Trends in the Abundances of North Sea Fish

A Preliminary Analysis of Bottom Trawl Survey Data

SHETLAND FISHERMEN'S ASSOCIATION

September 2024

Summary

A simple analysis has been carried out of data from the North Sea International Bottom Trawl Survey to investigate whether these data reveal any long-term trends in the abundances of fish in the North Sea.

Despite considerable variability these data suggest that the abundance of fish in the North Sea, and of commercially important species, has generally increased over the last 50 years or so and especially over the last 20 years or so. There is certainly no evidence from these data of any decline in the abundance of fish in the North Sea.

Introduction

A simple analysis has been carried out of data from the North Sea International Bottom Trawl Survey to investigate whether these data reveal any long-term trends in the abundances of fish in the North Sea.

North Sea International Bottom Trawl Survey

The North Sea International Bottom Trawl Survey (IBTS) is an annual survey that aims to provide ICES assessment and science groups with consistent and standardised data on spatial and temporal changes in the distribution and relative abundance of fish and biological parameters of commercial species for stock assessment purposes.[1]

The North Sea IBTS has its origins in surveys of juvenile herring from the late 1960s. As these surveys also provided valuable information for other fish species their objectives were broadened, and they became the International Young Fish Survey which was carried out in the first quarter of each year (Q1). Several separate national fish surveys developed in the 1970s and 1980s mainly in the third quarter of the year (Q3). These surveys were combined into the International Bottom Trawl Survey in the 1990s and have been carried out in the 1st and 3rd quarters of each year since 1997.[2]

The IBTS surveys are carried out by fisheries research vessels of several different nations using a standard small-mesh trawl net design and a standardised fishing method (including towing speed and duration).[1]

All fish and shellfish caught in each tow are identified, counted and measured. From these data, catch rates are calculated for each species in each area (number caught per hour of fishing time).

1 For details of the survey see the ICES Manual for the North Sea International Bottom Trawl Survey (**https://doi.org/10.17895/ices.pub.7562**).

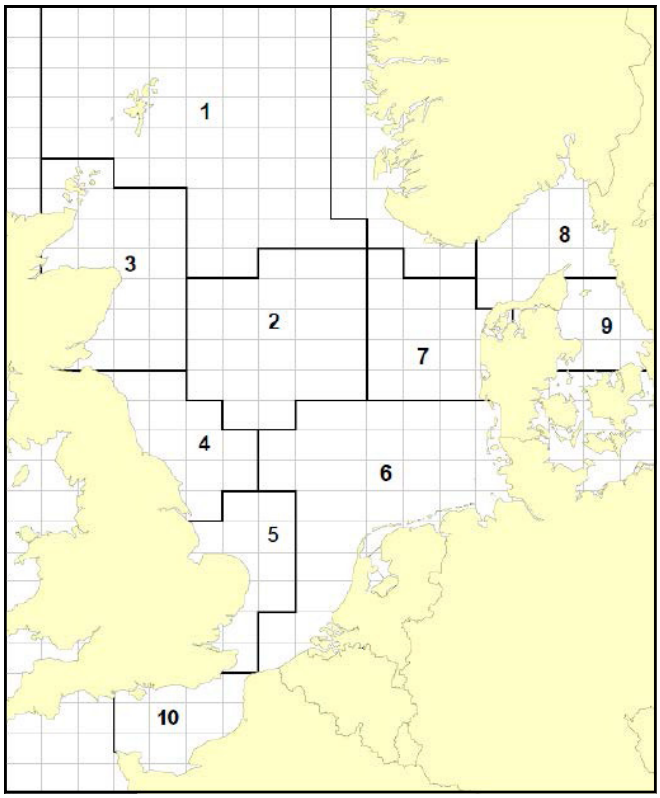
2 For further details see **https://datras.ices.dk/home/descriptions.aspx#NS-IBTS** or the ICES Manual (footnote 1).

Data

Data were downloaded from the ICES online DATRAS database of trawl surveys.[3]

The specific data set utilised was CPUE per length per area from the North Sea International Bottom Trawl Survey (NS-IBTS). These data are the catches per unit effort (the numbers of fish caught per hour of fishing) of each length of each species in each sampling area in each quarter of each year.

This data set includes catch data for more than 800 species or species groups including many invertebrates and other organisms as well as fish. Data were downloaded for about 160 species and groups of species of demersal (bottom-living) fish (*see Appendix 2*) subject to the following constraints:



- Sampling Areas 1 to 7: This covers the North Sea itself (ICES area 4) but excludes the Kattegat, Skagerrak and eastern English Channel which are included in the survey (Figure 1).
- Years 1971 to 2023: Before 1971 the survey did not extend to the northern North Sea (sampling area 1).
- Quarters 1 and 3. The survey was carried out in the first quarter of each year (Q1) from the beginning and a survey in the 3rd quarter (Q3) was added from 1990. Surveys were carried out in other quarters in only a few years.

Figure 1

ICES sampling areas within the North Sea. This analysis used data from areas 1 to 7. (From 'Areas in DATRAS Products', ICES 2023: https://datras.ices.dk/Documents/Manuals/Survey_Maps_Datras.pdf.)

