Status of the Penaeid Shrimp Resource in Sarawak Coastal Waters

[1/]HADIL, R. & [2/]ABDUL HARIS HILMI, A. A.

[1/]*Fisheries Research Institute, Sarawak Branch, P.O. Box 2243, 93744 Kuching, Malaysia*
[2/]*Fisheries Research Institute, 11960 Batu Maung, Penang, Malaysia*

Abstract. - The data obtained from the surveys carried out in 1980, 1982, 1990 and 1995 within the 12 nautical miles territorial waters were used in this study. The coastal water of Sarawak was divided into 3 sub-areas, I, II and III. The biomass of shrimp estimated over the years has decreased significantly except for sub area I during 1995 survey that showed an increase. The estimated potential yield of shrimp resource was 5,552 tonnes. The number of trawlers in operation now is very much higher than the estimated number able to exploit the available shrimp resource on a sustainable basis. It was recommended that use of 20 strings trammel net be encouraged in the untrawlable grounds of sub-areas II and III.

Keywords: Penaeid shrimp, resources, Sarawak

Abstrak. - Data yang telah diperolehi dari survei yang telah dijalankan pada tahun 1980, 1982, 1990 dan 1995 diperairan sehingga 12 batu nautika dari pantai digunakan. Analisa data adalah mengikut tiga pecahan kawasan; I, II dan III. Penurunan ketara berlaku pada nilai biomas udang dalam tempoh 15 tahun pada setiap kawasan, kecuali pada pecahan kawasan I yang menunjukkan peningkatan pada tahun 1995. Anggaran potensi tangkapan udang ialah 5,552 tan. Untuk perairan dasar rata, bilangan bot yang beroperasi pada masa ini adalah jauh melebihi anggaran bilangan bot yang diperlukan untuk eksploitasi secara mapan. Pukat hanyut tiga lapis dengan 20 utas setiap unit boleh ditambah bilangannya di pecahan kawasan II dan III yang berbatu.

Introduction

Commercial exploitation of penaeid shrimp in Sarawak began in the early seventies with the introduction of the trawl. It was intensified in the eighties with the improvement in mechanization and the introduction of the low-opening twin-outrigger trawl and the use of the net drum. Since then the effort level reached more than 1,000 trawlers of all sizes, which contributed to annual landings of around 19,000 tonnes until 1990. After the peak in 1989/1990, the catches fluctuated to 11,000 tonnes in 1998 (Anon., 1998). The bulk of the landings was attributed to trawlers less than 40GRT.

Shrimp is the main-stay of the coastal fisheries of Sarawak. Although the coastal waters of Sarawak is large, the major portions of it are rough grounds unsuitable for bottom trawling. The landings of shrimp increase from October onward and reach the peak during the monsoon months of January, February and March (Hadil, 1994). The landings during the monsoon contributed to the bulk of the annual production.

The Fisheries Research Institute, Sarawak Branch has carried out prawn resource surveys since 1980 (Bejie, 1981 and 1982; Yong, 1990; Hadil, 1995). Although the analysis of these data shows that prawn species distribution has not changed very much, the catch rates have decreased tremendously. This report presents the outcome of the analysis of the data from four surveys covering the period of 15 years from 1980 to 1995.

Materials and Methods

Source of data

The data obtained from the surveys carried out in 1980, 1982, 1990 and 1995 were used in this study. These surveys were carried out within the 12 nautical miles area from the coastline using the research vessel, KK MALONG except in 1995. In 1995 a twin outrigger commercial trawler, SF1-88 with a gross tonnage of 135 fitted with a Cummins 620Hp engine, was chartered to carry out the survey. The catch rates (kg hr^{-1}) data from the above 4 surveys were compiled. These catch rates were log transformed to conform to normal distribution. The average catch rate data from 1995 survey was also corrected for mesh-size difference by using mesh-size ratio. KK MALONG uses a trawl net with head rope length of 31.8 m and mesh size of 32 mm, while the head rope length and mesh size of the trawl gear of SF1-88 was 114.8 m and 38 mm respectively (Hadil, 1995).

Estimation of density and biomass

The biomass assessment was done using the swept-area method mentioned in Sparre (1985). Biomass is equal to (c/f).A/(a.q), where c/f is the average catch rate, A, the area within the survey zone, a, is the effective trawl swept area and q is the catchability coefficient.

The swept area, a, was calculated using the formula, a = t.v.h.x, where t = time (hr) taken for one haul, v = trawling speed, h = head rope length and x is the net-opening coefficient. This formula was chosen since the horizontal net opening is unknown. The x value of 0.7 was used as suggested by South China Sea Development Programme (1978). The trawling speed adopted for the shrimp surveys of 1980 and 1990 was 2.8 nm hr^{-1} (5.2 km hr^{-1}) and that used for 1982 and 1995 was 2.0 nm hr^{-1} (3.7 km hr^{-1}).

The density was estimated using the formula, d = (c/f)/(a.q), where the value of q suggested for the surveys of 1980, 1982 and 1990 was 0.6 and the value of 1.0 was used for data taken in 1995 by the commercial trawler. The reason for the choice in the values of q was on the assumptions that commercial trawler caught all (100%) of the fishes along it's path and only 60% were caught by research vessel. This is to reflect the more efficient gear in commercial fishing than in research fishing.

Estimation of potential yield

The potential yield, MSY was derived using the Cadima formula, MSY = 0.5(Y+MBc), where Y is the yield of shrimps landed by trawlers of all sizes, M is the natural mortality rate and Bc is the current biomass estimated. This formula was used since the resource was known to be exploited since the early seventies. Hadil (2000b) gave an estimate for instantaneous natural mortality, M, for adolescent and juvenile banana shrimp, *Penaeus merguiensis* at 3.01 and 2.69 per year for male and female shrimp respectively. Yong *et al.* (1990) estimated the M value for the banana shrimp of Sarawak at 2.14 per year. However, Garcia (1985) point towards an average natural mortality rate for penaeids of the order of 2.4 ± 0.3 per year for adults. A compromised value of M=3 was taken in the final assessment.

