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**SC11 – SQ05**

**Protocol for biometric and biological sampling of the *D gigas* to be used in  
SPRFMO**

*Republic of Peru*



**Protocol for biometric and biological sampling of the jumbo flying squid *Dosidicus gigas* to be used in the South Pacific Regional Fisheries Management Organization**

by

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This report contains information on the jumbo flying squid stock and fishery in Peruvian jurisdictional waters that, we reiterate, the delegation of Peru, in use of its discretionary powers, voluntarily provides for the purpose of information and support to the scientific research work within the Scientific Committee of the SPRFMO. In doing so, while referring to Article 5 of the Convention on the Conservation and Management of High Seas Fishery Resources in the South Pacific Ocean and reiterating that Peru has not given the express consent contemplated in Article 20 (4) (a) (iii) of the Convention, Peru reaffirms that the decisions and conservation and management measures adopted by the SPRFMO Commission are not applicable within Peruvian jurisdictional waters.

## **SUMMARY**

This document describes the methods to be used in the SPRFMO to obtain biometric and biological data on the jumbo flying squid *Dosidicus gigas* and aims to establish guidelines for the collection and recording of this information. It remarks the quality of the information recorded on board that is of the utmost importance for the SPRFMO Scientific Committee, therefore, the recording of this information must comply with the requirements described, such as the date and time of the sets or fishing operations in which the biometric and biological information of the target species was collected.

# **PROTOCOL FOR BIOMETRIC AND BIOLOGICAL SAMPLING OF JUMBO FLYING SQUID *Dosidicus gigas* TO BE USED IN THE SOUTH PACIFIC REGIONAL FISHERIES MANAGEMENT ORGANIZATION**

## **1. INTRODUCTION**

The South Pacific Regional Fisheries Management Organization (SPRFMO), in its last technical and compliance meeting in 2023, approved the IMARPE Observer Program for On-Board and Port Monitoring of Captures and Fishing Activities of Peruvian artisanal vessels authorized to fish jumbo squid *Dosidicus gigas* on the High Seas, in the Area of Application of the SPRFMO Convention in accordance with paragraph 4 of CMM 16-2023. This Program was adhered to CMM-16-2023 (Conservation and Management Measure Establishing the SPRFMO Observer Programme, Annex 4).

The biological information to be collected within this Program will be very useful for the *D. gigas* fishery management in the OROP-PS, especially for the population evaluation of the target species (*D. gigas*) and bycatch. The collection of this biological information is intended to provide a better understanding of the population structure of *D. gigas* in its distribution area in the South Pacific. In this sense, this document, which can be implemented by the other SPRFMO members that fish for jumbo squid in the SPRFMO area, aims to establish guidelines for the collection and recording of this information.

## **2. CMMS RELATED**

CMM 02-2022 Conservation and Management Measure on Standards for the Collection, Reporting, Verification, and Exchange of Data.

CMM 16-2023 Conservation and Management Measure Establishing the SPRFMO Observer Programme.

CMM 18-2023 Conservation and Management Measure on the Management of the Jumbo Flying Squid Fishery.

## **3. GENERAL OPERATING PROCEDURES**

Observers must bring the biometric and biological forms to complete during their stay on board. Once the permanence is over, the formats must be delivered to the respective national fishing authority, which will deliver this information to the SPRFMO Secretariat as stipulated in CMM-02-2022.

The quality of the information recorded on board is of the utmost importance for the work of the SPRFMO Scientific Committee, therefore, the recording of this information must comply with the requirements described below, such as the date and time of the sets or fishing operations in which the biometric and biological information of the target species was collected.

#### 4. UNITS AND FORMATS

Observers should ensure that the information recorded is in the specified unit and format indicated.

Field	Format	Description
Date	UTC format; YYYY-MON-DD	Y=year; MON=month;, D=day (e.g. 2000-12-02)
Time	hh:mm	h=hour, m= minute. All times are recorded in 24-hour format (e.g. 19:10, NOT 7:10 pm) and recorded in UTC, not local times
Latitude		With a resolution of 1/10 <sup>th</sup> degree, decimal format. Degrees; represent as positive (unsigned) or negative numbers from 0 to 89.99 (e.g. 82.3, means 82.3°N; -82.3, means 82.3° S)
Longitude		With a resolution of 1/10 <sup>th</sup> degree, decimal format. Degrees; represent as positive (unsigned) or negative numbers from 0 to 179.99 (e.g. 100.3, means 100.3°E; -100.3, means 100.3° W)

#### 5. STANDARD MEASURES

Each jumbo squid specimen is measured to the millimeter using a tape measure. The dimension to be measured is the dorsal mantle length (ML) in mm with a measuring tape, from the proximal edge of the mantle to the distal edge following the gladius in a straight line (Figure 1).

