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Selectivity of PE and PA material codends for rose shrimp (*Parapenaus longirostris*) in Turkish twin rigged beam trawl fishery

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Abstract

This study investigated the differences in the selective properties of 32 mm nominal polyethylene (PE) and 32, 36, 40 and 56 mm nominal polyamide (PA) codends in beam trawl fisheries targeting rose shrimp, *Parapenaeus longirostris*, in the Sea of Marmara, Turkey. Data were collected in spring 2005 onboard a commercial trawler, on commercial fishing grounds. Selectivity data were collected using the covered codend method in two twin beam trawls in every haul. Using this method, four selection curves could be obtained in one haul. Selectivity parameters were calculated by fitting a logistic function using maximum likelihood. The L_{50} values of 32, 36 and 40 mm PA codends were found to be 9.1, 10.2 and 12.6 cm, respectively. Due to retention of only a few specimens, realistic selectivity parameters could not be calculated for the 56 mm PA codend. Mean L_{50} decreased with a change in mesh material from PA to PE. The lowest L_{50} (8.0 cm) was found for the 32 mm PE material codend. This study has shown that for rose shrimp the 32 mm PA diamond mesh codend is not appropriate for the first maturity size (FMS) of 10 cm for rose shrimp in the Turkish twin rigged beam trawl fishery. In addition, the PE netting material provides a significantly lower L_{50} value than the PA netting material.

Keywords: Beam trawl; Selectivity; *Parapenaus longirostris*; Mesh size; Netting material; The Sea of Marmara

1. Introduction

The rose shrimp, *Parapenaeus longirostris* (Lukas, 1846), shows a wide geographic distribution, from the eastern Atlantic in the north of Spain (Olaso, 1990) to the southern waters of Angola (Crosnier et al., 1968) and the whole basin of the Mediterranean and its adjacent seas (the Tyrrhenian, Adriatic, Aegean and the Sea of Marmara) (Holthuis, 1980).

This epibenthic short-lived species is the main target species of a large fishing fleet working in the eastern Atlantic Ocean (Holthuis, 1980). The principal fishing grounds are located in south of Spain and Portugal (Pestana and Riberio-Cascalho, 1991) as well as areas off Morocco, Mauritania, Senegal, Guinea Bissau, Gabon and Angola (Sobrino and Garcia, 1991, 1992a,b, 1994; Lopez-Abellan and Garcia-Talavera, 1994). The species also has a high commercial value in France, Italy, Algeria, Tunisia, Greece and Turkey, although on a lesser scale (Holthuis, 1980).

In 2003, annual landings of rose shrimp in the Sea of Marmara were 4059 t (Anonymous, 2004a). It is believed that the actual landing figure is much higher as landings are not regularly recorded, particularly in small ports. In the Sea of Marmara rose shrimp is caught in the coastal zone (40–150 m). Numbers of registered vessels involved in shrimp fisheries are 125 demersal otter trawlers, 54 bottom seiners and 40 beam trawlers (Zengin et al., 2004). Lengths and engine powers of the beam trawl boats vary from 7 to 13 m and from 9 to 160 hp, respectively (Zengin et al., 2004). These boats are also used in gillnet, trammel net, and longline fisheries in the Sea of Marmara.

According to Turkish Fishery Regulations (TFR), rose shrimp is allowed to be caught in waters deeper than 50 m using beam trawls with a maximum codend length of 11 m and minimum mesh size of 32 mm. Each boat is allowed to

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use either two twin beam trawls with two codends and maximum total beam lengths of 15 m, or three beam trawls of 5 m maximum beam length each. There is no minimum landing size limit (MLS) for rose shrimp. However, there are closed seasons between 15th April and 31st August, and between 1st and 31st January (Anonymous, 2004b).

The selectivity studies and the effects of mesh size changes are considered of great importance for the management of fisheries (Goni, 1985; Pestana and Riberio-Cascalho, 1991; Sobrino et al., 2000; Campos et al., 2002). In deep-sea crustacean trawl fisheries where rose shrimp is one of the target species, minimum codend mesh sizes are 55 mm on the south coast of Portugal (Campos et al., 2002) and 40 mm in the Gulf of Cadiz in Spain (Sobrino et al., 2000). In the Sea of Marmara even though the minimum mesh size is 32 mm, the illegal use of 24 and 28 mm mesh size codends is rather common. The present paper analyses the differences in the selective properties of 32 mm nominal polyethylene (PE) and 32, 36, 40 and 56 mm nominal polyamide (PA) codends for rose shrimp in the northern Sea of Marmara.

