



# Improving knowledge of skate and ray bycatch in NWW

NWWAC/NSAC Workshop on Skates & Rays Management  
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**Project RAPANSEL - Julio Valeiras, Instituto Español de Oceanografía (IEO)**

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## Project RAPANSEL 2021-2023

### WP Skates and rays

**Aim:** improve the identification of skates and rays in bottom trawling catches

#### Tasks:

1. IDENTIFICATION GUIDE OF SKATES AND RAYS IN EUROPEAN WESTERN WATERS
2. CHARACTERISATION OF COMMON SKATE SPECIES *Dipturus* spp THROUGH MOLECULAR AND MORPHOLOGICAL IDENTIFICATION

#### Rationale:

- ✓ The species present a high morphological variability during their growth, which difficult a correct identification in catches
- ✓ There is scientific evidence of misidentifications and mixtures of species, which prevents proper fisheries management.

# Improving knowledge of skate and ray bycatch by bottom trawlers in NWW



## 1. IDENTIFICATION GUIDE OF SKATES AND RAYS IN EUROPEAN WESTERN WATERS

**Especies de Rayas en los caladeros de pesca del Atlántico**

De hábitat bentónico, las especies de rayas presentan ciertas dificultades en la identificación por la variabilidad de su pigmentación y su espinulación. Éstas son las especies más frecuentes que se encuentran en el Cantábrico-Noroeste y Gran Sol.

Orden: Rajiformes

- Raya nortega**  
RUS *Dipturus batis*  
Raya bicuda / Raya-orega
- Raya pizuda**  
RJO *Dipturus sarginichus*  
Ferreiro / Raya-bicuda / Moko-arela
- Raya moaisko**  
RUJ *Raja undulata*  
Raya forneta, riscada / Raya-curva / Mosaiko arrala
- Raya colorada**  
RUE *Raja microocellata*  
Raya cortada / Raya-zentreira / Arrala beixuiki
- Raya de clavos**  
RUC *Raja clavata*  
Raya cravada, raspadeira / Raya-teniga / Arrala gastaka
- Raya de espejos**  
JAI *Raja miraletus*  
Raya de espellos / Raya-quatro-olhos
- Raya pintada**  
RJM *Raja morogetus*  
Raya de pintas / Raya-manchada / Arrala pikart
- Raya Boca de Rosa**  
RUH *Raja brachyura*  
Raya boca rosa / Raya-puntuada / Arrala xanabatur
- Raya foles volo**  
RUJ *Leucoraja circularis*  
Raya de círculos / Raya-de-São-Pedro / Arrala biribi
- Neoraja* sp.

ESP  
 FAO Nombre científico  
 GAL / PT / EUS

Leyenda  
 ESP  
 FAO Nombre científico  
 GAL / PT / EUS

ID guide  
One page,  
waterproof

**DIVERSIMAR** Red de Observación de la biodiversidad marina y pesquera de Galicia y el Cantábrico

**Biodiversidad marina de Galicia y el Cantábrico**

**Rayas en los caladeros pesqueros**

- Raya nortega**  
RUS *Dipturus batis*  
Raya bicuda / Raya-orega
- Raya pizuda**  
RJO *Dipturus sarginichus*  
Ferreiro / Raya-bicuda / Moko-arela
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ESP  
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Leyenda  
 ESP  
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Poster

