

# Preliminary Study on Estimation of Abundance based on the Slips regarding the Catches Landed by Set Net off Nago, Abu Town, Yamaguchi Prefecture, Japan in 2014

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**Abstract** : Most of the slips for catches landed by set net fishery describe the number of boxes every catch shipped in Japan. The number of the catches contained in each box ( “*irisū*” ) depends on the species. Furthermore, even among the same species, the “*irisū*” may change depending on the season. In this study, under the cooperation of fishermen, with reference to their catch slips, the abundance by species of the catches landed was estimated by researching the contents of the boxes in Nago, Abu Town, Yamaguchi Prefecture, Japan, 2014. The number of operation days was 206, which amounted to the monthly average number of operation days of  $17.2 \pm 3.4$  (average  $\pm$  SD). The number of species shipped in the same year amounted to 61 with the monthly average of  $22.8 \pm 5.8$ . We interviewed fishermen to get the relationship between the species or fishes whose brand names may change depending on the season and the respective “*irisū*” . Based on the results of the interview, the total abundance of catches landed (exclude “*iromono*” boxes to be shipped with some different fish species) was estimated to 218,543 and the average abundance shipped per operation day amounted to  $943.3 \pm 1297.9$ .

**Key words** : Catch slips, Fish catches, Fisheries, Set net

## Introduction

Catch diversity of set net is one of the important items for understanding the characteristics of fishing conditions in coastal waters. There is one of the usual approaches of research the abundance data after purchasing all the catches obtained by set nets<sup>1)</sup>. On the other hand, Tanoue et al.<sup>2)</sup> indicated the catches in set nets using diversity indexes in the previous paper, where there remained a subject of how to convert the number of boxes into the abundance and also they used an index which described the only species instead of the abundance data<sup>3)</sup>.

Most of the slips for catches landed by set net fishery describe the number of boxes every catch shipped in

Japan. The number of the catches contained in each box (hereinafter referred to as “*irisū*” ) depends on the species. Furthermore, even among the same species, the “*irisū*” may change depending on the season.

In this study, under the cooperation of fishermen involved in set net fishery, with reference to their catch slips, the abundance by species of the catches landed was estimated by researching the contents of the boxes to be offered on the market.

## Materials and methods

This study uses the catch slip data from fishermen in Nago, Abu Town, Yamaguchi Prefecture. This area is located in the northern part of this prefecture along the

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Sea of Japan (34° 30' 11.9" N, 131° 28' 17" E). The catch data are based on the species and the number of boxes filled in the slip for 2014. Usually, the figures indicated on the slips stand for the number of boxes. In this study, we interviewed fishermen to get the relationship between the species or fishes whose brand names may change depending on the season and the respective "irisū". Based on the results of the interview, the abundance was estimated. Scientific names and identification of species follow Nakabo<sup>4)</sup> and Okutani<sup>5)</sup>.

## Results and Discussion

The number of operation days of set net fishery in the Nago area of Abu Town in 2014 was 206 (Table 1), which amounted to the monthly average number of operation days of  $17.2 \pm 3.4$  (average  $\pm$  SD) (Max: 23 days in February, Min: 12 days in September). The number of species shipped in the same year amounted to 61 with the monthly average of  $22.8 \pm 5.8$ .

The results of the interview showed as follows: For fish species, the figure filled in the "brand names" column corresponded to the "irisū". However, for squid species, the figure filled in the same column did not correspond to the "irisū" (Table 2), which means that different methods of calculating the number of individuals must be applied to fishes and squids. Furthermore, spear squid (*Heterololigo bleekeri*) and swordtip squid (*Uroteuthis edulis*) were caught in nets, some transactions ("Katsugyo": keep their alive in tank) were made on a weight basis. In such a case, the transaction was made in units of one kg and it was found that approximately three squids weighed one kg. Therefore, the individual data based on the weight should be calculated by multiplying the total weight (kg)/day by 3. Especially, extremely small size of squids and fishes (*Trachurus japonicus*) were shipped approximately 5 kg/box, which is called "baraika" and "zengoaji" in the Nago area. We calculated that the number of the catches contained in the box by dividing 5 kg by average of individual weight according to random sampling.

