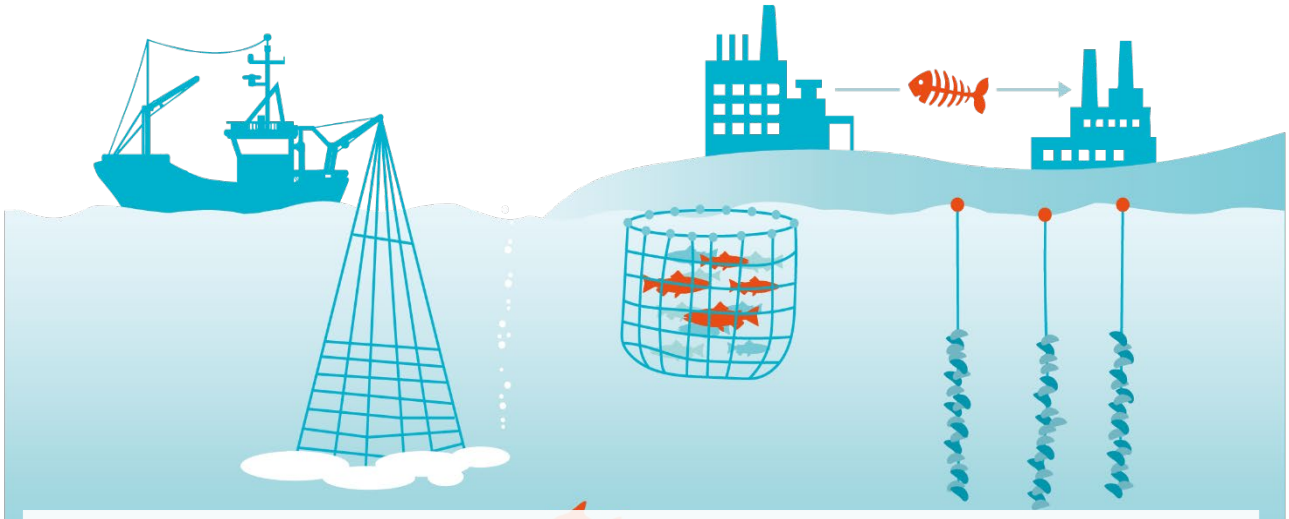
waseabi

Optimal utilization of seafood side-streams through the design of new holistic process lines

D1.1

Hurdles and bottlenecks in maintaining and value adding of seafood side-streams



Deliverable type: Report
WP number and title: WP1 Underutilized and new aquatic biomass side streams
Dissemination level: Public
Due date: 31th October 2020
Lead beneficiary for the task: DTU
Author: Mehdi Abdollahi, Grethe Hyldig, Ann-Dorit Moltke Sørensen, Rie Sørensen, Bruno Iñarra Chastagnol, Carlos Bald, Monica Gutierrez, David San Martin, Anni Simonsen, Laila Dam, Charlotte Jacobsen and Erasmo Cadena.
Version 1.2

BBI JU

Bio-based Industries Consortium

Horizon 2020 European Union Funding for Research & Innovation

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under grant agreement No 837726. The JU receives support from the European Union's Horizon 2020 research and innovation programme and the Bio Based Industries Consortium. This output reflects only the author's view and the JU cannot be held responsible for any use that may be made of the information it contains.

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Executive Summary

The aim of this study was to detect current hurdles and bottlenecks that prevent the implementation of valorisation solutions in the seafood industry. This analysis was performed through a dedicate survey prepared by the involved partners in WP1. According to the responses compiled in the industry questionnaire, the hurdles and bottlenecks that hinder valorisation of side-streams are lack of technology, space and personnel, as well as the lack of market for the final products.

Furthermore, the composition and quality of side-streams from companies participating in WaSeaBi were characterized. In general, there was a large variation in the composition and quality of the different side-streams from the same raw material, which must be taken into consideration when valorising it to new ingredients.

1 Deliverable Description

The objective of this report is to present the preliminary data obtained through the questionnaire developed for the seafood industries, as well as to show the results linked to the analysis of the collected samples from different side-streams. The developed questionnaire aimed to identify and describe the side-streams generation in the different fisheries, aquaculture and aquatic food processing industries. Regarding the chemical composition characterization and quality, selected side-streams samples were collected from corresponding WaSeaBi seafood industry partners.
This deliverable will only report the main conclusions, which can be drawn from the preliminary data gathered. The full and detailed data treatment, discussions and state-of-the art will be published later in scientific journals.

2 How the deliverable relates to the objective of WP1

The main objective of WP1 is:

- to identify hurdles and bottlenecks that prevent exploitation of side-streams and by-catches as exemplified by the selected cases in WaSeaBi.

Sub-objectives are to:

- describe and chemically **characterize** the side-streams generation in fisheries, aquaculture and aquatic processing industries and by-catches in the fisheries.
- detect current **hurdles and bottlenecks** that prevent the implementation of valorisation solutions in the participating companies.
- map consumer knowledge and **consumer barriers and motives** for using ingredients from side-streams in food production.

This deliverable is related to the main objective by investigating the two first sub-objectives.

The output with the description of the selected side-streams and the description of hurdles and bottlenecks will be used in WP2, 3, 4 and 5.

3 Questionnaire for the seafood industry

3.1 Development of the questionnaire

The first draft of the industry questionnaire was developed based on a brainstorm at the project kick-off meeting. This first draft was then further developed taking into account the literature study done in milestone - M1 "Enough knowledge to setup the questionnaires for the industry and the consumer test". The results from the EU project SEAFOODPlus were Included in M1, with focus on the motives and barriers for using ingredients or new developed food products from seafood side-streams. There was also gathered information from WP2, 3, 4 and 5 about which type of information and relevant species they wanted to be included in the questionnaire. Additionaly, the information needed for the development of an Analytic Hierarchy Process (AHP) methodology to identify the optimum decision about the best fish side-streams and by-catch valorization alternatives, targeted in Task 2.4, played an important role.

The goal was to develop a questionnaire that was no longer than the industry was willing to use to answer and, at the same time, provided as much information as possible about the hurdles and bottlenecks that prevent exploitation of side-streams. Side-stream is here defined as all waste and side-streams from a production. Here are given two examples:

- After filleting, a whole fish the side-streams are: head, guts, frames and processing water.
- For cooked peeled shrimps the side-streams are: shells, cooking and peeling water.

3.1.1 The questionnaire structure

The questionnaire consists of 208 questions in total. It started with an introduction to the project and the questionnaire itself. After the introduction, a section linked to the industry information and its contact details takes place; this information gives the possibility to address the industry later. Then, in two different sections, questions about the quantity of solid and liquid side streams generated in each company, their current handling situation and possible applications were asked. The questionnaire ended with some statements about the hurdles and bottlenecks that each company sees for not valorizing their side streams and the support that they need to valorize their side streams.

The structure and type of questions used in the survey has been summerized in the following table:

Survey structure and type of questions used.

Sections	Type of questions
Company details	• Main Company Activity. Processing line and products. Type of raw materials and processes. • Type of raw material (shrimps, cod, trout, mussels, salmon, herring, other). • Description of the processes (salting, filleting, freezing, cooking, canning...).
Solid side-stream treatment	Sorted or stored separately • For each raw material and each side-stream from this raw material: – Production quantity for each month (January – December) – Handling and storage conditions

	– Labour days per week (mean) – Storage temperature/time/conditions • Type of current (treatment/) application of side-stream (Fish meal or feed production, Meat separation, Food application, Landfilling, Biogas, Composting, Fresh feed, Stabilizing on site, Pouring into sea, Other) • Income and cost from each kg of by-product • Distance (Km) to the place where value is added to the by-products • Are the side-streams handled in a food grade manner. • Compositional information of the side-streams (fat, protein etc.) • Hurdles and bottlenecks for not valorising fish/shellfish side-streams (Lack of processing technology, space/personnel, market for final products, financial resources, sanitary handling or too small volume of the generated side streams to make investments profitable, Regulations and Legislations, Poor quality of the side streams, Not enough knowledge on different possibilities for valorisation, Other).
Liquid side-streams	Sorted or stored separately • Type of liquid side-streams (Filleting water, Marinades, Cooking water, Slaughter tank water, Blood, Refrigerated sea water, Pre salting brines, Peeling water, Other) – Annual volume of each side-stream – Treatment of each side-stream – Type of current (treatment/) application of liquid side-stream (Discharge directly in the sea, Pre-cleaning, Chemical flocculation, Handling municipal treatment plant, Other) • Compositional information of the side-streams (Fat , Protein, Dry matter, BOD, COD, Total bacterial count, Salinity, other) • Hurdles and bottlenecks for not valorising the liquid side-streams (Lack of processing technology, space/personnel, market for final products, financial resources, sanitary handling or too low volume of the generated side streams to make investments profitable, Regulations and Legislations, Poor quality of the side streams, Not enough knowledge on different possibilities for valorisation, Other)
Support to valorize the side-strems	- What kind of help do you need to start valorising your solid/liquid side streams?
Additional comments	The questionnaire was setup in SurveyXact and the access to the questionnaire is a link that could be sent to industry and uploaded to social media.

The online version of the questionnaire can be found in the following link: https://www.survey-xact.dk/LinkCollector?key=UWYZ25W1S53P

3.2 Conducting the questionnaire

The questionnaire was uploaded to the WaSeaBi homepage and sent to the industry partners in the project. It was also sent to seafood organisations to inform their members about the survey and to urge them to fill out the questionnaire. To help people in the industry, a guide was developed to fill out the questionnaire describing which information was needed to answer the questions before starting the process.

The questionnaire was also mentioned in the third project newsletter "To all seafood producers: Help us, help yourselves!" on the WaSeaBi homepage.

The corona crisis had just began when the questionnaire was finalised and was send out. The Covid-19 situation had therefore a great influence on the possibility to visit the seafood industries and the seafood industries have not had time for filling out the questionnaire. During the first 6 months after the questionnaire was sent out, only 8 seafood industries had answered the complete questionnaire.

Activities done with each partner for spreading the industry questionnaire are summarised below:

With the help of WaSeaBi partners from Chalmers, a list of 7 seafood companies inside Sweden and 1 seafood company in Norway, apart from WaSeaBi partners, were selected to contact. Each company was separately contacted via email where the link to the questionnaire and a short explanation about WaSeaBi and the questionnaire were included in the email. To succeed, the questionnaire was sent to our contact person in each company or whom we have worked with and we were continuously in contact with them to benefit from the mutual trust between us. In case a company did not respond, a reminder was sent to the contact person in that specific company.

In Denmark, Food & Bio Cluster Denmark (FBCD) contacted both Danish Seafood Organisation and Kontali, Norway who has conducted a EUMOFA case study in Denmark regarding side-streams named "Blue Economy – Availability and utilisation of rest raw materials in Denmark". DTU will have full access to the results when the case study is finished, and the final edition of the report is available.

AZTI sent 2 mailings (see image in the Annex) to a selected distribution list from the AZTI database of Spanish industries and association with interests in the fish and seafood value chain. This list comprises a total of 368 contacts.

The first mailing (sent in July 2020), reached 63 industries and only 4 accessed the questionnaire, but without completing it.

The second mailing, performed in October 2020, 56 industries were reached and 6 accessed the questionnaire, but again without completing it.

Several industries have been contacted by phone but have not been interested in participating.

The mailing was accompanied with sharing in LinkedIn the related post of WASEABI and by spreading the word on Twitter (9 tweet, 3715 impressions, 81 interactions) and Facebook.

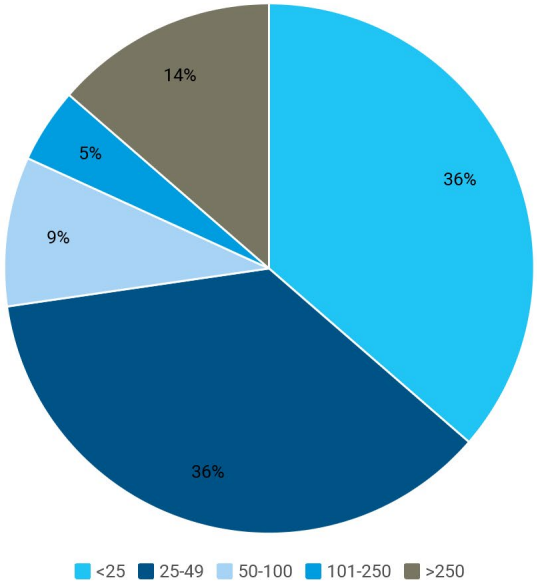
3.3 Results and discussion from the industry questionnaire

According to the results obtained from the industry questionnaire up to now, companies that have answered include small companies with less than 25 employees up to large companies with more than 250 employees, which cover a good range of stakeholders. The responding companies also process different species including cod, shrimp, mussel, salmon, and other species where shrimp and cod are among the most commonly processed species. It is interesting that solid side streams are already sorted and stored separately in 63% of the companies, but it is not handled properly in the rest. However, solid side streams are only handled in a food grade manner in 25% of the participated companies, which can be a big barrier ahead of valorisation of the side streams for food application. A positive aspect found is that most of the participating companies (83%) believe that their side streams can be handled in a food grade manner although it is not currently done. The results also show that only 13% of the companies already use their side streams for food application and the side streams in the remaining 87% are used for non-food applications, where feed is the most common application. A combination of issues has been selected by the companies as hurdles and bottlenecks ahead of valorisation of solid side streams where lack of technology, space and personnel, as well as a lack of market for final products are among the most named (>50% of answers) issues.

