

Appendix 3: Tutorial database reference sequences for authentication

A. Database login

Website: <https://www.seafoodtomorrowdata.eu/authentication/>

The required login information will be received after registration.

After login, the following page will be displayed:

The screenshot shows the SEAFOOD TOMORROW database interface. At the top, there is a navigation bar with the logo and links for "REFERENCE SPECIES" and "THIRD PARTY DNA SEQUENCES". A search bar is located on the right side. Below the navigation bar, a blue button labeled "REFERENCE SPECIES" is visible. The main content area displays a table of reference species with the following columns: Scientific name, Name, FAO code, WORMS, Family, Order, and #Specimen. The table lists 13 species, including Abramis brama, Acanthocardia aculeata, Acanthocardia echinata, Actinia equina, Actinaria, Aequipecten opercularis, Agonus cataphractus, Alloteuthis media, Alloteuthis subulata, Alosa alosa, Alosa fallax, Amblyraja radiata, and Ammodytes marinus. At the bottom of the table, there is a pagination control showing "Showing 1 to 13 of 200 entries". Below the table, a blue bar contains several icons and labels: "Create", "View", "Delete", "Bulk Select", "Export", and "Specimen".

Scientific name	Name	FAO code	WORMS	Family	Order	#Specimen
Abramis brama	Bream	FBM	154281	Cyprinidae	Cypriniformes	0
Acanthocardia aculeata	Spiny cockle	AKK	138990	Cardiidae	BIVALVIA	0
Acanthocardia echinata	Prickly cockle	AKJ	138992	Cardiidae	BIVALVIA	0
Actinia equina	Beardlet anemone	KQN	100803	Actiniidae	ANTHOZOA	0
Actinaria	Sea anemones	ATX	1360		ANTHOZOA	0
Aequipecten opercularis	Queen scallop	QSC	140687	Pectinidae	BIVALVIA	0
Agonus cataphractus	Hooknose	AFT	127190	Agonidae	SCORPAENIFORMES	0
Alloteuthis media	Midsized squid	OUM	153134	Loliginidae	CEPHALOPODA	0
Alloteuthis subulata	European common squid	OUL	153131	Loliginidae	CEPHALOPODA	0
Alosa alosa	Allis shad	ASD	126413	Clupeidae	CLUPEIFORMES	0
Alosa fallax	Twait shad	TSD	126415	Clupeidae	CLUPEIFORMES	0
Amblyraja radiata	Starry ray	RJR	105865	Rajidae	RAJIFORMES	0
Ammodytes marinus	Lesser sand-eel	QLH	126751	Ammodytidae	TRACHINOIDEI	0

At the top the breadcrumb "Reference species" is visible. This indicates the first part of the database. Relevant species for seafood authentication are listed here with their scientific name, English species name (Name), FAO code (Code given to the species by the Food and Agriculture Organization), WORMS code (Code given to the species by World Register of Marine Species), taxonomic family (Family) and order (Order). The number of specimens collected for a particular species is shown in the last column (#Specimen). To find the data for a particular species, the search bar at the top right can be used. When using the search bar, the database will automatically start filtering at the third letter of the term. To easily get an overview of species with collected specimens, the "#Specimen" column can be sorted by clicking on the column header.

At the bottom in the blue bar, several tasks can be executed. The "Create" and "Delete" buttons are only active for users with a Datamanager or Organisational manager role.

View: leads to additional information about the species.

Export: allows to create csv files from the data (see later)

Specimen: leads to the next part of the database, the specimens collected for the selected species.

When selecting a species, it will be highlighted in green, and the “View” button becomes active.

Scomber scombrus	Atlantic mackerel	MAC	127023	Scombridae	SCOMBROIDEI	3
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Clicking the “View” button shows a screen that lists all entered information about the species.

The screenshot shows the 'REFERENCE SPECIES' page for 'Scomber scombrus'. At the top, there are navigation links for 'REFERENCE SPECIES' and 'THIRD PARTY DNA SEQUENCES', and a user profile 'ddeconinck'. The main content area is titled 'REFERENCE SPECIES Scomber scombrus' and contains a 'Properties' sidebar and a central form. The form displays the following information:

Scientific name *	Scomber scombrus	Name	Atlantic mackerel
FAO code	MAC	WORMS	127023
Family	Scombridae	Order	SCOMBROIDEI

At the bottom of the page, there is a blue navigation bar with three buttons: 'Previous' (left arrow), 'Close' (X icon), and 'Next' (right arrow).

