# VERIFICATION OF SHARK CPUE REPORTED BY LOGBOOK OF JAPANESE LONGLINE FISHERY COMPARING WITH THE OBSERVER DATA

Daisuke Shiode and Hideki Nakano[1]

*SUMMARY*

*The shark CPUE from the Japanese logbook data was verified comparing with CPUE from Japanese observer data. And, the most appropriate range of reporting category for the logbook data was determined as abundance indices of blue and shortfin mako shark. Blue shark occupied 86 % of all sharks caught in more and equal 70 % of reporting categories in the logbook records. The CPUEs of blue shark were close to the values from Japanese observer data and within the range of the standard deviations of them. Shortfin mako shark occupied 40 % of all sharks caught in less than 40 % of reporting categories, and the CPUE of shortfin mako shark were almost within the range of the standard deviations. Therefore, these reporting categories (blue shark: more and equal 70 %, shortfin mako shark: less than 40 %) could be used as abundance indices for the species.*

*RÉSUMÉ*

*La CPUE des requins issue des données des livres de bord japonais a été vérifiée en la comparant à celle qui est fournie par les données japonaises d'observateurs. Aussi, la fourchette la plus appropriée de la catégorie de déclaration des données des carnets de pêche a été définie en tant qu'indice d'abondance du requin peau bleue et du requin-taupe commun. Le requin peau bleue constituait 86% de tous les requins capturés dans plus de et égal à 70% des catégories de déclaration des extraits de carnets de pêche. La CPUE du requin peau bleue était proche des valeurs des données japonaises d'observateurs et dans la gamme de la déviation standard de celles-ci. Le requin-taupe commun représentait 40% de tous les requins capturés dans moins de 40% des catégories de déclaration, et sa CPUE se situait presque dans la gamme de la déviation standard. Par conséquent, ces catégories de déclaration (requin peau bleue: plus de et égal à 70%, requin-taupe commun: moins de 40%) pourraient servir d'indices de l'abondance de ces espèces.*

*RESUMEN*

*En este documento se verifican las CPUE de tiburones de los datos de los cuadernos de pesca japoneses comparándolas con las CPUE de los datos de los observadores japoneses. El rango más apropiado de categoría de declaración para los datos de los cuadernos de pesca se determinó como índices de abundancia del tiburón azul y del marrajo dientuso. El tiburón azul representó el 86% de todas las capturas de tiburones en el 70% por ciento o más de los datos declarados en los registros de los cuadernos de pesca. Las CPUE de tiburón azul eran similares a los valores de los datos de los observadores japoneses y al rango de desviaciones estándar de los mismos. El marrajo dientuso representó el 40% de*

[1] National Research Institute of Far Seas Fisheries, 5-7-1 Orido, Shimizu, 424-8633, Japan E-mail: shiode@fra.affrc.go.jp

*las capturas de tiburón en menos del 40% de los datos declarados, y las CPUE de marrajo dientuso se hallaban casi en el mismo rango de desviaciones estándar. Por tanto, estas categorías de declaración (tiburón azul, igual o superior al 70%, marrajo dientuso, menos del 40%) pueden utilizarse como índices de abundancia para la especie.*

*KEYWORDS*

*Blue shark, Logbooks, Long lining, Observer, Reporting category, Shortfin mako shark*

## Introduction

Japanese longline fishery has covered wide range in the Atlantic Ocean. Therefore, abundance indices for the shark species from Japanese longline logbook data could be one of the most important sources, if it could be obtained. However, shark catch was recorded as “sharks” in the Japanese logbook system until 1992. Nakano and Honma (1996) examined the shark catches of the logbook records and submitted the evaluation procedures of CPUEs of sharks based on the relationship between reporting category and species composition of sharks caught (reporting category of more than 70 % reveals catch of all shark species, and less than 21 % reveals mainly shortfin mako shark). Furthermore, Kiyota and Nakano (1999) also validated these procedures.

In the present report, the shark CPUE from the Japanese logbook data was verified comparing with CPUE from Japanese observer data. And the most appropriate range of reporting category for the logbook data was determined as abundance indices of blue and shortfin mako shark.