3 Available at: https://www.ices.dk/data/data-portals/Pages/DATRAS.aspx

Pelagic fish and species with zero catches within the above constraints were not included in the analysis. Twenty-five of the species were categorised as being commercially important (*see Appendix 2*). This category was not intended to include every species that might ever be landed commercially but rather to reflect the principal species of commercial importance to the UK whitefish fleet (what might be regarded as their target species).

Ten species and species groups which are caught for industrial processing (to make fish meal or oil) rather than human consumption were categorised as 'industrial' (*see Appendix 2*).[4]

Data Set Limitations

ICES recommends caution in the interpretation of data in its DATRAS database as the fishing gear used may not sample all species adequately or equally and because changes in the sampling gear and survey methodology may have occurred over time. *See Appendix 1* for more details.

However, despite these limitations, these data represent the longest and most comprehensive time-series of data relating to the abundances of fish in the North Sea.

Analysis

The downloaded data comprised the catch rates of each length of each species in each sampling area in each quarter of each year. That is, the number of fish of each length caught per hour of fishing across all the hauls in each area in each quarter.

To obtain average annual catch rates for all species (or groups of species) across the North Sea these data were first summed to obtain the total catch rate of each species (of all lengths) in each survey area in each quarter of each year.

These summed data were then averaged across all species and areas to obtain average catch rates (numbers per hour) in each survey (Q1 and Q3) in each year. Average catch rates were also calculated in the same way for the sub-sets of commercially important and non-commercially important species, and for families of species.

Average catch rates were also calculated across longer-time periods.

4 Although UK fishing boats now carry out little if any industrial fishing they did do so in the past and significant industrial fisheries are still carried out in the North Sea by other nations.

Results

The average catch rates of fish in the North Sea International Bottom Trawl Surveys are characterised by large year-to-year fluctuations (*Figure 2*). Despite this variability, there appears to have been a general increase in the average annual catch rate in the 1st quarter (Q1) survey from the late 1970s to about 2000. A sharp decline in the catch rate in the early 2000s was followed by a second general increase from about the mid-2000s to the present. A similar pattern is apparent in the average annual catch rate in the 3rd quarter (Q3) survey with the general increase after the mid-2000s being more pronounced than that in the Q1 survey.

These trends are more apparent when the catch rates are averaged over five-year intervals (*Figure 3, Appendix 3 Table 1*) with the Q1 catch rate roughly doubling from 1979-1983 to 1998-2003 and the Q1 and Q3 catch rates both roughly doubling from 2004-2008 to 2019-2023.

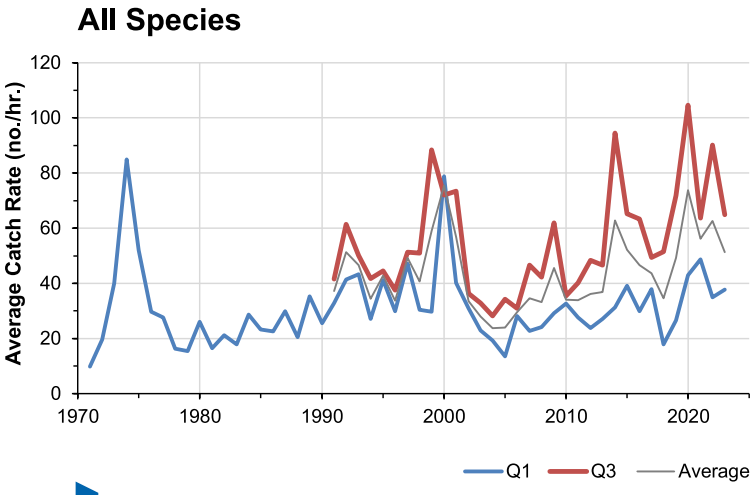


Figure 2

The average annual catch rates of 160 species and groups of species of fish in the Q1 and Q3 North Sea IBTS surveys from 1971 to 2023 (Q3 from 1991). The thin line shows the average catch rate across both annual surveys. (*See Appendix 2* for species.)

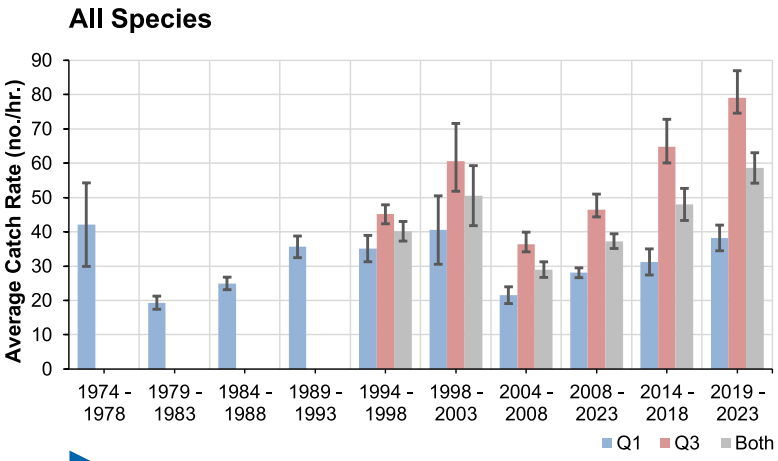


Figure 3

The average catch rates of 160 species and groups of species of fish in the Q1 and Q3 North Sea IBTS surveys and across both surveys in 5-year time periods from 1974 to 2023. Error bars show the standard errors of the means. (*See Appendix 3 Table 1 for values and Appendix 2 for species.*)

Commercially Important Species

Broadly similar trends are apparent in the average catch rates of the commercially important species (*Figure 4, Figure 5, Appendix 3 Table 2*). There was a particularly pronounced increase in the catch rate in the Q1 survey from the late 2010s to the early 2020s with the annual average catch rate more than tripling between 2018 and 2021. The annual average Q1 catch rates of commercially important species in 2021, 2022 and 2023 were amongst the highest in the whole time-series, only being exceeded in 2000 and 2001.

