. To combat the decline in the fishery, it is suggested that mullet be introduced as a culture species in brackish water as well as fresh water pond systems. The potential of mullet culture and further work on induced spawning and culture aspects are also discussed with reference to the findings embodied in this thesis.