Notification révisée de projets de recherche scientifique pour 2009/10 - Japon

COMMISSION FOR THE CONSERVATION OF
ANTARCTIC MARINE LIVING RESOURCES

COMMISSION POUR LA CONSERVATION DE LA FAUNE
ET LA FLORE MARINES DE L'ANTARCTIQUE

КОМИССИЯ ПО СОХРАНЕНИЮ МОРСКИХ
ЖИВЫХ РЕСУРСОВ АНТАРКТИКИ

COMISIÓN PARA LA CONSERVACIÓN DE LOS
RECURSOS VIVOS MARINOS ANTÁRTICOS

CCAMLR

PO BOX 213, NORTH HOBART, TASMANIA 7002 AUSTRALIA
181 MACQUARIE STREET, HOBART, TASMANIA 7000 AUSTRALIA
Website: www.ccamlr.org

Phone: (61) 3 6210 1111
Fax: (61) 3 6224 8744
Email: ccamlr@ccamlr.org

À TOUS LES MEMBRES DE LA COMMISSION
ET DU COMITE SCIENTIFIQUE

COMM CIRC 09/115
SC CIRC 09/59

Hobart, le 30 septembre 2009

Notification révisée de projets de recherche scientifique pour 2009/10 –
Japon

Conformément à la mesure de conservation 24-01, les Membres ont été avisés dans le courant de l'année que le Japon avait soumis une notification en vue de poursuivre ses activités de recherche scientifique dans la division 58.4.4 d'avril à juin 2010 (COMM CIRC 09/70–SC CIRC 09/33).

Cette notification relève du paragraphe 3 de la mesure de conservation 24-01 et le plan de recherche a été examiné par le WG-SAM. Le Japon a soumis un plan de recherche révisé (WG-FSA-09/12) à l'intention du WG-FSA et du Comité scientifique.

D.G.M. Miller
Secrétaire exécutif

P.J.

Title	**REVISED RESEARCH PLAN FOR TOOTHFISH IN DIVISION 58.4.4A and B BY *SHINSEI MARU NO. 3* IN 2009/10**
Author(s)	Delegation of Japan
Affiliation(s)	Oceanic Resources Division, National Research Institute of Far Seas Fisheries 2-12-4, Fukuura, Kanazawa, Yokohama, Kanagawa 236-8648, Japan. takisan@fra.affrc.go.jp

Published or accepted for publication elsewhere?   Yes ☐   No ☒

If published, give details

ABSTRACT

   The plan submitted to the WG-SAM-09 (Document 09/11) for fishing surveys on stock status and biological characteristics of *Dissostichus* spp. in Division 58.4.4 a & b has been revised according to the recommendations of the working group.

   The working group recommended the consecutive research focusing on tagging program for a period of 3-5 years to estimate current stock size accurately, and on fishing trials using both Trot line and Spanish line systems so that their properties can be better understood.

   We recalculated the necessary sample size as 120,000 kg for *Dissostichus* spp. for this division that includes 4 SSRUs, taking into account the conservative exploitation rate (less than 3.8 % of the total estimated biomass). Distributing research hauls across all SSRUs rather than concentrating the effort on a smaller subset of this Division is thought to be more reasonable in terms of minimizing localized impacts on the stock, avoiding predation of tagged and released toothfish by toothed whales, and accomplishing the objectives of the survey.

   To apply the mark-and-recapture studies, sufficient tagging rate was calculated to be 5 fish/ton, which can predict the CV of a Petersen estimate of population abundance to be sufficiently 0.31 when over-dispersion value is assumed to be 2.0.

   A total of 117 research hauls are allocated on 10-minute latitude x 20-minute longitude grid points, taking into account the need to deploy research hauls and tagging releases evenly throughout the survey area. A Trot line system will be employed for 88 research hauls in order to make an evaluation of the stock status and biological characteristics of *Dissostichus* spp. and to compare the information to be obtained in this survey with the information collected by the Trot line system used in the same Division in the previous research in 2007/08. In 29 hauls (a quarter of total sets), the experimental gear, which consists of three segments of Trot line system and Spanish line system respectively within one fishing line, will be used in order to standardize the CPUE of Trot line accurately in this Division and collect information on various properties of the two gears.