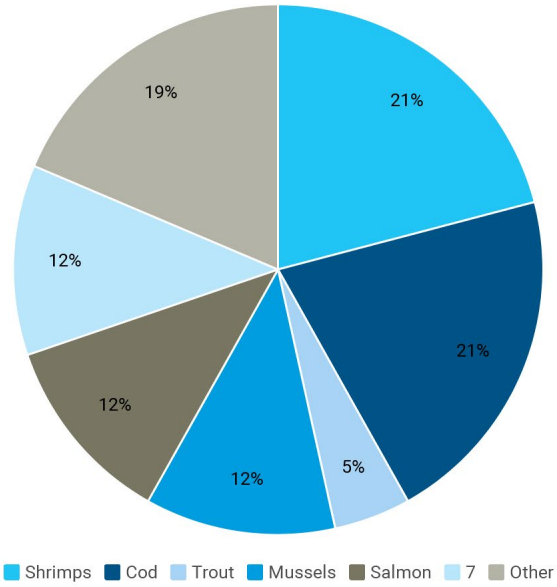
The results for the liquid side streams show that there is not any specific value addition which is done on the side streams and, in more than 75% of cases, it is directly sent to municipal treatment plant. More than 88% of companies even do not separate their liquid side streams and only 50% of the companies do some pre-treatment on their side streams in house. Hurdle and bottleneck named as issues hindering valorisation of liquid side streams were nearly similar to solid side streams and lack of technology, space and personnel plus lack of market for final products are among the most named (>50% of answers) issues.

A selection of the most relevant questions' results are presented below:

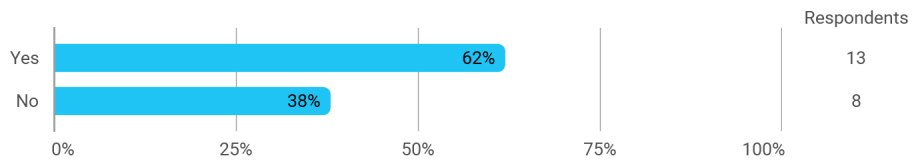
1.4 Number of Employees (administration + production):



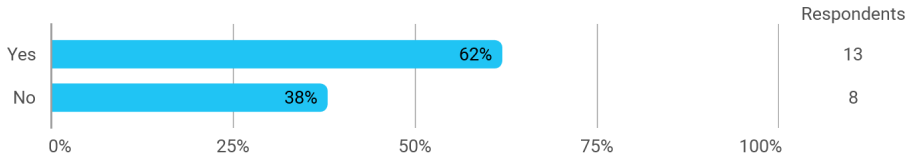
2.1 Type of raw materials and processes. Mark the raw materials and describe the processes in the textbox (salting, filleting, freezing, cooking, canning...)



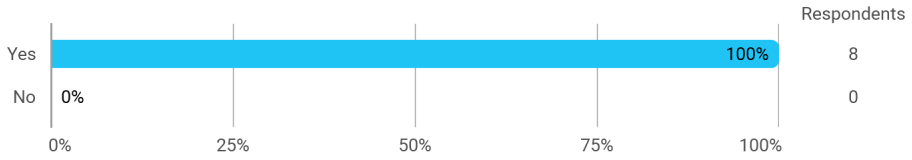
3.1 Are different solid side-streams already sorted or stored separately?



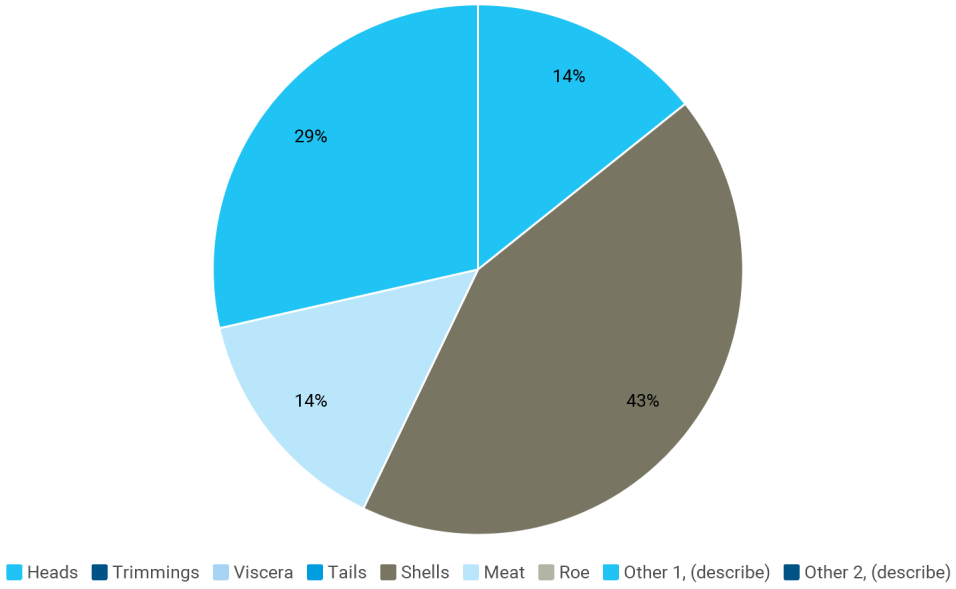
3.1 Are different solid side-streams already sorted or stored separately?



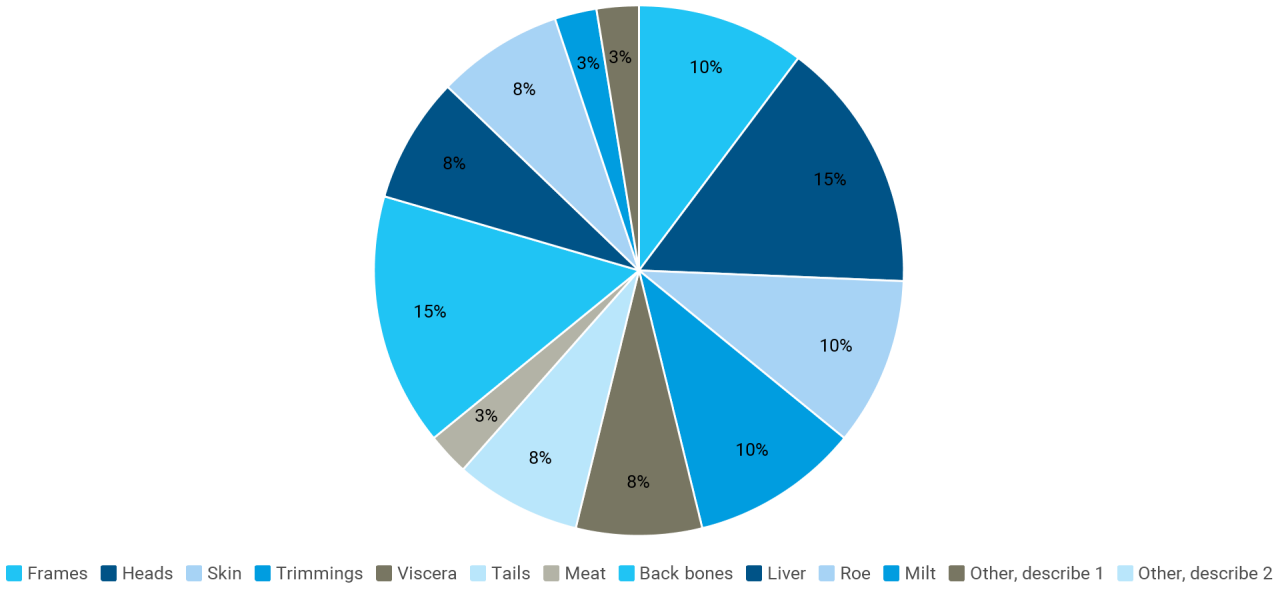
3.1.0 Could this solid side-stream be sorted separately?



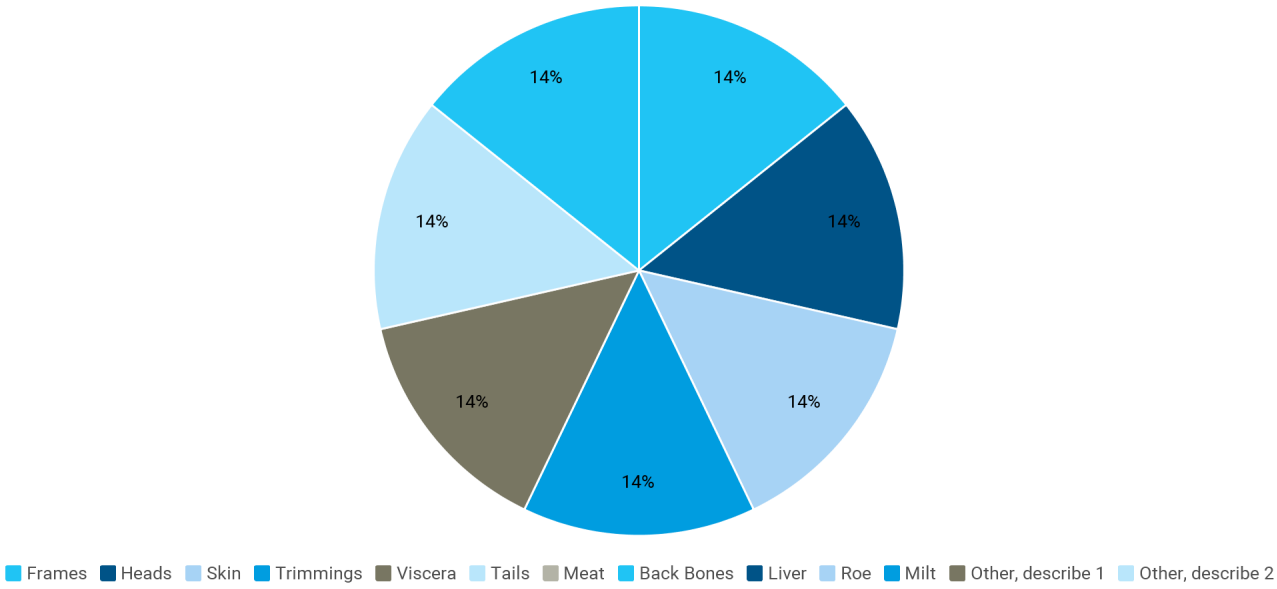
3.2.1 Select type of side-stream generated during processing of SHRIMPS.



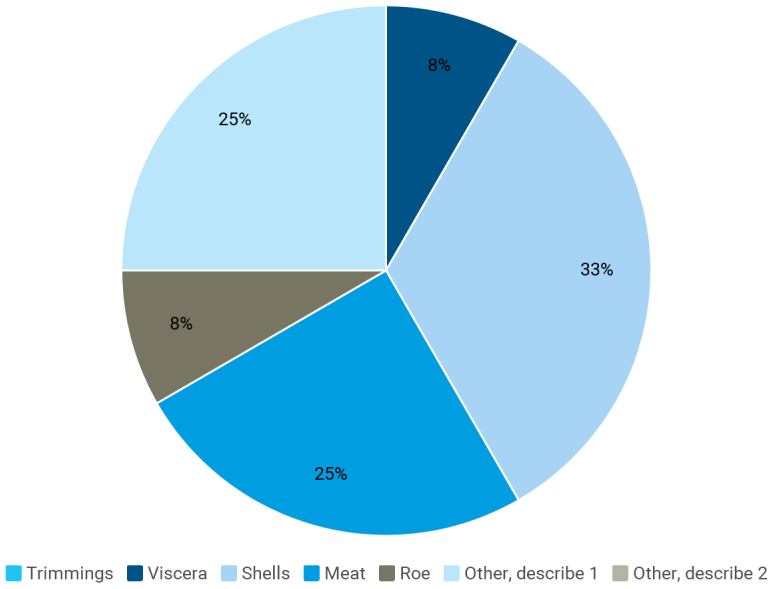
3.2.2 Select type of side-stream generated during processing of COD.