The catch rate of commercially important species in the Q3 survey more than doubled over the same time-period and the Q3 catch rates from 2020 to 2023 were again some of the highest in the time-series (exceeded only in the period around 2000).

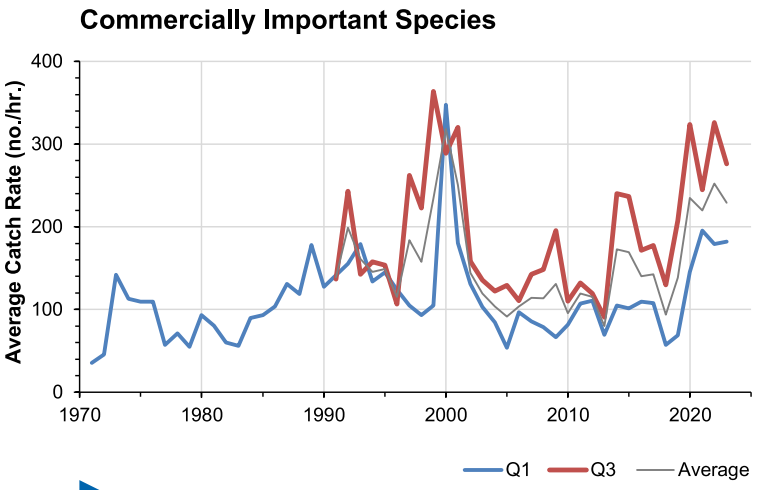


Figure 4

The average annual catch rates of 160 species and groups of species of fish in the Q1 and Q3 North Sea IBTS surveys from 1971 to 2023 (Q3 from 1991). The thin line shows the average catch rate across both annual surveys. (*See Appendix 2 for species.*)

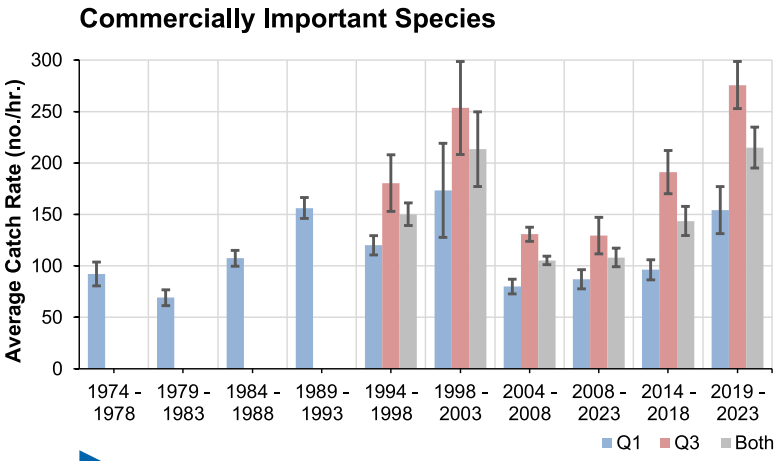


Figure 5

The average catch rates of commercial important species in the Q1 and Q3 North Sea IBTS surveys and across both surveys in 5-year time periods from 1974 to 2023. Error bars show the standard errors of the means. (*See Appendix 3 Table 2 for values and Appendix 2 for species.*)

Industrial Species

The catch rates of industrial fish have remained roughly similar in the Q1 survey from the 1970s to the present, albeit with considerable variability, excepting an exceptional peak in 1974 (*Figure 6, Figure 7, Appendix 3 Table 3*).

The catch rates in the Q3 survey were noticeably higher during the 2010s and 2020s than during the 1990s and 2000s. This is more apparent in *Figure 7* with the average Q3 catch rates from 2014 to 2023 almost double that in the previous two decades (85% higher than from 1994-2013).

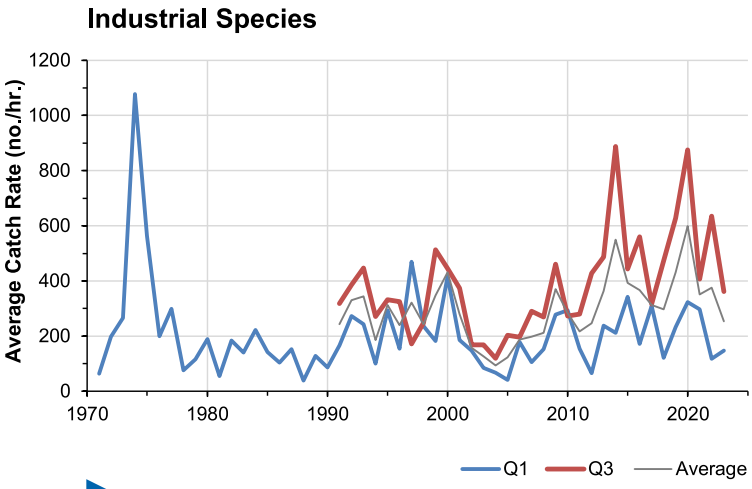


Figure 6

The average annual catch rates of industrial species in the Q1 and Q3 North Sea IBTS surveys from 1971 to 2023 (Q3 from 1991). The thin line shows the average catch rate across both annual surveys. (*See Appendix 2 for species.*)