## Materials and Methods

The Japanese logbook and observer data for 1995-1999 were used for the analysis. The areas were classified based on the locations of observer data for the comparison (Fig. 1). They are Area 1 (15°S-0°N, 10°W-5°E), Area 2 (0°-20°N, 40°-20°W), Area 3 (30°-45°N, 80°-60°W), and Area 4 (30°-50°N, 60°-40°W). The area between 40°-50°N and 40°-50°W was divided into two, and southern part of it was included to Area 4. The reporting category (percentage of operations with shark catch to total operations per one cruise) was calculated as same as Nakano and Honma (1996) performed. Data from vessels without shark catch (reporting category: 0 %) were excluded from the analysis in the logbook data. CPUE of sharks (number of sharks caught per 1,000 hooks) were calculated and compared.

## Results and Discussion

Table 1 shows the number of sets, hooks, and sharks recorded in the logbook and observer data used for the analysis. 11,091-28,363 sharks were caught in all areas in 1995-1999. The observed hooks and sharks catch in Area 3 were quite less than other areas. Species composition of sharks in north and south of 10°N in Atlantic Ocean is shown in Fig. 2 according to the reporting categories of the logbook data. Shortfin mako shark dominated in lower reporting categories, and proportion of blue shark increased in higher reporting categories as same as Nakano and Honma (1996). Frequencies distribution of reporting category of Japanese observer data is shown in Fig. 3. Frequencies of reporting category appeared in more than 70 % reporting categories.

Fig. 4 shows proportion of blue shark to all sharks caught and CPUE calculated according to the reporting categories respectively. Proportion of blue shark was almost constant and more than 80 % in all reporting categories, and blue shark occupied 86 % of all sharks caught in more and equal 70 % of reporting categories. The CPUE of blue shark increased gradually with increasing reporting category, and was 2.3 in more and equal 70 % of reporting categories. Fig. 5 shows the CPUE trends of blue shark from the Japanese observer and the logbook data classified with reporting categories of more and equal 50-90 % in Area 1,2, and 4. The CPUEs of blue shark from more and equal 70 % of reporting category are close to the values of Japanese observer data and within the range of the standard deviations of them (Fig.5).

Proportion of shortfin mako shark to all sharks caught and calculated CPUEs are shown in Fig. 6 respectively. Proportion of shortfin mako shark increased with decreasing reporting category (shortfin mako shark occupies 55 % of all sharks caught in less than 30 % of reporting categories, and 40 % in less than 40 % of reporting categories). Consequently, the lower reporting category is likely to represent the catch of shortfin mako shark. The CPUE level, however, decreased with decreasing reporting category. Thus, there is some “trade-off” problem for the determination of the most appropriate range of reporting category in the case of shortfin mako shark. In this report, therefore, reporting category of less than 40 % was selected for the abundance index of shortfin mako shark comparing the level of CPUEs and taking account of proportion of it. Fig. 7 shows the CPUEs of shortfin mako shark from the Japanese observer and the logbook data classified with reporting categories of less than 10-40 % in Area 1,2, and 4. The CPUEs of shortfin mako shark from the Japanese observer data were higher in Area 4, but they had quite wide range of standard deviations. The CPUEs categorized with less than 40 % of reporting category are almost within the range of the standard deviations. Therefore, these categories of reporting categories (blue shark: more and equal 70 %, shortfin mako shark: less than 40 %) could be used as abundance indices for the species.

**References**

Nakano, H. and M. Honma. 1996. Historical CPUE of pelagic sharks caught by Japanese longline fishery in the Atlantic Ocean. ICCAT BYC/96/05. pp.10.

Kiyota, M. and Nakano, H. 1999. Validation of shark catch data of the logbook records in Japanese longline fishery in the Atlantic Ocean. ICCAT BYC/99/05. pp.1.

**Table 1**. Summary of Japanese logbook data analyzed in this report showing number of sets and hooks and catch of sharks in the Atlantic Ocean during 1995-1999.