SUMMARY OF FINDINGS AS RELATED TO NOMINATED AGENDA ITEMS

Agenda Item   *Findings*
5   N/A

Revised research plan for toothfish in Division 58.4.4 a & b by Shinsei Maru No. 3 in 2009/10

FORMAT FOR REPORTING PLANS FOR FINFISH SURVEYS
IN ACCORDANCE WITH PARAGRAPH 3 OF
CONSERVATION MEASURE 24-01

CCAMLR MEMBER _Japan

SURVEY DETAILS

A statement of the planned research objectives

The plan submitted to the WG-SAM-09 (Document 09/11) for fishing surveys on stock status and biological characteristics of *Dissostichus* spp. in Division 58.4.4 a & b, has been revised, taking into account the recommendations of the working group.

The working group recommended a consecutive research focusing on tagging program for a period of 3-5 years to estimate current stock size accurately and on fishing trials using both Trot line and Spanish line systems so that their properties can be better understood.

We recalculated the necessary sample size as 120,000 kg for *Dissostichus* spp. for this Division that includes 4 SSRUs, taking into account the conservative exploitation rate (less than 3.8 % of the total estimated biomass). Distributing research hauls across all SSRUs rather than concentrating the effort on a smaller subset in this Division is thought to be more reasonable in terms of minimizing localized impacts on the stock, avoiding predation of tagged and released toothfish by toothed whales, and accomplishing the objectives of the proposed survey.

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this survey with the information collected by the Trot line system used in the same Division in the previous research in 2007/08. In 29 hauls (a quarter of total sets), the experimental gear, which consists of three segments of Trot line system and Spanish line system respectively within one fishing line, will be used in order to standardize the CPUE of Trot line in this Division and collect information on various properties of the two gears.

Survey Area/Subarea/Division: *Division 58.4.4a & 58.4.4b (Fig.1)*

Geographical Boundaries:
  SSRU A (Lat: 51°S - 54°S, Long: 40°E - 42°E)
  SSRU B (Lat: 51°S - 54°S, Long: 42°E - 46°E)
  SSRU C (Lat: 51°S - 54°S, Long: 46°E - 50°E)
  SSRU D (Whole division excluding SSRUs A, B and C)

Is a map of area surveyed (preferably including bathymetry and positions of sampling stations/hauls) appended to the format?   *Yes, the map and positions of hauls are appended in Fig. 2*

Proposed dates of survey: *from 2010 April to June (1.5 - 2 months)*

Name(s) and address of the chief scientist(s) responsible for planning and coordinating the research: *Dr. Kenji Taki*
  Oceanic Resources Division
  National Research Institute of Far Seas Fisheries
  2-12-4 Fukuura, Kanazawa, Yokohama, Kanagawa 236-8648, JAPAN
  TEL: +81-45-788-7500, E-mail: takisan@fra.affrc.go.jp

Number of scientists *2* and crew *30* to be aboard the vessel.

Is there opportunity for inviting scientists from other Members?   *No due to space limitation*
If so, indicate a number of such scientists *0*

DESCRIPTION OF VESSEL

Name of vessel: *Shinsei Maru No.3*

Name and address of vessel owner Name： *TAIYO A&F CO.,LTD.*
Address: 4-5, Toyomi-cho, Chuo-ku, Tokyo, Japan 104-0055

Vessel type (dedicated research or chartered commercial vessel): *Voluntary commercial fishing vessel*

Port of registration: *Yaizu, Shizuoka*　　Registration number: *128862*

Radio call sign: *JAAL*　　　　Overall length: *47.2 (m)*　　　　Tonnage: *495 ton*

Equipment used for determining position: GPS FURUNO GP500MK2

Fishing capacity (limited to scientific sampling activities only or commercial capacity):
　　10 (ton/day)

Fish processing capacity (if vessel type is commercial): *10 (ton/day)*

Fish storage capacity (if vessel type is commercial): *553 (m3)*

DESCRIPTION OF FISHING GEAR TO BE USED

Longline: *Shinsei Maru Trot line system*

Other sampling gear as plankton nets, CTD probes, water samplers, etc. (specify):
Compact temperature/depth recorders (down to a depth of 2000m)

DESCRIPTION OF ACOUSTIC GEAR TO BE USED

Type: *JRC JFV-250*　　Frequency: *28kHz/50kHz*

SURVEY DESIGN AND METHODS OF DATA ANALYSES

Survey design (random, semi-random): *Grid design as detailed in the appended 'APPLICATION TO UNDERTAKE SCIENTIFIC RESEARCH IN CCAMLR DIVISION 58.4.4 IN THE 2009/10 SEASON'*

Target species: *Dissostichus spp. (Dissostichus eleginoides and D. mawsoni)*

Stratification (if any) according to:

