The Study of Yield per Recruit of Brownbanded Bambooshark (*Chiloscyllium punctatum*) from Songkhla, Thailand

Supapong Pattarapongpan, SEAFDEC/TD, Thailand

Abstract

The brownbanded bambooshark (*Chiloscyllium punctatum*) is dominant benthic shark in Southeast Asia, which was caught mainly as by catch. Growth parameter as Asymptotic Length (L_∞) and Curvature Parameter (K) for unseparated sex, male and female were 101.47 cm. and 0.78 year^{-1}, 101.47 cm. and 0.78 year^{-1} and 98.12 cm. and 0.95 year^{-1}, respectively. Result shown that female brownbanded bambooshark can grow faster than male. Result of yield per recruit show that population of brownbanded bambooshark caught from southern gulf of Thailand now still in a good condition (B/B_{MSY} = 2.19 and F/F_{MSY} = 0.44).

Introduction

The Brownbanded Bambooshark (*Chiloscyllium punctatum*) is the small benthic shark in family Hemiscyllidae distributed mainly in Southeast Asian water (Compango and Niem, 1998 and Krajangdara, 2017). In Thailand, this species was caught as bycatch. Therefore, their status and trend of these species have not been determined yet (Krajangdara, 2017). However, Dudgeon *et al.* (2016) recognized this species as "Near Threaten" since 2003.

Beverton and Holt Yield per Recruit Analysis (Gulland, 1969, cited in Sparre and Venema, 1998) is the equation explained about relation between recruitment (by number) and the possible yield can derived by weigh. The result will be shown in term of the relation between yield per recruit and other related model as biomass per recruit and the fishing mortality (F) in each level (Sparre and Venema, 1998).

This study was aimed to using the yield per recruit method to monitoring the status of *C. punctatum* in Songkhla, Thailand. The result can be used as short-term references point for further management in this area in the future.

Material and Methods

The raw data used in this study was derived from the shark and ray one year data collection project from SEAFDEC – Sweden project.

The biological and mortality parameters will be determined using FAO – ICCLAM Stock Assessment Tools version 2 (FiSAT II) (Gayanilo *et al.*, 1998) while the age – length key and t0 using van Bertalanffy's growth equation (Sparre and Venema, 1998). Yield per recruit using Beverton and Holt (1957) method

Result and Discussion

Growth

Length – weight study separated by sex into three (3) groups namely unseparated sex, male and female, the results for unseparated sex, male and female were W =

$0.000003L^{3.078}$, $W = 0.000003L^{3.0443}$ and $W = 0.000002L^{3.1152}$, respectively. Growth parameters were calculated by FiSAT II giving asymptotic length (L_∞) and curvature parameter (K) for unseparated sex, male and female as 101.47 cm. and 0.78 year^{-1}, 101.47 cm. and 0.78 year^{-1} and 98.12 cm. and 0.95 year^{-1}, respectively.

Age – length key provides growth curve for each data set which size at first capture from modified von Bertalanffy equation was 16.1 cm. which in the same range as reported by IUCN red list that the hatching size of *C. punctatum* was ranged between 12.0 – 18.0 cm. (Dudgeon, 2016).

Female *C. punctatum* was growing faster than male with the higher curvature parameter (0.95 year^{-1}). However, there is lack of age and growth study for this species, considering to the age and growth study of its closed species as *C. plagiosum*, *C. indicum* and *C. griseum* (Compango and Niem, 1998) show that the growth rate between male and female quite similar to each other except the result of Liu and Wang (2007) which study on the *C. plagiosum* caught from Northern Taiwan reported that the female was growing slower than male.

Mortality estimation

Mortality estimation of *C. punctatum*, using Jones and van Zalinge equation to determine total mortality and natural mortality using equation of Pauly (1980) both presented in FiSAT II.

Result from Jones and van Zalinge show that total mortality of *C. punctatum* was 3.1424 year^{-1} while the natural mortality at 30°C of surface temperature was 1.03 year^{-1}, considering to the *C. punctatum* did not involve in the species list of Pauly's research for natural mortality (Pauly, 1980). Therefore, the natural mortality for this species should using only 1 or 2 digits to avoid uncertainties. Fishing mortality was 2.1124 year^{-1}.

Size at first capture

Size at first capture (table 1) show that *C. punctatum* landed in Songkhla, was smaller than size at first maturity from the report. However, the current information of this species still limited only for male (Ali and Pek Khiok, 2012). Therefore, the further study should be arranged for more understanding on this situation.

Table 1 Size at first capture compared with size at first maturity (male)

Size (TL, cm.)	Unseparated	L_m (TL, cm.)	References
$L_{25\%}$	51		
L_c	57.78	68 – 76	Ali and Pek Khiok, 2012
$L_{75\%}$	64.46		

Yield per Recruit Analysis

The result from yield per recruit analysis show that the Y/R was increased rapidly at low value of F at present natural mortality which was shown on figure 1
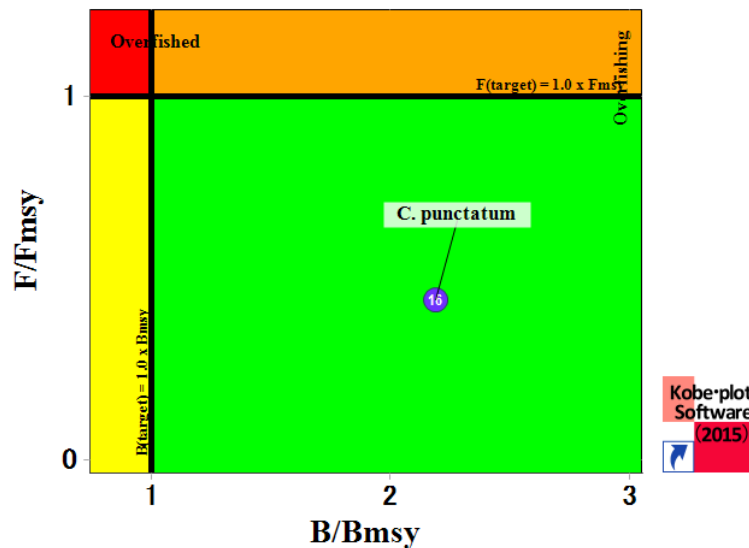
Figure 1 Result from Kobe plot show the current status of brownbanded bambooshark based on result from yield per recruit

Current situation, Y/R have highest value at 0.322708 g. per recruit at F = 4.8 year^{-1} while current situations show that Y/R was 0.311201 g. per recruit at F = 2.114144 year^{-1}. Therefore, current biomass status for *C. punctatum* was 119% higher than MSY level and fishing mortality was lower than MSY level about 56% (B/B$_{MSY}$ = 2.19 and F/F$_{MSY}$ = 0.44, respectively). However, because this species and other ground bambooshark were caught as bycatch, the management measure should be implemented carefully considering to the status of target species as well (Krajangdara, 2017).

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