| Data | Area | 1995 | 1996 | 1997 | 1998 | 1999 |
|---|---|---|---|---|---|---|
| hooks | 1 | 19.346.286 | 15.978.174 | 16.099.895 | 9.862.031 | 10.017.795 |
| | 2 | 16.664.510 | 26.381.238 | 22.450.982 | 19.683.261 | 16.331.543 |
| | 3 | 333.802 | 201.326 | 100.513 | 905.710 | 824.437 |
| | 4 | 1.256.922 | 1.966.979 | 2.452.078 | 3.303.195 | 4.122.343 |
| | Total | 37.601.520 | 44.527.717 | 41.103.468 | 33.754.197 | 31.296.118 |
| | *Atl. Total* | *101.215.082* | *122.518.251* | *108.844.324* | *114.593.543* | *80.329.531* |
| Blue shark | 1 | 5.829 | 3.647 | 3.532 | 1.555 | 2.583 |
| | 2 | 12.673 | 11.521 | 7.540 | 5.721 | 3.352 |
| | 3 | 1.405 | 757 | 0 | 709 | 328 |
| | 4 | 3.519 | 1.782 | 913 | 1.167 | 3.152 |
| | Total | 23.426 | 17.707 | 11.985 | 9.152 | 9.415 |
| | *Atl. Total* | *46.359* | *37.738* | *33.100* | *39.941* | *24.786* |
| Porbeagle | 1 | 17 | 35 | 113 | 24 | 56 |
| | 2 | 180 | 62 | 57 | 217 | 10 |
| | 3 | 0 | 12 | 0 | 1 | 0 |
| | 4 | 0 | 23 | 1 | 0 | 0 |
| | Total | 197 | 132 | 171 | 242 | 66 |
| | *Atl. Total* | *822* | *260* | *368* | *1.856* | *626* |
| Shortfin mako | 1 | 910 | 469 | 317 | 143 | 218 |
| | 2 | 2.098 | 1.265 | 1.184 | 1.041 | 622 |
| | 3 | 88 | 325 | 11 | 85 | 18 |
| | 4 | 606 | 216 | 410 | 422 | 460 |
| | Total | 3.702 | 2.275 | 1.922 | 1.691 | 1.318 |
| | *Atl. Total* | *9.756* | *5.690* | *5.491* | *6.028* | *3.276* |
| Other shark | 1 | 175 | 262 | 102 | 103 | 184 |
| | 2 | 613 | 114 | 289 | 288 | 64 |
| | 3 | 110 | 235 | 0 | 4 | 0 |
| | 4 | 140 | 5 | 8 | 1 | 44 |
| | Total | 1.038 | 616 | 399 | 396 | 292 |
| | *Atl. Total* | *3.304* | *3.052* | *1.418* | *5.087* | *1.784* |
| All shark | 1 | 6.931 | 4.413 | 4.064 | 1.825 | 3.041 |
| | 2 | 15.564 | 12.962 | 9.070 | 7.267 | 4.048 |
| | 3 | 1.603 | 1.329 | 11 | 799 | 346 |
| | 4 | 4.265 | 2.026 | 1.332 | 1.590 | 3.656 |
| | Total | 28.363 | 20.730 | 14.477 | 11.481 | 11.091 |
| | *Atl. Total* | *60.241* | *46.740* | *40.377* | *52.912* | *30.472* |

**Table 2.** CPUE of blue shark obtained from the Japanese logbook and observer data in 1995-1999.

| Area | Year | CPUE | | | | | | CPUE | |
|---|---|---|---|---|---|---|---|---|---|
| | | Reporting rate categories | | | | | | | |
| | | >= 50% | >= 60% | >= 70% | >= 80% | >= 90% | S.D.(>= 70%) | observer | S.D. |
| 1 | 95 | 1,69 | 1,76 | 1,76 | 1,82 | 2,32 | 2,61 | - | - |
| | 96 | 1,39 | 1,42 | 1,53 | 1,63 | 2,41 | 1,59 | - | - |
| | 97 | 1,63 | 1,64 | 1,64 | 1,85 | 2,05 | 1,89 | 2,14 | 1,92 |
| | 98 | 1,05 | 1,05 | 1,15 | 1,44 | 1,56 | 1,53 | - | - |
| | 99 | 1,45 | 1,56 | 1,56 | 1,56 | 1,65 | 1,24 | - | - |
| 2 | 95 | 2,69 | 2,74 | 2,74 | 2,87 | 3,24 | 3,63 | 5,96 | 2,31 |
| | 96 | 2,64 | 2,82 | 2,89 | 3,31 | 3,95 | 3,65 | - | - |
| | 97 | 2,24 | 2,46 | 2,78 | 2,95 | 2,98 | 3,03 | 1,73 | 3,20 |
| | 98 | 1,53 | 1,65 | 1,81 | 1,98 | 2,10 | 2,16 | - | - |
| | 99 | 1,21 | 1,29 | 1,39 | 1,45 | 1,42 | 1,35 | 0,87 | 0,87 |
| 3 | 95 | 14,05 | 14,05 | 14,05 | 14,05 | 15,87 | 21,28 | - | - |
| | 96 | 12,46 | 12,46 | 12,46 | 12,46 | 12,46 | 12,30 | - | - |
| | 97 | - | - | - | - | - | - | 1,27 | 0,96 |
| | 98 | 2,39 | 2,39 | 4,82 | 3,46 | 3,98 | 5,18 | 2,02 | 1,65 |
| | 99 | 6,60 | 6,60 | 6,60 | 6,60 | 2,44 | 5,28 | - | - |
| 4 | 95 | 12,33 | 12,33 | 12,44 | 12,44 | 14,52 | 16,08 | 11,11 | 10,93 |
| | 96 | 11,88 | 11,88 | 11,88 | 11,88 | 11,88 | 21,76 | - | - |
| | 97 | 2,08 | 2,01 | 2,17 | 5,55 | 5,78 | 6,48 | 9,46 | 10,26 |
| | 98 | 1,61 | 1,61 | 2,41 | 1,86 | 2,44 | 8,35 | 14,87 | 9,64 |
| | 99 | 2,90 | 3,10 | 3,43 | 3,43 | 3,55 | 3,90 | - | - |