Depth zones (list) N/A:

Fish density (list) N/A

Other (specify) N/A

Duration of standard sampling stations/hauls (preferably 30 min): *Soak time of not less than six hour*s

Proposed number of hauls: *117 hauls*

Proposed sample size (total): *120,000 kg in total*

Proposed methods of survey data analyses (i.e. swept area method, acoustic survey)

Swept area method and mark-and-recapture analysis

DATA TO BE COLLECTED

Haul-by-haul catch and effort data in accordance with CCAMLR Form C4 for reporting results of fishing for research purposes: *Dissostichus spp.*

Fine-scale biological data in accordance with CCAMLR Forms B1, B2 and B3:

B2 and Longline observer data: Dissostichus spp.

Other data (as applicable) (see application for more details)

(Macrourus spp.) : 30fish/line for length and weight measurement

(Other by-catch species): 10 fish/line for length and weight measurement

Tagging of Dissostichus spp.: 5 fish/ton

Dissostichus spp.: Otoliths for ageing

Vulnerable Marine Ecosystems: *Information on benthos taken*

APPLICATION TO UNDERTAKE SCIENTIFIC RESEARCH IN CCAMLR DIVISION

58.4.4 IN THE 2009/10 SEASON

CCAMLR MEMBER: JAPAN

Abstract

The plan submitted to the WG-SAM-09 (Document 09/11) for fishing surveys on stock status and biological characteristics of *Dissostichus* spp. in Division 58.4.4 a & b has been revised according to the recommendations of the working group.

The working group recommended the consecutive research focusing on tagging program for a period of 3-5 years to estimate current stock size accurately, and on fishing trials using both Trot line and Spanish line systems so that their properties can be better understood.

We recalculated the necessary sample size as 120,000 kg for *Dissostichus* spp. for this division that includes 4 SSRUs, taking into account the conservative exploitation rate (less than 3.8 % of the total estimated biomass). Distributing research hauls across all SSRUs rather than concentrating the effort on a smaller subset of this Division is thought to be more reasonable in terms of minimizing localized impacts on the stock, avoiding predation of tagged and released toothfish by toothed whales, and accomplishing the objectives of the survey.

To apply the mark-and-recapture studies, sufficient tagging rate was calculated to be 5 fish/ton, which can predict the CV of a Petersen estimate of population abundance to be sufficiently 0.31 when over-dispersion value is assumed to be 2.0.

A total of 117 research hauls are allocated on 10-minute latitude x 20-minute longitude grid points, taking into account the need to deploy research hauls and tagging releases evenly throughout the survey area. A Trot line system will be employed for 88 research hauls in order to make an evaluation of the stock status and biological characteristics of *Dissostichus* spp. and to compare the information to be obtained in this survey with the information collected by the Trot line system used in the same Division in the previous research in 2007/08. In 29 hauls (a quarter of total sets), the experimental gear, which consists of three segments of Trot line system and Spanish line system respectively within one fishing line, will be used in order to standardize the CPUE of Trot line accurately in this Division and collect information on various properties of the two gears.

Introduction

Division 58.4.4 is comprised of four SSRUs (Small Scale Research Units) as established by CCAMLR, as follows:
(Figure.1)

    SSRU A: Area between 51°S-54°S and 40°E-42°E;

    SSRU B: Area between 51°S-54°S and 42°E-46°E;

    SSRU C: Area between 51°S-54°S and 46°E-50°E; and

    SSRU D: Whole division excluding SSRUs A, B and C.

SSRU A consists of a single small seamount named Ob bank and ca. 1,400 square mile (mi^2) of seabed shallower than 2000 m (Table 1). SSRU B consists of a large flat top seamount named Lena bank and ca. 5,600 mi^2 of seabed shallower than 2000 m. SSRU C consists of a single pinnacle shaped unnamed seamount in its western part, a larger bumpy seamount in its eastern part and ca. 3,700 mi^2 of seabed shallower (deeper) than 2,000 m. According to the bathymetric chart around SSRU D, fishable area (ca. 4,200 mi^2) is located close to the south eastern side of the bumpy seamount in SSRU C. Those four major seamounts form a line in the Division, 50 to 60 miles apart from each other.