B. Database exploration

- 1) There are two options to go to the specimen information: either double click the species which you wish to investigate, or click on “Specimen” at the bottom right. This will display the specimens that have been collected for that particular species.

The screenshot shows the SEAFOOD TOMORROW database interface. At the top, there are navigation links for 'REFERENCE SPECIES' and 'THIRD PARTY DNA SEQUENCES', and a user profile 'ddeconinck'. Below the navigation, there are two tabs: 'REFERENCE SPECIES' and 'SPECIMEN', with 'SPECIMEN' being the active tab. A search bar and a filter icon are visible. The main content is a table with the following data:

Reference species	Code	Eco region	Stock	Processed by	#Tissue
Scomber scombrus	ScoCol_NEA_01	Oceanic northeast Atlantic		ICETA	1
Scomber scombrus	ScoSco_NS_01	North Sea		ILVO	6
Scomber scombrus	ScoSco_NS_02	North Sea		ILVO	6

At the bottom of the table, there is a pagination control showing '1' and a 'Showing 1 to 3 of 3 entries' indicator.



The breadcrumb at the top of the page has expanded, and now lists the name of the species, in this example “*Scomber scombrus*”, and shows a tab called “Specimen”. For each specimen, the following information is available:

Reference species: lists the species name of the specimen

Code: the code given to the specimen (first three letters of the genus name, first three letters of the species name, code of ecoregion and the number of the individual)

Eco region: the geographic region where the specimen was caught

Stock: if known, the biological stock of the specimen

Processed by: the institute or university that collected the specimen

#Tissue: the number of tissue samples collected from the specimen

Clicking a specimen will highlight it in green.



Clicking “View” will lead to a page with more information about the highlighted specimen.

The screenshot shows a web interface for specimen management. At the top, there is a logo for 'SEAFOOD TOMORROW' and navigation links for 'REFERENCE SPECIES' and 'THIRD PARTY DNA SEQUENCES'. The user 'ddeconinck' is logged in. The main content area is divided into two tabs: 'REFERENCE SPECIES' (Scomber scombrus) and 'SPECIMEN' (ScoSco_NS_01). Under the 'SPECIMEN' tab, there are two sub-tabs: 'Properties' and 'Pictures'. The 'Properties' sub-tab is active, displaying a form with the following fields:

Code *	ScoSco_NS_01	Eco region	North Sea
Stock		Collected by	ILVO
Date of collection	2018-09-05	Processed by *	ILVO
Storage [?]	-20°C In freezer D1	Note [?]	

At the bottom of the page, there is a blue navigation bar with three buttons: 'Previous', 'Close', and 'Next'.

Date of collection: the date when the specimen arrived in the lab

Collected by: the institute or university responsible for collecting the specimen

Storage: the physical location of the specimen

On the left side underneath the breadcrumb, there are two tabs (“Properties” and “Pictures”). Clicking on “Pictures” will display a page with available pictures for the specimen. A larger version of the picture can be obtained by clicking on the picture.

REFERENCE SPECIES

Scomber scombrus

SPECIMEN

ScoSco_NS_01

Properties

Pictures



Previous



Close



Next

- 2) There are two options to see all of the tissues collected for a certain specimen: either double click the specimen, or highlight it in green and click on “Tissue” at the bottom right in the blue bar. In the top right corner, “Tissue” has been added to the breadcrumb. The screen shows a list with available tissues for the specimen.

The screenshot shows the SEAFOOD TOMORROW interface. At the top, there are navigation tabs: REFERENCE SPECIES (Scomber scombrus), SPECIMEN (ScoSco_NS_01), and TISSUE. A search bar and a menu icon are on the right. Below is a table with the following data:

Code	Type	Processing date	Processed by	#Dna
ScoSco_NS_01_01	Muscle	2018/10/17	ILVO	1
ScoSco_NS_01_02	Muscle	2018/10/17	ILVO	0
ScoSco_NS_01_03	Muscle	2018/10/17	ILVO	0
ScoSco_NS_01_04	Finclip	2018/10/17	ILVO	0
ScoSco_NS_01_05	Finclip	2018/10/17	ILVO	0
ScoSco_NS_01_06	Finclip	2018/10/17	ILVO	0

At the bottom left, there is a pagination control showing page 1 of 6. At the bottom right, it says "Showing 1 to 6 of 6 entries".