2. Materials and methods

The research cruise was conducted between 14th March and 13th April, 2005. A total of 12 hauls were carried out on the commercial trawler "Deniz" (length 13 m; engine power 130 hp), during daylight hours in stable weather and sea conditions. Fishing was performed between Yeniçiftlik and Kocaburun in the northern Sea of Marmara, on commercial fishing grounds at depths from 50 to 100 m.

The gear studied was a commercial shrimp beam trawl (Fig. 1) with a beam length of 3.5 m and vertical net opening of 0.5 m. The length of the headline and the groundrope (chain) were 3.5 and 4.3 m, respectively. The twin beam trawl has two identical nets rigged side-by-side on the same beam. In the trials, two twin rigged beam trawls which had the same design and were made of multifilament, knotted 32 mm polyamide twine [210 Tdx18 (6 × 3)] were used. The towing duration was 5 h for all the hauls and the towing speed varied between 1.5 and 2.0 knots as in commercial fishing. The warp length used during the trials was 250–350 m. Two twin rigged beam trawls were towed with a 50 m longitudinal distance between them. By using this gear, data could be obtained for four codends in each tow.

Selectivity data were collected by using the covered codend method. Five different codends in nominal mesh sizes and materials of 32 mm PA, 36 mm PA, 40 mm PA, 56 mm PA and 32 mm PE were tested. Covers were constructed of single twisted PA 24 mm mesh netting with a twine thickness of 1.0 mm. Overall dimensions of the covers were larger than 1.5 times the width and length of the codends. Each cover was held open by a 1.0 m diameter half hoop over the top panel of the codend (Polet, 2000). Full hoops were not used in order to avoid frequent damage caused by the close bottom contact of the beam trawl (Polet, 2000).

The mesh opening of the codend netting was measured using a calliper rule. A 4 kg weight was tied vertically to the stationary jaw of the rule. A total of 60 meshes (3 lines of 20 meshes in the towing direction) near to the aft of each codend were measured (Tokaç et al., 2004).

The captured rose shrimps, those retained in the codend and those escaped into the cover, were weighed and individually measured to the nearest millimetre with a ruler, taking the total length (TL), from the tip of the rostrum to the end of the telson. Weighing and measuring were performed directly on fresh material, on the whole catch without subsampling.

Differences in mean catch, mean size and length class distributions of rose shrimp entering the two nets (A1 and

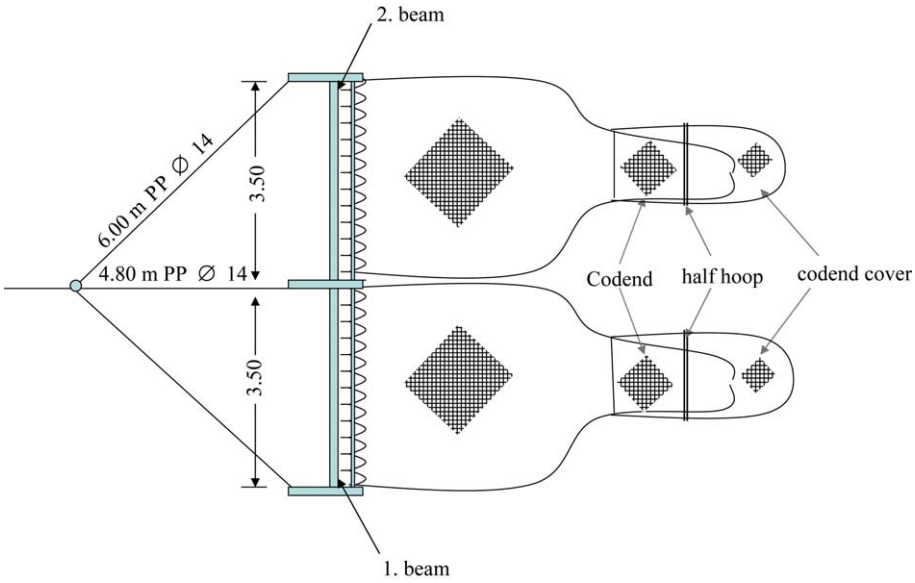

Fig. 1. A diagram of the twin rigged shrimp beam trawl were used in the study.