# Improving knowledge of skate and ray bycatch by bottom trawlers in NWW

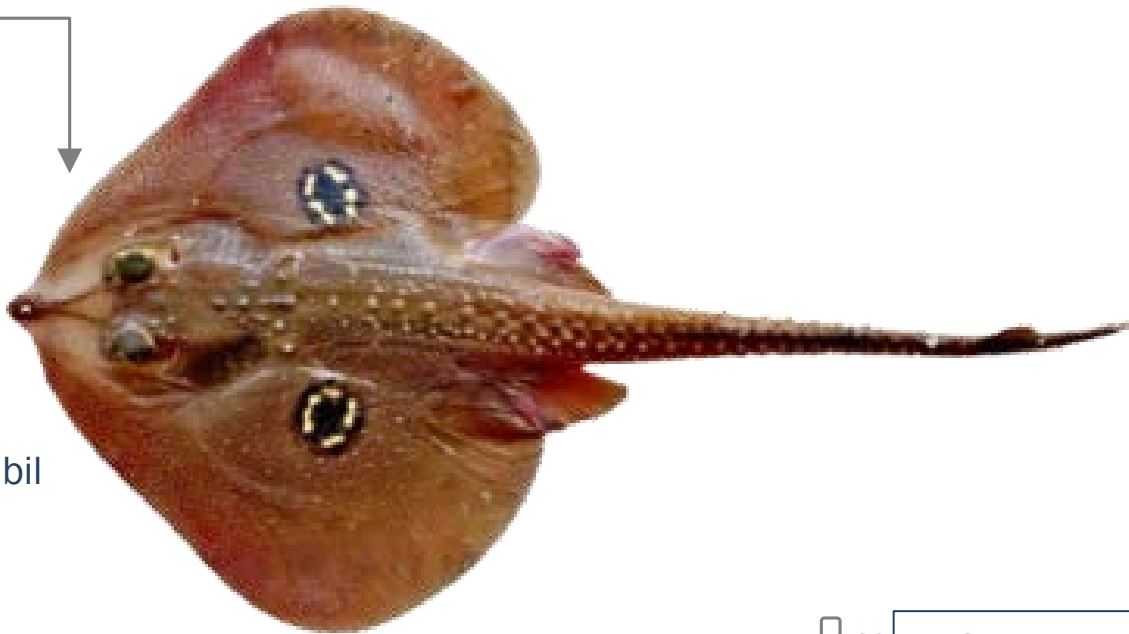


## 1. IDENTIFICATION GUIDE OF SKATES AND RAYS IN EUROPEAN WESTERN WATERS

Raya santiaguesa

RJN *Leucoraja naevus*

Raia santiaguesa / Raia-de-dois-olhos / Arraia zerra




Arraia biribil

**ID guide**


One page,  
waterproof

**ID guide**

Several pages,  
Species




MINISTERIO  
DE CIENCIA  
E INNOVACIÓN



CSIC  
CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS

**ANEXO – ESPECIES DE RAYAS EN GRAN SOL**

<b>Raya noriega - RUB</b>	
Nombre científico	<i>Dipturus batis</i>
ENG / FRA	Blue Skate / Pocheteau gris
IUCN Red List Status	Críticamente amenazada (CR)
Características	Disco romboidal, con un rostro muy largo y puntiagudo, fila central con 12 a 18 espinas en la cola. Color del dorso grisáceo, verdoso o marrón, con un patrón variable de puntos más claros. En la parte ventral de color gris oscuro o azulado, con numerosos poros negros. Dos espinas (rara vez 1) entre las dos aletas dorsales. Talla: 250 cm LT

