Cefas' biological sampling programmes of finfish and shellfish

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ISF workshop, 6th March 2018

Centre for Environment
Fisheries & Aquaculture
Science

Cefas

Assessment data

Fishery independent data:

e.g. Surveys

Fishery dependent data:

e.g. Fisheries Observer programme

Fishery dependent data

- Size data
- Age data
- Maturity data
- Discard data
- Catch data
- Landings data
- Effort data

Size data

- Length relates to age
- Length is easier and quicker to collect so we can sample a larger proportion of the catch
- Lengths are converted to ages when processing the data to get the age compositions for a fleet

Sex & Maturity data

Immature

Maturing

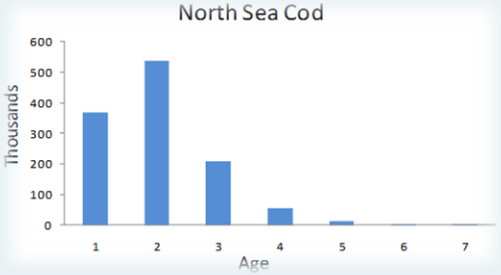
Hyaline

Running

Spent

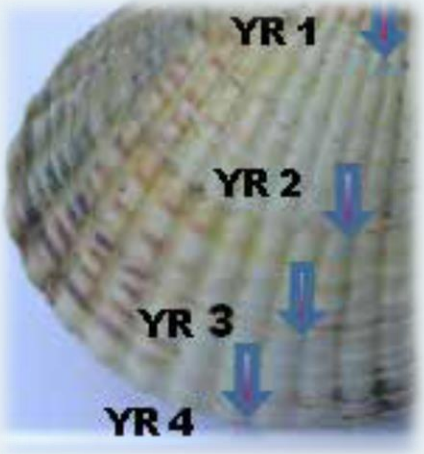
Estimating age of fish and shellfish

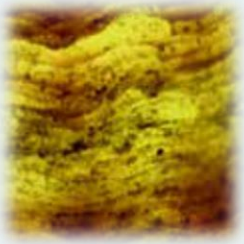
- Age data provide insight into the state of the fish stock
- Very important components of the information required to carry out a stock assessment
- Otoliths, scales and shells are used for ageing



Age reading of shellfish

- Crabs and lobsters grow by moulting their exoskeleton, so an effective method of age determination has yet to be found
- Scallops and cockles have clear winter rings (annuli)
- Scallop annuli may require microscopic analysis



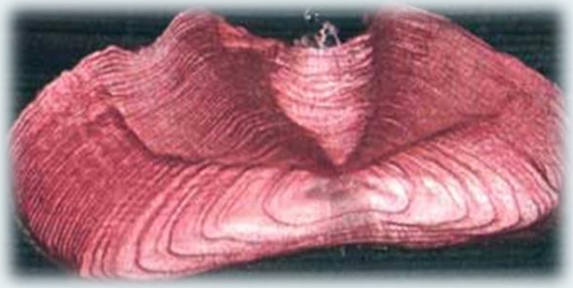


Estimating age of crustaceans

- Crabs and lobsters grow by moulting their exoskeleton, so an effective method of age determination has yet to be found – age is not used in stock assessment
- Gastric mill and eye stalk (new more reliable methods)
- Crab and lobster stock assessments use growth parameters rather than age
- “Length Cohort Analysis”

Estimating age of finfish

- Otoliths/Ear stones
- Made of calcium and help the fish maintain its balance
- Layers of calcium carbonate that are built up on an annual basis, much like tree bands
- Each year of growth is composed of an opaque and a translucent zone
- Age of fish is determined by counting the pattern of bands on the otolith.