#### 6. WEIGHTS

Total weight and weight of some organs (reproductive and digestive) are recorded in kilograms or grams in the respective sampling formats. Where possible, electronic movement compensation scales should be used for all weight measurements. However, other scales can be used, as dynamometers (indicate the weighing equipment used).

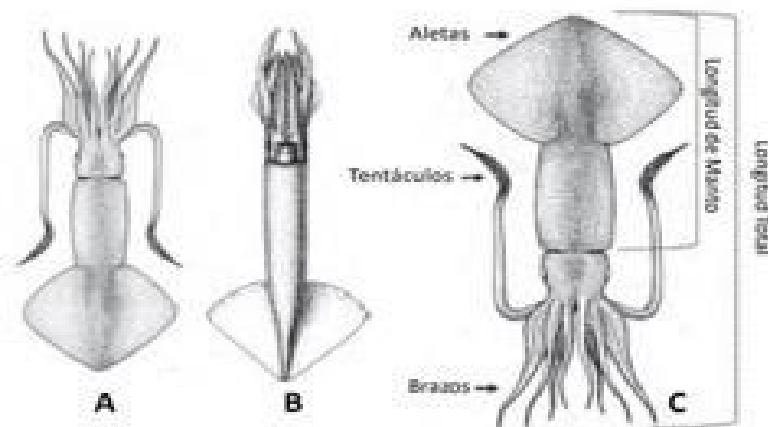


Figure 1.- Jumbo flying squid *Dosidicus gigas* in (A) dorsal view (taken from ROPER et al. 1984, in MARKAIDA 2001); (B) ventral view (taken from WORMUTH 1976, in MARKAIDA 2001); and, (C) dorsal view (modified from ROPER et al. 1984)

## 7. SEX AND STAGES OF MATURITY

To determine the sex, the specimen is opened along the ventral midline using scissors, and the sex is determined by identifying the presence of specific reproductive organs (males: spermatophoric complex, testis; females: nidamental gland, ovaries, oviducts). The sex is recorded according to the following code: 1=male; 2=female; 3=indeterminate (specimens in which, due to their small size, it is impossible to determine the sex).

The stage of gonadal maturity is determined according to the scale developed for *Dosidicus gigas* (Perea et al., 2018), which is detailed in table 2.

Table 2. Gonadal maturity stages for females and males of *Dosidicus gigas* according to Perea et al. (2018).

Gonadal maturity stage	Females	Males
I: Immature	The ovary is shaped like a pyriform sac, which is elongated, not granular and clear in appearance; being translucent in the initial phase of this stage. The wall of the ovary is very thin.	Small, flaccid, elongated, white-colored and translucent testicle.
II: Maturing	The vary looks grainy, opaque, creamy or slightly yellowish.	A larger, somewhat consistent, whitish to creamy, but not translucent testicle. Whitish spermatophores sack.
III: Mature	Larger and turgid, more piriform in appearance, yellowish-cream to amber in color, due to the presence of a large number of mature oocytes. The wall of the ovary is thin. Oviduct of great size for being full of advanced mature oocytes. The nidamental gland is developed and turgid. It presents immature, maturing, and mature oocytes.	A testicle of a more developed size with respect to the previous stages, turgid, white-colored and milky in appearance. Spermatophores sac is full of spermatophores; free spermatophores are observed in the abdominal cavity.
IV: Spawning or expelling	Less turgid, granular, with lots of cream-colored and amber oocytes, with a predominance of the latter, giving an orange hue to the ovary. The wall of the ovary is very thin. Flaccid nidamental gland. The oviducts may be compact and large because they are full of advanced mature oocytes or somewhat flaccid due to their evacuation. In addition, in	

	<p>the external part of the oviductal gland some advanced mature oocytes are observed, a sign of spawning in the squid. Immature, maturing, and mature oocytes are observed. In the oviducts, these are full of oocytes at maximum maturity and ovulated. In the ovary, at microscopic level, the presence of post-ovulatory follicles is observed.</p>	
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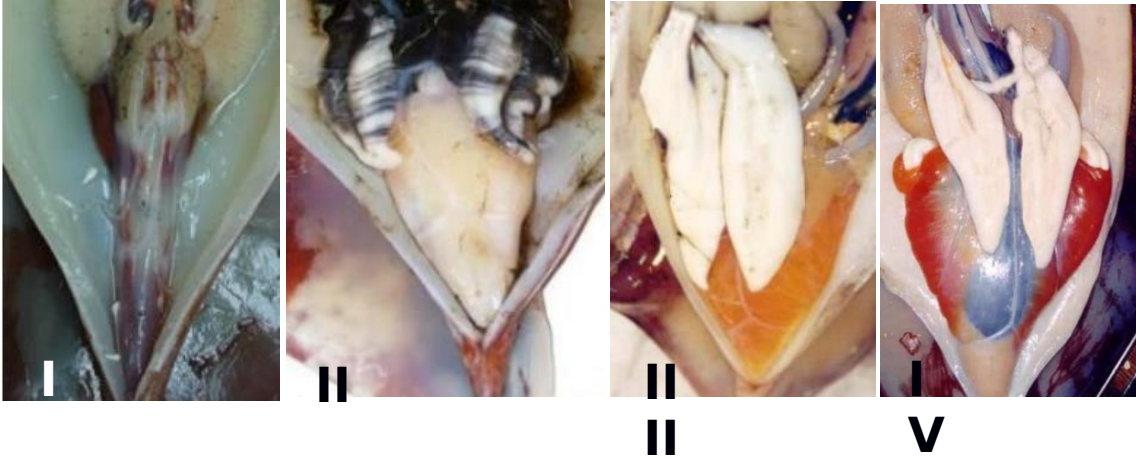


