LENGTH-BASED ESTIMATES OF GROWTH PARAMETERS, MORTALITY RATES, AND RECRUITMENT OF *ASTACUS LEPTODACTYLUS* (ESCHSCHOLTZ, 1823) (DECAPODA, ASTACIDAE) IN UNEXPLOITED INLAND WATERS OF THE NORTHERN MARMARA REGION, EUROPEAN TURKEY

BY

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ABSTRACT

The growth parameters, mortality rates, and recruitment pattern of *Astacus leptodactylus* from an unexploited area in inland waters of the northern Marmara region were investigated based on length-frequency data using FISAT software. Specimens were collected during eight scientific samplings carried out between March 2005 and May 2006. The seasonalized Von Bertalanffy growth function was fitted to the length frequency data (n = 2434) with the following parameters: \( L_\infty = 80.8 \text{ mm}, K = 0.405 \text{ year}^{-1}, C = 1, \) and WP = 0.90. The study of functional regressions permits us to conclude that the growth of this population is allometric. Natural mortality (\( M \)) was estimated at 0.578 year\(^{-1}\) and total mortality at 0.589 year\(^{-1}\). The longevity of the crayfish was calculated as \( t_{\text{max}} = 7.4 \text{ year} \). The recruitment pattern shows that there is peak recruitment in May and June.

We also estimated the potential instantaneous fishing mortality coefficient at \( F = 1.53\text{-}1.63 \text{ year}^{-1} \), the instantaneous total mortality coefficient at \( Z = 2.11\text{-}2.21 \text{ year}^{-1} \), and the exploitation rate \( E = 0.72\text{-}0.73 \), all through the length-converted catch curve procedure using the length-frequency data of the fyke-nets of 32 mm polyamide (PA) mesh size (stretched mesh).

RÉSUMÉ

Les paramètres de croissance, les taux de mortalité et le modèle de recrutement d’*Astacus leptodactylus* d’une zone non-exploitée des eaux intérieures du nord de la région de Marmara ont été étudiés à partir des données longueur-fréquence en utilisant le logiciel FISAT. Les spécimens ont été collectés au cours de huit campagnes scientifiques d’échantillonnage menées entre mars 2005 et mai 2006. La fonction de croissance de Von Bertalanffy s’ajuste aux données de longueur-fréquence

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(n = 2434) avec les paramètres suivants: \( L_\infty = 80,8 \text{ mm}, K = 0,405 \text{ an}^{-1}, C = 1, \text{ et WP} = 0,90. \) L’étude des régressions fonctionnelles nous permet de conclure que la croissance de cette population est allométrique. La mortalité naturelle \((M)\) a été estimée à 0,578 \text{ an}^{-1} et la mortalité totale à 0,589 \text{ an}^{-1}. La longévité de l’écrevisse a été calculée comme \( t_{\text{max}} = 7,4 \) ans. Le modèle de recrutement montre un pic de recrutement en mai et juin.

Nous avons aussi estimé le taux potentiel instantané de mortalité par pêche à \( F = 1,53-1,63 \text{ an}^{-1}, \) le taux instantané de mortalité totale à \( Z = 2,11-2,21 \text{ an}^{-1}, \) et le taux d’exploitation à \( E = 0,72-0,73, \) par la technique de courbes de prises converties en longueur en utilisant les données longueur-fréquence à partir des verveux de maille polyamide (PA) de 32 mm.

INTRODUCTION

The Turkish crayfish, \textit{Astacus leptodactylus} (Eschscholtz, 1823) (Astacidae) is an especially important fishery resource in Turkey. Under natural circumstances, \textit{A. leptodactylus} is widely distributed in lakes, pond, and rivers throughout Turkey. The fishery for this species is the most valuable freshwater fishery, and nearly all of the crayfish production is exported to other European countries, of which France and Sweden are the main buyers (Köksal, 1988; Balık et al., 2003).

The annual landings of \textit{A. leptodactylus} in Turkey varied from 3850 to 7936 tons between 1977 and 1984 (Köksal, 1988). After 1985, however, the production of \textit{A. leptodactylus} has decreased dramatically in most Turkish lakes as a result of the crayfish plague fungus, the presence of which was reported in several studies (Baran et al., 1987; Rahe & Soylu, 1989; Oray, 1990). The reduction in the production of \textit{A. leptodactylus} could also be attributed in part to over-fishing, water pollution, and withdrawing of water for agricultural irrigation (Erençin & Köksal, 1977). Egg-bearing females have also been exported for farming purposes (Roth & Kinzelbach, 1986) and this may have contributed to a reduced Turkish production as well (Harlıoğlu, 2004). In the early 1990s, annual landings were around 300-500 tons (Harlıoğlu & Harlıoğlu, 2004) but reached 2183 tons in 2003 (Anonymous, 2004a). However, the culture of this species in captivity is not practiced in Turkey.

Although the natural presence of \textit{A. leptodactylus} in the Tunca and Meriç rivers, northern Marmara region, has been reported (Köksal, 1988), no specific information concerning more than 50 dams, ponds, and rivers in the cities of Edirne and Tekirdağ has been found. In Tekirdağ, the total surface area of 27 ponds where our research was conducted encloses 675 hectares (data of the General Directorate of State Hydraulic Works). According to the Turkish Fishery Regulations (TFR), the minimum landing size limit (MLS) for \textit{A. leptodactylus} is 90 mm total length. In addition, there is an open season between 15 June and 31 December (Anonymous, 2004b).

There is not much information about \textit{A. leptodactylus} in European Turkey, so in this study we decided to undertake an analysis of its growth parameters and mortality rates, in order to assess its potential for fishery and/or aquaculture.