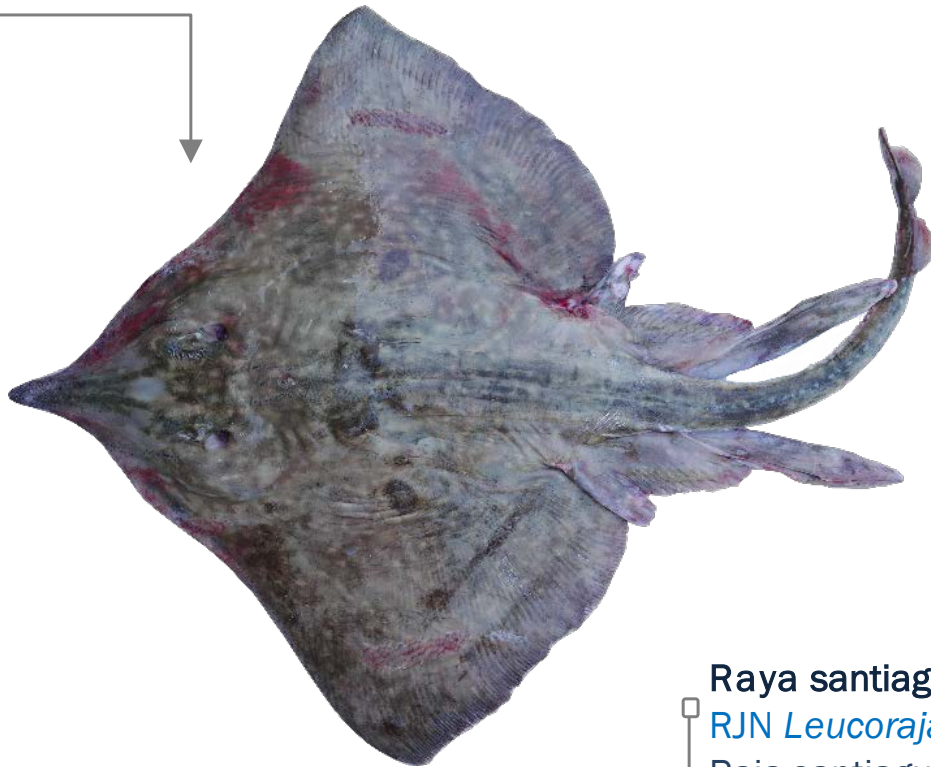


## 1. IDENTIFICATION GUIDE OF SKATES AND RAYS IN EUROPEAN WESTERN WATERS

Raja noriega

RJB *Dipturus batis*

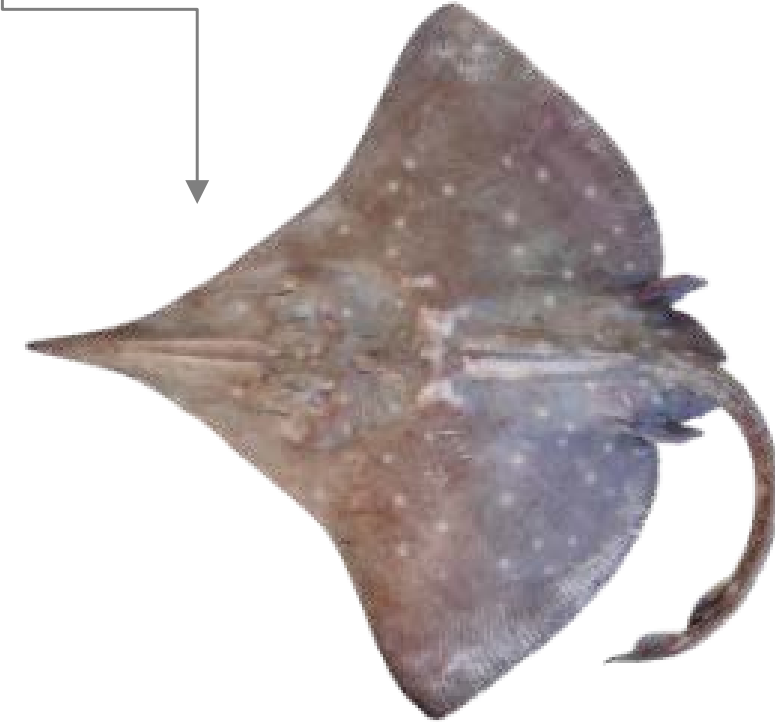
Raia bicuda / Raia-oirega



Raya picuda

RJO *Dipturus oxyrinchus*

Ferreiro / Raia-bicuda / Moko-arraia



Raya santiaguesa

RJN *Leucoraja naevus*

Raia santiaguesa / Raia-de-dois-olhos / Arraia zerra



## 2. CHARACTERISATION OF COMMON SKATE SPECIES DIPTURUS SPP THROUGH MOLECULAR AND MORPHOLOGICAL IDENTIFICATION

### Rationale

Genera *Dipturus* has 4 species in the area: **common blue skate** *Dipturus batis flossada* and **flapper skate** *Dipturus batis intermedius*, **Norwegian skate** *D. nidarosiensis* and **longnosed skate** *D. oxyrinchus*

They may be misidentified, affecting the accuracy of survey and landings data. Except longnosed skate, all are on the list of prohibited species in EU waters and *D. batis* are considered to be 'Critically Endangered' globally by the IUCN.