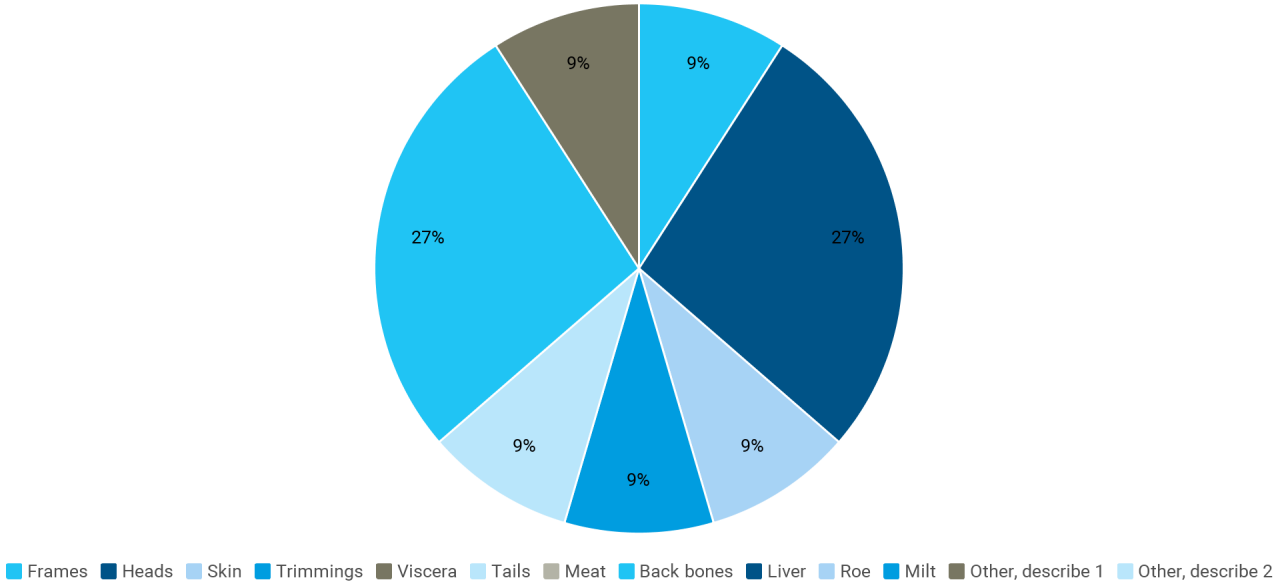
3.2.3 Select type of side-stream generated during processing of TROUT.



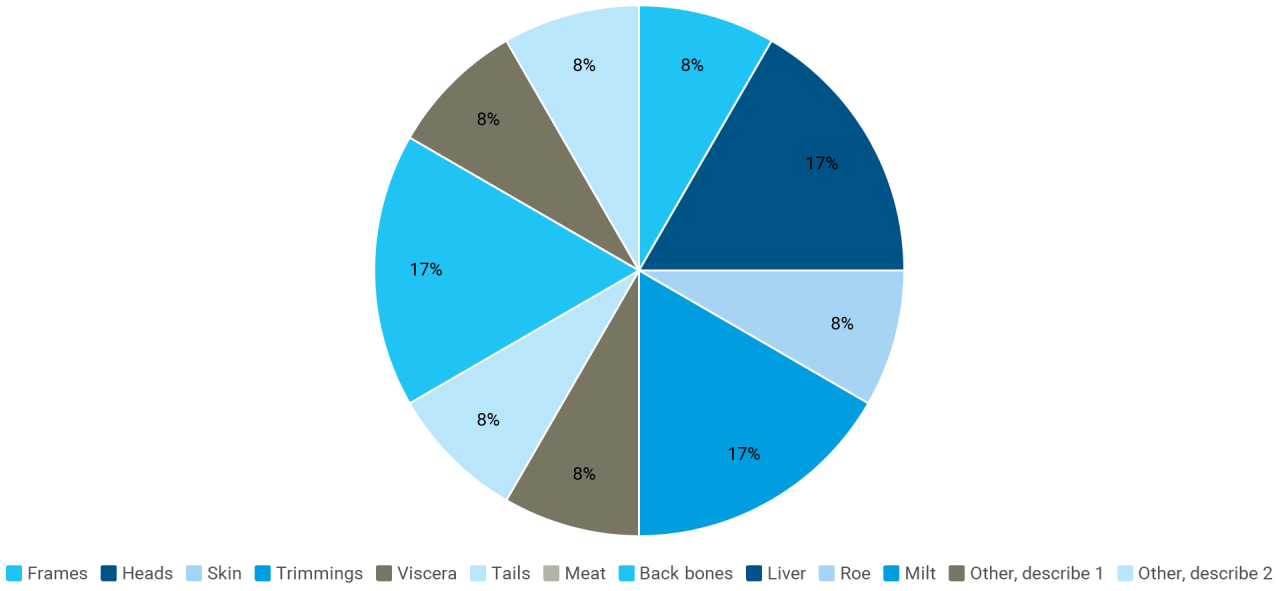
3.2.4 Select type of side-stream generated during processing of MUSSELS.



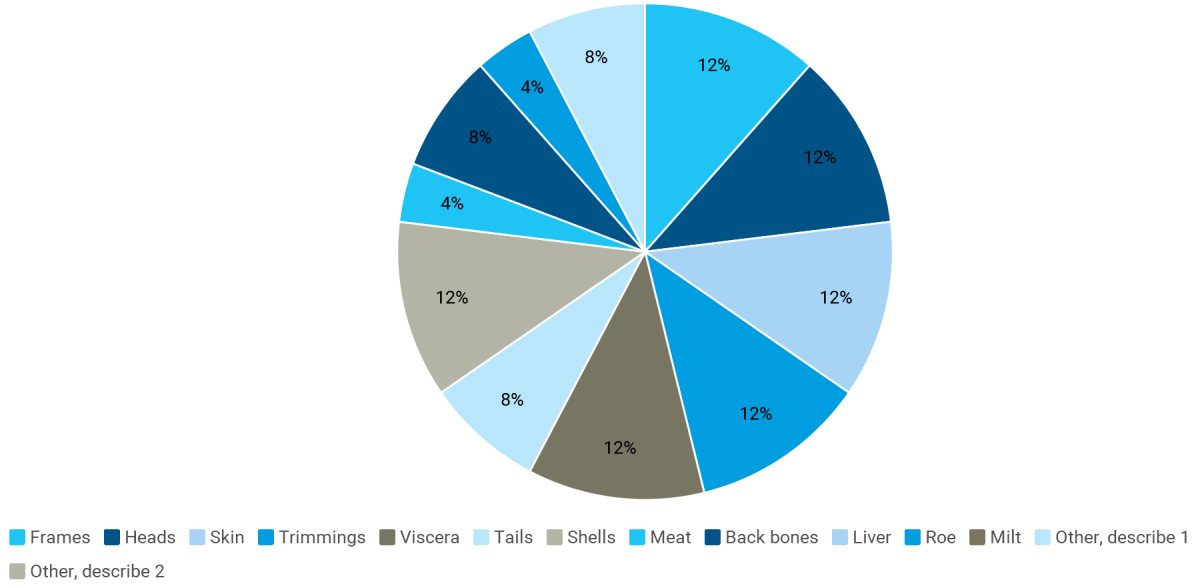
3.2.5 Select type of side-stream generated during processing of SALMON.



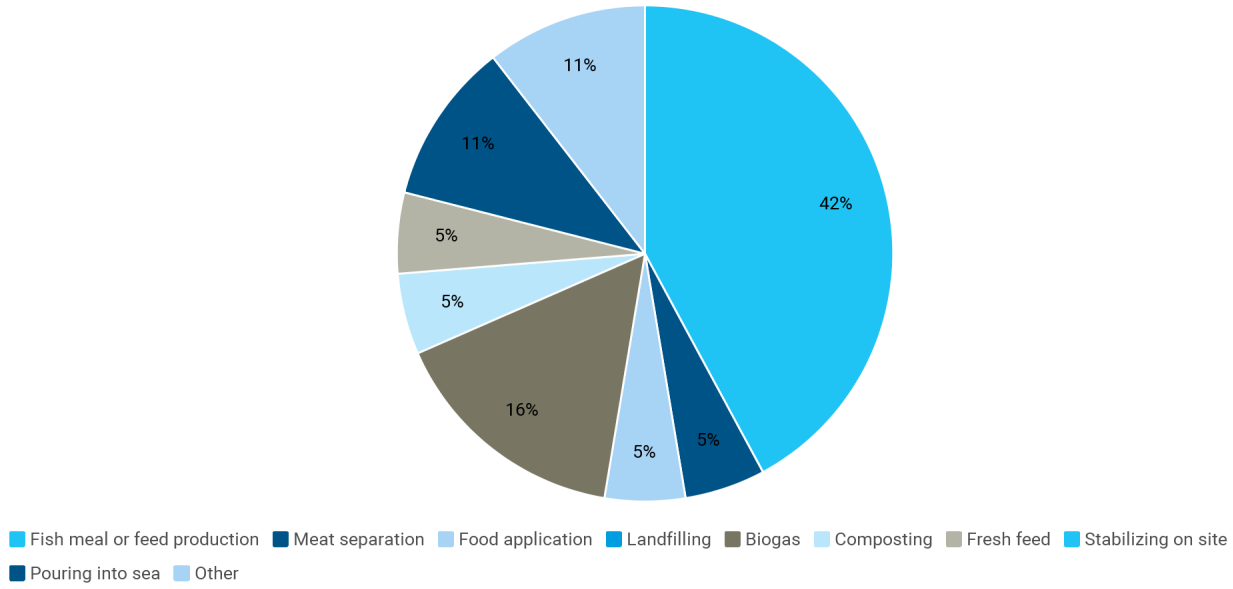
3.2.7 Select type of side-stream generated during processing of HERRING.



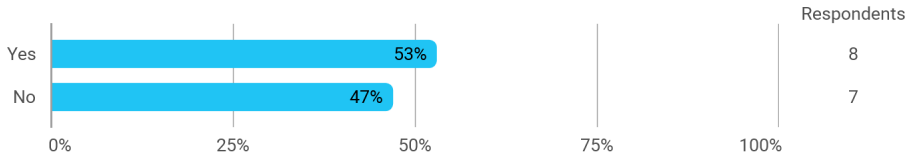
3.2.6 Select type of side-stream generated during processing of OTHER.



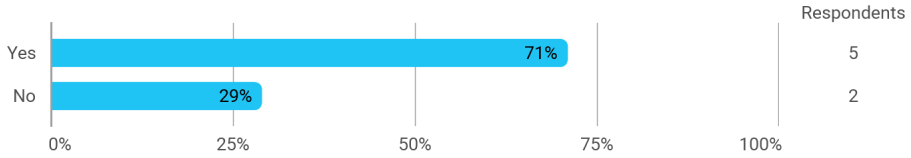
3.9 Type of current (treatment/) application of side-stream (you can write or chose):



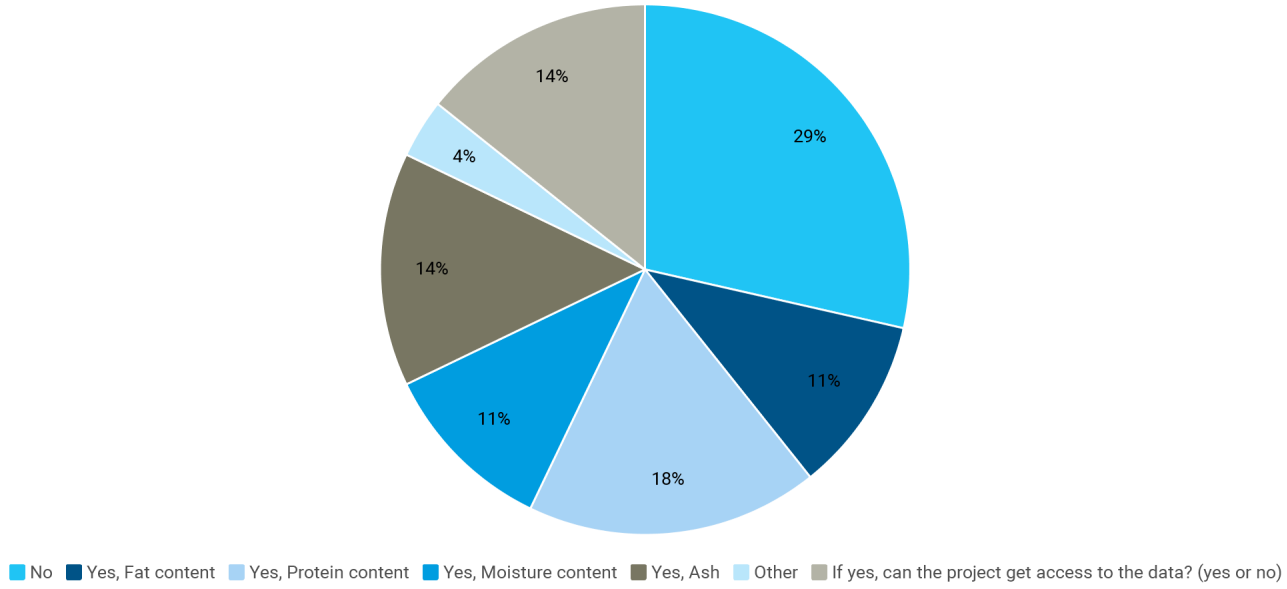
3.11 Are the side-streams handled in a food grade manner?