Longline fishery in this area started in 1997/98 season by South Africa and Ukraine. The catch limit for *Dissostichus* spp. for this season was 580 tonnes and remained at about the same level for the next season. For the 1999/00 and 2000/01 seasons, this catch limit was reduced to 370 tonnes, followed by a further reduction to 103 tonnes in 2001/02 season. Finally in 2002/03 season, the direct fishing of *Dissostichus* spp. was prohibited in this area, according to the Scientific Committee's recommendation based on the low level of the stock and the high levels of IUU fishing in this area (SC-CAMLR-XXI, paragraphs 4.106 and 4.108).

Since the catch prohibition in 2002/03 season, the first survey was undertaken by Shinsei Maru No.3 in 2007/08 season, covering the whole SSRUs in Division 58.4.4. Results of this first survey suggested the recovery of toothfish stocks to a certain level (Taki et al. 2009).   It is however considered that only a single year survey is not enough to identify whether or not the results reflect the actual status of the toofhfish stock in this Division, especially due to two reasons: the first survey did not cover whole habitats of *Dissostichus* spp., and CPUE estimates in Phase I of the first survey were not sufficient to evaluate and check the data quality with reducing uncertainties of the data (Taki et al. 2009). Therefore, additional data on toothfish in this area by multi year

survey is necessary for more accurate evaluation of the stock status.

Meanwhile, in Division 58.4.3b during 2008/09, the experiment to compare Shinsei maru Trotline system with Spanish double line system was conducted to convert the CPUEs obtained by the trotline system to those by the Spanish system. However, the ratio of CPUEs in Trot/Spanish line systems varied widely, mainly due to the lack of experience of Shinsei Maru No. 3 in operations using Spanish line systems (Appendix).

We submitted the research plan for toothfish in Division 58.4.4 a & b by Shinsei Maru No. 3 in 2009 / 10 for WG-SAM-09 (WG-SAM-09 / 11), primarily focusing on the analysis of CPUE by the grid-based survey. In this working group meeting, a 3-5 year consecutive surveys focusing on the concentrated tagging program were recommended (WG-SAM-09, paragraphs 2.3.8 & 2.3.25), and a R-code program to calculate the sufficient tagging rate was provided. The working group also recommended further experiments to collect information on various properties for the two gears, namely Trotline system and Spanish double line system (WG-SAM-09, paragraph 2.3.20). Taking into account these recommendations, we revised the research plan by recalculating the sufficient tagging rate and sample size, mainly based on the recommended R-code program by the working group for WG-FSA-09.

Research proposal

1) Objectives

The primary objective of this research is to clarify the current stock status of *Dissostichus* spp. in Division 58.4.4 a & b, and to collect various biological information such as distribution, migration and population structure of these species over their whole habitats in the Division. To this end, the grid-based survey including concentrated tagging activities will be conducted. Secondly, experimental comparison of the Spanish and the Trotline systems will be conducted to collect information on the fishing properties of the two systems and to improve the standardization of CPUE data collected by the Trotline system. Thirdly, to evaluate the habitat for *Dissostichus* spp. in the Division 58.4.4 a & b, bottom topography and oceanographic conditions will be examined over the grid points.

2) Methods

The research will be conducted using a commercial fishing vessel, Shinsei Maru No. 3 from April to June, 2010 (1.5 – 2 months). Bottom longline operations using the Trot

line and the Spanish line systems will be conducted at 117 grid points in the four SSRUs in Division 58.4.4.

2-1) Proposed sample size

The proposed sample size for *Dissostichus* spp. is calculated to be 120,000 kg in Division 58.4.4 a &b, taking into account 3 factors: (1) area coverage of the proposed survey, (2) need for completion of the proposed survey plan (117 research hauls) and (3) impacts on the stock.   Details are as follows:

(1) Area coverage of the proposed survey

The proposed survey covers all of the four SSRUs rather than concentrating the research/sampling efforts on a subset of the Division during 3-5 year consecutive surveys. One of the reasons is to distribute sampling impacts on the stock over the four SSRUs rather than putting the impacts on a smaller subset of the area. Another reason is to avoid predation and loss of tagged fish caused by predators such as sperm whales

(*Physeter macrocephalus*) and killer whales (*Orcinus orca*) . If these predators occur

around the vessel (Shinsei Maru No.3), the vessel has to move great distances to escape from them as we experienced in the 2007 / 08 survey. The small subset of the area is not large enough to avoid the predation and to implement proposed research successfully. Thus, to clarify the accurate stock status and collect biological information on toothfish, the proposed survey covers all of the four SSRUs, and a total of 117 research hauls are allocated on 10-minute latitude x 20-minute longitude grid points (spaced approximately 10 nautical miles apart; Fig. 2) (Table 2). Almost all of the research hauls are distributed shallower than 2000 m sea depths over each SSRU.