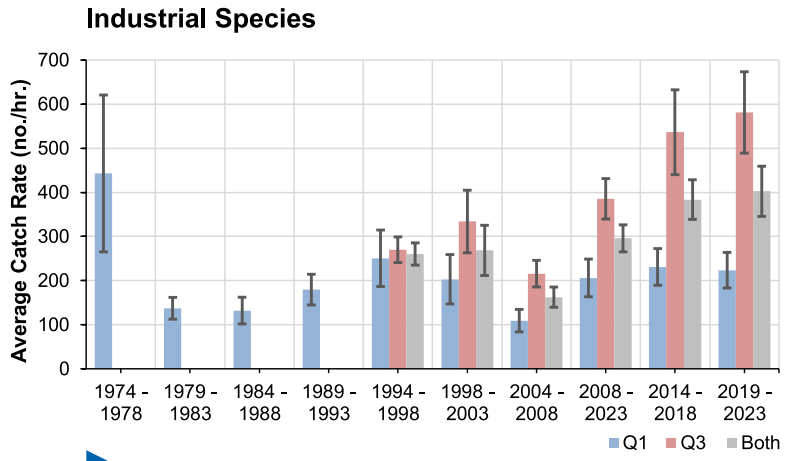


Figure 7

The average catch rates of industrial species in the Q1 and Q3 North Sea IBTS surveys and across both surveys in 5-year time periods from 1974 to 2023. Error bars show the standard errors of the means. (*See Appendix 3 Table 3 for values and Appendix 2 for species.*)

Non-Commercial Species

The catch rates of non-commercial fish were relatively very low compared to those of commercial or industrial fish, typically around 2 to 4 fish per hour, compared to 100 or more per hour (*Figure 8, Figure 9, Appendix 3 Table 4*).

The trend in the catch rates of non-commercial species was different also with a general increase until the late 2000s followed by a slower decrease, especially in the Q1 survey. Despite that decrease, catch rates in the most recent period (2019-2023) were comparable to those in the mid-1990s (1994-1998).

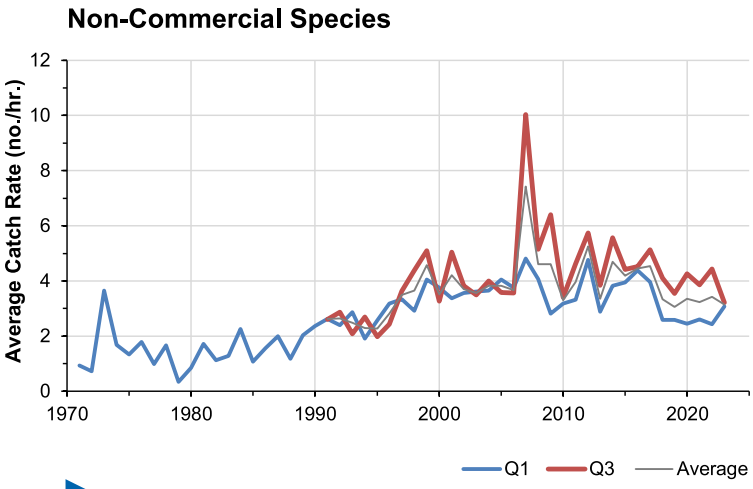


Figure 8

The average annual catch rates of species that are neither industrial or commercially important in the Q1 and Q3 North Sea IBTS surveys from 1971 to 2023 (Q3 from 1991). The thin line shows the average catch rate across both annual surveys. (*See Appendix 2 for species.*)

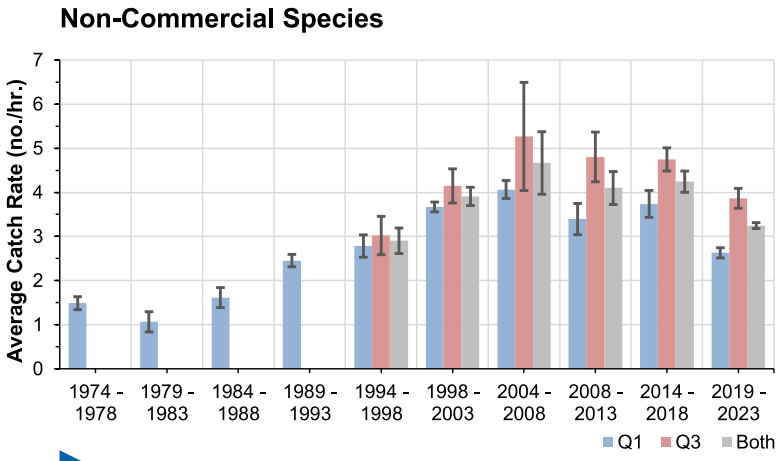


Figure 9

The average annual catch rates of species that are neither industrial or commercially important in the Q1 and Q3 North Sea IBTS surveys and across both surveys in 5-year time periods from 1974 to 2023. Error bars show the standard errors of the means. (*See Appendix 3 Table 4 for values and Appendix 2 for species.*)

Trends by Taxonomic Group

The species included in this analysis all belonged to one of 10 Orders (larger taxonomic groups).[5,6]

The average catch rates of species belonging to the eight of these Orders are shown in *Figure 10 to Figure 17*. Species belonging to the remaining two Orders (Chimaeriformes and Mugiliformes) were only very occasionally recorded in the North Sea IBTS survey providing insufficient data for meaningful time-series.