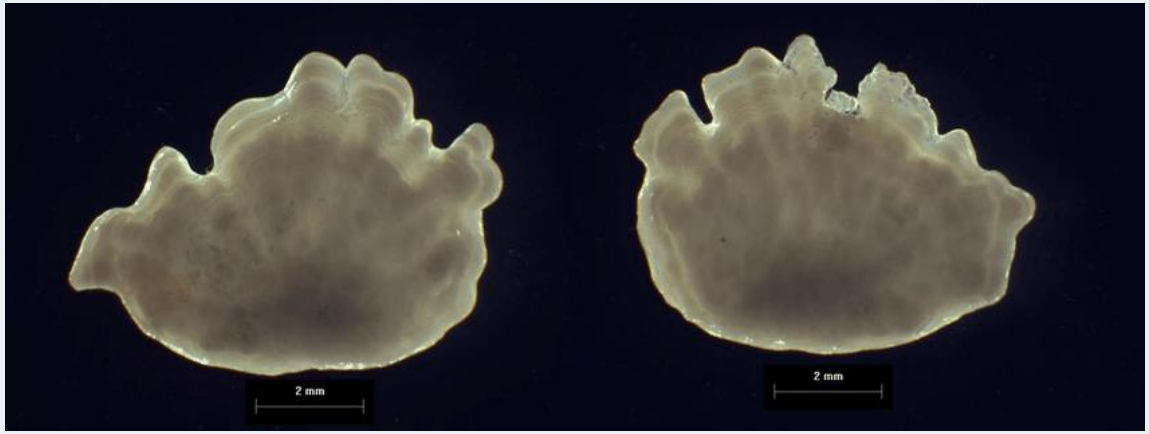


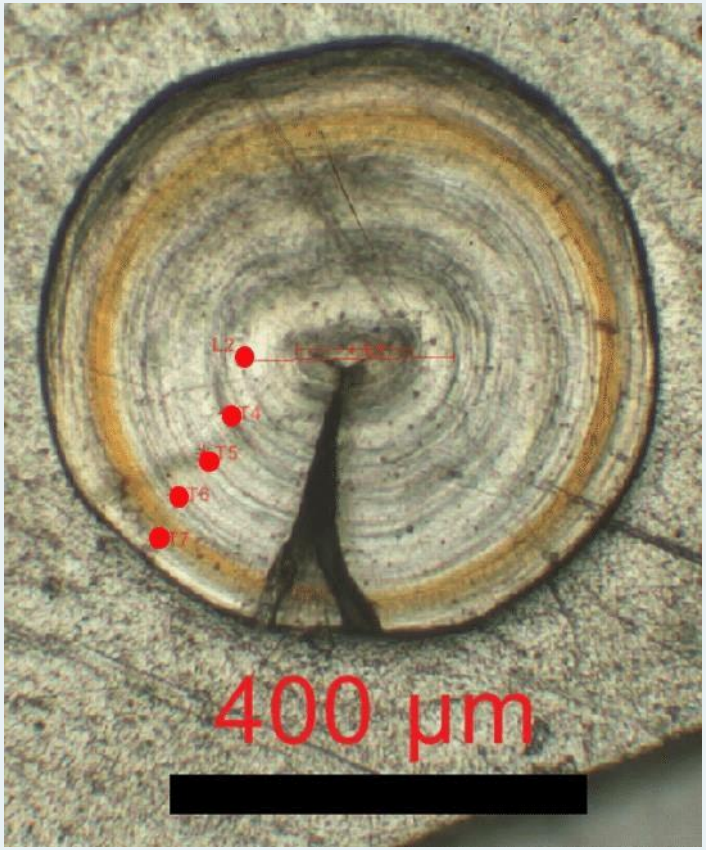
Otolith from a 40 year old sole

Age of monkfish

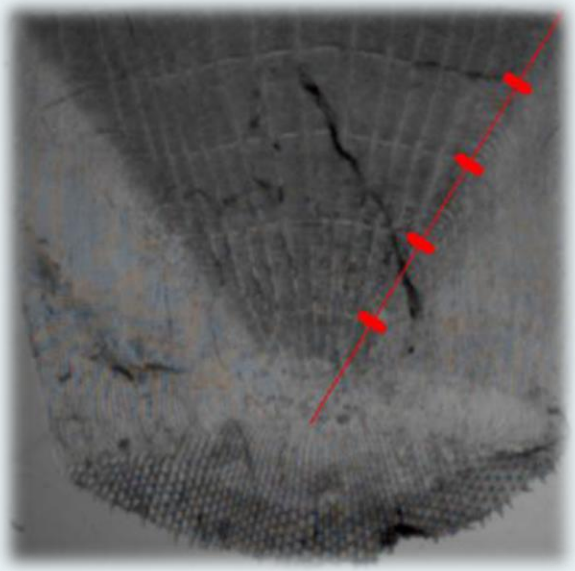
lure, or illicium

otoliths

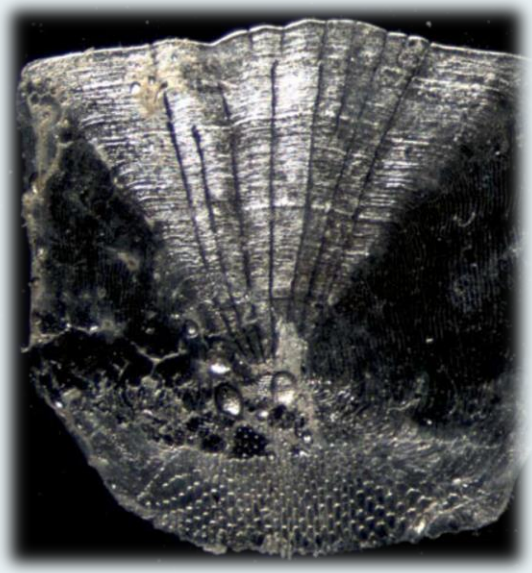




Estimating age of sea bass



5 year old male bass of 33 cm



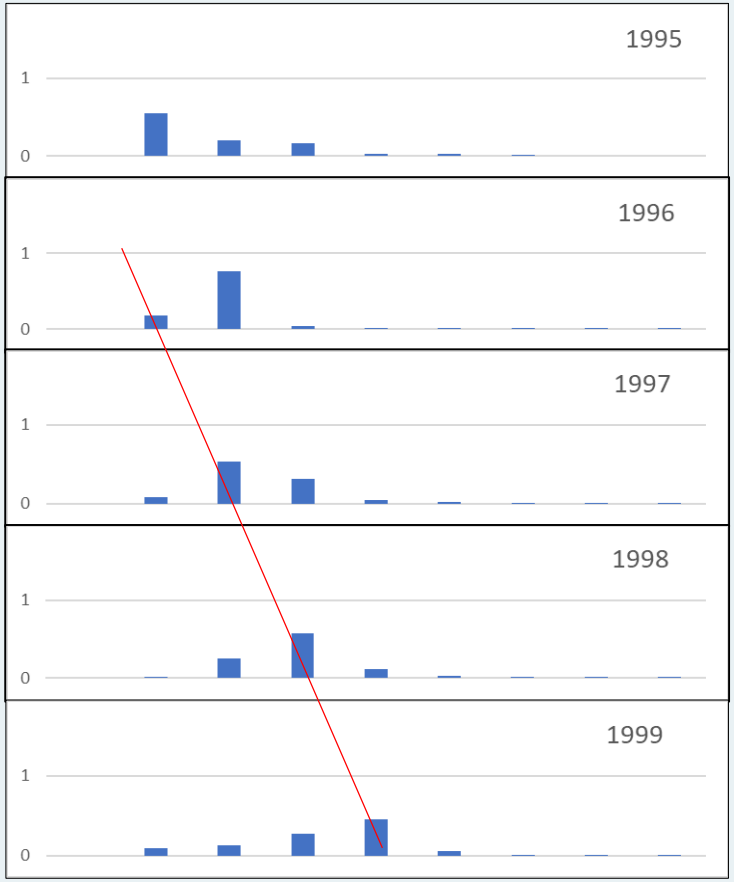
5 year old male bass of 42 cm

Using Age and Numbers

	0	1	2	3	4	5	6	7	8	Total
1995	0	4275	1622	1327	270	245	46	0	0	7785
1996	0	3693	15998	818	313	93	32	10	9	20966
1997	0	1353	9645	5553	716	354	139	144	110	18014
1998	0	167	3184	7403	1443	307	178	86	61	12829
1999	0	476	654	1464	2425	307	18	19	6	5369
2000	0	2197	2996	784	741	1250	205	35	28	8236
2001	0	4297	8638	1131	303	317	321	54	39	15100
2002	0	879	4274	3400	765	39	89	74	26	9546