**Table 3.** CPUE of shortfin mako shark obtained from the Japanese logbook and observer data in 1995-1999.

| Area | Year | CPUE | | | | S.D.(< 40%) | CPUE | |
|---|---|---|---|---|---|---|---|---|
| | | Reporting rate categories | | | | | | |
| | | < 10% | < 20% | < 30% | < 40% | | observer | S.D. |
| 1 | 95 | 0,02 | 0,03 | 0,04 | 0,04 | 0,13 | - | - |
| | 96 | 0,02 | 0,03 | 0,04 | 0,04 | 0,16 | - | - |
| | 97 | 0,02 | 0,04 | 0,04 | 0,04 | 0,14 | 0,02 | 0,09 |
| | 98 | 0,02 | 0,03 | 0,03 | 0,03 | 0,13 | - | - |
| | 99 | 0,02 | 0,05 | 0,04 | 0,05 | 0,44 | - | - |
| 2 | 95 | 0,03 | 0,04 | 0,05 | 0,05 | 0,16 | 0,16 | 0,32 |
| | 96 | 0,03 | 0,04 | 0,06 | 0,07 | 0,27 | - | - |
| | 97 | 0,02 | 0,04 | 0,09 | 0,08 | 0,53 | 0,02 | 0,15 |
| | 98 | 0,03 | 0,03 | 0,05 | 0,05 | 0,18 | - | - |
| | 99 | 0,02 | 0,03 | 0,08 | 0,08 | 1,26 | 0,03 | 0,10 |
| 3 | 95 | - | 0,07 | 0,08 | 0,13 | 0,24 | - | - |
| | 96 | - | - | - | - | - | - | - |
| | 97 | - | - | 0,91 | 0,34 | 0,61 | 0,39 | 0,45 |
| | 98 | - | 0,15 | 0,12 | 0,12 | 0,25 | 0,35 | 0,40 |
| | 99 | - | 0,00 | 0,00 | 0,01 | 0,12 | - | - |
| 4 | 95 | 0,05 | 0,05 | 0,14 | 0,14 | 0,43 | 0,27 | 0,47 |
| | 96 | 0,03 | 0,04 | 0,04 | 0,05 | 0,17 | - | - |
| | 97 | 0,05 | 0,13 | 0,16 | 0,26 | 0,82 | 1,15 | 1,14 |
| | 98 | 0,03 | 0,14 | 0,07 | 0,08 | 0,22 | 1,14 | 0,86 |
| | 99 | 0,05 | 0,03 | 0,06 | 0,11 | 0,31 | - | - |