(2) Need for completion of the proposed survey plan (117 research hauls):
As shown in the report on Abundance and biological information on toothfish in Division 58.4.4 a & b by Shinsei maru No. 3 in 2007/08 season, the grid-based standardized CPUE (mean ± SD) in this Division for 2007/08 season is 0.1088 ±0.0786 kg / hook. Also, the mean CPUE ratio in weight of Trot line system to Spanish line system obtained in the comparison test in Division 58.4.3b during 2008/09 is 1.72 (details are described in Appendix). Therefore, expected sample size per line with mean + 1.5 SD is calculated as 1,134 kg ((0.1088 kg / hook + 1.5 x 0.0786 kg / hook) x 5,000 hooks)) for Trot line system and 708 kg ((0.1088 kg / hook + 1.5 x 0.0786 kg / hook) x 1,950 hooks + (0.1088 kg / hook + 1.5 x 0.0786 kg / hook) / 1.72 x 2,016 hooks) for the experimental gear,

which consists of three segments of Trot and Spanish systems respectively within one fishing line. As 88 hauls are sampled by Trot line system and 29 hauls are sampled by the experimental gear, the estimated sample size for completing the 117 research hauls with 93.32 % probability is 120,274 kg (1,134 kg per line x 88 lines + 708 kg per line x 29 lines).

(3) Impacts on the stock status:

An approximate biomass level of *Dissostichus* spp. in the Division 58.4.4 a & b was estimated using the R-code program on comparative CPUE analysis (Agnew et al. 2008). According to the program, the biomass in target area *x* (Division 58.4.4) can be expressed:

$$B_x = I_x A_x B_R / q_{Rx} I_R A_R$$

Where I is the CPUE index, A is the toothfish-habitable seabed area, q_{Rx} is the relative efficiency of the gear in the target area *x* (Division 58.4.4) relative to the reference area *R* (Division 48.4), and B_R is the reference area biomass estimate. According to the sub-area 48.4 information in Roberts and Agnew (2008), B_R, I_R and A_R are 2,000 ton, 0.2 kg / hook and 2,921 mi^2, respectively. I_x is 0.1088 kg / hook, which was estimated by the grid-based survey for 2007/08 season (WG-SAM-09/10). A_x is 14,909 mi^2 corresponding to area < 2,000 m within the Division 58.4.4 (Table 1). q_{Rx} is 1.72, which corresponds to mean CPUE ratio in weight of Trot line system to Spanish line system obtained in the comparison test in Division 58.4.3b during 2008/09 (Appendix table 1). As a result, the estimated exploitable biomass in the Division 58.4.4 is 3,229 ton. According to Agnew et al. (2008), long-term sustainable yield corresponded to an exploitation rate of 3.8 %. Thus, the sample size of 120,000 kg (3,229 x 0.038) is thought to be conservative exploitation value taking into account the impact on stock status.

2-2) Tagging program

Tagging is one of the main objectives in this survey to estimate the abundance of toothfish. The mark-and-recapture method will be applied to the tagging data. Then, the sufficient tagging rate was calculated using predictable CV of a Petersen estimated of population abundance (Hillary 2008). The CV is expressed as follows:

$$CV(N) = ((\varphi T(1-\xi) / (T+1)(\xi T+2))^{0.5}$$

In the above equation the abundance CV is given in terms of tags in the water in the following year, T, the exploitation rate , ξ, and the over-dispersion value, φ. Here, T is calculated as (proposed sample size: 120 ton) x tpt (number of tagging fish per ton) x exp $(-M - tagM)$ (natural and tag mortality). The natural and tag mortality is supposed to be 0.13 and 0.1, respectively, assuming the same levels as in sub-area 48.3 and 48.4 (Agnew et al. 2008). If φ. is 2 and tpt is 5 fish per ton, the CV becomes 0.31. Thus, 5 fish/ton is thought to be the sufficient tagging rate.

The toothfish in good health condition will be selected for tag deployment. Among the toothfish caught in a longline haul, vigorous fish without serious damage will be tagged and retained in a sea water tank onboard, and then released.   Before the tagged fish are released, absence of predators such as toohthed whales around the vessel will be checked.   If there are predators around the vessel, the vessel will move to avoid predation of tagged and released fish by the predators. The released point will be recorded in the log book.