The toolbar contains the following icons and labels from left to right: Create (plus icon), View (eye icon), Edit (pencil icon), Delete (trash icon), Bulk Select (three horizontal lines with a plus icon), Export (share icon), and DNA (DNA double helix icon).

Code: a unique code for the tissue, which starts with the code from the specimen with addition of two digits at the end (01, 02 and 03: muscle tissue and 04, 05 and 06: finclip)

Type: the type of tissue collected (muscle or finclip)

Processing date: the date the muscle tissues or fin clips were taken from the specimen.

Processed by: name of the institute or university where the tissues were collected

#DNA: the amount of DNA samples extracted from the tissue sample

Clicking on a tissue sample will highlight it in green.

ScoSco_NS_01_01	Muscle	2018/10/17	ILVO	1
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Clicking “View” will lead to a page with additional information of the highlighted tissue sample.

REFERENCE SPECIES Scomber scombrus | SPECIMEN ScoSco_NS_01 | **TISSUE ScoSco_NS_01_01**

Properties

Code *	ScoSco_NS_01_01	Type	Muscle
Processing date	2018-10-17	Processed by *	ILVO
Storage	-20°C in freezer D1 (doctoraat - bodem)		
		Note	

Previous Close Next

Storage: the physical location where the tissue sample is being stored

3) Double clicking a tissue sample or highlighting it in green and clicking on “DNA sequence” at the bottom right in the blue bar will lead to a page with all of the extracted DNA samples from that tissue.

The screenshot shows the SEAFOOD TOMORROW interface. At the top, there are navigation links for 'REFERENCE SPECIES' and 'THIRD PARTY DNA SEQUENCES', and a user profile 'ddeconinck'. Below this is a breadcrumb navigation bar with four steps: 'REFERENCE SPECIES' (Scomber scombrus), 'SPECIMEN' (ScoSco_NS_01), 'TISSUE' (ScoSco_NS_01_01), and 'DNA' (highlighted in blue). To the right of the breadcrumbs is a search bar and a list view icon. Below the breadcrumbs is a table with the following columns: 'DNA tube', 'DNA extraction', 'Processing date', 'Processed by', and '#DnaSequence'. The table contains one row of data: 'ScoSco_NS_01_01_01', 'Dneasy Blood and Tissue kit', '2018/09/24', 'ILVO', and '2'. Below the table is a pagination control showing '1' and 'Showing 1 to 1 of 1 entries'.

The screenshot shows the bottom navigation bar of the SEAFOOD TOMORROW interface. It contains seven icons with corresponding labels: 'Create' (plus icon), 'View' (eye icon), 'Edit' (pencil icon), 'Delete' (trash icon), 'Bulk Select' (three horizontal lines with plus icon), 'Export' (share icon), and 'DNA Sequence' (tag icon).

The breadcrumb at the top left has expanded and now shows the code of the selected tissue and DNA, indicating that the extracted DNA samples for that tissue sample are displayed.

DNA tube: the code given to the DNA extract. This is the same code as the tissue sample, with addition of two digits

DNA extraction: the extraction method used to extract the DNA from the tissue

Processing date: the date of the DNA extraction

Processed by: the name of the institute or university that conducted DNA extraction.

#DNA Sequence: The number of sequences obtained from the extraction

Clicking on a sample will highlight it in green.

The screenshot shows the table row from the previous screenshot, now highlighted in green. The data in the row is: 'ScoSco_NS_01_01_01', 'Dneasy Blood and Tissue kit', '2018/09/24', 'ILVO', and '2'.