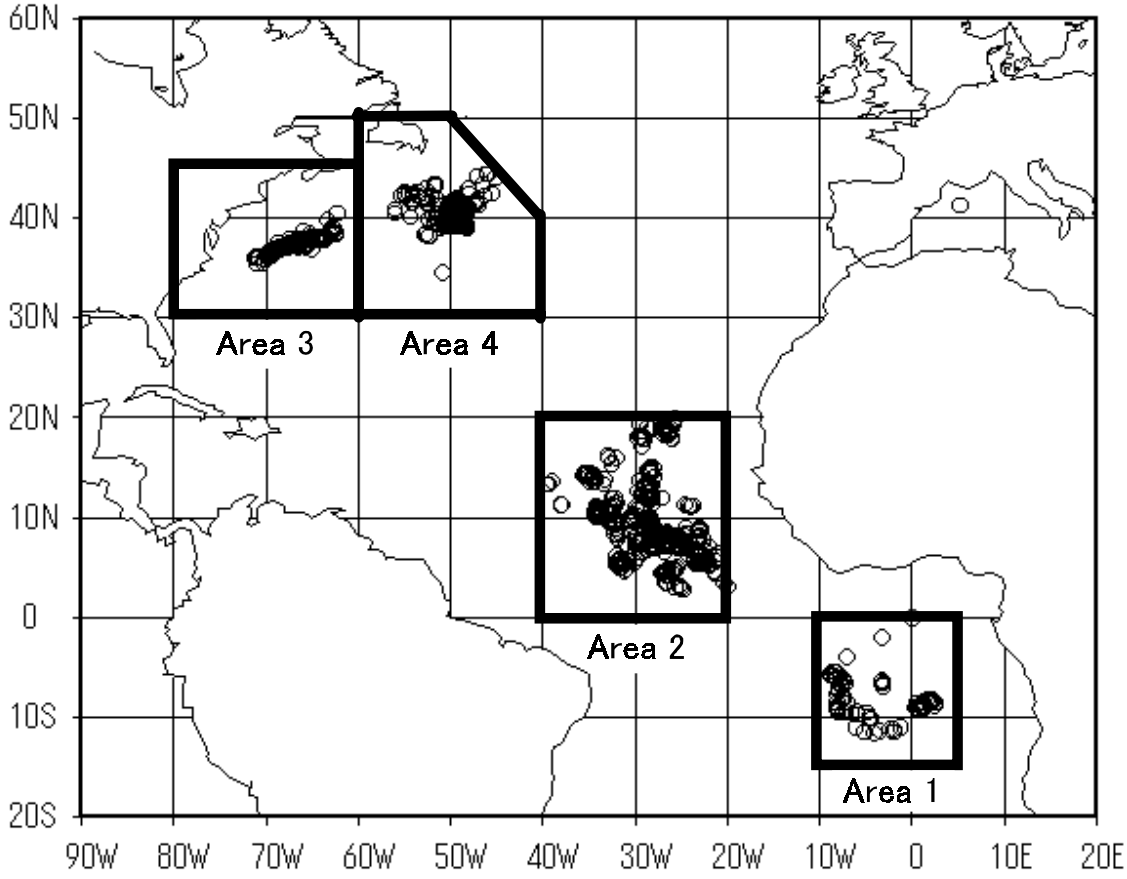


**Fig. 1.** Area classification and positions of fishing operations of the observer data for the comparison with the logbook data.

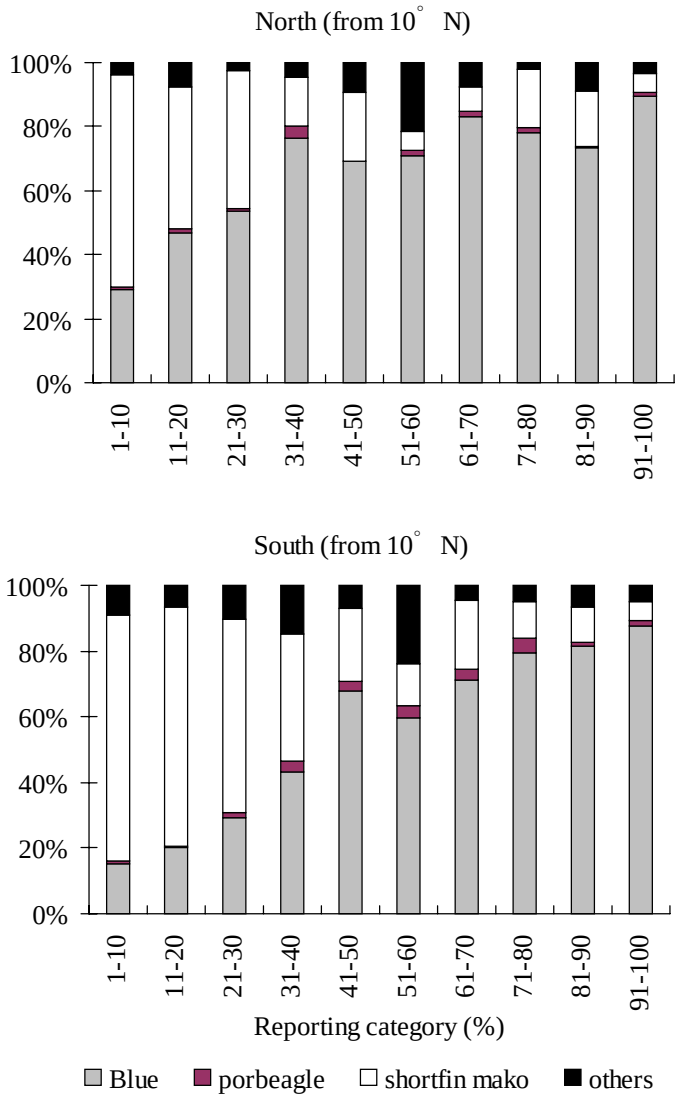


**Fig.2**. Proportion of shark species by the recording categories in the 1995-1999 logbook data.
(Upper: North from 10° N, Lower: South from 10° N)