2-3) Operation

A Trot line system will be employed for 88 research hauls (three quarter of total sets) in order to obtain data on the stock status and biological characteristics of *Dissostichus* spp. comparable to those collected by the Trot line system in the same Division in July-September 2008. The Trot line system has a total of 200 vertical droppers with 25 hooks per dropper. Thus 5,000 hooks in total will be used per line.

Twenty-nine hauls (a quarter of total sets) will be conducted for the experimental comparison of the Trot and Spanish systems. The experimental longline gear consists of three segments of Trot line system and Spanish line system respectively within one fishing line. The hook numbers in one segment of the experimental gear will be 650 hooks for the Trot line system and 672 hooks for the Spanish line system.   Thus 1,950 hooks and 2,016 hooks per line will be used in total for the Trot line and the Spanish line systems, respectively. These two fishing systems will be connected alternately in one line (i.e. Trot-Spanish-Trot-Spanish-Trot-Spanish or Spanish-Trot-Spanish-Trot-Spanish-Trot) to minimize the effect of other factors within a longline operation.

The starting point for each line setting will be fitted to the allocated grid point (Fig. 2). However, if the grid point is deeper than 2,000m, the starting point will be shifted to the location shallower than 2,000 m closest to the grid point. In addition, if the vicinity

of the grid point location has large crevasses, large protuberances or sharp slope > 45 °, the starting point will be shifted to the location close to the grid point to ensure safety of the fishing operation.

2-4) Collection of Data and Specimen
[Biological measurement (toothfish: species, length, weight, sexual maturity, stomach contents, otolith, etc.)

For all individuals of *Dissostichus* spp. caught, species and sex will be identified and body length will be measured and recorded along with the sampled depths and gear types. The weight, stomach content and otolith of 30 fish will also be recorded for each haul. The 30 sample fish will be carefully selected in terms of their size, so that this 30 sample would accurately represent the whole fish caught in a haul.   As the timing of this proposed survey is different from the previous survey, the biological data would be useful, for example, to determine the spawning season. The age and growth study with otoliths might explain the peculiar sex ratio found in the previous survey.

[Stock structure (toothfish)]

About 200 tissue samples have already been collected in the previous survey. As the sample size is large enough for the analysis of stock structure, the tissue sample will not be collected in this proposed survey.

[Environmental data]

The detailed bottom configuration will be recorded with the marine navigation software (MaxSea). As the information is essential for abundance estimation, the whole area, especially those areas unsurveyed in the first survey, will be covered. The compact temperature/depth recorder (maximum depth: 2,000m), which was not available in the previouys survey, will be attached to the gear..

[By-catch species]
Measurements will be the same as in the first survey.
Macrourus spp were the major by-catch species in the first survey. Up to 30 fish will be measured for each haul. The coordinates and depth of the center of the line will be recorded.
For the other by-catch species, up to 10 fish will be measured for each haul. The coordinates and depth of the center of the line will be recorded.
For benthos, species identification (Scleractinia, Alcyocea, Phylum Porifera, Class

Holothuroidea, Asteroidea, Ophiuroidea, Bryozoa), volume, coordinates, and depth will be recorded and photographic image will be taken as many as possible.

3) Effects on seabirds

Every effort will be taken during the survey to reduce any negative effect on seabirds and marine mammals in the survey area.

4) Reports and analysis

Various biological data as well as set-by-set catch and effort data (C4) will be provided to CCAMLR for evaluation of toothfish resources. The summary cruise report and the final report will also be presented to the CCAMLR SC 2010.

Reference

Agnew DJ, Edwards C, Hillary R, Michell R, Lopez Abellan LJ 2008 Revised assessment of toothfish stocks in Division 58.4.1, 58.4.2. WG-FSA-08/43

Delegation of Japan 2009 Research plan for toothfish in Divison 58.4.4 a & b by Shinsei Maru No. 3 in 2009/10. WG-SAM-09/11

Hillary RM 2008 Defining tag rates and TACs to obtain suitably precise abundance estimates for new and exploratory fisheries in the CCAMLR convention area. WG-SAM-08/6

Roberts J and Agnew DJ 2008 Proposal for an extension to the mark recapture experiment to estimate toothfish population size in Subarea 48.4. WG-FSA-08/46

SC-CAMLR-XXI, 2002. Report of the twenty-first meeting of the Scientific Committee.

Taki K, Ichii T & Kiyota M. 2009. Abundance and biological information on toothfish in Division 58.4.4 a & b by Shinsei maru No. 3 in 2007/08 season. WG-SAM/09/10

Table 1. Area of seabed less than 2,000m by main depth range in each SSRU.