The average catch rates of all the Orders shown are characterised by high levels of year-to-year variability. There are also large differences between the catch rates of different Orders. Average catch rates were highest for the Gadiformes (cod-like fishes, *Figure 10*), Pleuronectiformes (flatfishes, *Figure 14*) and Trachiniformes (sandeels, *Figure 17*), but generally much lower for the other Orders.

Despite the variability, upward trends in catch rates over the last few decades are apparent for most of the Orders. For seven of the eight Orders shown the average catch rates over the most recent five-year period (2019-2023) were higher than in the period from 1994-1998 by amounts that ranged from about 40% to over 180% (*Figure 18*). The only Order for which the average catch rate fell between these two time periods was the Gobiiformes.

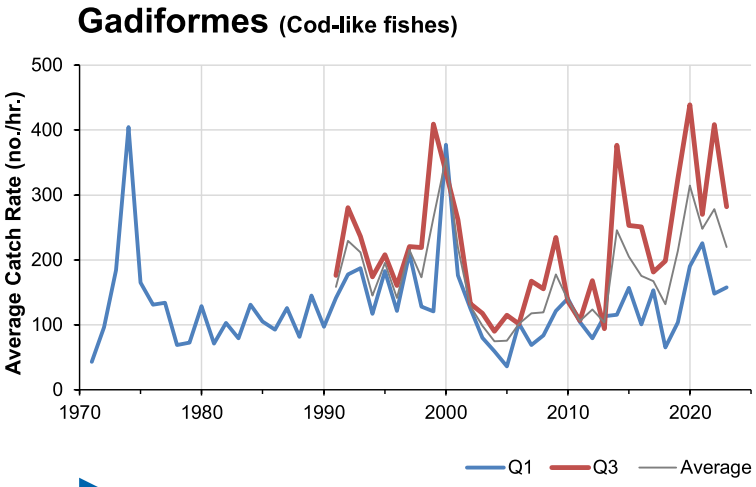


Figure 10

The average annual catch rates of Gadiforme fishes in the Q1 and Q3 North Sea IBTS surveys from 1971 to 2023 (Q3 from 1991). The thin line shows the average catch rate across both annual surveys.

5 'Orders' are one of the major ranks used in taxonomy to classify organisms. In ascending order, species are grouped by genus, then family, then order, then class, and so on. An Order therefore represents a large group of broadly related species. For example, cod and hake belong to the same Order (Gadiformes) but to different families within that order.

6 See Appendix 2 for the species in each order.

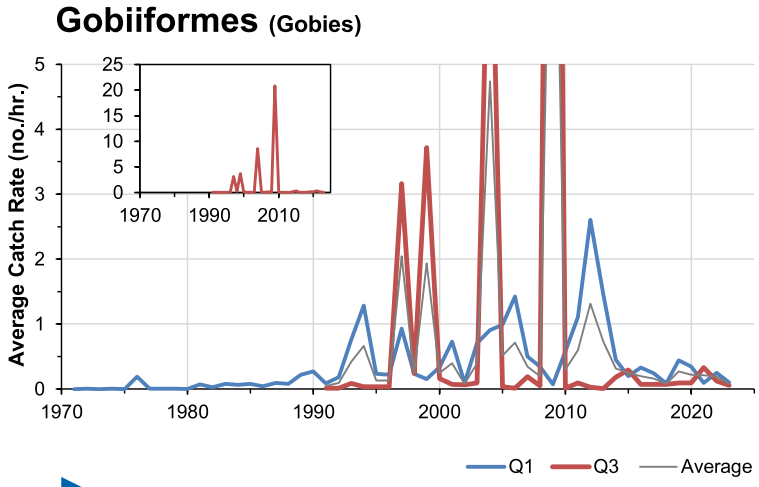


Figure 11

The average annual catch rates of Gobiiforme fishes in the Q1 and Q3 North Sea IBTS surveys from 1971 to 2023 (Q3 from 1991). The thin line shows the average catch rate across both annual surveys.
(Some peaks in the Q3 average exceed the scale shown – *see inset chart.*)

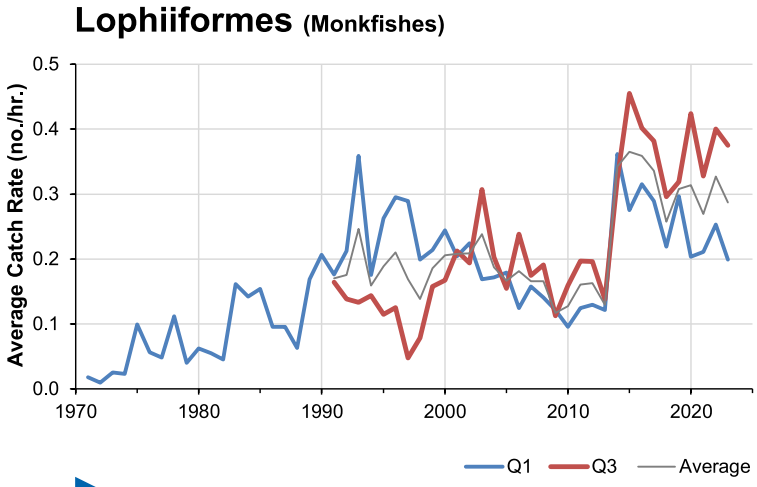


Figure 12

The average annual catch rates of Lophiiforme fishes in the Q1 and Q3 North Sea IBTS surveys from 1971 to 2023 (Q3 from 1991). The thin line shows the average catch rate across both annual surveys.