Clicking “View” leads to the following page which contains more information about the sample:

REFERENCE SPECIES	SPECIMEN	TISSUE	DNA
Scomber scombrus	ScoSco_NS_01	ScoSco_NS_01_01	ScoSco_NS_01_01_01

Properties

DNA tube * ScoSco_NS_01_01_01

Processing date 2018-09-24

Storage -20°C in freezer D1 (doctoraat - bodem)

DNA extraction Dbtk Dneasy Blood and Tissue kit

Processed by * ILVO

Note

Previous
Close
Next

Storage: the physical location where the DNA sample is being stored

- 4) Double clicking an extracted DNA sample or highlighting it in green and clicking on “DNA Sequence” at the bottom of the page leads to a page with all of the DNA sequences obtained from that DNA extraction.

SEAFOOD TOMORROW REFERENCE SPECIES THIRD PARTY DNA SEQUENCES ddeconinck

REFERENCE SPECIES SPECIMEN TISSUE DNA DNA SEQUENCE

Scomber scombrus ScoSco_NS_01 ScoSco_NS_01_01 ScoSco_NS_01_01_01

Search

PCR tube	Gene	Processing date	Processed by	GenBank accession no.
ScoSco_NS_01_01_01_01	COI	2018/09/24	ILVO	
ScoSco_NS_01_01_01_02	Cytb		ILVO	

Showing 1 to 2 of 2 entries

Create View Edit Delete Bulk Select Export

PCR tube: this is the code given to the samples after PCR, and contains the DNA extraction code with two digits added representing the sequence. In this case we have 2 sequences: 01 for COI and 02 for Cytb.

Gene: the gene for which the sequence was generated

Processing date: the date when the sequence was obtained

Processed by: the name of the institute or university that obtained the sequence

GenBank accession no.: if the sequence is added to GenBank, its accession number will be indicated here.

You can again click on a sequence to have it highlighted in green.

ScoSco_NS_01_01_01_01	COI	2018/09/24	ILVO	
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Clicking on “View” while having a sequence selected will lead to a page that contains additional information and contains the code of the sequence.

REFERENCE SPECIES	SPECIMEN	TISSUE	DNA	DNA SEQUENCE
Scomber scombrus	ScoSco_NS_01	ScoSco_NS_01_01	ScoSco_NS_01_01_01	ScoSco_NS_01_01_01_01

Properties	PCR tube *	ScoSco_NS_01_01_01_01	Gene *	COI
	Processing date	2018-09-24	Processed by *	ILVO
	Forward primer	LCO1490 5'-GGT CAA CAA ATC ATA A	Forward primer 2	
	Reverse primer	HCO2198 5'-TAA ACT TCA GGG TGA C	Reverse primer 2	
	PCR cycling conditions	94°C 2min,35x (94°C 1min, 48°C 1min, 72°C 1min), 72°C 7min, HOLD 12°C	DNA sequence *	ATACCTGCAGGTTTCATATTAATAATTG TTGTGATGAAGTTAATGGCCCAAGA ATTGAGGAACACCTGCTAGGTGAAG GGAGAAGATGGTTAGGTCAACTGATG CCCCGGCATGCGCTAGGTTACCAGCT AGTGGGGGTAGACTGTTCAGCCAG TTC
	GenBank accession no.		Note	Blast: Scomber Scombrus

Previous Close Next

Forward primer: the forward primer used for PCR and sequencing

Forward primer 2: when a primer cocktail is used during PCR, the second forward primer is listed here

Reverse primer: the reverse primer used for PCR and sequencing

Forward primer 2: when a primer cocktail is used during PCR, the second forward primer is listed here

