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Global Standard for Responsible Supply of Marine Ingredients

Fishery Assessment Methodology and Template Report V2.0

Fishery Under Assessment	**Edible crab *Cancer pagurus*, Ireland**
Date	**May 2019**
Assessor	**Jim Daly**

Application details and summary of the assessment outcome				
Name: Pelagia – Killybegs				
Address:				
Country: Ireland		**Zip:**		
Tel. No.:		**Fax. No.:**		
Email address:		**Applicant Code**		
Key Contact:		**Title:**		
Certification Body Details				
Name of Certification Body:		**SAI Global Ltd**		
Assessor Name	**Peer Reviewer**	**Assessment Days**	**Initial/Surveillance/Re-approval**	**Whole fish/ By-product**
Jim Daly	Virginia Polonio	0.5	SURV 1	By-product
Assessment Period	2018			

Scope Details	
Management Authority (Country/State)	Ireland, EU
Main Species	Edible crab *Cancer pagurus*
Fishery Location	Ireland
Gear Type(s)	Pots and creels
Outcome of Assessment	
Overall Outcome	PASS
Clauses Failed	NONE
Peer Review Evaluation	Some review in the removals is needed and also in the status of North Irish Sea segment.
Recommendation	PASS

Assessment Determination
This assessment covers assessment units in Irish waters only (Celtic Sea, Southwest Ireland, North Irish Sea) The Marine Institute & the Irish Sea Fisheries Board (BIM, 2014) summarise exploitation status and stock for all assessment units (**Table 2).** On the Irish coast these units are identified from tag return data, distribution of fishing activity and larval distribution. Fishery removals of the species in the fishery under assessment are included in the stock assessment process. Exploitation rates (fishing mortality rates, F) and stock levels (spawning biomass per recruit or spawning stock biomass, SSB) are estimated in assessments reported in relation to reference points or management limits and targets for the stock. The species is considered, in its most recent stock assessment, to have a biomass above the limit reference point (or proxy). In addition to licensing and Minimum Landing Size (MLS) Regulations, EU or national legislation on crabs include bans on landing berried females and soft pre-moult (white crabs) or recently moulted crabs. In certain areas, crabs are taken as by-catch in static gear, such as gill nets. It is difficult to remove them whole from the nets, they are often de-clawed and claws retained. This practice is regulated by EU legislation and local bye-laws. Edible crab is not listed on the IUCN Red List of Threatened Species or CITES appendices (accessed 22.05.19). Edible crab is approved by the assessment team for the production of fishmeal and fish oil under the IFFO-RS v 2.0 by-products standard.
Peer Review Comments
Agree
Notes for On-site Auditor

Species-Specific Results

Category	Species	% landings	Outcome (Pass/Fail)	
Category A			A1	
			A2	
			A3	
			A4	
Category B				
Category C	Edible crab *Cancer pagurus* (Irish stocks)	N/A	PASS	
Category D				

[List all Category A and B species. List approximate total %age of landings which are Category C and D species; these do not need to be individually named here]

HOW TO COMPLETE THIS ASSESSMENT REPORT

This assessment template uses a modular approach to assessing fisheries against the IFFO RS standard.

Whole Fish

The process for completing the template for a **whole fish** assessment is as follows:

1. ALL ASSESSMENTS: Complete the Species Characterisation table, to determine which categories of species are present in the fishery.
2. ALL ASSESSMENTS: Complete clauses M1, M2, M3: Management.
3. IF THERE ARE CATEGORY A SPECIES IN THE FISHERY: Complete clauses A1, A2, A3, A4 for **each** Category A species.
4. IF THERE ARE CATEGORY B SPECIES IN THE FISHERY: Complete the Section B risk assessment for **each** Category B species.
5. IF THERE ARE CATEGORY C SPECIES IN THE FISHERY: Complete clause C1 for **each** Category C species.
6. IF THERE ARE CATEGORY D SPECIES IN THE FISHERY: Complete Section D.
7. ALL ASSESSMENTS: Complete clauses F1, F2, F3: Further Impacts.

A fishery must score a pass in **all applicable clauses** before approval may be recommended. To achieve a pass in a clause, the fishery/species must meet **all** of the minimum requirements.

