



# Trawl Codend Selectivity in respect of Silver Pomfret *Pampus argenteus* (Euphrasen, 1788)

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## Abstract

The silver pomfret *Pampus argenteus* (Euphrasen, 1788) belonging to the family Stromateidae is an important resource exploited by trawlers in India and is one of the most sought after marine food fish worldwide. Information on trawl selectivity is required in biological investigations, fish stock assessment, fisheries management and fishing gear design and development. The size selectivity for this species in 100 mm diamond mesh codend was estimated using covered codend method and the selectivity parameters were estimated using the software CC 2000 (ConStat, Denmark). The  $L_{50}$ , selection range and selection factor were determined as 144.8 mm, 27.3 mm and 1.45 respectively. The optimum mesh size estimated based on the highest reported value of length at first maturity for silver pomfret in Indian waters and the selection factor determined through trawl selectivity experiments was 150 mm, for conventional diamond mesh codends.

**Key words:** Trawl codend selectivity, diamond mesh, *Pampus argenteus*, India

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## Introduction

Pomfrets are schooling, pelagic, medium-sized fishes inhabiting shallow waters (Fischer & Bianchi, 1984). The silver pomfret *Pampus argenteus* (Euphrasen, 1788) belonging to the family Stromateidae is one of the most sought after marine

food fish worldwide. It has an extensive geographical distribution from the East China Sea to Southeast Asia, Indian Ocean, Arabian Gulf and the North Sea (Kuronuma & Abe, 1972; Davis & Wheeler, 1985; Froese & Pauly, 2011). The species attains a maximum size of about 60 cm (Fischer & Bianchi, 1984). Adults feed on ctenophores, salps, medusae, and other zooplankton groups (Khan, 2000; Froese & Pauly, 2011). Silver pomfret landings were about 28,000 t, during 2009-10, which formed about 0.9% of the marine fish landings in India (CMFRI, 2011). They are caught using bottom trawls, gill nets and fixed bag nets in Indian waters (Khan, 2000).

Tropical trawl fisheries produce large amounts of bycatch containing various aquatic organisms including juveniles of commercial fishes. Responsible fishing regime requires that fishing gears should preferentially catch the adult fish at a particular age, which would maximize yield while permitting the juveniles and sub-adults to escape and also minimize the catch of non targeted and protected organisms (Boopendranath & Pravin, 2005). In this context, studies on codend selectivity assume importance as it would facilitate choice of mesh size to selectively harvest the target fish of a particular size which would have spawned at least once to ensure long term sustainability of the fishery resources.

Boopendranath & Pravin (2005) have reviewed trawl selectivity and presented selectivity parameters reported for some fishes caught in Indian waters. Selectivity characteristics of trawl codends in respect of *Metapenaeus dobsoni*, *Parapenaeopsis stylifera*, *Alepes kleinii*, *Caranx para*, *Dussumieria acuta*, *Lactarius lactarius*, *Leiognathus bindus*, *Nemipterus japonicus*, *Rastrelliger kanagurta*, *Saurida tumbil*, *Thryssa purava*, *Thryssa mystax*, *Upeneus vittatus* and *Upeneus moluccensis*, occurring in Indian waters have been reported (Kunjipalu et al., 1994; 2001; Varghese et al., 1996; Prakash et al., 2008; 2010; Madhu et al.,

2010; Pravin et al., 2010; Remesan et al., 2010). In this paper, selectivity characteristics of 100 mm diamond mesh codend, in respect of silver pomfret are discussed, based on trawl selectivity experiments conducted off Cochin, India.

## Materials and Methods

Selectivity studies using covered codend method (Pope et al., 1975) were carried out onboard Research Vessels MFV Sagar Sakthi ( $L_{OA}$  15.24 m; 223 hp) and MFB Matsyakumari ( $L_{OA}$  17.5 m; 278 hp) off Cochin during 2007 using 18 m semi-pelagic trawl (CIPT, 2011) fitted with 100 mm diamond mesh codend made of knotted polyethylene netting with 1.5 mm diameter twine. The codend was provided with a cover made of 30 mm mesh size polyamide netting with 210dx2x2 twine, which is approximately 1.5 times the size of the codend as suggested by Stewart & Robertson (1985). During the selectivity experiments, hauls of 1 h duration each were carried out in the depth range of 10-25 m, at a trawling speed of 2.3-3 kn. The *Pampus argenteus* retained in the codend and cover were separately collected and the Fork Lengths (FL) were measured to the nearest millimeter. The retention probability of pooled data from multiple hauls was modeled by means of logistic selectivity curve (Wileman et al., 1996):

$$r(l) = \exp(v_1 + v_2 l) / 1 + \exp(v_1 + v_2 l)$$

where  $r(l)$  is the retained proportion of length class  $l$  that has entered the codend and  $v_1$  and  $v_2$  are intercept and slope of linear logistic function.