PCR cycling conditions: the protocol used for PCR

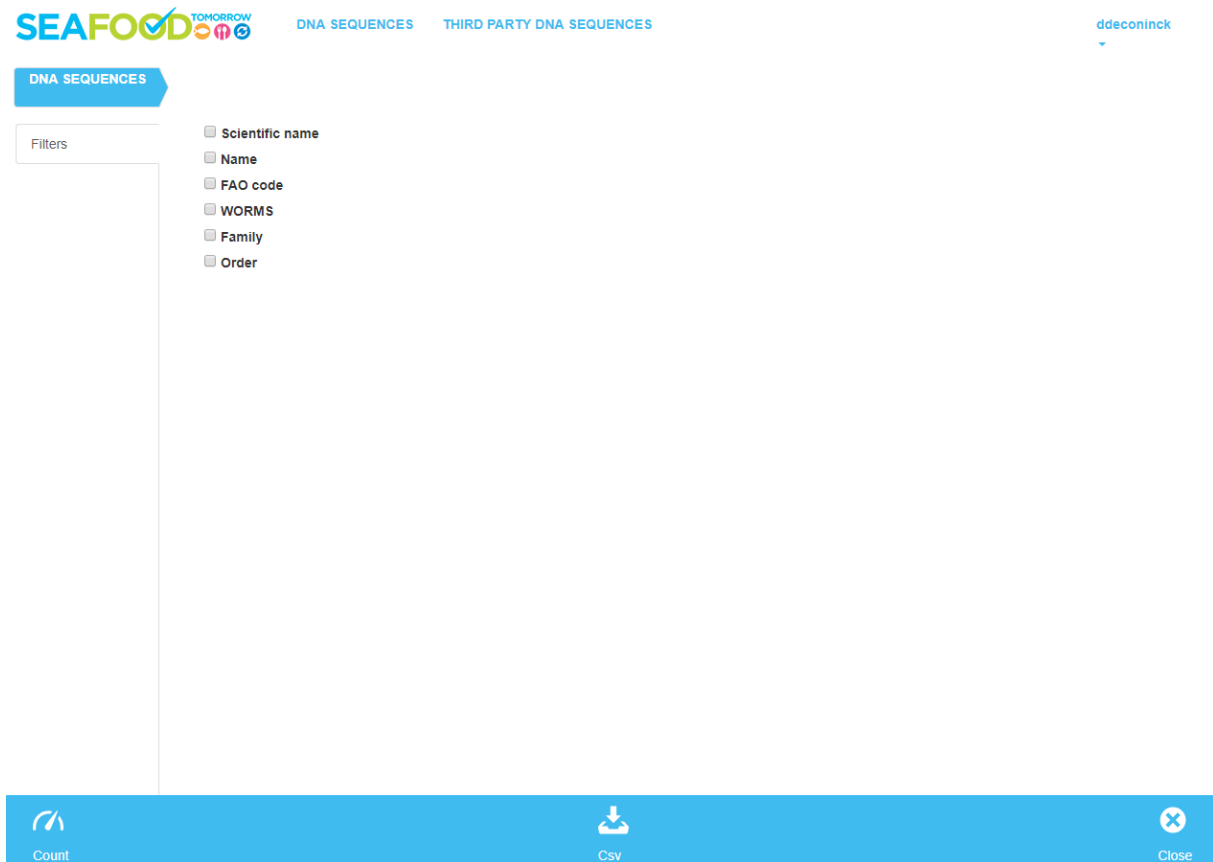
DNA sequence: the DNA sequence obtained from the PCR

C. Exporting data

From the previous section the hierarchical structure of the database has been explored. Data can be exported at every level. In the blue bar at the bottom there will always be an export button which will lead you to an export screen.



- 1) For example, when looking at the list of all species and clicking on the export button the following screen is displayed:



Different filters or displayed. In this example, we wish to obtain the data for all *Scomber scombrus*. By ticking “Scientific name” a field appears where the name of the desired species can be entered.

Scientific name

Scomber scombrus

Name

FAO code

WORMS

Family

Order

Clicking on "Csv" in the middle of the blue bar at the bottom of the screen will download a dataset with all information about the species with the scientific name "*Scomber scombrus*".