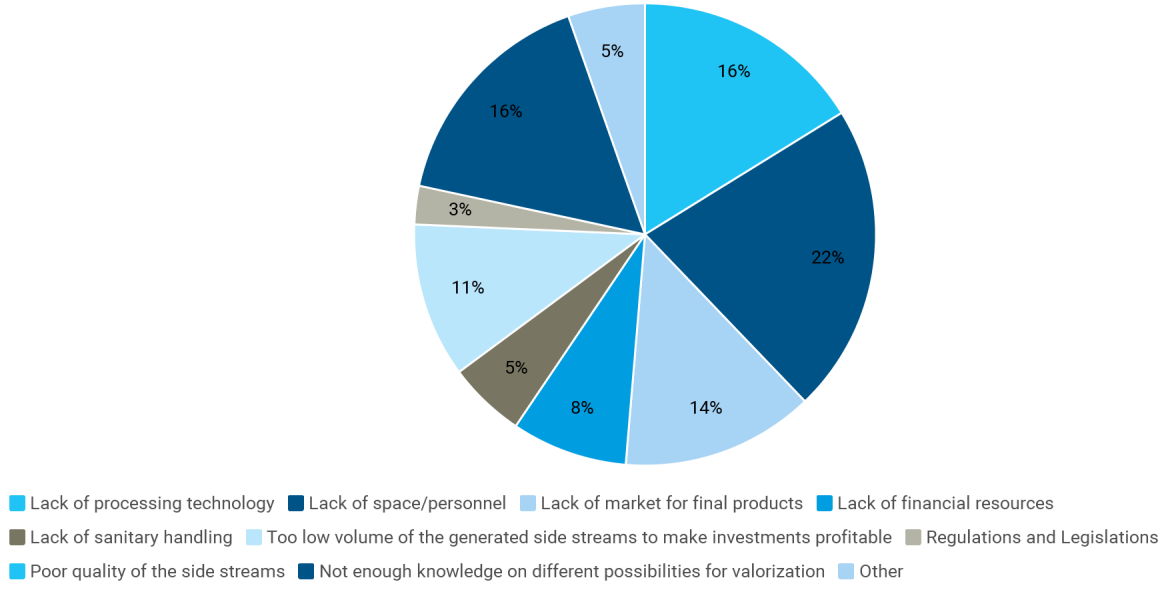
3.12 Could it be handled in a food grade manner?



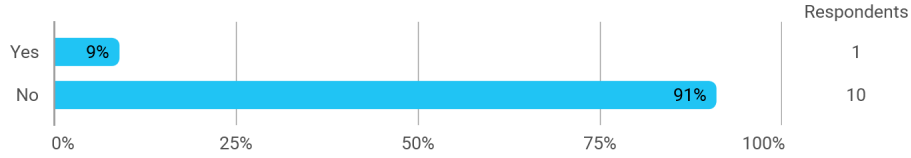
3.13 Do you have any compositional information for the side-streams (i.e. what they contain)?



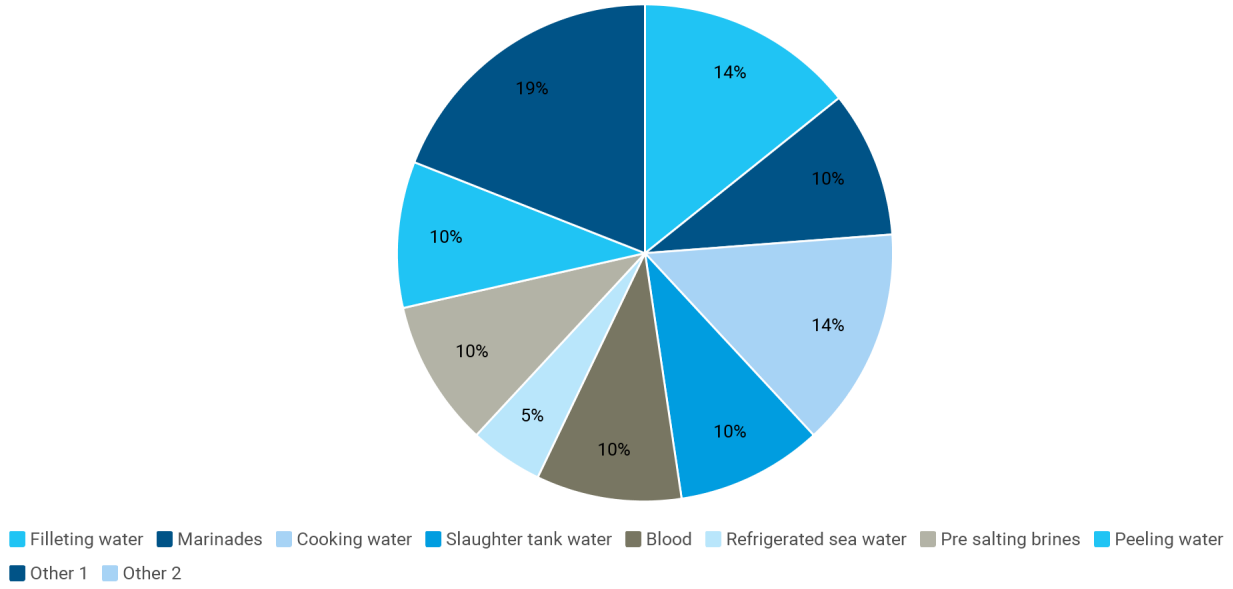
3.14 If you do not valorize your fish/shellfish side-streams, what hurdles and bottlenecks hinders such activities in your company?



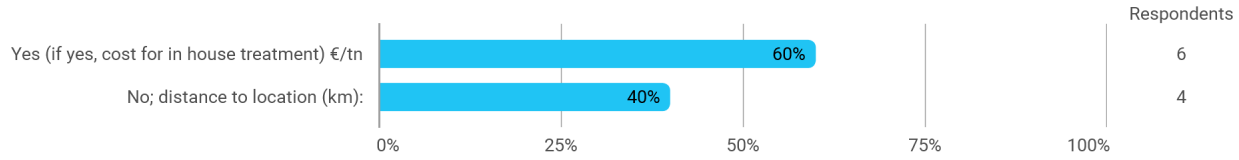
4.1 Are different liquid side-streams already sorted or stored separately?



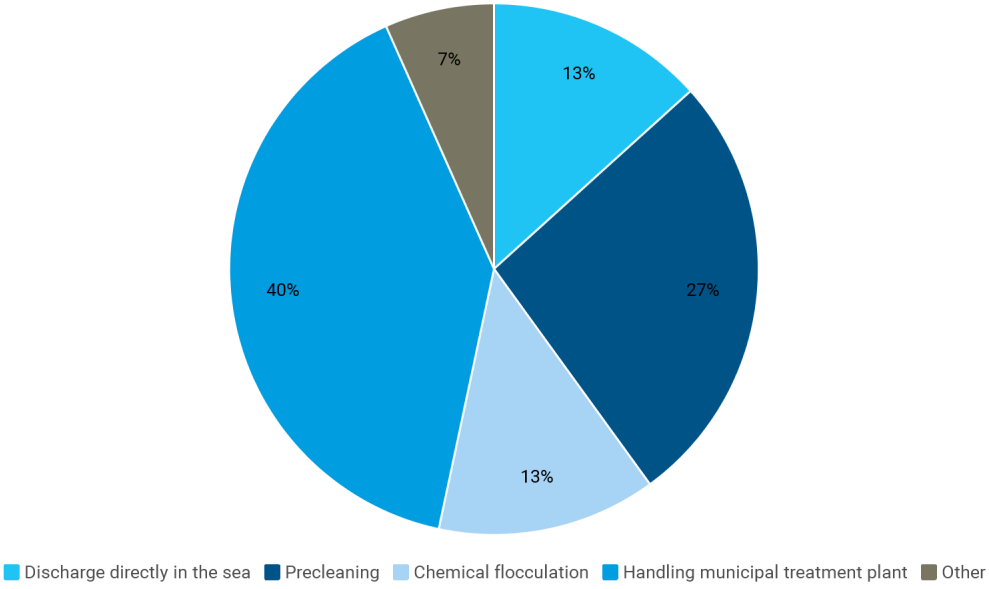
4.2 What type of liquid side-streams are generated in the company? (you can tick off more than one box)



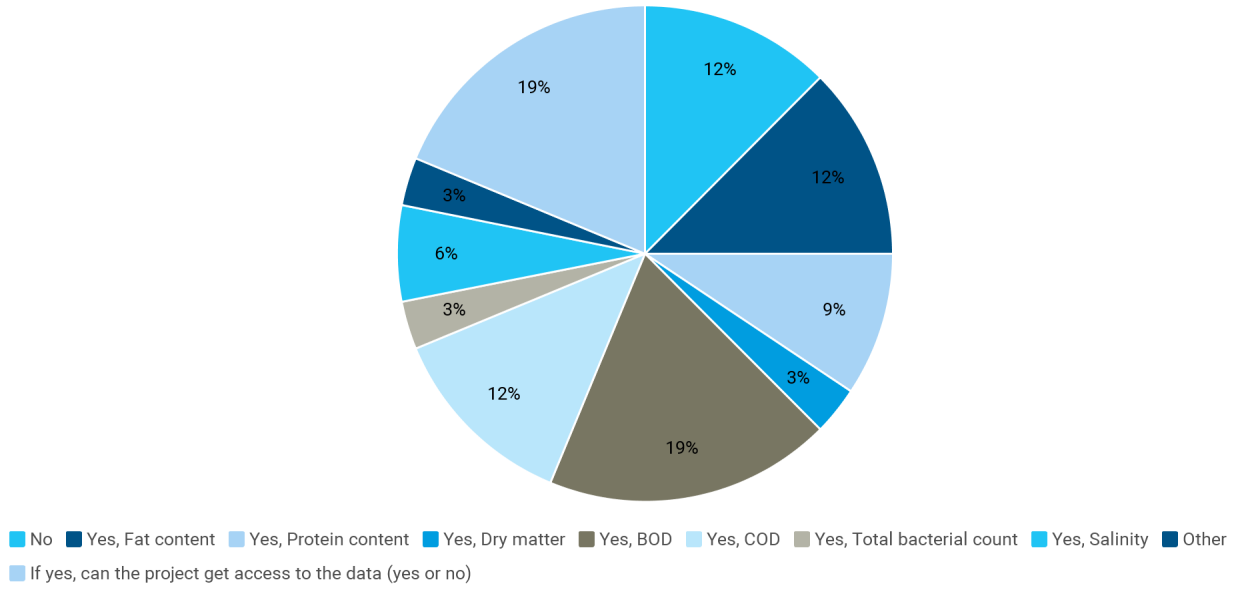
4.4 Treated in house?



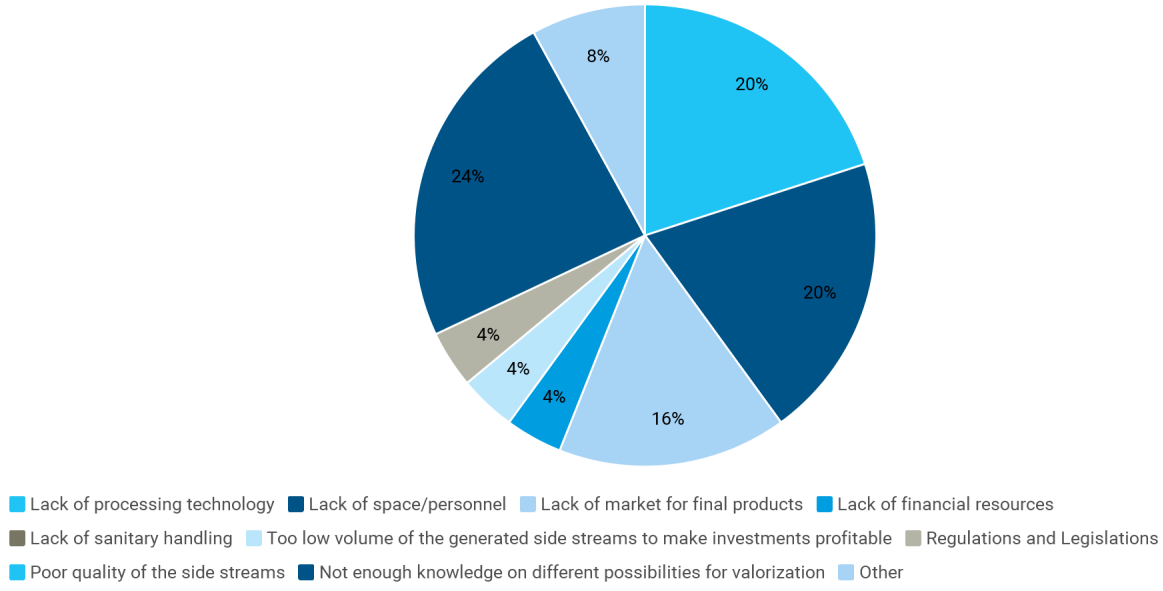
4.5 Type of current (treatment/) application of liquid side-stream (you can write or chose):



4.6 Do you have any compositional information for the side-streams?



4.7 If you do not valorize your liquid side-streams in any way, what hurdles and bottlenecks hinders such activities in your company?