On the other hand, there is a box to be shipped with

some different fish species because the catch does not amount to the "irisū" of a certain brand, which is called "iromono". Such a box was identified for 133 (64.4%) out of 206 operation days, which accounted for  $3.8 \pm 6.7$  % of the total amount of money of the catches landed per day. In this study, the abundance of such a box is not considered.

Based on the results of the interview, the calculation was completed by adding the individual data estimated by multiplying the number of fish boxes by the "irisū" to that estimated from the weights of the squids and fishes. The calculation results showed that the total abundance of catches landed was estimated to 218,543 and the average abundance shipped per operation day amounted to  $943.3 \pm 1297.9$  (Table 3).

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**Table 1.** Summary of operation-days and landing by set net off Abu town in 2014

Operation days		No. of species		Landed quantity (abundance)	
Total	days / month ( $\pm$ SD)	Total	species / month ( $\pm$ SD)	Total	individuals / day ( $\pm$ SD)
206	17.2 $\pm$ 3.4	61	22.8 $\pm$ 5.8	218,543	943.3 $\pm$ 1297.9

**Table 2.** Relationship between catch slips of brand names (code number) and the number of squids contained (squid's "irisu") in box

Species	Brand names (Code number)											
	Uncoded	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
Spear squid ( <i>Heterololigo bleekeri</i> )	14	-	-	-	17	27(24)	-	-	-	-	-	-
Swordtip squid ( <i>Uroteuthis edulis</i> )	14	-	-	-	17	24	28	36	40	50	55	66
Bigfin reef squid ( <i>Sepioteuthis lessoniana</i> )	2	-	3	4	6(3)	12	16(14)	20(16)	22	25	-	-
Golden cuttlefish ( <i>Sepia esculenta</i> )	8	-	-	-	-	-	-	-	-	-	-	-
Japanese flying squid ( <i>Todarodes pacificus</i> )	14	-	-	-	-	-	-	-	-	-	-	-
Rhomboid squid ( <i>Thysanoteuthis rhombus</i> )	1	-	-	-	-	-	-	-	-	-	-	-

Number shown in parentheses is "irisu", especially from December to January in winter.

**Table 3.** Results of landed species and quantity by set net off Abu town in 2014

		Species	Landed quantity (n)	
Cephalopoda	Sepiida	Sepiidae	<i>Sepia esculenta</i> 152	
		Myopsida	Loliginidae	<i>Uroteuthis edulis</i> 143,454
			<i>Heterololigo bleekeri</i> 37,220	
			<i>Sepioteuthis lessoniana</i> 2,978	
	Teuthida	Ommastrephidae	<i>Todarodes pacificus</i> 2,282	
		Thysanoteuthidae	<i>Thysanoteuthis rhombus</i> 9	
	Octopoda	Octopodidae	<i>Octopus vulgaris</i> 19	
	Chondrichthyes	Carcharhiniformes	Triakidae	<i>Triakis scyllium</i> 5
			Squatiniiformes	Squatinaidae
Rhinobatiformes		Rhinobatidae		<i>Rhinobatos schlegelii</i> 12
Myliobatiformes		Dasyatidae	<i>Dasyatis akajei</i> 6	
Osteichthyes		Anguilliformes	Congridae	<i>Conger myriaster</i> 2
			Salmoniformes	Slamonidae
		<i>Oncorhynchus masou masou</i> 2		
	Clupeiformes	Clupeidae	<i>Konosirus punctatus</i> 2	
	Gadiformes	Gadidae	<i>Gadus macrocephalus</i> 5	
	Zeiformes	Zeidae	<i>Zeus faber</i> 77	
	Gasterosteiformes	Fistulariidae	<i>Fistularia petimba</i> 6	
Perciformes	Sebastidae	<i>Sebastes spp.</i> 4		
		<i>Sebastes marmoratus</i> 9		
	Synanceiida	<i>Inimicus japonicus</i> 15		
	Triglidae	<i>Chelidonichthys spinosus</i> 33		
	Lateolabracidae	<i>Lateolabrax japonicus</i> 1,072		