By-products

The process for completing the template for **by-product raw material** is as follows:

1. ALL ASSESSMENTS: Complete the Species Characterisation table with the names of the by-product species and stocks under assessment. The '% landings' column can be left empty; all by-products are considered as Category C and D.
2. IF THERE ARE CATEGORY C BYPRODUCTS UNDER ASSESSMENT: Complete clause C1 for **each** Category C by-product.
3. IF THERE ARE CATEGORY D BYPRODUCTS UNDER ASSESSMENT: Complete Section D.
4. ALL OTHER SECTIONS CAN BE DELETED. Clauses M1 - M3, F1 - F3, and Sections A and B do not need to be completed for a by-product assessment.

By-product approval is awarded on a species-by-species basis. Each by-product species scoring a pass under the appropriate section may be approved against the IFFO RS Standard.

SPECIES CATEGORISATION

The following table should be completed as fully as the available information permits. Any species representing more than 0.1% of the annual catch should be listed, along with an estimate of the proportion of the catch each species represents. The species should then be divided into Type 1 and Type 2 as follows:

- **Type 1 Species** can be considered the 'target' or 'main' species in the fishery. They make up the bulk of annual landings and are subjected to a detailed assessment.
- **Type 2 Species** can be considered the 'bycatch' or 'minor' species in the fishery. They make up a small proportion of the annual landings and are subjected to relatively high-level assessment.

Type 1 Species must represent 95% of the total annual catch. Type 2 Species may represent a maximum of 5% of the annual catch (see Appendix B).

Species which make up less than 0.1% of landings do not need to be listed (NOTE: ETP species are considered separately). The table should be extended if more space is needed. Discarded species should be included when known.

The 'stock' column should be used to differentiate when there are multiple biological or management stocks of one species captured by the fishery. The 'management' column should be used to indicate whether there is an adequate management regime specifically aimed at the individual species/stock. In some cases it will be

immediately clear whether there is a species-specific management regime in place (for example, if there is an annual TAC). In less clear circumstances, the rule of thumb should be that if the species meets the minimum requirements of clauses A1-A4, an adequate species-specific management regime is in place.

NOTE: If any species is categorised as Endangered or Critically Endangered on the IUCN Red List, or if it appears in the CITES appendices, it **cannot** be approved for use as an IFFO RS raw material. This applied to whole fish as well as by-products.

TYPE 1 SPECIES (Representing 95% of the catch or more)
Category A: Species-specific management regime in place.
Category B: No species-specific management regime in place.

TYPE 2 SPECIES (Representing 5% OF THE CATCH OR LESS)
Category C: Species-specific management regime in place.
Category D: No species-specific management regime in place.

Common name	Latin name	Stock	% of landings	Management	Category
Edible crab	*Cancer pagurus*	Central North Sea, Western Channel, Celtic Sea	N/A	UK & Ireland	C

CATEGORY C SPECIES

In a whole fish assessment, Category C species are those which make up less than 5% of landings, but which are subject to a species-specific management regime. In most cases this will be because they are a commercial target in a fishery other than the one under assessment. In a by-product assessment, Category C species are those which are subject to a species-specific management regime, and are usually targeted species in fisheries for human consumption.

Clause C1 should be completed for **each** Category C species. If there are no Category C species in the fishery under assessment, this section can be deleted. A Category C species does not meet the minimum requirements of clause C1 should be re-assessed as a Category D species.

Species Name		**Edible crab *Cancer pagurus***	
C1	**Category C Stock Status - Minimum Requirements**		
	C1.1	Fishery removals of the species in the fishery under assessment are included in the stock assessment process, OR are considered by scientific authorities to be negligible.	Pass
	C1.2	The species is considered, in its most recent stock assessment, to have a biomass above the limit reference point (or proxy), OR removals by the fishery under assessment are considered by scientific authorities to be negligible.	Pass
		Clause outcome:	**Pass**

Evidence

C1.1:

Assessment Units (**Figure 1**) reflect the spatial scale at which the ICES Working Group on the Biology and Life History of Crabs **(**WGCRAB) believe fisheries data should be aggregated. Assessment Units do not reflect stocks as there is not a consistent approach to defining the latter and insufficient information to properly define stocks at present (ICES, 2010 **R1**):