4 Characterization of side-stream samples

Chemical composition of side-streams can provide a basis to understand the type and the amount of nutrients or bioactive compounds in each side streams that can be targeted for upcycling and value addition. This can also provide a road map for other WPs in WaSeaBi to choose the correct process and processing condition for adding value to each side-stream. An other important aspect having a fundamental role in defining strategies for valorization of side-streams is chemical and microbial quality of these side streams. This will help to elucidate if they are already handled properly and if their quality fulfill the defined permitted levels in legislation for using the side streams as raw material in each value chain. Therfore this section of WP1 has provided an overview of chemical composition (content of macro and micro nutrients) and physicochemcial quality (lipid oxidation and microbial load) of side streams targeted in WaSeaBi.

4.1 Selection of side-streams

An overview of the species targeted in WaSeaBi, corresponding side-streams of each species, their provider and responsible partner was initially prepared to specify type of targeted side streams and their responsible partner. The overview, which is summarized in the table 4.1, was prepared by scanning all the tasks in WP2 and WP3 which are also listed below the table.

Table 4.1. An overview of all species and their corresponding side-streams targeted for valorization in WASEABI.

Partner	Solid side streams	Liquid side streams
CTH	Herring head, backbone, tail, viscera	Herring salt brine
DTU	Cod: head, backbone, viscera	
		Process waters (from dry / wet salted cod)
AAZTI	Hake under MCRS (discarded)	
	Mussel shell	
		Mussel cooking water
	Salmon, head, skin, trimming, backbone	

Task 2.3; Roles: Storage solutions will be tested, and chemical plus microbial analyses will be carried out as follows.

DTU: Liquid and solid cod side-streams.

CTH: herring solid and liquid side-streams.

AZTI: Liquid and solid side-streams from mussel processing, salmon head, backbone, trimmings and skin and by-catches (hake under MCRS).

Task 3.1; In this task, food grade flocculants that can cope with high salt levels of some of the herring process waters and cod-brines or with the lower salt levels in mussel cooking water will be tested to recover proteins and lipids.

Task 3.2; In this task, side-streams (cod brine, solid cod side-streams, liquid and solid herring side-streams and mussel cooking water) will be tested as substrates for pH-shift-processing to obtain protein isolates.

Task 3.3; The following side-streams will be used in this task: whole hake, salmon side-streams, mussel shells and cod and herring solid side-streams.
Roles: AZTI will develop BP on salmon side streams, hake and mussel shells. DTU will develop BP based on cod and herring solid side-streams. NS will evaluate the potential for using the BP in animal feed. BN, SP, RG will provide side-streams and information about them.

Task 3.4; The aim of this task is to obtain flavouring agents from the following side-streams subjected to quality improving measures in WP2 (salmon side-streams and cod solid side-streams)

Task 3.5; Hake, cod and salmon bones or residual from both hydrolysis and pH-shift process has been targeted for production of minerals in **T3.5**. Maybe their mineral composition would be interesting as well.

4.2 Analysis of side-streams

To achieve a comprehensive picture of composition and quality of the side streams, three different approaches including using background knoweledge from each partner, analysis of samples and using bio bibilometric informations in the literature were used.

The used analytical methods were initally discussed among the three partners invloved in this task to somehow align the anlytical methods used by the partner as much as possible.

4.2.1 Methods

Herring side streams:

Crude composition

The total protein content of herring side streams was measured using a LECO nitrogen analyzer (TruMac-N, LECO Corp., USA) according to the Dumas method. A nitrogen-to-protein conversion factor of 5.58 was used to calculate the protein content (Mariotti et al., 2008). Protein contnet of herring liquid side streams was meausred using the Lowry methodas modified by Markwell (Markwell et al., 1975).

The total lipid content of the samples was analyzed using the method of Lee et al. (1995), as modified by Undeland et al. (2002). The moisture content of the samples was measured by overnight heating at 105 ℃. Ash content was also determined gravimetrically by heating the samples at 550 ℃ in a furnace for 6 h.

Total volatile basic nitrogen (TVBN)

TVB-N was determined using Conway diffusion cells according to Rawdkuen, et al. (2010) with slight modifications using 2 g of solid sample or 2 ml of liquid side streams.

Ionic strength

The ionic strength (IS) was analysed using a standard conductivity meter (Radiometer analytical, Lyon, France) and was converted to % NaCl using a standard curve.

Total amount of heme

Total amount of heme in the side streams was measured according to the Hornsey method (Hornsey, 1956). Acidic acetone (80% acetone, 18% HCl (37% purity) and 2% water) (4.5 ml) was added to 1 g of the samples, and after shaking for 20 s the samples were incubated in a refrigerator for 1 h. After that, samples were

filtered through a Whatman No 1 filter paper and the absorbance of the filtrate was read at 640 nm against acidic acetone. Hb content was calculated using a standard curve constructed using bovine Hb.

Lipid oxidation (PV and TBARS)

Total lipids were extracted from 1-g samples of mince using chloroform:methanol (2:1) (Cavonius & Undeland, 2017). The chloroform phase was recovered and analyzed for peroxide value (PV) using the ferric thiocyanate method as described by Undeland et al (2002). TBA-reactive substances (TBARS) was determined according to the method of Schmedes and Hølmer (1989), in the water–methanol phase recovered from the extraction described above.

Total microbial count:

Five g of each sample was mixed with 45 mL of 0.9% saline in stomacher plastic and treated in stomacher for 60 S thereafter 1 mL of appropriate dilution was transfered to a petri dish which mixed with plate count agar media and incubated for 2 days at 25 C. Each sample was run in duplicate and then cultured in duplicate.

Cod solid side streams:

Crude composition:

Dry matter was measured gravimetrical (105°C for 20-24 hours). Protein content measured using DUMAS and a conversion factor of 6.25. Lipid content was measured using B&D extraction (chloroform:methanol).

Lipid oxidation (PV, TBARS, Tocopherols):

Prior to the analysis of PV, TBARS, tocopherols and FFA, the lipids in the side-streams were extracted with chloroform and methanol (7:3, v/v) according to the method described by Bligh and Dyer (1959) with reduced amount of solvent applied (Iverson, Lang, & Cooper, 2001).

For the PV measurement, the lipid extract was evaporated to dryness and redissolved in chloroform:methanol (7:3 v/v) and the PV was determined using the ferric thiocyanate method (Shantha and Decker, 1994).

TBARS was determined using thiobarbituric acid after extraction of the aldehydes with TCA (Vyncke, 1970; Vyncke, 1975).

The content of tocopherols was determined from the lipid extract. The solvent was evaporated and lipids redissolved in heptane and analysed on HPLC according to the AOCS method (AOCS Official Method Ce 8-89, 1998).

FFA:

The free fatty acid is determined in the lipid extract (B&D extraction). The free fatty acids are titrated with NaOH with phenolphthalein as an indicator (AOAC Official Method 41.1.21, 1995; AOCS Official Method Ca 5a-40, 1998).

Cod liquid side streams (DTU), Process waters from dry / wet saltet cod, Jeka Fish:

Screening of process water from different places in the process has been carried out and samples have been selected for full characterization. Four different waters have been selected for full characterization (Sample ID 3, 4, 14 and 15). Sample description:

Sample ID 3: Process water from wet salted cod (after 3 days) before salting
Sample ID 4: Process water from light salted (IQF) cod (after 1 day) before injector
Sample ID 14: Process water with fish / fluid ice (after 2 days) cold storage (thawing process)
Sample ID 15: Process water with fish / fluid ice (after production) cold storage (thawing process)
Some analysis such as protein, dry matter ash and salt content are done.

Dry matter: NMKL no. 23, ver. 3, 1991

Protein: NMKL no. 6, ver. 4, 2003

Salt: NMKL no. 178, 2004

Ash: NMKL no. 173, Ver. 2, 2005

Salmon and mussel side-streams:

Protein content:

Total nitrogen was analysed by Kjeldahl method and total protein using a conversion factor of 6.25.

Total fat:

Gravimetric method based on Soxhlet extraction with previous acid digestion.

Moisture:

Gravimetric method drying the sample at 105ºC until constant weight.

Ash:

By weighing sample after calcination in furnace overnight at 550 °C following AOAC methods (AOAC, 2007).

Fatty acid composition:

Fatty acid composition was determined by gas chromatography with Flame Ionization Detector (GC/FID) according to EEC (EEC No 2568/91).

Peroxide value:

PV was determined using then Oficial: ISO 3960 (2001) method. Sample is extracted with cloroform, dissolved in acetic acid. The solution is treated with a potassium iodide solution. The liberated iodine is titrated with a sodium thiosulfate solution. Results are expressed in terms of milliequivalents of active oxygen per kg of fat

Heavy metals :

Cd, Hg, Pb and As were measured by graphite furnace atomic absorption spectroscopy (GFAAS) (AOAC, 2007).

Minerals:

Fe, Ca and Zn were measured by Flame Atomic Absorption Spectrometry previous calcination in furnace (AOAC, 2007).

Phosphorus by spectrophotometric method with molybdovanadate reagent previous calcination (CE 152/2009).

Salt as chloride:

Volumetric method by titration with ammonium thiocyanate based in Volhard's method.

Amino acid profile:

Hydrolysis with HCl 6N 110ºC 24h, neutralization with NaOH 6N. Derivatization using a AccQ Fluor Reagent Kit Waters WAT052880 (waters, USA) and determination by HPLC with fluorescence detector.

Microbial parameters:

Salmonella spp and Listeria monocytogenes, using real time PCR with iQ-Check™ Salmonella II kit fom BIO-RAD and iQ-Check™ Listeria monocytogenes II kit´ respectively from BIO-RAD (USA), total aerobic mesophylic in 3M™ PETRIFILM™ Aerobic Count Plate in agar red (AFNOR 3M 01/01-09/89), enterobacteria 3M™ PETRIFILM™ Enterobacteriaceae Count Plate (AFNOR 3M 01/06-09/97) and Escherichia coli in 3M™ PETRIFILM™ Select E. coli Count Plate (SEC) (AFNOR 3M 01/08-06/01).

Liquid side-streams parameters:

Salinity (chloride g/L) APHA Standard Methods, 23rd ed., Method 4500-Cl- C-1997.

COD – Chemical oxygen demand by UV-Vis spectrophotometry (closed reflux) Standard Methods for Water and wastewater characterisation Nº 5220 (2007).

4.3 Results and discussion of the analysis of the selected side-streams

Results of crude composition, lipid oxidation, TVB-N and microbial load of herring solid and liquid side streams are summerized in Table 4.3.1. As can be seen, a large variation in the fat conten of herring solild side streams and in its 5% salting brine was noticable which reflects the seasonal change in herring fat content. Also, a wide range was found in the level of lipid oxidation paramters (PV and TBARS) and microbial load of herring soild side streams which reflects the large variation in the quality of side streams from different batches of herring experienced different time onboard or in the factory before or after processing. These varitation should be considered in planning valorization of the side streams. Also, herring liquid side streams showed a large variation in their protein content and had a relatively high PV and TBARS despit their low protein and fat content.

Table 4.3.1, Crude compotation, lipid oxidation, microbial quality and TVB-N of solid and liquid side streams of herring (*Clupea harengus*) generated in Scandic Pelagic Ellös AB. Note that the table comprises data from numerous different samplings, which for process waters also comprises variations in the incubation time together with the herring, and sometimes also the specific herring cut (i.e. gutted, filleted or pieces of fillets). When data from numerous samplings are shown, we have chosen to give a range rather than an average value. Average value ± SD is only given when data is from a single batch. All data are from non-stored samples.