## 2. CHARACTERISATION OF COMMON SKATE SPECIES DIPTURUS SPP THROUGH MOLECULAR AND MORPHOLOGICAL IDENTIFICATION

### Objective

Study the correct identification using morphometric and molecular analyses

### Material and methods

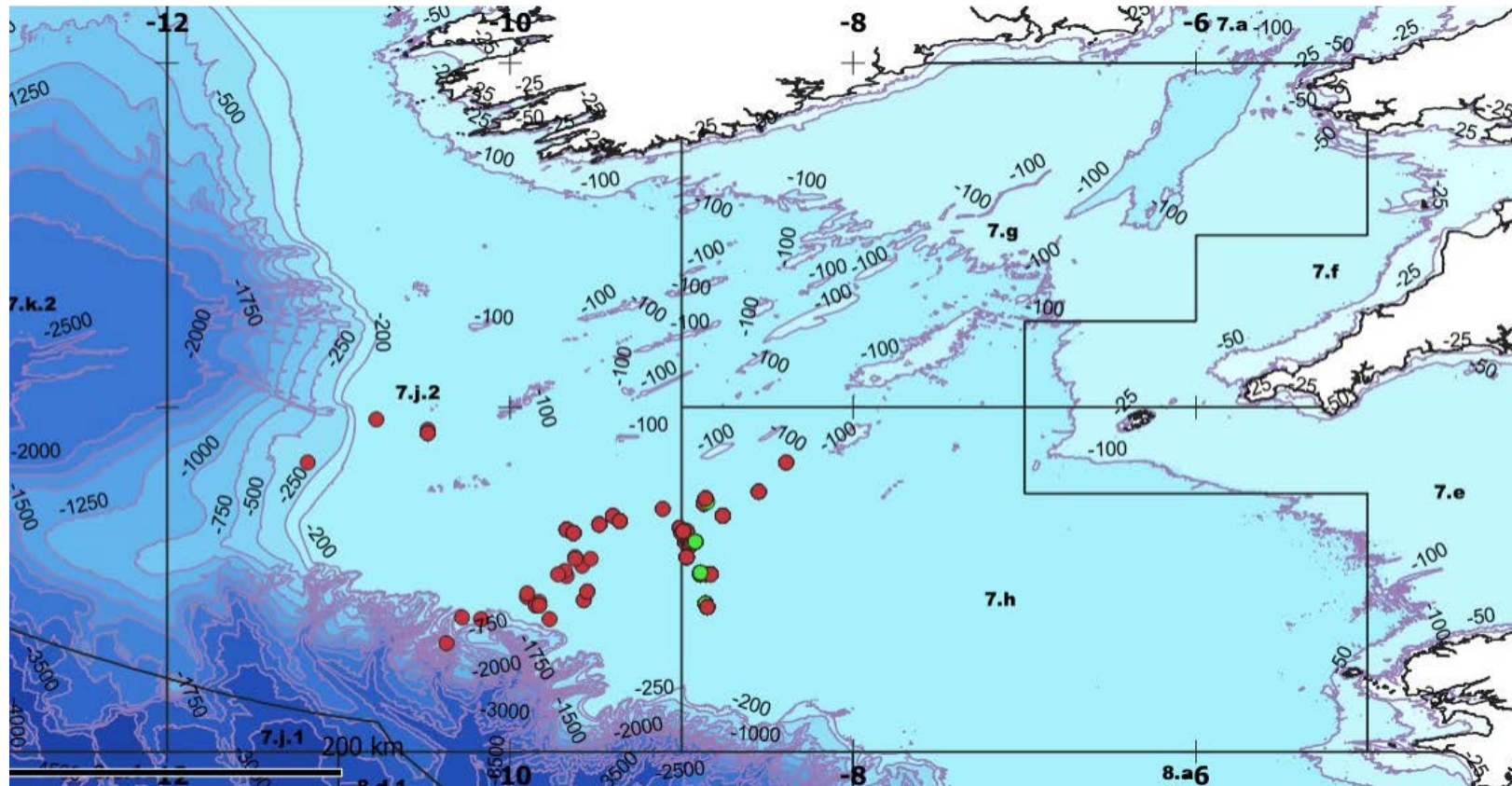
Sampling of skates was carried out on board bottom trawlers at ICES 7 area.

Morphological and molecular identification/analysis was performed in 418 samples of *Dipturus batis* spp, *Dipturus oxyrinchus*, *Dipturus nidarosiensis* and others (Thornback ray *Raja clavata*, Cuckoo ray *Leucoraja naevus* and Shagreen ray *Leucoraja fullonica*).

## 2. CHARACTERISATION OF COMMON SKATE SPECIES DIPTURUS SPP THROUGH MOLECULAR AND MORPHOLOGICAL IDENTIFICATION

### Geographical area

Sampling of skates and rays onboard bottom trawlers at ICES 7 area.