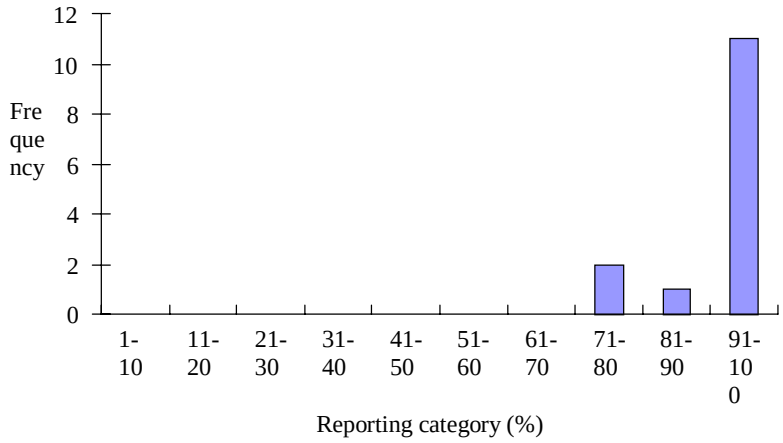


**Fig. 3.** Frequencies distribution of reporting categories of Japanese observer data.

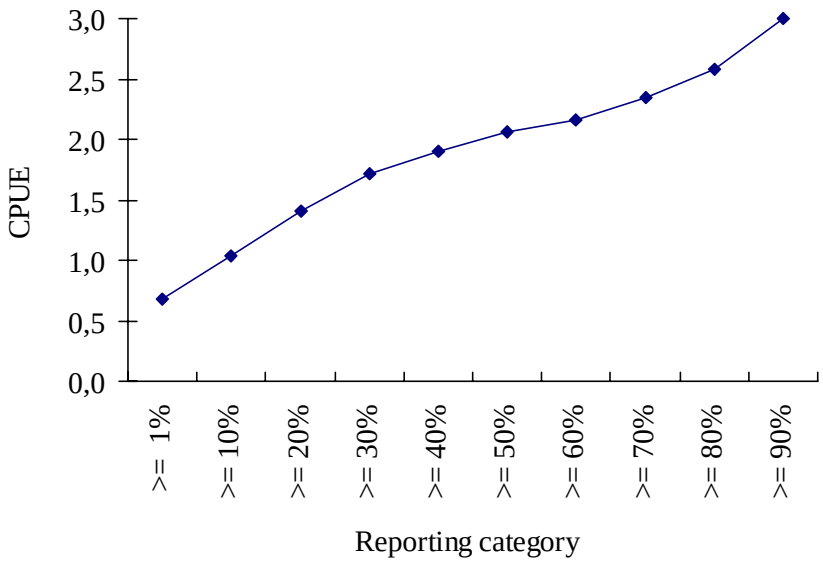


**Fig. 4.** Proportion of blue shark in all sharks caught and CPUE calculated according to the reporting categories.

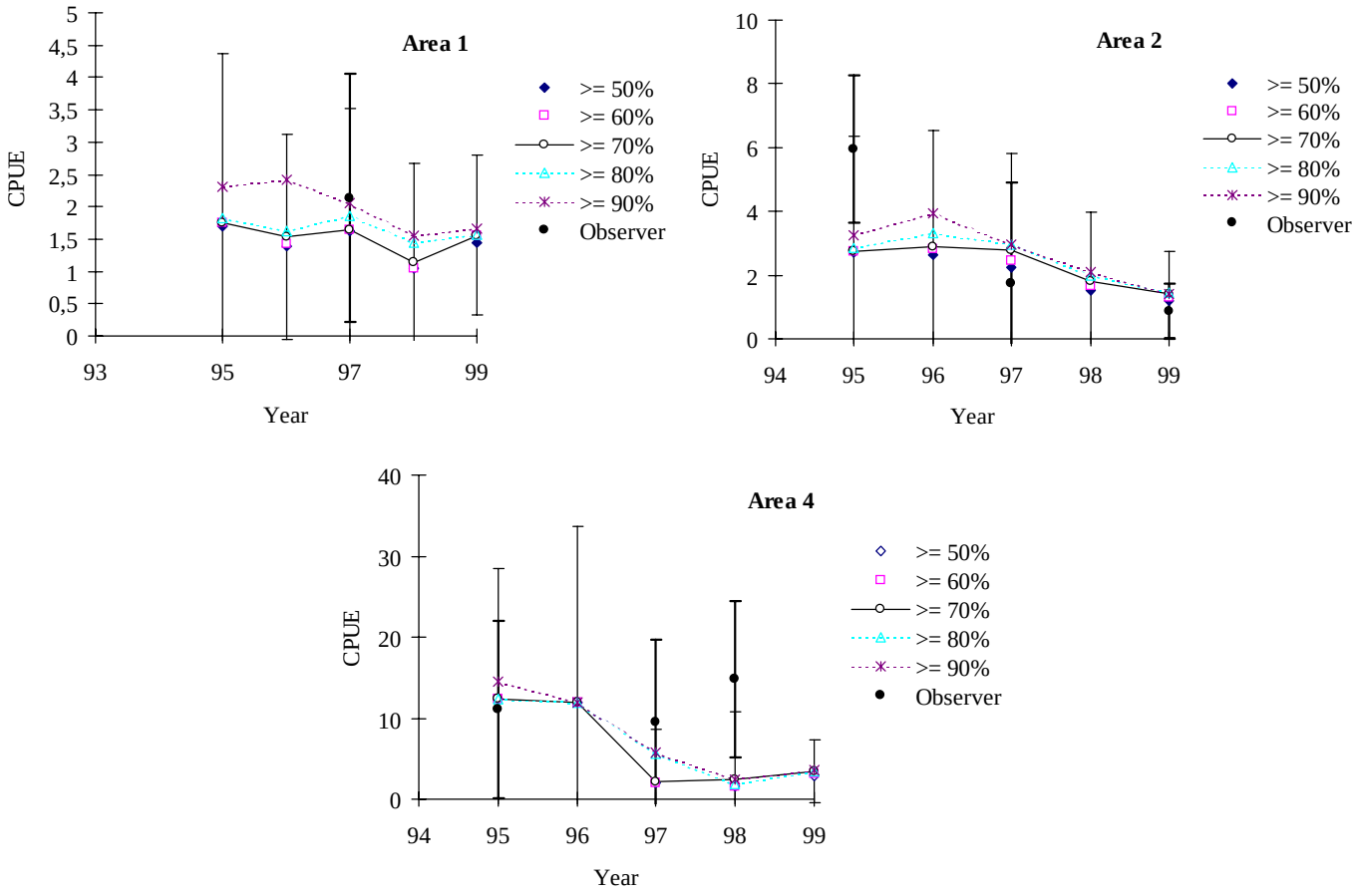