	0	1	2	3	4	5	6	7	8
1995	0	0.549133	0.208349	0.170456	0.034682	0.031471	0.005909	0	0
1996	0	0.176142	0.763045	0.039016	0.014929	0.004436	0.001526	0.000477	0.000429
1997	0	0.075108	0.535417	0.30826	0.039747	0.019651	0.007716	0.007994	0.006106
1998	0	0.013017	0.248188	0.577052	0.11248	0.02393	0.013875	0.006704	0.004755
1999	0	0.088657	0.12181	0.272676	0.451667	0.05718	0.003353	0.003539	0.001118
2000	0	0.266756	0.363769	0.095192	0.089971	0.151773	0.024891	0.00425	0.0034
2001	0	0.28457	0.572053	0.074901	0.020066	0.020993	0.021258	0.003576	0.002583
2002	0	0.09208	0.447727	0.35617	0.080138	0.004085	0.009323	0.007752	0.002724

ICES WGCSE Report 2017 - Haddock



Otolith collection

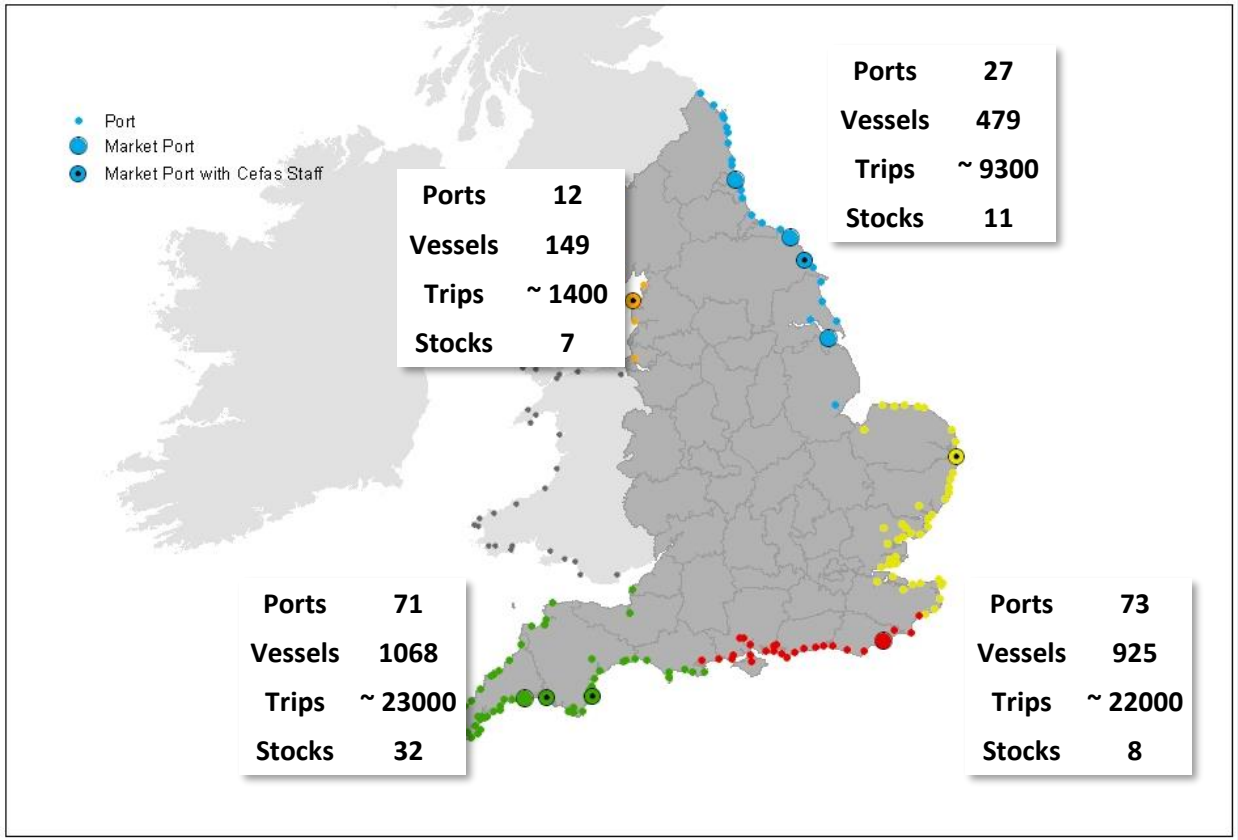
Fishery dependant data

Biological data - commercial catch

Aim *– Age/size composition of all the 'removals' from a stock*

- Age, length, sex and maturity
- Catch, landings and discards

- Onshore sampling programme (~1200 sampling days) supplemented with an…
- Offshore sampling programme (~520 sampling days).