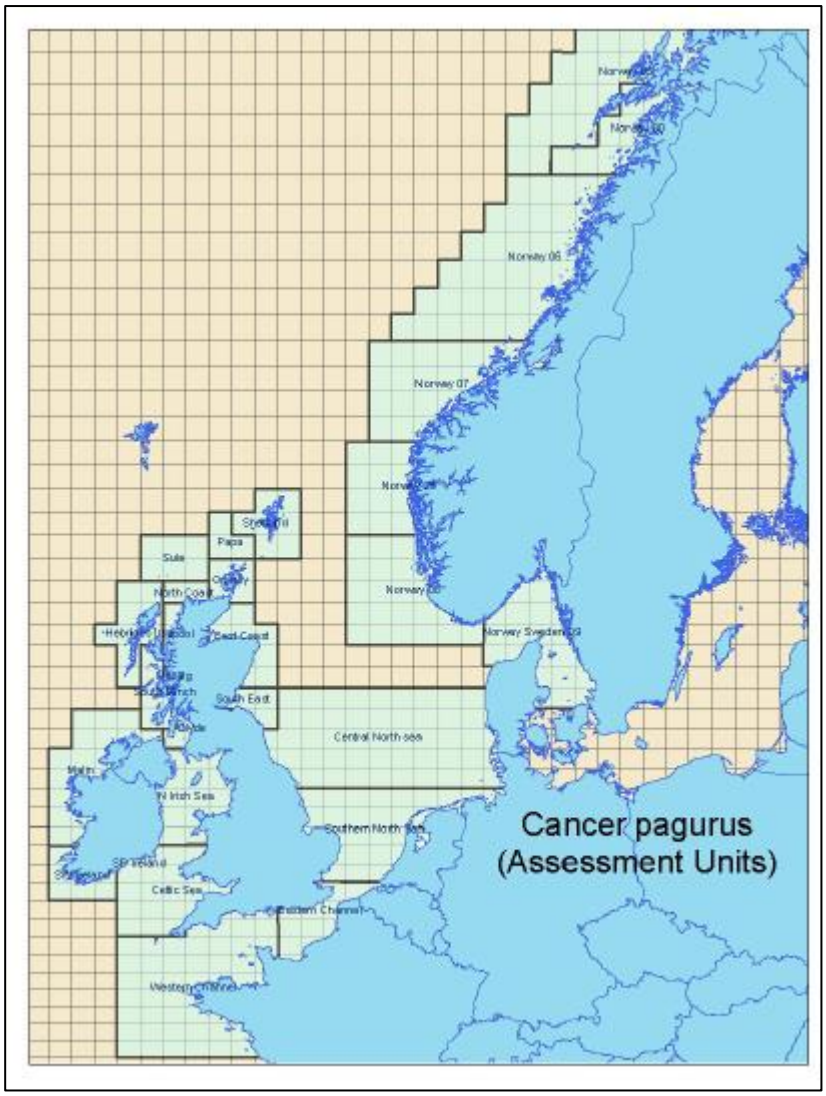

Figure 1. Assessment units for brown crabs fished by vessels from UK, Ireland, France, Channel Islands, Norway and Sweden. Source: ICES, 2010. **R1**

This assessment covers assessment units in Irish waters only (Celtic Sea, Southwest Ireland, North Irish Sea) The Irish fleet is currently divided into 5 segments. Of these five two are broken into sub-segments, namely Polyvalent (including potting) and Specific Segments. The bulk of polyvalent vessels targeting edible crab are between 3-10m in length. These are typical open or half-decked traditional fishing vessels fishing seasonally in coastal waters.

Two main methods for stock assessments are used in combination with ancillary information on biology and minimum size regulations:

Length cohort analysis (LCA):

- Estimates of fishing mortality rate (F) are presented in a Yield per recruit and Biomass per recruit context
- Estimates F and reconstructs the population biomass using landings data

Annual landings of crustaceans and bivalves, excluding *Nephrops* and wild blue mussel (*Mytilus*) seed, which is re-laid for on-growing, during the period 2005-2014, are available for the Irish fleet:

Table 1: Estimates of annual landings (tonnes) and value (€) of crustacean and bivalve shellfish (excl. prawns and mussels) into Ireland 2005-2013 (source: SFPA[1], logbooks). Unit value (per kilo) is from sales note data or other sources **R2**

Scientific Name	Common name	2005	2006	2007	2008	2009	2010	2011	2012	2013	*2014*	2013 (2014 where available)	
												Unit Price	Value
Cancer pagurus	Edible crab	9,527	10,827	9,251	7,640	6,614	8,622	6,372	6,691	**6,510***		€1.49	€9,699,900

[1]Sea Fishery Protection Authority (Ireland's Competent Authority for Seafood Control & Safety)

Ireland did not participate in the 2017 Working Group on crab (**R4**). Landing statistics are provided by the Sea Fishery Protection Authority (SFPA) Ireland's Competent Authority for Seafood Control.

Not all landings will be recorded as there are exemptions from reporting requirements for small scale fisheries and recreational catches.