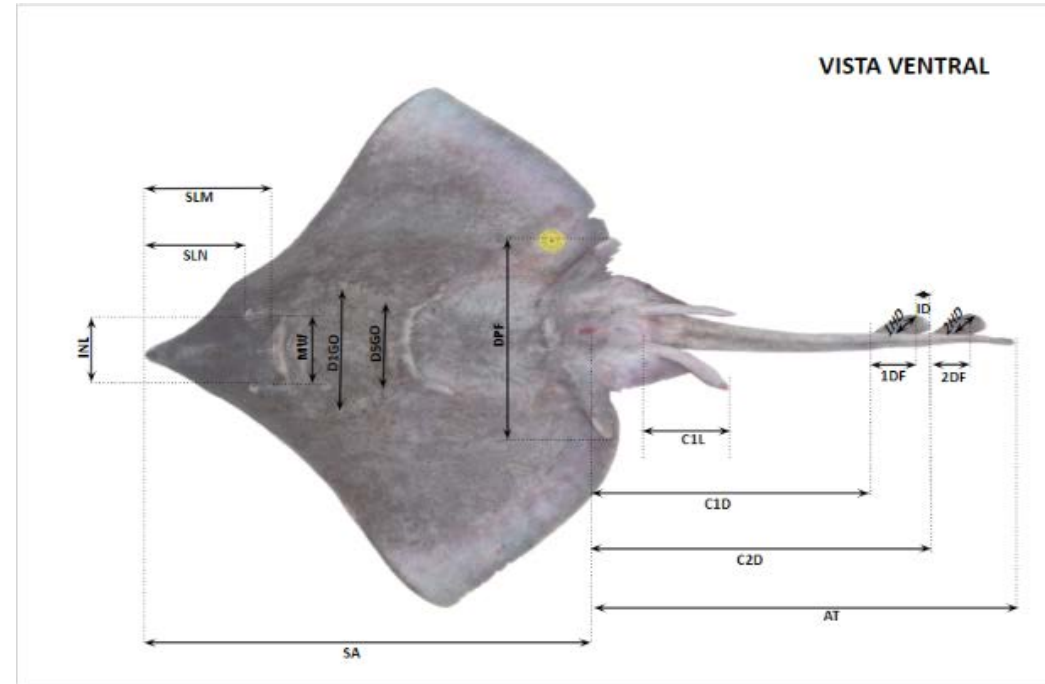
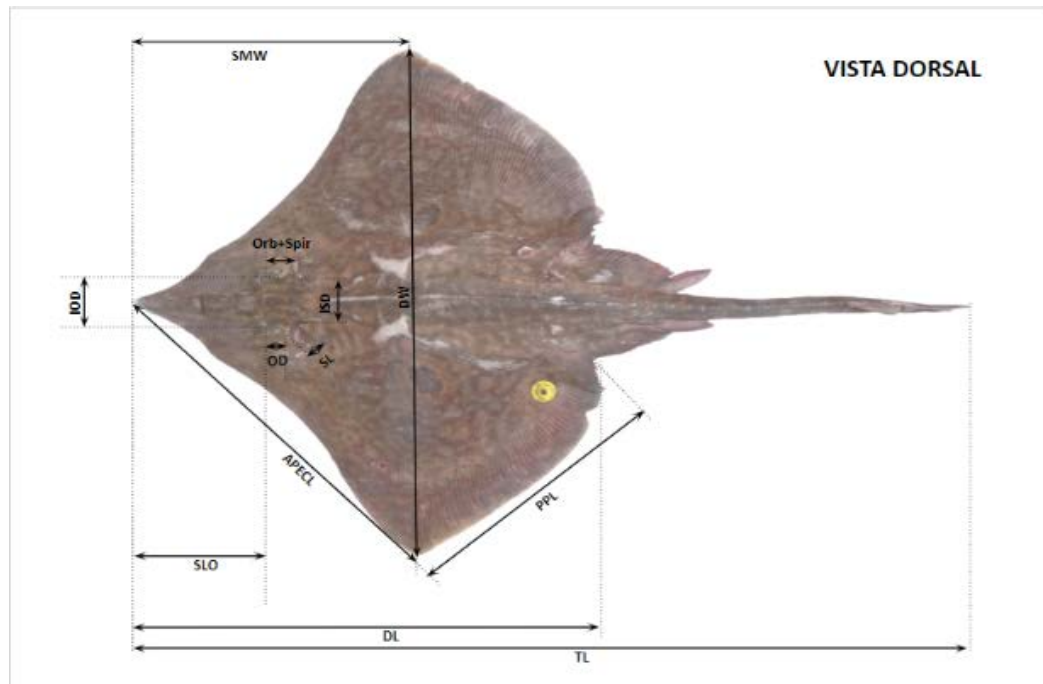