Figure 2. Gonadal maturity scale for females of jumbo flying squid *D. gigas* (Perea et al. 2018)



Figure 3. Gonadal maturity scale for males of jumbo flying squid *D. gigas* (Perea et al. 2018)

**8. MATERIALS USED**

The materials to use in these processes should include:

- Acrylic board,
- Measuring tape with 1 mm accuracy,

- Electronic scale with 0.01 g accuracy,
- Dynamometer scale with 0.25 kg accuracy
- Dissecting equipment: scissors, watchmaker's tweezers, straight tweezers, stainless steel knife,
- Vernier caliper (for laboratory sampling, to measure the length of the testis, etc),
- Plastic trays,
- Stationery: pens, pencil, eraser, correction fluid, notepad,
- Biometric sampling form,
- Biological sampling form.

## **9. SAMPLING TYPE**

The sampling type being used is the one considered for cephalopods, and is carried out as follows:

To obtain biometric data, it will be by taking a simple random sample of the maximum of 120 specimens per fishing day (distributed among the different fishing sets or fishing operations of the day); and,

To obtain biological data, 10 female and 10 male specimens from the above sample will be set aside per day by means of a stratified random sampling, so that the specimens cover the entire range of sizes in the large daily sample.

## **10. BIOMETRIC SAMPLING**

The size frequency of the specimens in the daily sample must be recorded with vertical bars forming groups of 5 (with the 5th bar crossing over previous four) in the biometric sampling form, together with the date, latitude, longitude, catch weight (kg), sample weight (kg), name of the vessel and names of those who carried out the biometric sampling.

## **11. BIOLOGICAL SAMPLING**

The biological sampling will be different and will collect different sets of data depending on whether is conducted on board an artisanal vessel or in land, in a coastal laboratory, as follows:

### **11.1 Biological sampling on board.**

In this case, the onboard observer will only be recording the mantle length (mm), total weight (g), gutted weight (g), sex, gonadal maturity stage, and evidence of copulation (in the case of females).

### **11.2 Biological sampling in coastal laboratories.**

In this case the port observers and/or the coastal laboratory personnel will do a more complete processing of the samples of whole squid specimens that have been purchased for sampling and research purposes from selected vessels participating in, or cooperating with the observers' programme. And for this laboratory sampling:

- The mantle length (ML) of each specimen is measured to the nearest mm with measuring,
- The total weight of each specimen weighed to the nearest g with an electronic scale, • The specimens placed in the ventral position are dissected and the sex and gonadal stage of maturity is determined using the scale proposed by PEREA et al. (2018),



- In the case of female specimens, the length of the nidamental gland (mm) is measured and the reproductive structures (i.e., nidamental glands, oviducts, oviductal gland and ovary) are removed and set aside to be weighted. In the case of male specimens, the spermatophoric complex (sac and organ) and the testis are removed set aside to be weighted after measuring the length of the testis (mm). The reproductive structures of each male and female specimen are weighed with a precision scale to the nearest 0.01 g,
- The digestive gland is removed and weighed,
- The degree of fullness of the stomach is determined according to a 4-stage empirical scale (0 = empty, 1 = half full, 2 = full and 3 = completely full). The stomach is removed for dissection and qualitative analysis of items in the food content, which are classified into fish (F), crustaceans (C), squid (Sq), others (O) and red liquid (LR).
- In females, evidence of copulation is determined by observing and recording the presence or absence of spermatophores in the oral veil,
- The statoliths, which are found in the nuchal region (under the siphon), are collected by using a scalpel blade to make a transverse cut, and with the help of a watchmaker's tweezers, it is extracted, cleaned and the pair of statoliths is placed in statolith boxes or cartons (the label will be the serial number or the length and sex).
- The mantle is weighed