Cefas offshore sampling programme

Key aims:

- *Quarterly estimates of discarded - numbers at age/size by stock and fleet.*
- *Overall discard rates*

Design influenced by:

- Stock definitions and metiers
- National and international requirements
- Staff resources and location
- Spatial activity of fleets
- Access points

Biological data – offshore sampling programme

…the sampling frame is stratified by:

- **Quarter**
- **Region** (5 strata) Port regions that map closely to ICES divisions, stock boundaries and fleet activities - 1Northeast, 2East and Southeast combined …
    - **a) Predominant gear** (Nets, Trawls, Lines, Beam trawl and scallop dredge)
    - **b) Vessel length overall** (Under 10m and Over 10m)

Effort allocation

Vessel length	*Under 10*	*AnySIze*	*Over 10*					
Gear	All gears	Beam CRU	Nets	Trawls	Beam DEF	Scallop		
District								
1NORTHEAST	15		23		28	12	38	
2EAST	34	6	6				46	
3SOUTHEAST							115	
4WEST	32		15	28				
7NORTHWEST	6		9				15	**214**
	87	**6**	**81**		**28**	**12**		

Biological data – offshore sampling programm

Target population – all fish and commercial shellfish caught by English and Welsh vessels for which estimates of discards and a length or age composition are required.

Sampling frame –all fishing trips made by all commercial fishing vessels [registered in E&W]