In trying to conform to regional jurisdiction of the Marine Fisheries of Sarawak, the coastal waters of Sarawak was divided into 3 sub-areas (I, II & III) and subsequently divided into trawlable and untrawlable areas. The untrawlable area is an area with reef and hard coral ground.

Table 3 : Summary of the analysis carried out on 1995 shrimp resource survey data to obtain potential yield

Resource	Target	Source of data	Data availability	Formula	Biomass by sub-area	Area (sq.km)	Potential Yield by area	Vessel/Gear performance	No. of licences		Gears in Operation 1998
PRAWN	Current Potential Yield (CPY)	Survey 1995	1. Survey 1995	$B = ((c/f)*A)/a*q$ $a = t*v*h*_x$ Assumption $q = 1.0$ $x = 0.7$	* Sub-area I	Trawlable Area = 7,768 Untrawlable Area=0	2,743	20T/unit/year	137	Trawler (40 GRT) Trammel Net	473 103
					Sub-area II	Trawlable Area = 3,577 Untrawlable Area = 627	1,263 221	20T/unit/year 2.5T/20strings/year	63 88	Trawler (40 GRT) Trammel Net	227 0
					Sub-area III	Trawlable Area = 1,844 Untrawlable Area = 1908	651 674	20T/unit/year 2.5T/20strings/year	33 270	Trawler (40 GRT) Trammel Net	78 0
			2. Commercial landings 1995. Yield = 9,775 tonnes	MSY = 0.5* (Y+MBc)	M = 3	CPY value = 5552 tonnes					

* Sub-area I : Tanjong Dato to Tanjong Sirik
Sub-area I : Tajong Sirik to Tanjong Kidurong
Sub-area I : Tanjong Kidurong to Kuala Baram

RM3.4 million. In the year 2001, twenty-two trawlers were harvesting tiger shrimp.

Proposed management measures

Over exploitation of the shrimp resource can lead to depletion in the natural stock, thus the livelihood of the coastal fishermen will be affected. Though it is hard to reduce the existing number of trawlers in operation, it is recommended that no new permits be issued and the transfer of licences of trawlers that stopped fishing be curtailed. By doing so, trawling will be minimized in the 0 - 5 miles zone. The use of trammel nets as recommended should be increased especially for 'sampan' with outboard engine.

Localised enforcement should be carried out, in areas rich in shrimp resource and during the peak season. Constant surveillance to prevent the trawlers encroachment in Lawas has enabled the trammel net shrimp fishery to thrive for the past 30 years.

Acknowledgements

The authors are very grateful to the Head of Fisheries Research Institute, Sarawak Branch, Mdm. Faazaz Abd Latiff and Head of Resource Section, Fisheries Research Institute Malaysia, Mr Abu Talib Ahmad for their support and encouragement in pursuing the ultimate usefulness of research studies for the development of the fishing industry. Appreciation also goes to Miss Teng Siew Chin and those who have rendered their assistance in ensuring the success of this endeavor.

References

Anon. 1998. Annual Fisheries Statistics. Department of Marine Fisheries Sarawak.

Bejie, A. B. 1981. First prawn resource survey along the coast of Sarawak (May-July 1980). Marine Fisheries Department, Sarawak. Mimeo : 18 p.

Bejie, A. B. 1982. Second prawn resource survey along the coast of Sarawak (May-July 1981). Marine Fisheries Department, Sarawak. Mimeo : 28 p.

Garcia, S. 1985. Reproduction, stock assessment models and population parameters in exploited penaeid shrimp populations, *In*: Second Australian National Prawn Seminar, pp. 139-58, ed Rothliberg, P. C., Hill, B. J., Staples, D. J. NPS2, Cleveland, Queensland Australia.

Hadil, R. 1994a. The status of the prawn fishery in Sarawak, Malaysia. *Fisheries Bulletin* **92**.

Hadil, R. 1994b. Penaeid prawn distribution and abundance in the coastal waters of Sarawak, Malaysia. *Fisheries Bulletin* **95**.

Hadil, R. 1995. Penaeid shrimp assessment for Sarawak coastal waters. (Mimeo - 10 p. Unpublished).

Hadil, R. 2000. Growth and Mortality estimate of the juvenile and adolescent banana shrimps, *Penaeus merguiensis* of Santubong-Salak mangrove estuary. *Malaysian Fisheries Journal* **1(2)**: December 2000.

Hadil, R. 2000. Bioeconomic sustainability of giant tiger shrimp, *Penaeus monodon* broodstock resource. Fisheries research Institute, Sarawak Branch. Unpublished.

SCSP (South China Sea Development Programme). 1978. Report on the workshop on the demersal resources of the Sunda Shelf, Part 1. Manila, South China Sea Fisheries Development and Coordinating Programme, SCS/GEN/77/12: 44 p.

Yong, A. H. 1990. Prawn resource survey along the coast of Sarawak. Marine Fisheries Department, Sarawak. Unpublished.

Yong, A. H., Pang, S. C. and Bejie, A. B. 1990. A first multi-species bioeconomic model of Sarawak's prawn fishery. A summary of papers from the Second session on stock assessment and data analysis/report and scientific paper writing 13-18 August 1990, Fisheries Research Institute, Gelugor, Malaysia. Fisheries Department, Ministry of Agriculture Malaysia. November 1990.