Commercial removals of the species in the fishery under assessment are included in the stock assessment process, the species passes Clause C1.1.

C1.2:

Stock status is recorded as follows: (**Table 2**):

- **High** = close to or at biomass target reference point,
- **Moderate** = between biomass target and limit reference points,
- **Low** = at or below biomass limit reference point,
- **Stable** = in relation to trends in CPUE.

Trends in stock status indicators are also calculated:
LPUE, DPUE and CPUE (landings, discards, catch per unit effort indicators derived from commercial fleet data). Exploitation rates (fishing mortality rates, F) and stock levels (spawning biomass per recruit or spawning stock biomass, SSB) are also estimated in assessments reported in relation to reference points or management limits and targets for the stock(s).

The Marine Institute & the Irish Sea Fisheries Board BIM (2014) summarise exploitation status and stock status for the relevant stock assessment units (**Table 2**).

Table 2: Edible crab: exploitation status and stock status **R2**

				Exploitation status		Stock status		MLS	
				F (in relation to F_{msy})					
ICES	**Stock Assessment Unit**	**Main Fleets**	Assessment	Male	Female	Male	Female	Male	Female
VII	Western Channel	England, France	LCA	F<Fmsy	F<Fmsy	High	High	140-160	140-150
VII	Eastern Channel	England, France	LCA	F=>Fmsy	F=>Fmsy	Moderate	Moderate	130-140	130-140
VII	Celtic Sea, SE Ireland	Ireland, UK, France	LCA, Trends	Unreported	F=>Fmsy	Unreported	High	130-160	130-150
VII	SW Ireland	Ireland	Trends	Unreported	Unreported	Stable	Stable	130	130
VII, VI	Malin	Ireland, N.Ireland, Scotland	Trends	Unreported	Unreported	Stable	Stable	130	130
VII	N Irish Sea	Ireland, IoM, Wales, England	Trends	Unreported	Unreported	Unreported	Unreported	130	130
VI	Clyde	Northern Ireland, Scotland	LCA per recruit	Unreported	Unreported	Unreported	Unreported	140	140
VI	South Minch	Scotland	LCA per recruit	F>Fmsy	F>Fmsy	Unreported	Unreported	140	140
VI	Mallaig	Scotland	LCA per recruit	Unknown	Unknown	Unreported	Unreported	140	140
VI	Hebrides	Scotland	LCA per recruit	F<Fmsy	F>Fmsy	Unreported	Unreported	140	140
VI	Ullapool	Scotland	LCA per recruit	Unknown	Unknown	Unreported	Unreported	140	140
VI	North Coast	Scotland	LCA per recruit	F<Fmsy	F<Fmsy	Unreported	Unreported	140	140
VI	Sule	Scotland	LCA per recruit	F=Fmsy	F>Fmsy	Unreported	Unreported	140	140
IV	Orkney	Scotland	LCA per recruit	F>Fmsy	F>Fmsy	Unreported	Unreported	140	140
IV	Papa	Scotland	LCA per recruit	F<Fmsy	F<Fmsy	Unreported	Unreported	140	140
IV	Shetland	Shetland	LCA per recruit	F=Fmsy	F<Fmsy	Unreported	Unreported	140	140
IV	East Coast	Scotland	LCA per recruit	F>Fmsy	F>Fmsy	Unreported	Unreported	140	140
IV	South East	Scotland, England	LCA per recruit	F>Fmsy	F>Fmsy	Unreported	Unreported	130	130
IV	Central North Sea	England, Ireland	LCA	F>Fmsy	F>Fmsy	Low	Low	130-140	130-140
IV	Southern North Sea	England, Ireland	LCA	F>Fmsy	F>Fmsy	Low	Low	115-130	115-130

Stock status of the Irish stocks is reported as high or stable, with the exception of the North Irish Sea stock (unreported).

There is significant high grading above the legal Minimum Landing Size (MLS) in the Irish fishery and given that the MLS is also well above the size at maturity there is probably adequate spawning escapement and recruitment is unlikely to be limited. There are indications of overexploitation and low biomass in some stocks in the North Sea and east and West of Scotland (out of the scope of this report).

The species is considered, in its most recent stock assessment, to have a biomass above the limit reference point (or proxy) and passes Clause C1.2.