## 2. CHARACTERISATION OF COMMON SKATE SPECIES DIPTURUS SPP THROUGH MOLECULAR AND MORPHOLOGICAL IDENTIFICATION

### Morphometric analysis

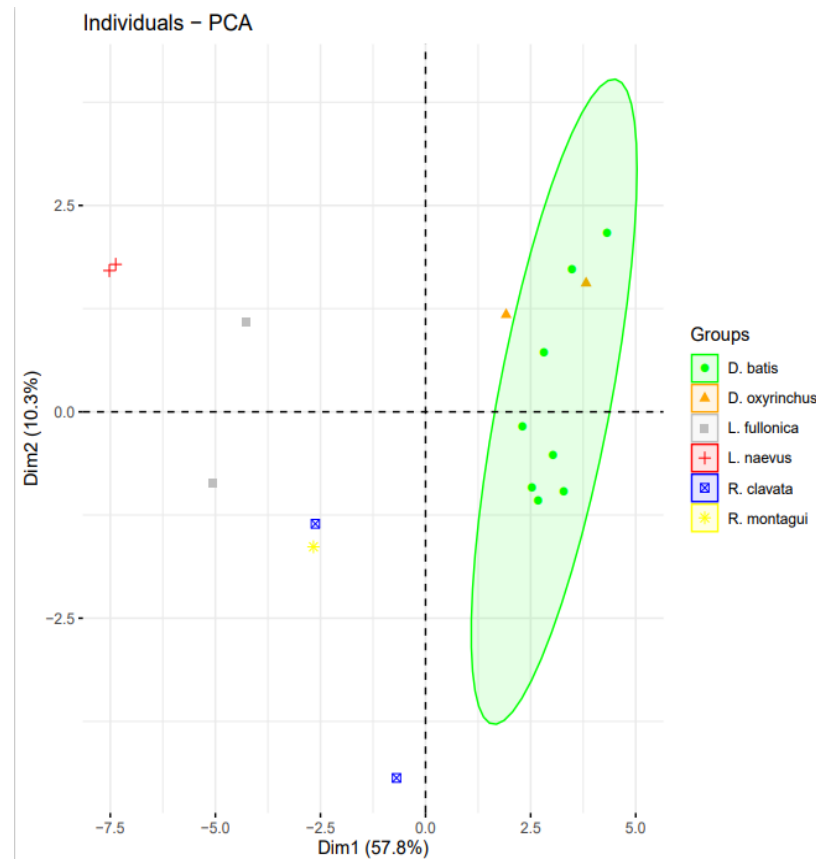
For the analysis, 29 morphometric characters of 17 adult specimens were used, to avoid errors due to the allometric growth of the skates.



## 2. CHARACTERISATION OF COMMON SKATE SPECIES DIPTURUS SPP THROUGH MOLECULAR AND MORPHOLOGICAL IDENTIFICATION

### Morphometric analysis. Results

Principal component analysis indicates that morphometry might not be a useful identification tool to differentiate species.

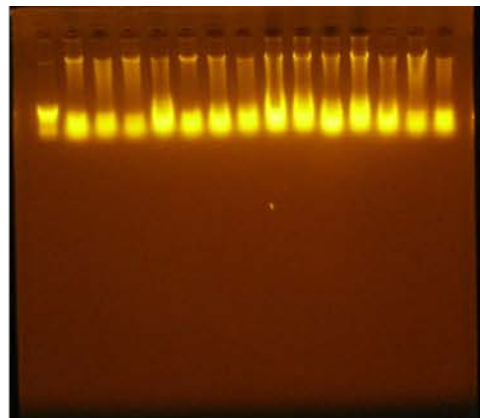


## 2. CHARACTERISATION OF COMMON SKATE SPECIES DIPTURUS SPP THROUGH MOLECULAR AND MORPHOLOGICAL IDENTIFICATION

### Molecular analysis

For genetic analysis, a piece of muscle tissue was dissected from fresh specimens.