**Fig. 5.** CPUEs of blue shark by Area obtained from Japanese logbook and observer data in 1995-1999.

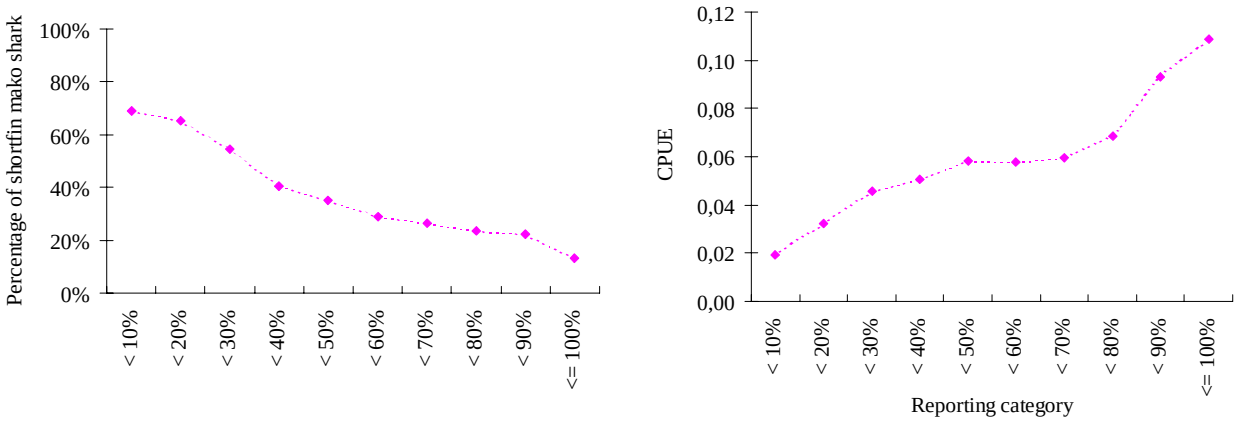


**Fig. 6.** Proportion of shortfin mako shark in all sharks caught and CPUE calculated according to the reporting categories.