Partner	Parameter	Solid side streams		Liquid side streams					
		All parts	Without gut	Refrigerated sea water (RSW)	Filleting water	Storage water	3% salting brine	5% salting brine	13% salting brine
Chalmers	Protein (g/100g wet weight)	11.39 - 14.95	17.57 ± 0.63	0.05-0.3	0.19 – 0.39	0.10 – 0.58	0.5 – 1.3	0.5 – 1.2	0.72 – 1.4
	Fat (g/100g wet weight)	3.07 - 17.85	9.31 ± 0.48	0.3 -0.5	0.08 – 0.15*	0.2 – 0.3 *	0.3 - 0.4	0.8 -4.4	0.3 ± 0,0
	Dry matter (g/100g wet weight)	22.97 - 33.30	27.77 ± 0.87	1.1 - 2.5	0.4 ± 0.0	2.8 - 3.8	3.4 – 4.7	5.8 - 6.2	5.0 – 8.4
	Ash (g/100g wet weight)	2.69 – 5.75	4.03± 0.17	-	-	-	-	-	-
	Peroxide Value (PV) (µmol peroxide/kg wet weight)	20.50 - 113.42[a]	30.00 ± 1.25 [b]	-	-	-	260 ± 31.5	1063 ± 98.2	497 ± 45.8
	TBARS (µmol TBARS/kg wet weight)	7.34 - 28.46 [a]	4.00 ± 0.32[b]	-	-	-	64.4 ± 4.6	50.1 ± 1.4	40.0 ± 3.3
	Total Microbial Count (log CFU/g wet weight)	3.63 - 5.8[a] 3.3-6.9[b]	4.2 - 4.95[b]	-	-	-	-	7.1 ± 0.06	-
	TVB-N (mg N/ 100g wet weight)	5.12 ± 0.06	-	2.8 – 10.8	-	10.8 – 35.1	10.5 - 12.5	4.5 – 22.3	-
	Total amount of heme (µmol/100g wet weight)	67.44 ± 0.30	87.33 ± 2.20	-	-	-	-	-	-
	Ionic strength (Na Cl equivalent, %)	-	-	2.9 ± 0.0	0.09 ± 0.00	-	1.9 ± 0.0	3.7 ± 0.1	9.2 ± 0.5

*Data are based on analyses of total fatty acid content

[a]In house analyses

[b] Analyses done at Synlab

Results on crude composition and oxidative quality of cod solid side stream is shown in Table 4.3.2. As can be seen, different side streams showed a big difference in the content of protein and fat. Cod frame and head as a lean fish can be a good source of protein. Regarding the very high fat content of viscera (22% wet weight), it can be an interesting source for extraction of both protein and especially fat. Also, a large variation in the levels of PV and TBARS among different side streams was noticeable which should be considered when planning for valorization of these side streams or when designing stabilization technologies in WP 2. It seems that cod head is more sensitive side stream to lipid oxidation compared with its frame and viscera.

Table 4.3.2, Crude composition and lipid oxidation parameters of solid and liquid side streams of cod (*Gadus morhua*) samples targeted in WASEABI. Data are presented as mean ± SD for solid side streams.

Partner	Species	Parameter	Cod solid side-streams (RG_O19)			Process water (Dry/wet salted cod)			
			Frame n = 6	Head n = 6	Viscera n = 6	3	4	14	15
DTU	Cod	Protein (g/100g wet weight)	15.30 ± 0.67	13.64 ± 0.56	10.26 ± 0.68	0.95	0.88	0.58	0.84
		Fat (g/100g wet weight)	1.25 ± 0.08	5.60 ± 0.46	22.5 ± 5.07				
		Dry matter (g/100g wet weight)	23.20 ± 1.83	23.36 ± 1.63	34.93 ± 5.28	13.17	2.97	0.75	1.15
		Ash (g/100g wet weight)	6.07 ± 0.31	4.23 ± 0.44	0.98 ± 0.17	11.75	2.00	0.18	0.30
		Salt (g/ 100g wet weight)				10.75	1.97	0.08	0.13
		Peroxide Value (PV) (meq. peroxide/kg oil)	1.45 ± 0.26	25.98 ± 4.15	0.37 ± 0.07				
		TBARS (µmol malonaldehyde/kg wet weight)	5.87 ± 3.68	64.63 ± 13.00	54.15 ± 17.04				
		Free fatty acids (g/100 g fat)	21.83 ± 3.18	8.76 ± 0.69	6.55 ± 0.69				
		α-tocopherol (µg/ g wet weight)	15.43 ± 2.72	n.d.	88.79 ± 7.52				

Results on crude composition and microbial quality of mussel cooking water and shell are summarized in Table 4.3.3 and Table 4.3.4. Both side streams show a good level of hygiene considering their low microbial load. High level of ash in both cooking water and shell which surpass the amount of protein is something which should be considered when planning for valorization of side streams for protein recovery or peptide production.

Table 4.3.3. Crude composition, microbial quality, salinity, and COD of liquid and solid side streams of mussel cooking water.

Partner	Species/side stream	Parameter	Results
AZTI	Mussel cooking waters	Protein (g/100g wet weight)	0.65
		Fat (g/100g wet weight)	ND
		Dry matter (g/100g wet weight)	4.26
		Ash (g/100g wet weight)	1.75
		Microbial Analysis	
		Salmonella spp (Inv/25 g wet weight)	ND
		Listeria monocytogenes (Inv/25 g wet weight)	ND
		Aerobic mesophylic (ufc/g wet weight)	4.0E+02
		Enterobacteria (ufc/g wet weight)	< 10
		Escherichia coli (ufc/g wet weight)	< 10
		Salinity (chloride g/L)	13.4
		BOD	-
		COD (mg/L)	22.400

ND: non determined. Fat content was expected less than 0.001%, estimation based in previous analysis of the processing waters of Pescados Marcelino.

Table 4.3.4. Crude composition, microbial quality, salinity, and COD of liquid and solid side streams of mussel cooking water. Data are presented as range (min-max) where multiple measurements have been done.

AZTI	Mussel shells	Parameter	AZTI	Bibliography (Naik, and Hayes, 2019)
		Protein (g/100g wet weight)	3 – 7	0.1 - 5
		Fat (g/100g wet weight)	ND	
		Dry matter (g/100g wet weight)	93.1 - 94.9	
		Ash (g/100g wet weight)	91 - 95	95 - 99
		Chloride (g/100g wet weight)	0.158	
		Cd (mg/kg wet weight)	<0.10	
		Hg (µg/kg wet weight)	<0.10	
		Pb (mg/kg wet weight)	0.65	
		As (µg/kg wet weight)	<0.30	

ND: non determined.

Results on the content of macro and micronutrients in different salmon side streams are summarized in table 4.3.5. As can be seen, all the side streams can be a good source for extraction of both protein and n-3 poly unsaturated fatty acids. Also, salmon skin can be a very rich source of marine collagens. All side streams contained a very low amounts of heavy metals. However, a big variation is some of the parameters measured in different batches of side streams or measured at Chalmers and at AZTI is something which should be considered in planning for valorisation of the side streams and a larger number of samples and analysis are needed to have a robust conclusion about the content of valuable compounds in each side streams.

Table 4.3.5. Macro and micronutrient composition and content of heavy metals of salmon (*Salmo salar*) solid side streams (mean ± SD n=2 and 4).

Partner	Parameters	Salmon solid side stream				
		Heads	Skins	Trimmings	Backbones	
AZTI					AZTI	CTH
	Protein (g/100g wet weight)	14.73 ± 1.69	18.87 ± 6.58	14.72 ± 2.10	18.52 ± 7.63	14.55 ± 0.39
	Fat (g/100g wet weight)	21.64 ± 1.28	22.37 ± 6.82	29.62 ± 5.67	24.21 ± 1.13	21.88 ± 0.05
	Dry matter (g/100g wet weight)	38.91 ± 1.13	51.99 ± 2.15	46.37 ± 3.49	48.78 ± 1.73	42.05± 0.11
	Ash (g/100g wet weight)	3.83 ± 0.48	1.14 ± 0.22	1.34 ± 0.48	7.55 ± 0.34	11.93 ± 0.19
	Collagen (g/100g wet weight)	3.20 ± 0.47	20.65 ± 0.82	1.04 ± 0.17	4.50 ± 0.20	
	Ca (g/kg wet weight)	12.723± 0.016			19.45 ± 5.73	3.556± 329
	Fe (mg/kg wet weight)	10.95 ± 0.49			3.6- ND	7.65 ± 0.27
	P (g/kg wet weight)	5.979 ± 1.389			8.69 ± 2.85	
	Zn (mg/kg wet weight)	83.00 ± 39.60			51.85 ± 26.66	5.81 ± 0.63
	Fatty acid profile	In % of total fatty acids				
	EPA+DHA	13.27 ± 1.47	13.57 ± .0.01	13.35 ± 1.88	13.50 ± 0.38	4.7 ± 0.4
	n-3	29.05 ± 2.78	30.10 ± 0.27	28.64 ± 4.50	29.78 ± 0.45	7.3 ± 0.6

	Saturated	30.02 ± 0.03	27.86 ± 0.23	24.21 ± 5.68	27.64 ± 2.27	92.4± 5.5
	Monounsaturated	33.01 ± 1.51	32.47 ± 0.30	40.19 ± 11.80	34.62 ± 4.75	
	Polyunsaturated	36.78 ± 1.75	39.53 ± 0.34	35.09 ± 6.01	37.43 ± 2.24	35.5 ± 2.8
	Trans	0.19 ± 0.27	0.13 ± 0.19	0.52 ± 0.1	0.31 ± 0.24	-
	Heavy metals					
	Cd (mg/kg wet weight)	<0.25	<0.25	<0.25	<0,25	
	Hg (mg/kg wet weight)	< 0.05	< 0.05	< 0.05	0,05	
	Pb (mg/kg wet weight)	< 0.01	< 0.01	< 0.01	< 0,01	
	As (mg/kg wet weight)	< 0.2	< 0.2	< 0.2	< 0.2	

(1) Fabiola Bubel et al. 2015. Open Chem., 2015; 13: 1333–1340

Table 4.3.6. Crude composition of whole fish discard hake (*Merluccius merluccius*) under Minimum Conservation Reference Size (MCRS). Data are shown as mean ± SD (n=3)

Partner	Parameters	Hake *Merluccius merluccius*
AZTI	Moisture (g/100 g wet weight)	79.83 ± 0.39
	Ash (g/100 g wet weight)	3.05 ± 0.22
	Fat (g/100 g wet weight)	0.85 ± 0.08
	Protein (g/100 g wet weight)	15.91 ± 0.57

Table 4.3.7. Fatty acid profile Hake (*Merluccius merluccius*). In % of total fatty acids (2020 sample n=2).

EPA+DHA	2.51 ± 0.39
Saturated	68.20 ± 4.61
Monounsaturated	25.28 ± 4.80
Polyunsaturated	3.78 ± 0.39
Trans FA	2.74 ± 0.58

5 Conclusion

Although a limited number of seafood industries answered the questionnaire developed for this activity, the information provided was valuable for the analysis and aligned with the objective of this report. The participating industries are representative of a variety of raw materials and processes, providing a broad overview of the current situation.

According to the results found trough the online questionnaire, 13 % of the companies already use their side streams for food applications. Solid side streams are already sorted and stored separately in 63% of the companies, but only handled in a food grade manner in 25% of the participating companies. More than 88% of companies even do not separate their liquid side streams and only 50% of the companies do some pre-treatment on their side streams in house.

On the other hand, the main hurdle and bottlenecks identified, that hinder valorisation of side-streams, are lack of technology, space and personnel, as well as the lack of market for the final products.

Generally, there was a large variation in the composition and quality of the different side-streams from the same raw material, which must be taken into consideration when valorising it to new ingredients.

Finally, the full and detailed data treatment, discussions and state-of-the art will be later published in scientific journals.

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7 Appendix

The full questionnaire:

Survey description

Currently, aquatic side-streams and by-catchs are going to low value applications or in worse cases are even treated as waste. With your help WaSeaBi wants to change that! The purpose of this survey is to obtain help in identifying and characterizing side-streams, as well as to target hurdles and bottlenecks that prevent further exploitation of side-streams and by-catches. The knowledge obtained in this survey will be used to develop storage solutions, sorting technologies and decision tools, that will secure an efficient and sustainable supply system for by-catches and side-streams from aquaculture, fisheries, and the aquatic processing industries.

We would like to highlight that your answers will be totally confidential.

We really appreciate your inputs.

Thank you in advance!

1 Company details:

1.1 Company name

1.2 Address

1.3.1 Your contact informations; Name

1.3.2 Your contact informations e-mail

1.4 Number of Employees (administration + production):

(1) ❑ <25
(2) ❑ 25-49
(3) ❑ 50-100
(5) ❑ 101-250
(6) ❑ >205

2 Main Company Activity

Processing line and products:

2.1 Type of raw materials and processes.

Mark the raw materials and describe the processes in the textbox (salting, filleting, freezing, cooking, canning...)