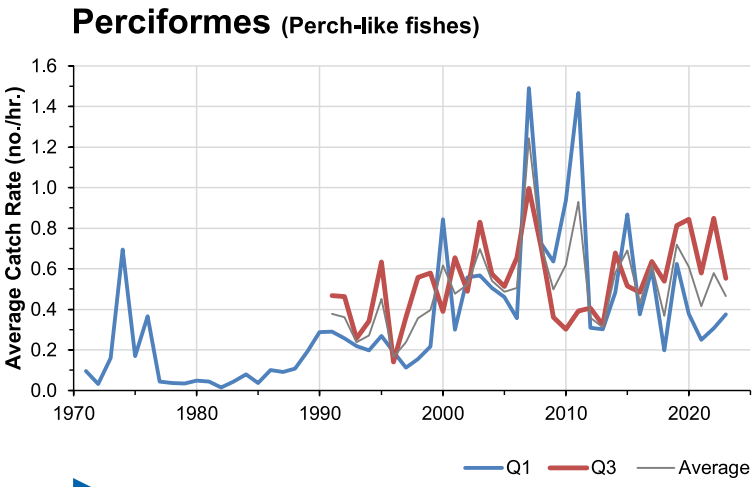


Figure 13

The average annual catch rates of Perciforme fishes in the Q1 and Q3 North Sea IBTS surveys from 1971 to 2023 (Q3 from 1991). The thin line shows the average catch rate across both annual surveys.

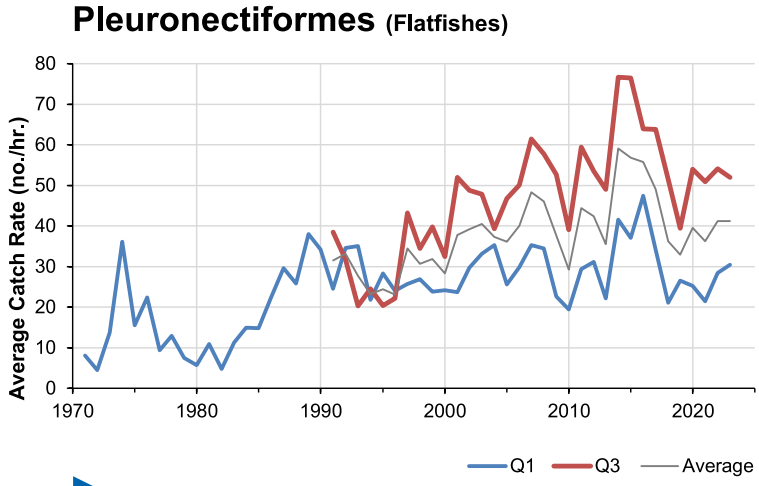


Figure 14

The average annual catch rates of Pleuronectiforme fishes in the Q1 and Q3 North Sea IBTS surveys from 1971 to 2023 (Q3 from 1991). The thin line shows the average catch rate across both annual surveys.

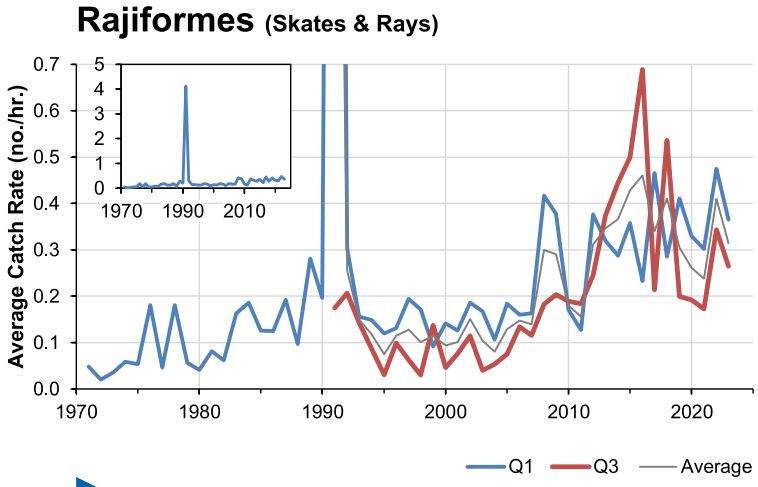


Figure 15

The average annual catch rates of Rajiforme fishes in the Q1 and Q3 North Sea IBTS surveys from 1971 to 2023 (Q3 from 1991). The thin line shows the average catch rate across both annual surveys.
(Q1 value for 1991 exceeds the scale shown – see inset chart.)