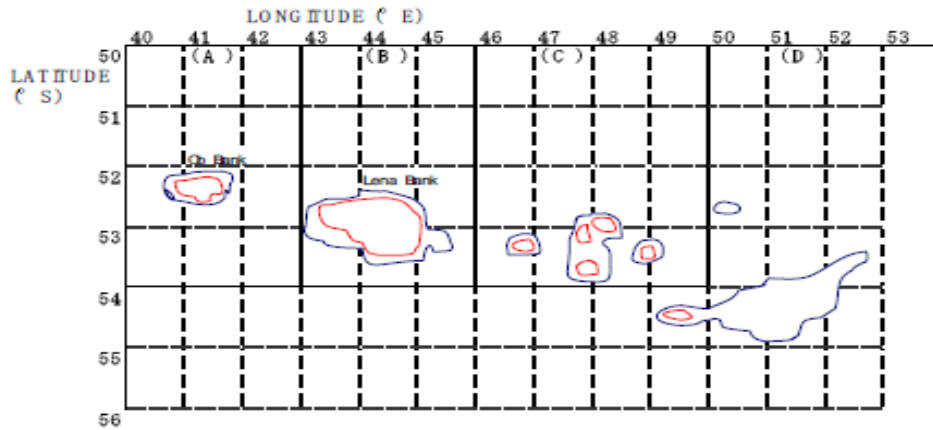| SSRU	0-500	500-1000	1000-1500	1500-2000	Total
A	427.9	218.4	246.2	535.6	1428.0
B	880.4	1639.0	904.9	2166.5	5590.9
C	-	361.3	1095.7	2275.1	3732.1
D	-	-	2060.7	2099.0	4159.7

(mile^2)

Fig. 1. Map of the Division 58.4.4. Bathymetry: 1,000m contour line in red and 2,000m in blue.
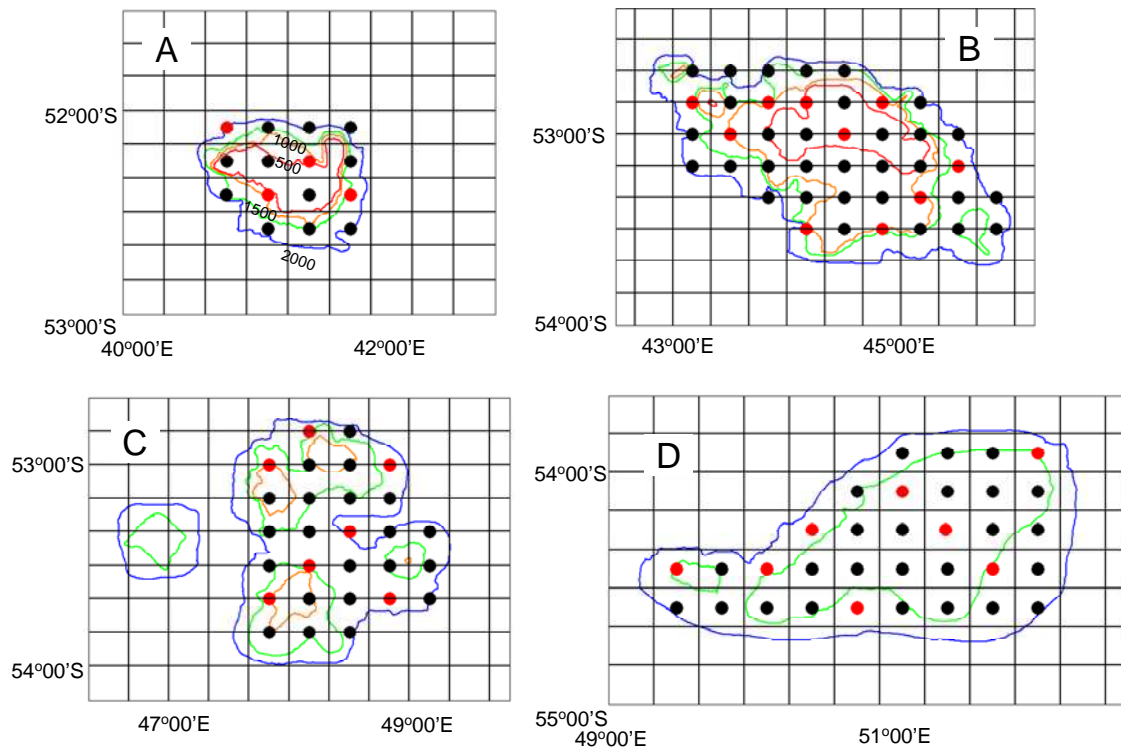

Fig. 2. Allocated locations for longline survey 2009/10. The experimental gear, which consists of three segments of Trot line system and Spanish line system respectively within one fishing line, will be employed for the 29 red points.