Stratified random selection of vessels **-** drawlists for each metier

Primary sampling unit – the vessel

Currently ~525 days are available for at sea observer sampling

One scheme

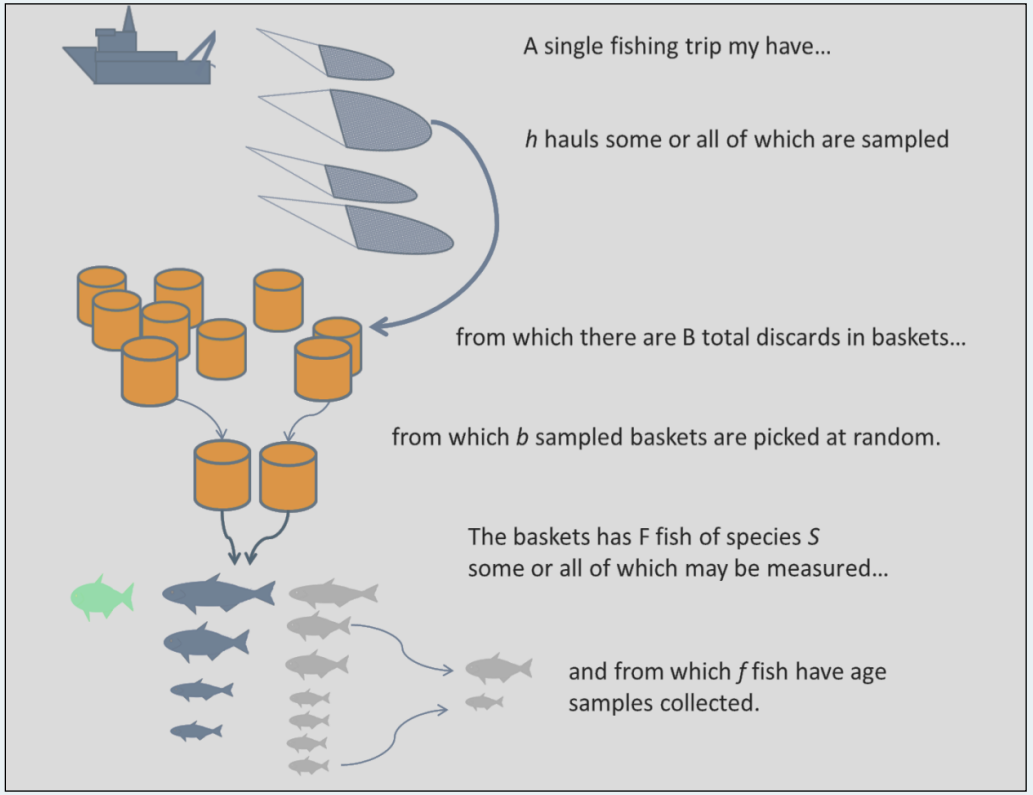
Offshore - sampling hierarchy

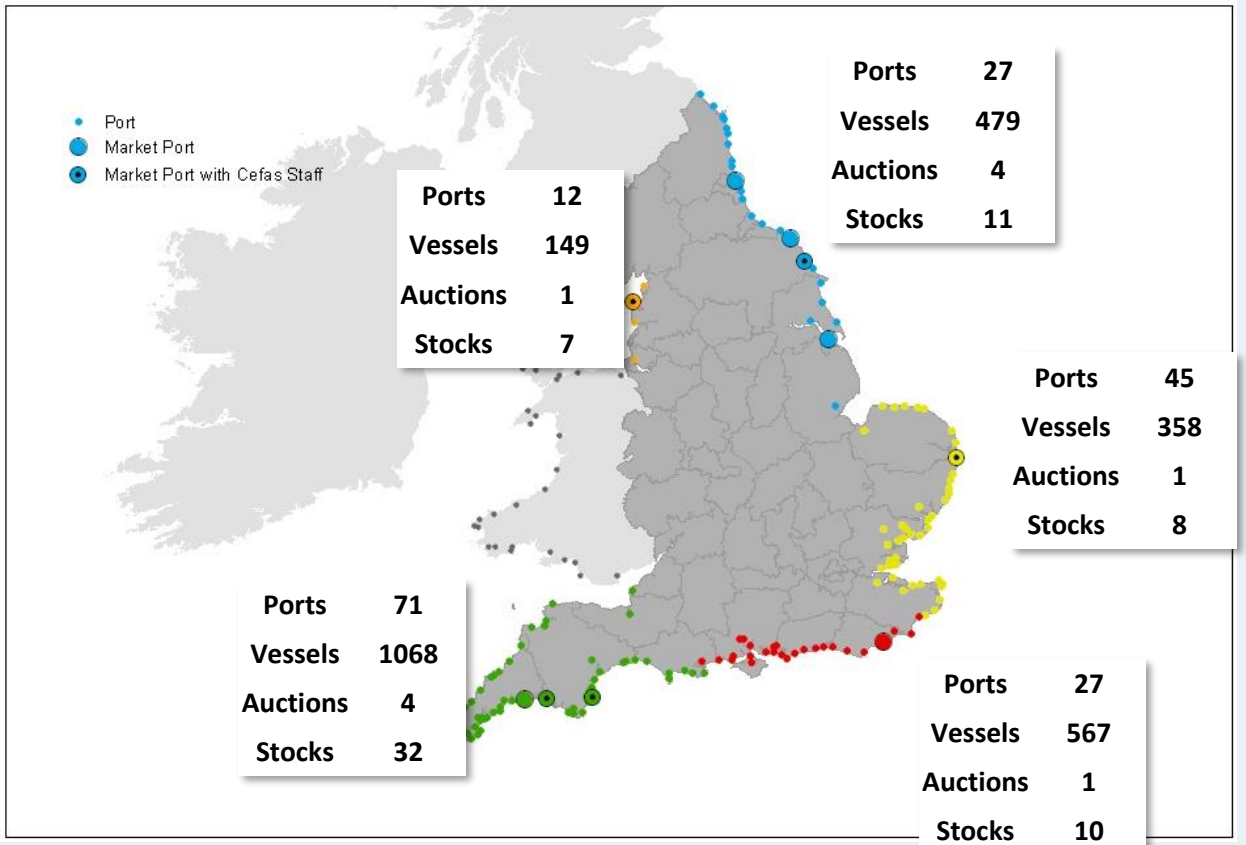
Vessel

Hauls

Baskets

Fish





Cefas onshore sampling programme

Key aims:

- *Quarterly estimates of landings - numbers at age/size by stock*

Design influenced by:

- Stock definitions
- National and international requirements
- Staff resources and location
- Spatial activity of fleets
- Access points

Onshore sampling programme

Target population – all fish and shellfish landed into England and Wales for which estimates of length or age composition is required.

Sampling frame – list of fishing ports, auctions or processors at which all or a defined proportion of the total landings are accessible.