Scientific Name	FAO code	WORMS	Family	Order	SpeciesID	Code	Eco region	StockID	Collected	Date of collection	Processed	Storage	Note	Specimen Code	Type	Processing Date
Scomber s Atlantic m MAC	127023	Scombri	SCOMBRC	Scomber s	ScoSco_N	North Sea		ILVO	#####	ILVO	-20Â°C	In freezer D1	ScoSco_N	ScoSco_N	Muscle	10/17/2019
Scomber s Atlantic m MAC	127023	Scombri	SCOMBRC	Scomber s	ScoSco_N	North Sea		ILVO	#####	ILVO	-20Â°C	In freezer D1	ScoSco_N	ScoSco_N	Muscle	10/17/2019
Scomber s Atlantic m MAC	127023	Scombri	SCOMBRC	Scomber s	ScoSco_N	North Sea		ILVO	#####	ILVO	-20Â°C	In freezer D1	ScoSco_N	ScoSco_N	Finclip	10/17/2019
Scomber s Atlantic m MAC	127023	Scombri	SCOMBRC	Scomber s	ScoSco_N	North Sea		ILVO	#####	ILVO	-20Â°C	In freezer D1	ScoSco_N	ScoSco_N	Muscle	10/17/2019
Scomber s Atlantic m MAC	127023	Scombri	SCOMBRC	Scomber s	ScoSco_N	North Sea		ILVO	#####	ILVO	-20Â°C	In freezer D1	ScoSco_N	ScoSco_N	Muscle	10/17/2019
Scomber s Atlantic m MAC	127023	Scombri	SCOMBRC	Scomber s	ScoSco_N	North Sea		ILVO	#####	ILVO	-20Â°C	In freezer D1	ScoSco_N	ScoSco_N	Finclip	10/17/2019
Scomber s Atlantic m MAC	127023	Scombri	SCOMBRC	Scomber s	ScoSco_N	North Sea		ILVO	#####	ILVO	-20Â°C	In freezer D1	ScoSco_N	ScoSco_N	Finclip	10/17/2019
Scomber s Atlantic m MAC	127023	Scombri	SCOMBRC	Scomber s	ScoCol_N	Oceanic northeast A		ICETA	#####	ICETA	Freezer @ room 10.P	ScoCol_N	ScoCol_N	Muscle	#####	48
Scomber s Atlantic m MAC	127023	Scombri	SCOMBRC	Scomber s	ScoSco_N	North Sea		ILVO	#####	ILVO	-20Â°C	In RMG228	ScoSco_N	ScoSco_N	Finclip	10/17/2019
Scomber s Atlantic m MAC	127023	Scombri	SCOMBRC	Scomber s	ScoSco_N	North Sea		ILVO	#####	ILVO	-20Â°C	In RMG228	ScoSco_N	ScoSco_N	Finclip	10/17/2019
Scomber s Atlantic m MAC	127023	Scombri	SCOMBRC	Scomber s	ScoSco_N	North Sea		ILVO	#####	ILVO	-20Â°C	In RMG228	ScoSco_N	ScoSco_N	Muscle	10/17/2019
Scomber s Atlantic m MAC	127023	Scombri	SCOMBRC	Scomber s	ScoSco_N	North Sea		ILVO	#####	ILVO	-20Â°C	In RMG228	ScoSco_N	ScoSco_N	Muscle	10/17/2019
Scomber s Atlantic m MAC	127023	Scombri	SCOMBRC	Scomber s	ScoSco_N	North Sea		ILVO	#####	ILVO	-20Â°C	In RMG228	ScoSco_N	ScoSco_N	Finclip	10/17/2019
Scomber s Atlantic m MAC	127023	Scombri	SCOMBRC	Scomber s	ScoSco_N	North Sea		ILVO	#####	ILVO	-20Â°C	In RMG228	ScoSco_N	ScoSco_N	Muscle	10/17/2019
Scomber s Atlantic m MAC	127023	Scombri	SCOMBRC	Scomber s	ScoSco_N	North Sea		ILVO	#####	ILVO	-20Â°C	In RMG228	ScoSco_N	ScoSco_N	Muscle	10/17/2019

- 2) Going to the Specimen page for “*Scomber scombrus*” and clicking export will displays the filters available at that level. At this point for example, we can decide to only look at the samples collected by ILVO and from the North Sea.

The screenshot shows a web interface for filtering specimen data. At the top, there are two tabs: 'DNA SEQUENCES' (with 'Scomber scombrus' below it) and 'SPECIMEN' (which is highlighted in blue). Below the tabs is a 'Filters' section. On the left, there is a vertical box labeled 'Filters'. On the right, there is a list of filter categories, each with a checkbox and a label:

- Code
- Eco region
 - North Sea ▼
- Stock
- Collected by
 - ILVO ▼
- Date of collection
- Processed by
- Storage
- Note

For each level in the dataset, different filters will appear that allow subsetting the data depending on user requirements. Additionally, the whole dataset can be exported and filtered using excel or other programs.