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Appendix
Preliminary comparison of CPUE for toothfish between Trot line and Spanish line systems

      Preliminary trials were undertaken to compare CPUE (Catch per unit of effort) for *Dissostichus* spp. (TOT) between Trot line and Spanish line systems by a Japanese commercial bottom longline vessel, the Shinsei Maru No.3, for the purpose of standardization of the Trot line CPUE in terms of Spanish line CPUE. The trials were conducted in Division 58.4.3b in 2008/09.

      The longline gear used in the survey consisted of 6 segments, of which three were Trot lines and the other three were Spanish lines. Trot line segment was 1,170 m in length with 650 hooks. Spanish line segment was 1,200 m in length with 672 hooks. Within one longline, Trot line segments and Spanish line segments were connected each other. For example, one line has Trot line segment (T), Spanish line segment (S), T, S, T and S (TSTSTS longline) or vice versa (STSTST longline). The TSTSTS and STSTST longlines were used one after the other in order to randomize bottom depth and soak time between these two different types of segments. Sardine and squid were used as bait. 23 trials were conducted in total. Considering that some hooks were lost from every Spanish line set, whereas very few hooks were lost in Trot line, the effective number of hooks, which was calculated by subtracting the number of hooks lost from the number of hooks set, were used for calculating CPUE.

      The ratios of Trot line CPUE to Spanish line CPUE ranged widely between 0.48 and 5.69 with mean of 1.68 in the case of number of fish per 1,000 hooks and between 0.51 and 8.98 with mean of 1.72 in the case of weight (kg) of fish per 1,000 hooks (Table 1). However, these figures should be treated with caution since the Shinsei Maru No.3 was inexperienced with Spanish line system. According to CCAMLR Scientific Observed Cruise Report for this cruise, a total of 2,597 hooks and 3,225 m of Spanish bottom-line were lost in the operation, whereas the Trot segments loss were only 200 hooks during 23 comparison trials. Furthermore, the report documented that line tangles were frequent in the Spanish segments while line tangles were rare for the Trotline segments. Thus, there is a high possibility that CPUE of Spanish segments is underestimated and that the above-mentioned ratios of Trot line CPUE to Spanish line CPUE is overestimated. For obtaining more accurate standardization of Trot line CPUE in terms of Spanish line CPUE, further comparison trials are needed.

Table 1. Comparisons of CPUE between trotline and Spanish longline

C2 no	CPUE (no / 1000hooks)			CPUE (kg/ 1000hooks)		
	TR	SP	TR/SP	TR	SP	TR/SP
12	12.8	11.1	1.72	209.2	211.7	1.47
13	18.5	13.2	1.43	321.8	278.5	1.18
14	15.4	7.6	2.07	285.9	140.4	2.09
15	9.2	6.8	1.43	123.0	61.1	2.13
16	9.2	4.7	2.07	168.7	65.0	2.73
17	13.3	13.3	1.03	263.1	219.3	1.24
18	9.2	5.6	1.69	148.5	102.5	1.49
19	12.3	3.4	4.14	253.3	62.9	4.60
20	22.1	13.6	1.71	369.2	216.1	1.80
21	9.2	7.1	1.55	200.3	100.5	2.38
22	13.8	3.5	3.99	320.8	73.7	4.35
23	17.9	7.7	2.78	347.4	153.6	2.70
24	14.9	8.9	2.00	251.0	197.5	1.52
25	15.9	5.0	3.20	350.3	74.4	4.71
26	13.8	9.9	1.40	327.4	193.5	1.69
27	8.7	5.0	1.76	190.0	113.1	1.68
39	1.5	2.5	0.62	73.3	81.3	0.90
40	4.1	2.5	1.65	142.6	96.7	1.47
41	3.1	6.4	0.48	107.7	211.3	0.51
42	4.6	4.0	1.16	134.9	194.4	0.69
43	11.3	2.0	5.69	387.2	70.4	5.50
44	3.1	0.5	6.20	110.3	12.4	8.89
45	2.6	3.0	0.86	80.0	74.4	1.08
mean	10.7	6.4	1.68	224.6	130.6	1.72

TR: trotline, SP: Spanish line, TR/SP: ratio of TR to SP