(1) ❑ Shrimps
(2) ❑ Cod
(3) ❑ Trout
(4) ❑ Mussels
(5) ❑ Salmon
(6) ❑ Herring
(7) ❑ Other

3 Solid side-stream treatment section

3.1 Are different solid side-streams already sorted or stored separately?

(1) ❑ Yes
(2) ❑ No

3.1.0 Could this solid side-stream be sorted separately?

(1) ❑ Yes
(2) ❑ No

3.2.1 Select type of side-stream generated during processing of SHRIMPS.

(1) ❑ Heads
(2) ❑ Trimmings
(3) ❑ Viscera
(4) ❑ Tails
(7) ❑ Shells
(8) ❑ Meat
(11) ❑ Roe
(13) ❑ Other 1, (describe)
(14) ❑ Other 2, (describe)

3.2.2 Select type of side-stream generated during processing of COD.

(1) ❑ Frames
(2) ❑ Heads
(3) ❑ Skin
(4) ❑ Trimmings
(5) ❑ Viscera
(6) ❑ Tails
(8) ❑ Meat
(9) ❑ Back bones
(10) ❑ Liver
(11) ❑ Roe
(12) ❑ Milt
(13) ❑ Other, describe 1 _____
(14) ❑ Other, describe 2 _____

3.2.3 Select type of side-stream generated during processing of TROUT.

(1) ❑ Frames
(2) ❑ Heads
(3) ❑ Skin
(4) ❑ Trimmings
(5) ❑ Viscera
(6) ❑ Tails
(8) ❑ Meat
(9) ❑ Back bones
(10) ❑ Liver
(11) ❑ Roe
(12) ❑ Milt
(13) ❑ Other, describe 1 _____
(14) ❑ Other, describe 2 _____

3.2.4 Select type of side-stream generated during processing of MUSSELS.

(1) ❑ Trimmings
(2) ❑ Viscera
(4) ❑ Shells
(5) ❑ Meat
(6) ❑ Roe
(7) ❑ Other, describe 1 _____
(8) ❑ Other, describe 2 _____

3.2.5 Select type of side-stream generated during processing of SALMON.

(1) ❑ Frames
(2) ❑ Heads
(3) ❑ Skin
(4) ❑ Trimmings
(5) ❑ Viscera
(6) ❑ Tails
(8) ❑ Meat
(9) ❑ Back bones
(10) ❑ Liver
(11) ❑ Roe
(12) ❑ Milt
(13) ❑ Other, describe 1 _____
(14) ❑ Other, describe 2 _____

3.2.6 Select type of side-stream generated during processing of OTHER.

(1) ❑ Frames
(2) ❑ Heads
(3) ❑ Skin
(4) ❑ Trimmings
(5) ❑ Viscera
(6) ❑ Tails
(7) ❑ Shells
(8) ❑ Meat
(9) ❑ Back bones
(10) ❑ Liver
(11) ❑ Roe
(12) ❑ Milt
(13) ❑ Other, describe 1 _____
(14) ❑ Other, describe 2 _____

3.3.1a Information for SHRIMPS solid side-stream HEADS

a:

Production quantity for (0-? tn) January

Production quantity for (0-? tn) February

Production quantity for (0-? tn) March

Production quantity for (0-? tn) April

Production quantity for (0-? tn) May

Production quantity for (0-? tn) June

Production quantity for (0-? tn) July

Production quantity for (0-? tn) August

Production quantity for (0-? tn) September

Production quantity for (0-? tn) October

Production quantity for (0-? tn) November

Production quantity for (0-? tn) December

3.3.1b Information for SHRIMPS solid side-stream HEADS

Handling and storage conditions

b:

Labour days pr week (mean)

Refrigeration/frozen (ad temperature)

Ambient temperature (ad temperature)

Please describe the steps in proces line where the side-stream is generated

Is it mixed with other side-streams?

Time of preservation on-site (hrs)

3.3.2a Infomations for SHRIMPS solid side-stream TRIMMINGS

3.3.2b Infomations for SHRIMPS solid side-stream TRIMMING

Handling and storage conditions

3.3.3a Infomations for SHRIMPS solid side-stream VISCERA

3.3.3b Infomations for SHRIMPS solid side-stream VISCERA

Handling and storage conditions

3.3.4a Infomations for SHRIMPS solid sidest-ream TAILS

3.3.4b Infomations for SHRIMPS solid side-stream TAILS

Handling and storage conditions

3.3.5a Infomations for SHRIMPS solid side-stream SHELLS

3.3.5b Infomations for SHRIMPS solid side-stream SHELLS

Handling and storage conditions

3.3.6a Infomations for SHRIMPS solid sides-tream MEAT

3.3.6b Infomations for SHRIMPS solid side-stream MEAT

Handling and storage conditions

3.3.7a Infomations for SHRIMPS solid side-stream ROE

3.3.7b Infomations for SHRIMPS solid side-stream ROE

Handling and storage conditions

3.3.8a Infomations for SHRIMPS solid side-stream OTHER 1

3.3.8b Infomations for SHRIMPS solid side-stream OTHER 1

Handling and storage conditions

3.3.9a Infomations for SHRIMPS solid side-stream OTHER 2

3.3.9b Infomations for SHRIMPS solid side-stream OTHER 2

Handling and storage conditions

3.4.1b Infomations for COD solid side-stream FRAMES

Handling and storage conditions

3.4.2a Infomations for COD solid side-stream HEADS

3.4.2b Infomations for COD solid side-stream HEADS

Handling and storage conditions

3.4.13a Infomations for COD solid side-stream OTHER 2

3.4.13b Infomations for COD solid side-stream OTHER 2

Handling and storage conditions

3.5.1a Infomations for TROUT solid side-stream FRAMES

3.5.1b Infomations for TROUT solid side-stream FRAMES

Handling and storage conditions

3.5.2b Infomations for TROUT solid side-stream HEADS

Handling and storage conditions

3.5.3b Infomations for TROUT solid side-stream SKIN

Handling and storage conditions

3.5.4b Infomations for TROUT solid side-stream TRIMMINGS

Handling and storage conditions

3.5.5b Infomations for TROUT solid side-stream VISCERA

Handling and storage conditions

3.5.6b Infomations for TROUT solid side-stream TAILS

Handling and storage conditions

3.5.7a Infomations for TROUT solid side-stream MEAT

3.5.7b Infomations for TROUT solid side-stream MEAT

Handling and storage conditions

3.5.8a Infomations for TROUT solid side-stream BACK BONES

3.5.8b Infomations for TROUT solid side-stream BACK BONES

Handling and storage conditions

3.5.9a Infomations for TROUT solid side-stream LIVER

3.5.9b Infomations for TROUT solid side-stream LIVER

Handling and storage conditions

3.5.10a Infomations for TROUT solid side-stream ROE

3.5.10b Infomations for TROUT solid side-stream ROE

Handling and storage conditions

3.5.11a Infomations for TROUT solid side-stream MILT

3.5.11b Infomations for TROUT solid side-stream MILT

Handling and storage conditions

3.5.12a Infomations for TROUT solid side-stream OTHER 1

3.5.12b Infomations for TROUT solid side-stream OTHER 1

Handling and storage conditions

3.5.13a Infomations for TROUT solid side-stream OTHER 2

3.5.13b Infomations for TROUT solid side-stream OTHER 2

Handling and storage conditions

3.6.1a Infomations for MUSSELS solid side-stream FRAMES

3.6.1b Infomations for MUSSELS solid side-stream FRAMES

Handling and storage conditions

3.6.2a Infomations for MUSSELS solid side-stream VISCERA

3.6.2b Infomations for MUSSELS solid side-stream VISCERA

Handling and storage conditions

3.6.3a Infomations for MUSSELS solid side-stream SHELLS

3.6.3b Infomations for MUSSELS solid side-stream SHEELS

Handling and storage conditions

3.6.4b Infomations for MUSSELS solid side-stream MEAT

Handling and storage conditions

3.6.5a Infomations for MUSSELS solid side-stream ROE

3.6.5b Infomations for MUSSELS solid side-stream ROE

Handling and storage conditions

3.6.6a Infomations for MUSSELS solid side-stream OTHER 1

3.6.6b Infomations for MUSSELS solid side-stream OTHER 1

Handling and storage conditions

3.6.7a Infomations for MUSSELS solid side-stream OTHER 2

3.6.7b Infomations for MUSSELS solid side-stream OTHER 2

Handling and storage conditions

3.7.1a Infomations for SALMON solid side-stream FRAMES

3.7.1b Infomations for SALMON solid side-stream FRAMES

Handling and storage conditions

3.7.2a Infomations for SALMON solid side-stream HEADS

3.7.2b Infomations for SALMON solid side-stream HEADS

Handling and storage conditions

3.7.3a Infomations for SALMON solid side-stream SKIN

3.7.3b Infomations for SALMON solid side-stream SKIN

Handling and storage conditions

3.7.4a Infomations for SALMON solid side-stream TRIMMINGS

3.7.4b Infomations for SALMON solid side-stream TRIMMINGS

Handling and storage conditions

3.7.5a Infomations for SALMON solid side-stream VISCERA

3.7.5b Infomations for SALMON solid side-stream VISCERA

Handling and storage conditions

3.7.6a Infomations for SALMON solid sidestream TAILS

3.7.6b Infomations for SALMON solid side-stream TAILS

Handling and storage conditions

3.7.7a Infomations for SALMON solid side-stream MEAT

3.7.7b Infomations for SALMON solid side-stream MEAT

Handling and storage conditions

3.7.8a Infomations for SALMON solid side-stream BACK BONES

3.7.8b Infomations for SALMON solid side-stream BACK BONES

Handling and storage conditions

3.7.9a Infomations for SALMON solid side-stream LIVER

3.7.9b Infomations for SALMON solid side-stream LIVER

Handling and storage conditions

3.7.10a Infomations for SALMON solid side-stream ROE

3.7.10b Infomations for SALMON solid side-stream ROE

Handling and storage conditions

3.7.11a Infomations for SALMON solid side-stream MILT

3.7.11b Infomations for SALMON solid side-stream MILT

Handling and storage conditions

3.7.12a Infomations for SALMON solid side-stream OTHER 1

3.7.12b Infomations for SALMON solid side-stream OTHER 1

Handling and storage conditions

3.7.13a Infomations for SALMON solid side-stream OTHER 2

3.7.13b Infomations for SALMON solid side-stream OTHER 2

Handling and storage conditions

3.8.1a Infomations for HERRING solid side-stream FRAMES

3.8.1b Infomations for HERRING solid side-stream FRAMES

Handling and storage conditions

3.8.2a Infomations for HERRING solid side-stream HEADS

3.8.2b Infomations for HERRING solid side-stream HEADS

Handling and storage conditions

3.8.3a Infomations for HERRING solid side-stream SKIN

3.8.3b Infomations for HERRING solid side-stream SKIN

Handling and storage conditions

3.8.4b Infomations for HERRING solid side-stream TRIMMINGS

Handling and storage conditions

3.8.5a Infomations for HERRING solid side-stream VISCERA

3.8.5b Infomations for HERRING solid side-stream VISCERA

Handling and storage conditions

3.8.6a Infomations for HERRING solid side-stream TAILS

3.8.6b Infomations for HERRING solid side-stream TAILS

Handling and storage conditions

3.8.8a Infomations for HERRING solid side-stream MEAT

3.8.8b Infomations for HERRING solid side-stream MEAT

Handling and storage conditions

3.8.9a Infomations for HERRING solid side-stream BACK BONES

3.8.9b Infomations for HERRING solid side-stream BACK BONES

Handling and storage conditions

3.8.10a Infomations for HERRING solid side-stream LIVER

3.8.10b Infomations for HERRING solid side-stream LIVER

Handling and storage conditions

3.8.11a Infomations for HERRING solid sidestream ROE

3.8.11b Infomations for HERRING solid side-stream ROE

Handling and storage conditions

3.8.12a Infomations for HERRING solid side-stream MILT

3.8.12b Infomations for HERRING solid side-stream MILT

Handling and storage conditions

3.8.13a Infomations for HERRING solid side-stream OTHER 1

3.8.13b Infomations for HERRING solid side-stream OTHER 1

Handling and storage conditions

3.8.14a Infomations for HERRING solid side-stream OTHER 2

3.8.14b Infomations for HERRING solid side-stream OTHER 2

Handling and storage conditions

3.9.1a Infomations for OTHER solid side-stream FRAMES

3.9.1b Infomations for OTHER solid side-stream FRAMES

Handling and storage conditions

3.9.2a Infomations for OTHER solid side-stream HEADS

3.9.2b Infomations for OTHER solid side-stream HEADS

Handling and storage conditions

3.9.3a Infomations for OTHER solid side-stream SKIN

3.9.3b Infomations for OTHER solid side-stream SKIN

Handling and storage conditions

3.9.4b Infomations for OTHER solid side-stream TRIMMINGS

Handling and storage conditions

3.9.5a Infomations for OTHER solid side-stream VISCERA

3.9.5b Infomations for OTHER solid side-stream VISCERA

Handling and storage conditions

3.9.6a Infomations for OTHER solid side-stream TAILS

3.9.6b Infomations for OTHER solid side-stream TAILS

Handling and storage conditions

3.9.7a Infomations for OTHER solid side-stream SHELLS

3.9.7b Infomations for OTHER solid side-stream SHELLS

Handling and storage conditions

3.9.8a Infomations for OTHER solid side-stream MEAT

3.9.8b Infomations for OTHER solid side-stream MEAT

Handling and storage conditions

3.9.9a Infomations for OTHER solid side-stream BACK BONES

3.9.9b Infomations for OTHER solid side-stream BACK BONES

Handling and storage conditions

3.9.10a Infomations for OTHER solid side-stream LIVER

3.9.10b Infomations for OTHER solid side-stream LIVER

Handling and storage conditions

3.9.11a Infomations for OTHER solid sidestream ROE

3.9.11b Infomations for OTHER solid side-stream ROE

Handling and storage conditions

3.9.12a Infomations for OTHER solid side-stream MILT

3.9.12b Infomations for OTHER solid side-stream MILT

Handling and storage conditions

3.9.13a Infomations for OTHER solid side-stream OTHER 1

3.9.13b Infomations for OTHER solid side-stream OTHER 1

Handling and storage conditions

3.9.14a Infomations for OTHER solid side-stream OTHER 2

3.9.14b Infomations for OTHER solid side-stream OTHER 2

Handling and storage conditions

3.9 Type of current (treatment/) application of side-stream (you can write or chose):

(1) ❑ Fish meal or feed production
(2) ❑ Meat separation
(3) ❑ Food application
(4) ❑ Landfilling
(5) ❑ Biogas
(6) ❑ Composting
(7) ❑ Fresh feed
(8) ❑ Stabilizing on site
(9) ❑ Pouring into sea
(10) ❑ Other _____