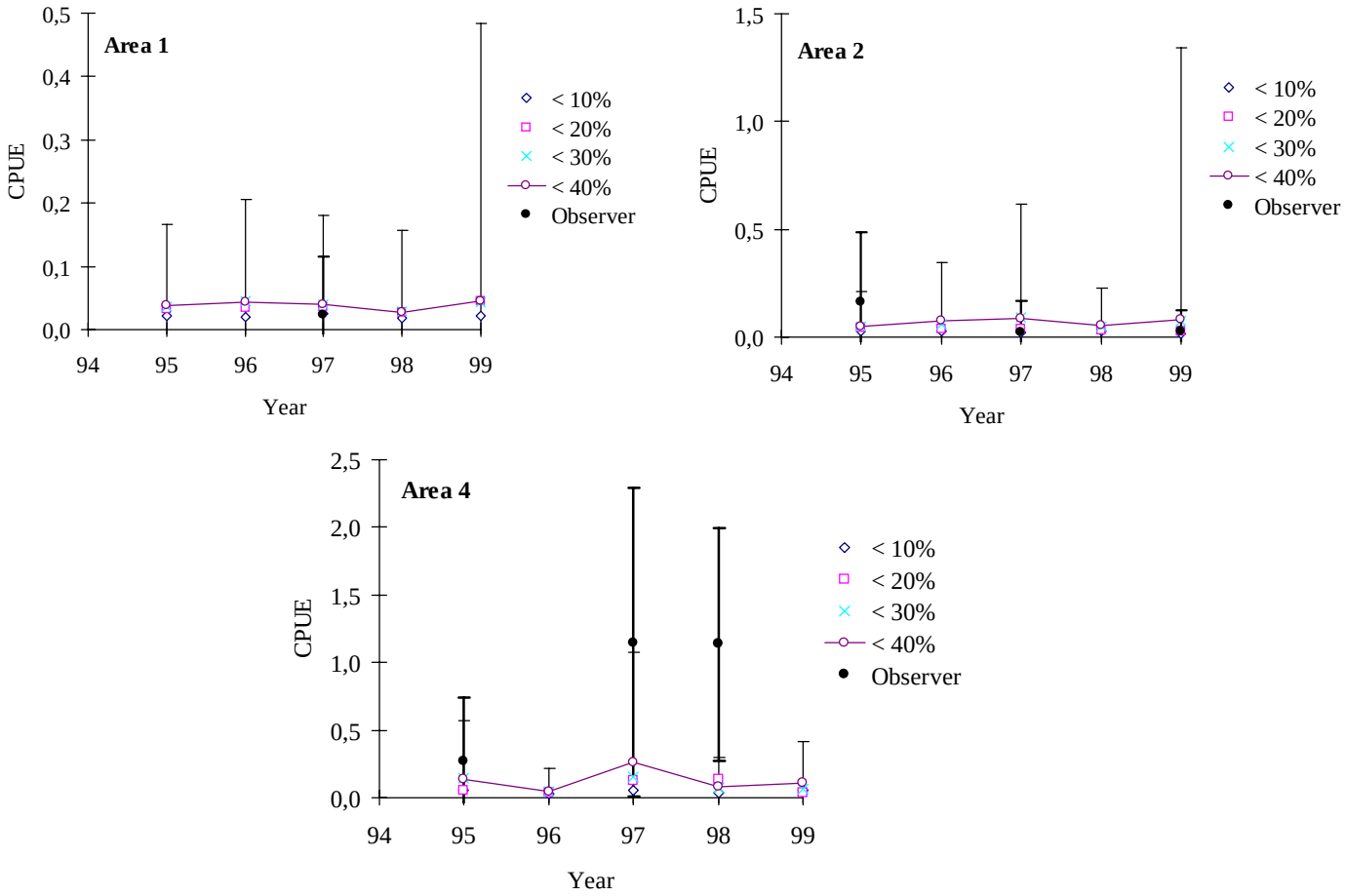


**Fig. 7**. CPUEs of shortfin mako shark by Area obtained from Japanese logbook and observer data in 1995-1999.