References

R1 ICES, 2010. Report of the Working Group on the Biology and Life History of Crabs (WGCRAB), 19–22 October 2010, Galway, Ireland. ICES CM 2010/SSGEF: 16. 110 pp. http://ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/SSGEF/2010/WGCRAB10.pdf

R2 Marine Institute and BIM, 2014. Shellfish Stocks and Fisheries, Review 2014. An Assessment of selected stocks: https://oar.marine.ie/bitstream/handle/10793/1063/Shellfish%20Stocks%20and%20Fisheries%20Review%202014_v2.pdf?sequence=1&isAllowed=y

R3 Cefas, 2014. Edible crab (*Cancer pagurus*) Stock Status Report, 2014 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/462265/2014_Crab_assessments.pdf

R4 ICES, 2017. Report of the Working Group on the Biology and Life History of Crabs (WGCRAB), 1–3 November 2016, Aberdeen, Scotland, UK. ICES CM 2016/SSGEPD:10. 78 pp.

http://www.ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/SSGEPD/2016/01%20WGCRAB%20-%20Report%20of%20the%20Working%20Group%20on%20the%20Biology%20and%20Life%20History%20of%20Crabs.pdf
Standard clauses 1.3.2.2

CATEGORY D SPECIES

In a whole fish assessment, Category D species are those which make up less than 5% of landings and are not subject to a species-specific management regime. In the case of mixed trawl fisheries, Category D species may make up the majority of landings. In a by-product assessment, Category D species are those which are not subject to a species-specific management regime. In both cases, the comparative lack of scientific information on the status of the population of the species means that a risk-assessment style approach must be taken.

The process for assessing Category D species involves the use of a Productivity-Susceptibility Analysis (PSA) to further subdivide the species into 'Critical Risk', 'Major Risk' and 'Minor Risk' groups. If there are no Category D species in the fishery under assessment, this section can be deleted.

Productivity and susceptibility ratings are calculated using a process derived from the APFIC document "Regional Guidelines for the Management of Tropical Trawl Fisheries, which in turn was derived from papers by Patrick *et al* (2009) and Hobday *et al* (2007). Table D1 should be completed for each Category D species as follows:

- Firstly, the best available information should be used to fill in values for each productivity and susceptibility attribute.
- Table D2 should be used to convert each attribute value into a score between 1 and 3.
- The average score for productivity attributes and the average for susceptibility attributes should be calculated.
- Table D3 should be used to determine whether the species is required to meet the requirements of Table D4. A species which does not need to meet the requirements of D4 is automatically awarded a pass.
- Table D4 should be used to assess those species indicated by Table D3 to determine a pass/fail rating.
- Any Category D species which has been categorised by the IUCN Red List as Endangered or Critically Endangered, or which appears in the CITES appendices, automatically results in a fail.

Table D2 - Productivity / Susceptibility attributes and scores.

Productivity attributes	Low productivity/ High risk	Medium productivity/ Medium risk	High productivity/ Low risk
	Score 3	Score 2	Score 1
Average age at maturity (years)	>4	2 to 4	<2
Average maximum age (years)	>30	10 to 30	<10
Fecundity (eggs/spawning)	<1 000	1 000 to 10 000	>10 000
Average maximum size (cm)	>150	60 to 150	<60
Average size at maturity (cm)	>150	30 to 150	<30
Reproductive strategy	Live bearer, mouth brooder or significant parental investment	Demersal spawner "berried"	Broadcast spawner
Mean trophic level	>3.25	2.5–3.25	<2.5

Susceptibility attributes		High susceptibility/ High risk	Medium susceptibility/ Medium risk	Low susceptibility/ Low risk
		Score 3	Score 2	Score 1
Availability	1) Overlap of adult species range with fishery	>50% of stock occurs in the area fished	Between 25% and 50% of the stock occurs in the area fished	<25% of stock occurs in the area fished
	2) Distribution	Only in the country/ fishery	Limited range in the region	Throughout region/ global distribution
Encounterability	1) Habitat	Habitat preference of species make it highly likely to encounter trawl gear (e.g. demersal, muddy/sandy bottom)	Habitat preference of species make it moderately likely to encounter trawl gear (e.g. rocky bottom/reefs)	Depth or distribution of species make it unlikely to encounter trawl gear (e.g. epi-pelagic or meso-pelagic)
	2) Depth range	High overlap with trawl fishing gear (20 to 60 m depth)	Medium overlap with trawl fishing gear (10 to 20 m depth)	Low overlap with trawl fishing gear (0 to 10 m, >70 m depth)
Selectivity		Species >2 times mesh size or up to 4 m length	Species 1 to 2 times mesh size or 4 to 5 m length	Species <mesh size or >5 m length
Post capture mortality		Most dead or retained Trawl tow >3 hours	Alive after net hauled Trawl tow 0.5 to 3 hours	Released alive Trawl tow <0.5 hours

Note: Availability 2 is only used when there is no information for Availability 1; the most conservative score between Encounterability 1 and 2 is used.