3.10

Income from each kg of by-product if any (€/kg):

Km to the destination place where by-product is value-added (km):

Cost for the by-product's final treatment (€/kg):

3.11 Are the side-streams handled in a food grade manner?

(1) ❑ Yes
(2) ❑ No

3.12 Could it be handled in a food grade manner?

3.13 Do you have any compositional information for the side-streams (i.e. what they contain)?

(1) ❑ No
(2) ❑ Yes, Fat content
(3) ❑ Yes, Protein content
(4) ❑ Yes, Moisture content
(5) ❑ Yes, Ash
(6) ❑ Other _____
(7) ❑ If yes, can the project get access to the data? (yes or no) _____

3.14 If you do not valorize your fish/shellfish side-streams, what hurdles and bottlenecks hinders such activities in your company?

(1) ❑ Lack of processing technology
(2) ❑ Lack of space/personnel
(3) ❑ Lack of market for final products
(4) ❑ Lack of financial resources
(5) ❑ Lack of sanitary handling
(6) ❑ Too low volume of the generated side streams to make investments profitable
(7) ❑ Regulations and Legislations
(8) ❑ Poor quality of the side streams
(9) ❑ Not enough knowledge on different possibilities for valorization
(10) ❑ Other _____

4 Liquid side-streams

4.1 Are different liquid side-streams already sorted or stored separately?

(1) ❑ Yes
(2) ❑ No

4.2 What type of liquid side-streams are generated in the company?
(you can tick off more than one box)

(1) ❑ Filleting water
(2) ❑ Marinades
(3) ❑ Cooking water
(4) ❑ Slaughter tank water
(5) ❑ Blood
(6) ❑ Refrigerated sea water
(7) ❑ Pre salting brines
(8) ❑ Peeling water
(9) ❑ Other 1 _____
(10) ❑ Other 2 _____

4.3 Annual volume of Filleting water(m3/year)

4.3.1 Annual volume of Marinades (m3/year)

4.3.2 Annual volume of Cooking water(m3/year)

4.3.3 Annual volume of Slaughter tank water(m3/year)

4.3.4 Annual volume of Blood(m3/year)

4.3.5 Annual volume of Refrigerated sea water (m3/year)

4.3 .6 Annual volume of Pre salting brine (m3/year)

4.3.7 Annual volume of Peeling water (m3/year)

4.3.8 Annual volume of Other (m3/year)

4.5 Treated in house?

(1) ❑ Yes (if yes, cost for in house treatment) _____

(2) ❑ No; distance to location (km): _____

4.6 Type of current (treatment/) application of liquid side-stream (you can write or chose):

(1) ❑ Discharge directly in the sea

(2) ❑ Precleaning

(3) ❑ Chemical flocculation

(4) ❑ Handling municipal treatment plant

(5) ❑ Other _____

4.7 Do you have any compositional information for the side-streams?

(1) ❑ No

(2) ❑ Yes, Fat content

(3) ❑ Yes, Protein content

(4) ❑ Yes, Dry matter

(5) ❑ Yes, BOD

(6) ❑ Yes, COD

(7) ❑ Yes, Total bacterial count

(8) ❑ Yes, Salinity

(9) ❑ Other _____

(10) ❑ If yes, can the project get access to the data (yes or no) _____

4.7 If you do not valorize your liquid side-streams in any way, what hurdles and bottlenecks hinders such activities in your company?

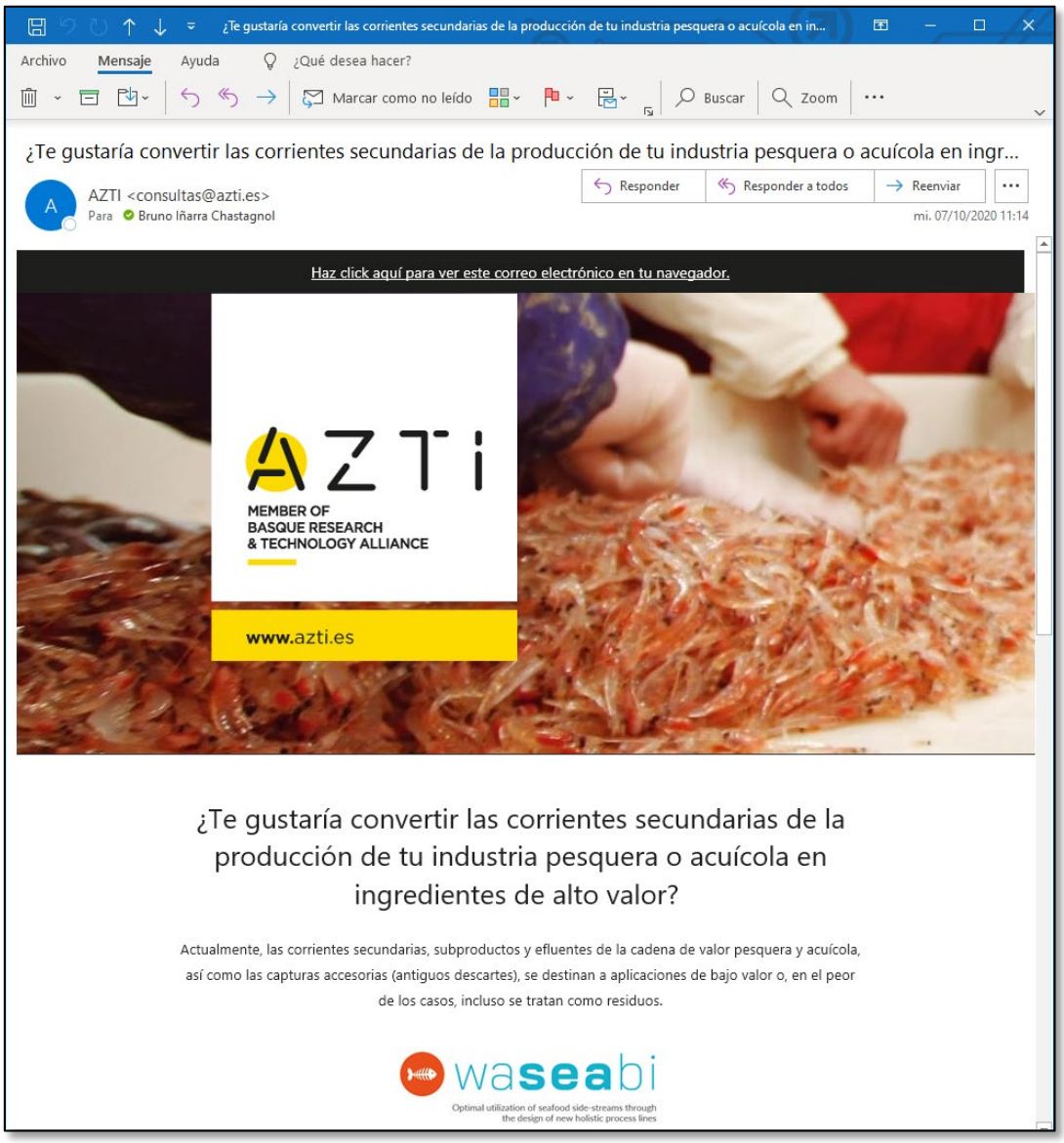
(1) ❑ Lack of processing technology
(2) ❑ Lack of space/personnel
(3) ❑ Lack of market for final products
(4) ❑ Lack of financial resources
(5) ❑ Lack of sanitary handling
(6) ❑ Too low volume of the generated side streams to make investments profitable
(7) ❑ Regulations and Legislations
(8) ❑ Poor quality of the side streams
(9) ❑ Not enough knowledge on different possibilities for valorization
(10) ❑ Other _____

4.9 What kind of help do you need to start valorizing your solid/liquid side streams?

5 Additional comments

Thank you for your time!

AZTI's mail to industries.




¡Con tu ayuda en el proyecto WaSeaBi queremos cambiar eso!
El propósito de este estudio es obtener información para identificar y caracterizar las corrientes secundarias, así como los obstáculos y cuellos de botella que impiden una mayor explotación de estas corrientes secundarias y capturas accesorias.
Los conocimientos obtenidos en este estudio se utilizarán para desarrollar soluciones de almacenamiento, tecnologías de clasificación y herramientas de decisión, que aseguren un sistema de suministro eficiente y sostenible que permita la valorización de estas capturas accesorias, corrientes secundarias de la pesca, acuicultura e industrias de transformación de pescado y productos acuáticos.
COMPLETA LA ENCUESTA
AQUÍ
Toda la información aportada será tratada totalmente como confidencial y empleada solo dentro del marco del proyecto WaSeaBi.
Muchas gracias por tu colaboración.
BBI JU
Bio-based Industries Consortium
Horizon 2020 European Union Funding for Research & Innovation
This project has received funding from the Bio Based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 837726. The JU receives support from the European Union's Horizon 2020 research and innovation programme and the Bio Based Industries Consortium. This output reflects only the author's view and the JU cannot be held responsible for any use that may be made of the information it contains.
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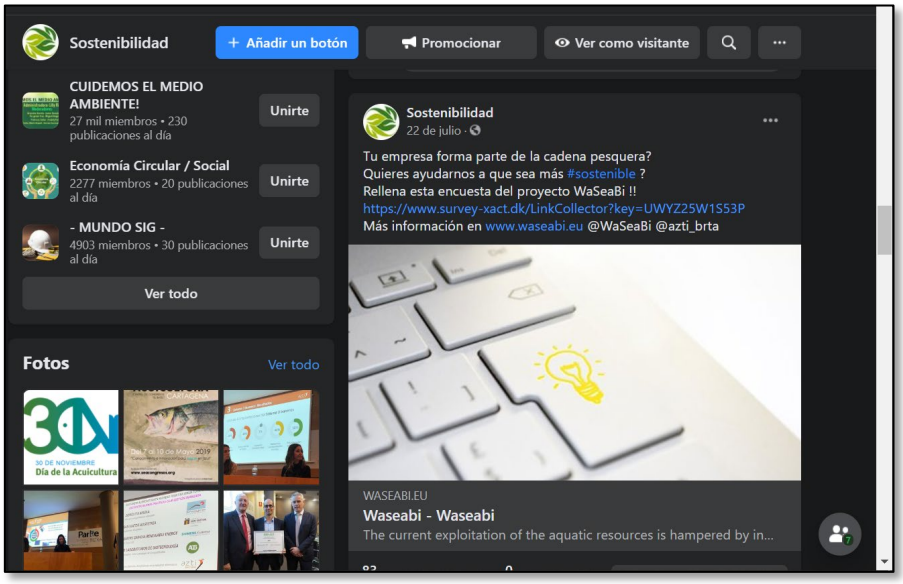
Sostenibilidad
+ Añadir un botón
Promocionar
Ver como visitante
CUIDEMOS EL MEDIO AMBIENTE!
27 mil miembros • 230 publicaciones al día
Unirte
Economía Circular / Social
2277 miembros • 20 publicaciones al día
Unirte
- MUNDO SIG -
4903 miembros • 30 publicaciones al día
Unirte
Ver todo
Fotos
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Sostenibilidad
22 de julio ·
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Quieres ayudarnos a que sea más #sostenible ?
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