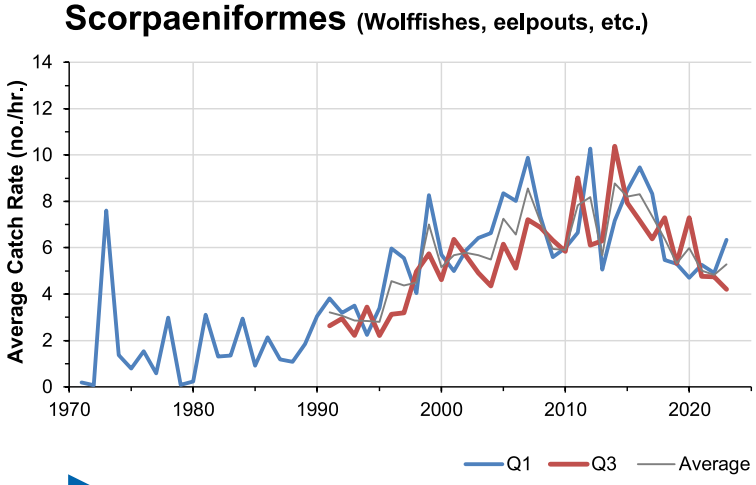


Figure 16

The average annual catch rates of Scorpaeniforme fishes in the Q1 and Q3 North Sea IBTS surveys from 1971 to 2023 (Q3 from 1991). The thin line shows the average catch rate across both annual surveys.

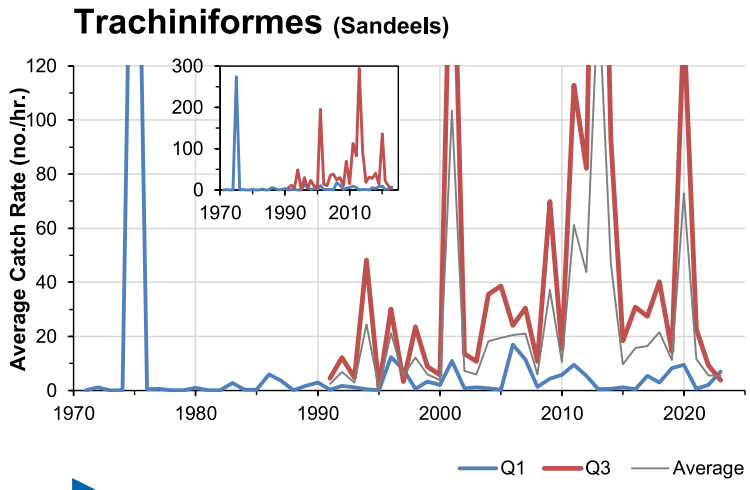


Figure 17

The average annual catch rates of Trachiniforme fishes in the Q1 and Q3 North Sea IBTS surveys from 1971 to 2023 (Q3 from 1991). The thin line shows the average catch rate across both annual surveys.
(Some peaks in the averages exceed the scale shown – *see inset chart.*)

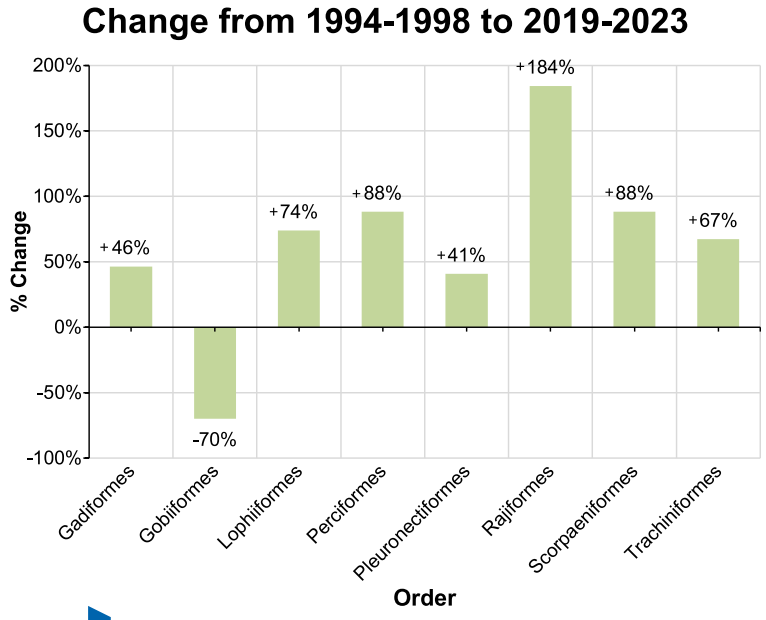


Figure 18

The percentage changes in the average catch rates of eight orders of fish in the Q1 and Q3 North Sea IBTS surveys between the five-year periods 1994-1998 and 2019-2023.

Discussion

ICES advises caution in the use of data from the North Sea International Bottom Trawl Survey due to the unequal sampling of different species and habitats and the possibility of changes over time in the sampling methodology (see Appendix 1). Nevertheless, these data do represent the longest and most consistent time-series of data relating to the abundances of fish in the North Sea covering a period of 50 years or more.

Further, the results outlined above are based on a preliminary and relatively simple analyses of these data, intended primarily to identify substantial long-term trends.

All that said, if it is accepted that the catch rates in the North Sea IBTS survey reflect the abundance of fish then the results of this analysis suggest that the abundance of fish in the North Sea has increased over the last 50 years or so and especially over the last 20 years or so (albeit with very large year-to-year and longer-term fluctuations). At the very least, there is no evidence in these data of any decline in the abundance of fish in the North Sea.