	<i>Lateolabrax latus</i>	45
Serranidae	<i>Epinephelus bruneus</i>	4
	<i>Epinephelus akaara</i>	16
Coryphaenidae	<i>Coryphaena hippurus</i>	18
Carangidae	<i>Seriola quinqueradiata</i>	8,824
	<i>Seriola aureovitata</i>	1,570
	<i>Seriola dumerili</i>	107
	<i>Trachurus japonicus</i>	6,762
Bramidae	<i>Brama japonica</i>	1
Haemulidae	<i>Parapristipoma trilineatum</i>	31
	<i>Diagramma picta</i>	11
Sparidae	<i>Acanthopagrus schlegelii</i>	16
	<i>Pagrus major</i>	105
	<i>Rhabdosargus sarba</i>	1
Girellidae	<i>Girella punctata</i>	1,672
Kyphosidae	<i>Kyphosus vaigiensis</i>	6
Oplegnathidae	<i>Oplegnathus punctatus</i>	56
	<i>Oplegnathus fasciatus</i>	32
Cheilodactylidae	<i>Goniistius zonatus</i>	2
Siganidae	<i>Siganus fuscescens</i>	146
Acanthuridae	<i>Prionurus scalprum</i>	7
Trichiuridae	<i>Trichiurus japonicus</i>	1
Scombridae	<i>Scomber japonicus</i>	2,030
	<i>Acanthocybium solandri</i>	1
	<i>Scomberomorus niphonius</i>	2,479
	<i>Thunnus orientalis</i>	25
	<i>Thunnus tonggol</i>	15
Istiophoridae	<i>Istiophorus platypterus</i>	1
Pleuronectiformes		
Paralichthyidae	<i>Paralichthys olivaceus</i>	206
Pleuronectidae	<i>Pleuronectes herzensteini</i>	18
Tetraodontiformes		
Monacanthidae	<i>Stephanolepis cirrhifer</i>	26
	<i>Aluterus Monoceros</i>	92
Tetraodontidae	<i>Takifugu pordalis</i>	2,900
	<i>Takifugu xanthopterus</i>	3
	<i>Lagocephalus spadiceas</i>	45
	<i>Takifugu rubripes</i>	29
	<i>Takifugu flavipterus</i>	3,850

## 2014年山口県阿武町奈古定置網の伝票をもとにした 水揚げ個体数の推定に関する予備的調査

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### 要 旨

定置網の水揚げ伝票には、出荷された漁獲物が箱数で記載されている場合が多い。箱に入っている漁獲物の個体数（以下、入数）は種によって異なり、同じ種であったとしても季節によって入数が増減する可能性がある。本研究では、山口県阿武町奈古の定置網で出荷される漁獲物の個体数を推定するために、漁業者に協力いただき、2014年の種また季節で変化する可能性がある入数を聞き取り調査によって調べることを検討した。2014年の阿武町奈古の定置網の操

業日数は206日、月当たりの平均操業日数は $17.2 \pm 3.4$ （平均  $\pm$  SD）日であった。出荷種数は61種、月平均は $22.8 \pm 5.8$ 種であった。聞き取り調査の結果をもとに市場に揚がる箱の内容物を確認し、水揚げされた種毎の個体数を推定した。その結果、入数に数が達せず、複数の魚種を混ぜて出荷された箱（イロもの、1日辺り水揚げ金額の $3.8 \pm 6.7\%$ ）を除いた2014年の水揚げ総個体数は、218,543個体と推定され、操業日当たりの推定平均出荷個体数は $943.3 \pm 1297.9$  個体であった。

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