SOCIAL CRITERION

In addition to the scored criteria listed above, applicants must commit to ensuring that vessels operating in the fishery adhere to internationally recognised guidance on human rights. They must also commit to ensuring there is no use of enforced or unpaid labour in the fleet(s) operating upon the resource.

Appendix A - Determining Resilience Ratings

The assessment of Category B species described in this assessment report template utilises a resilience rating system suggested by the American Fisheries Society. This approach was chosen because it is also used by FishBase, and so the resilience ratings for many thousands of species are freely available online. As described by FishBase, the following is the process used to arrive at the resilience ratings:

"*The American Fisheries Society (AFS) has suggested values for several biological parameters that allow classification of a fish population or species into categories of high, medium, low and very low resilience or productivity (Musick 1999). If no reliable estimate of r_m (see below) is available, the assignment is to the lowest category for which any of the available parameters fits. For each of these categories, AFS has suggested thresholds for decline over the longer of 10 years or three generations. If an observed decline measured in biomass or numbers of mature individuals exceeds the indicated threshold value, the population or species is considered vulnerable to extinction unless explicitly shown otherwise. If one sex strongly limits the reproductive capacity of the species or population, then only the decline in the limiting sex should be considered. We decided to restrict the automatic assignment of resilience categories in the Key Facts page to values of K, t_m and t_{max} and those records of fecundity estimates that referred to minimum number of eggs or pups per female per year, assuming that these were equivalent to average fecundity at first maturity (Musick 1999). Note that many small fishes may spawn several times per year (we exclude these for the time being) and large live bearers such as the coelacanth may have gestation periods of more than one year (we corrected fecundity estimates for those cases reported in the literature). Also, we excluded resilience estimates based on r_m (see below) as we are not yet confident with the reliability of the current method for estimating rm. If users have independent r_m or fecundity estimates, they can refer to Table 1 for using this information*."

Parameter	**High**	**Medium**	**Low**	**Very low**
Threshold	0.99	0.95	0.85	0.70
r_{max} (1/year)	> 0.5	0.16 – 0.50	0.05 – 0.15	< 0.05
K (1/year)	> 0.3	0.16 – 0.30	0.05 – 0.15	< 0.05
Fecundity (1/year)	> 10,000	100 – 1000	10 – 100	< 10
t_m (years)	< 1	2 – 4	5 – 10	> 10
t_{max} (years)	1 - 3	4 – 10	11 – 30	> 30

Taken from the FishBase manual, "Estimation of Life-History Key Facts":
http://www.fishbase.us/manual/English/key%20facts.htm#resilience]

Appendix B – Background on the 5% catch rule

The proposed fishery assessment methodology uses a species categorisation approach to divide the catch in the assessment fishery into groups. These groups are:

- **Category A:** "Target" species with a species-specific management regime in place.
- **Category B:** "Target" species with no species-specific management regime in place.
- **Category C:** "Non-target" species with a species-specific management regime in place.
- **Category D:** "Non-target" species with no species-specific management regime in place

The distinction between 'target' and 'non-target' species is made to enable the assessment to consider the impact of the fishery on all the species caught regularly, without requiring a full assessment be conducted for each. Thus 'target' species are subjected to a more detailed assessment, while 'non-target' species are considered more briefly. For the purposes of the IFFO RS fishery assessment, 'target' and 'non-target' species are defined by their prevalence in the catch, by weight. Applicants must declare which species are considered 'target' species in the fishery, and the combined weight of these must be at least 95% of the annual catch. The remaining 5% can be made up of 'non-target' species. Note also that ETP species are considered separately, irrespective of their frequency of occurrence in the catch.

The proposed use of 5% as a limit for 'non-target' species is one area in which feedback is being sought via the public consultation. The decision to propose a value of 5% ensures consistency with other fishery assessment programmes, such as the MSC which uses 5% to distinguish between 'main' and 'minor' species (see MSC Standard, SA3.4 and GSA3.4.2); and Seafood Watch, which uses 5% when defining the 'main' species for the assessment (see Seafood Watch Standard, Criterion 2). The value is also consistent with the approached used in Version 1 of the IFFO RS Standard, in which up to 5% of the raw material could be comprised of 'unassessed' species.