The selectivity parameters for the pooled data were estimated using a specialized selectivity analysis software package CC 2000 (ConStat, Denmark). Selection range (SR) is the range of length between the 25% retention length ( $L_{25}$ ) and the 75% retention length ( $L_{75}$ ), and the selection factor (SF) is the ratio between mean selection length ( $L_{50}$ ) and mesh size, using the same unit of measure. The nominal mesh size was used for estimating SF.

## Results and Discussion

Selectivity parameters of 100 mm diamond codend in respect of *Pampus argenteus* based on the results of selectivity experiments are shown in Table 1. The  $L_{50}$  selection range and selection factor were determined as 144.8 mm, 27.3 mm and 1.45 respectively. The selectivity curve of *Pampus argenteus*

Table 1. Selectivity parameters of *Pampus argenteus* and optimum codend mesh size based on selection factor and  $L_m$

Selectivity parameters	Value
$L_{50}$ (FL, mm)	147.8
Selection range (mm)	27.3
Selection factor	1.45
Length at first maturity- female (FL, mm) (based on Ghosh et al., 2009)	217
Recommended codend mesh size (mm)	150

is given as Fig. 1. It is known that selection curve for trawls giving proportion retained for each length class, normally assumes a sigmoid form (Wileman et al., 1996; Sparre & Venema, 1998).

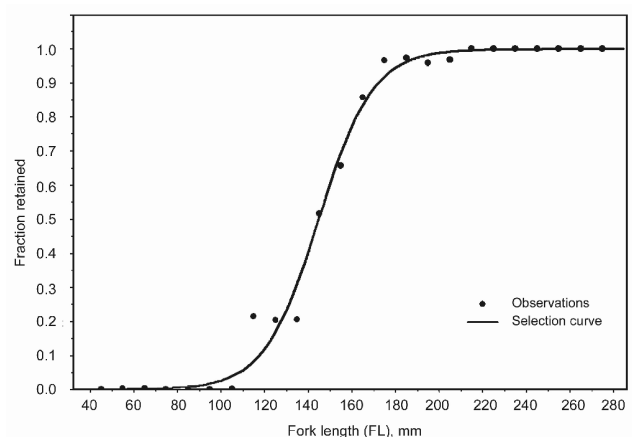


Fig. 1. Selectivity curve in respect of *Pampus argenteus*

The length at first maturity ( $L_m$ ) of *Pampus argenteus* reported from different fisheries varies considerably (Table 2).  $L_m$  reported for males ranged from 13.9 to 18.0 cm FL and for females ranged from 18.9 to 24.9 cm FL (Gopalan, 1967; Pati, 1982; Dadzie et al., 2000; Mohammad & Ehsan, 2007; Narges et al., 2007; Ghosh et al., 2009). The highest value of  $L_m$  from Indian waters is 21.7 cm FL based on Ghosh et al. (2009) which is close to the value reported from Persian Gulf by Narges et al. (2007) (Table 2).  $L_m$  reported in other formats such as Total Length (TL) and Standard Length (SL) were converted to Fork Length (FL) for the sake of comparison, using regression equations given by Froese & Pauly (2011).

Table 2. Length at first maturity of *Pampus argenteus*

Reported $L_m$	$L_m$ in FL*	Area	Source
22.0 cm TL (male)	17.4 cm FL (male)	Arabian Sea	Gopalan (1967)
26.0 cm TL (female)	20.6 cm FL (female)		
15.0 cm SL (male)	16.7 cm FL (male)	Bay of Bengal	Pati (1982)
17.0 cm SL (female)	18.9 cm FL (female)		
21.0 cm FL (unsexed)	21.0 (unsexed)	Java Sea	Rusmadji et al. (1990)
12.5-14.4 cm SL (male)	13.9-16.0 cm FL (male)	Kuwait waters	Dadzie et al. (2000)
20.5-22.4 cm SL (female)	22.8-24.9 cm FL (female)		
24.8 cm (FL) (female)	24.8 cm FL (female)	Persian Gulf	Mohammad & Ehsan (2007)
18.0 cm FL (male)	18.0 cm FL (male)	Persian Gulf	Narges et al. (2007)
22.2 cm FL (female)	22.2 cm FL (female)		
22.0 cm TL (male)	17.4 cm FL (male)	Arabian Sea	Ghosh et al. (2009)
27.5 cm TL (female)	21.7 cm FL (female)		

\* Conversion equations:  $TL=0+1.265 \times FL$ ;  $TL=0+1.407 \times SL$ ;  $SL=0+0.899 \times FL$  (Froese and Pauly, 2011)

The mean selection length is generally proportional to the mesh size of the codend over a certain range (Gulland, 1969; Fryer & Shepherd, 1996). The optimum mesh size was estimated as 150 mm based on the highest reported value of length at first maturity for silver pomfret in Indian waters and the selection factor determined through trawl selectivity experiments (Table 1).

Information on trawl selectivity is essential in biological investigations, fish stock assessment, fisheries management and fishing gear design and development. Based on the results of selectivity experiments, the mesh size that can be recommended to harvest the silver pomfret is 15.0 cm, for conventional diamond mesh codends, in order to protect the juveniles and sub-adults.

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