Primer	Secuencia	Tamaño (bp)
FishF2	5' TCG ACT AAT AT AAA CAT ATC GGC AC 3'	600
FishR2	5' ACT TCA GGG TGA CCG AAG AAT CAG AA 3'	600
16S-RB	5'CCGGTCTGAACTCAGATCAC GT3'	500
16S-RA	5-CGC CTG TTT ATC AAA AAC AT-3	500



**DNA Extraction**  
Kit de NZY Food gDNA  
Isolation Kit



**Amplification and Sequencing**  
**COI and 16S**  
FISH F2/FISH R2  
16S-RA/16S-RB



**Identification**  
Basic Local Alignment Search Tool  
of GenBank

## 2. CHARACTERISATION OF COMMON SKATE SPECIES DIPTURUS SPP THROUGH MOLECULAR AND MORPHOLOGICAL IDENTIFICATION

### Molecular analysis. RESULTS

Morphological identification errors were detected and confirmed molecularly

Sample code	Morphological identification	Identity	Accession number	BLAST specie
4	<i>D. flossada</i>	100%	<a href="#">MW074306.1</a>	<i>D. flossada</i>
8	<i>D. flossada</i>	99,65%	<a href="#">NC_046684.1</a>	<i>D. flossada</i>
233	<i>D. oxyrinchus</i>	100%	<a href="#">MW074308.1</a>	<i>D. intermedius</i>
1	<i>D. oxyrinchus</i>	100%	<a href="#">EF647874.1</a>	<i>D. oxyrinchus</i>
161	<i>D. nidarosiensis</i>	100%	<a href="#">MW074306.1</a>	<i>D. nidarosiensis</i>
198	<i>D. flossada</i>	100%	<a href="#">MT576561.1</a>	<i>D. intermedius</i>

# Improving knowledge of skate and ray bycatch by bottom trawlers in NWW



## 2. CHARACTERISATION OF COMMON SKATE SPECIES DIPTURUS SPP THROUGH MOLECULAR AND MORPHOLOGICAL IDENTIFICATION

### Molecular analysis. RESULTS

Morphological identification errors by scientific observers were confirmed molecularly:

D. intermedius gets confused with D. oxyrhynchus (16)

D. intermedius gets confused with D. flossada (2)

Gene	Morphological Identification	Molecular Identification	% GenBank Identity				Morphological Identification errors
	Specie	Genbank Results	Nº Individuals analyzed	Nº Individuals 100%	Nº Individuals >99%	Nº Individuals <99%	
COI	<i>D. flossada</i>	<i>D. flossada</i>	235	154	81		
		<i>D. intermedius</i>	1		1		1
	<i>D. oxyrinchus</i>	<i>D. intermedius</i>	15	11	4		15
16S	<i>D. flossada</i>	<i>D. flossada</i>	70	2	65	3	
	<i>D. oxyrinchus</i>	<i>D. intermedius</i>	1		1		1
		<i>D. oxyrinchus</i>	4	1	3		
Total			326	168	155	3	17

## CONCLUSIONS

- **Morphological identification errors were confirmed molecularly.** Therefore, it is confirmed that there are difficulties in identifying species correctly. Even by observers.
- This misidentification has an **impact on the quality of scientific data (and commercial landing/discard information)** and therefore on the assessment of fish stocks.
- The results obtained in the molecular and morphometric identification indicate that within the *Dipturus* genus of the sampling area there is a **large percentage 92,63%** of samples corresponding to the species *Dipturus cf. flossada*, and a **low percentage of individuals of *Dipturus cf. intermedius*.**
- The existence of two species that are confused must be considered in the reviews of the list of threatened species, including both species of the *D. batis* complex as well as other species of the *Dipturus* genus such as *D. oxyrinchus* and *D. nidarosiensis*, which are also distributed in the fishing area. The two *D. batis* species appear to have very **different abundances in catches**, which could be an indicator of different abundances of the two populations, and affect their status.
- More research and higher **quality data** are needed for assessment

## ACKNOWLEDGEMENTS

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