Stratified random selection of **ports and days** is made for sampling trips by Cefas staff

Primary sampling unit is port x day

Currently ~1200 days are available for port sampling

Three schemes:

1. **Demersal** (Finfish)
2. **Crustacean** (Shellfish)
3. **Pelagic** (Mackerel, pilchards, sprats, etc)

Onshore - sampling hierarchy

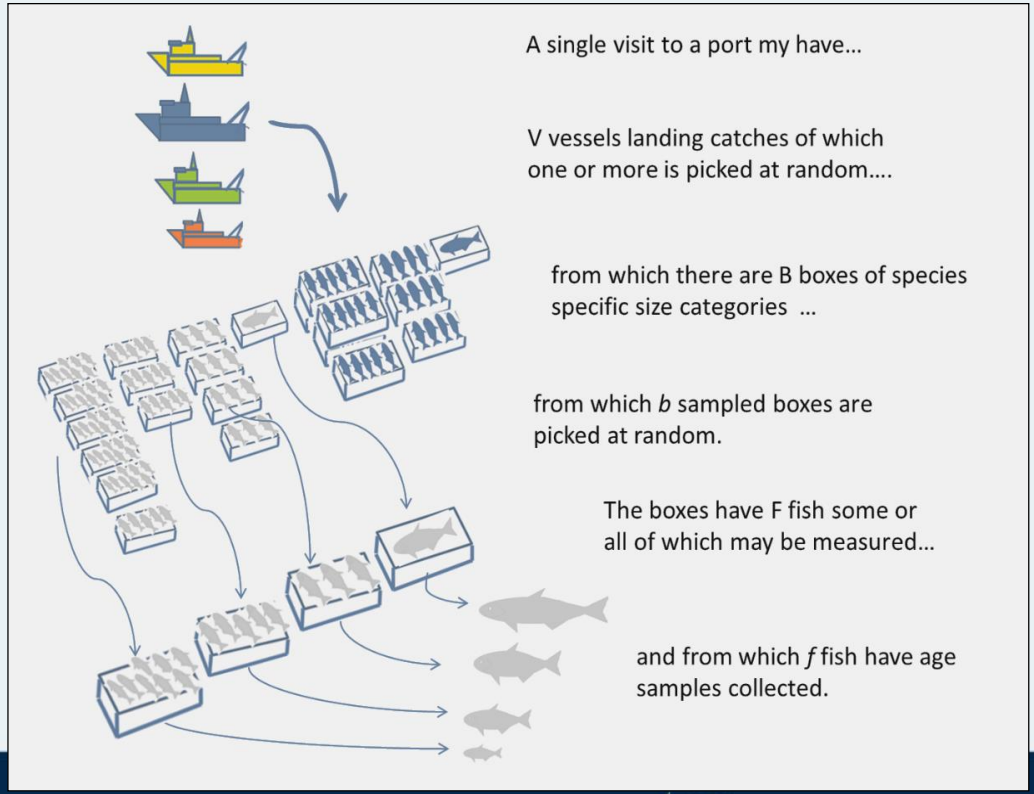
'Port' x day

Vessel

Species

Box

Fish



Future advances

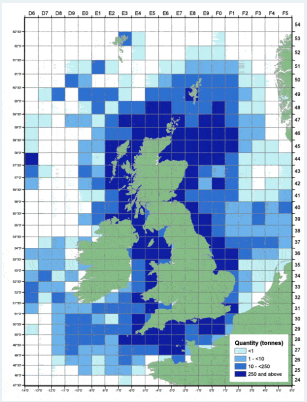
CCTV – Catch Quota Trials – Remote Electronic Monitoring

SMARTFISH - many European research agencies (Norway +)
- 4 year programme
- improve on-board camera systems + image analysis (fish and shellfish)
- capture individual fish weights from grading machines

Onshore and offshore programmes

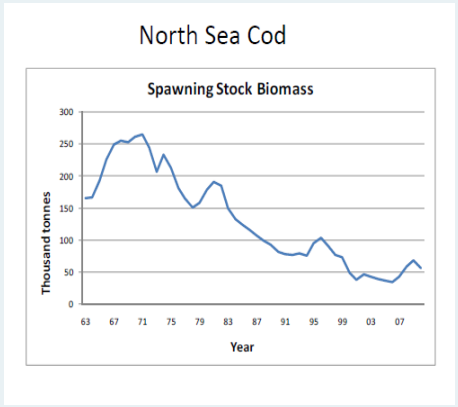
Biological Data:

- Size data
- Age data
- Maturity data
- Discard data
- Catch data
- Landings data



Stock status

- Catch forecasts
- Management advice



ASSESSMENT

(Main end-users are ICES and STECF (EU))

Lunchtime demonstration of otolith extraction