Very similar patterns are apparent in the abundances of commercially important and industrial fish species. Although the catch rates of non-commercial species appear to have declined slightly over the last decade or so following a peak in the late 2000s they remain comparable to those seen in the 1990s. It needs to be borne in mind that the catch rates of non-commercial species are very much lower overall (one or two Orders of magnitude lower) than those of the commercially important and industrial species which may have affected these results.

The general increase in catch abundance was apparent in seven of the eight Orders (higher taxonomic groups) for which there were sufficient data to construct time-series with catch rates in the 2020s between 40% and 180% higher than during the mid-1990s.

These data also show that there have been very large changes in catch rates and thus presumably in abundances over short timescales, including from one year to the next. This highlights the importance of taking a longer-term view of data such as these, rather than focussing on short periods which may not show representative trends.

It is worth noting that the occasional peaks in the catch rates (for example in the Q1 survey in 1974 and 2000) are very largely due to substantial increases in catches of a small number of species, such as Norway pout, haddock, whiting or gurnards. These species are recognised as having exceptionally large year-classes from time to time.

Appendix 1

Data Limitations

ICES recommends caution in the interpretation of data in its DATRAS database. In particular:

- There is no guarantee that the fishing gears used adequately or equally sample all species.
- The survey tows are limited to certain habitat types and avoid others (areas of rocky seabed, for example) which will influence the species caught and their relative abundances.
- Over time species determination skills improve. As a result, new taxa will emerge in the dataset that were previously reported as part of another closely related taxon.
- Over time the sampling procedures, gear characteristics, timing of the survey or the area covered may have changed thereby influencing the catches.

Source

Modified from ICES's data set disclaimer.

Appendix 2

Species Included in Analysis

The analysis included the 160 species and species groups listed below. Species were excluded from the analysis if their catch rate was zero throughout the area and time-period covered by the analysis.

Species are grouped by Family and Order. For example, cod (genus: *Gadus*; species: *morhua*) belongs to the Family Gadidae and the Order Gadiformes. Saithe (*Pollachius virens*) also belongs to the Gadidae family. Hake (*Merluccius merluccius*) belongs to the same Order (Gadiformes) as cod and saithe but to a different Family (Macrouridae) indicating that it is more distantly related to cod and saithe than they are to each other.

For the purposes of the analysis, 25 species (shaded) were categorised as 'commercially important'. This category does not include every species that is ever landed commercially but is intended to reflect the principal species important to UK whitefish fishing boats (what might be regarded as 'target' species).

Ten species and species groups (mainly sandeels plus Norway pout) were categorised as 'industrial' because they are caught primarily for reduction to fish meal and oil rather than for human consumption.

All other species (not categorised as 'commercially important' or 'industrial') are regarded as 'non-commercial'.

Order / Family	*Genus species*	Common name	
Chimaeriformes			
Chimaeridae	*Chimaera monstrosa*	Rabbit fish	
Gadiformes			
Gadidae	*Brosme brosme*	Tusk	Commercial
	Ciliata	Rockling	
	Ciliata mustela	Fivebeard rockling	
	Ciliata septentrionalis	Northern rockling	
	Enchelyopus cimbrius	Fourbeard rockling	
	Gadiculus argenteus	Silvery pout	
	Gadus morhua	Atlantic cod	
	Gaidropsarus	Rockling	
	Gaidropsarus argentatus	Arctic rockling	
	Gaidropsarus macrophthalmus	Bigeye rockling	
	Gaidropsarus mediterraneus	Shore rockling	
	Gaidropsarus vulgaris	Three-bearded rockling	
	Gobius	Goby	
	Gobius gasteveni	Steven's goby	
	Melanogrammus aeglefinus	Haddock	Commercial
	Merlangius merlangus	Whiting	Commercial
	Molva dypterygia	Blue ling	Commercial
	Molva molva	Ling	Commercial
	Phycidae	Forkbeard	
	Phycis blennoides	Greater forkbeard	
	Pollachius pollachius	Pollack	Commercial
	Pollachius virens	Saithe	Commercial
	Raniceps raninus	Tadpole fish	
	Trisopterus esmarkii	Norway pout	Industrial
	Trisopterus luscus	Pouting (Bib)	
	Trisopterus minutus	Poor cod	
Macrouridae	*Coelorinchus caelorhincus*	Hollowsnout grenadier	
	Coryphaenoides rupestris	Roundnose grenadier	
	Malacocephalus laevis	Softhead grenadier	
	Merlucciidae	Other Merluccid hakes	
	Merluccius merluccius	European hake	Commercial

Order / Family	*Genus species*	Common name	
Gobiiformes			
Gobiidae	*Aphia minuta*	Transparent goby	
	Crystallogobius linearis	Crystal goby	
	Gobiidae	Other gobies	
	Gobius cobitis	Giant goby	
	Gobius niger	Black goby	
	Gobius paganellus	Rock goby	
	Lesueurigobius friesii	Fries's goby	
	Pomatoschistus	Goby	
	Pomatoschistus lozanoi	Lozano's goby	
	Pomatoschistus microps	Common goby	
	Pomatoschistus minutus	Sand goby	
	Pomatoschistus norvegicus	Norway goby	
	Pomatoschistus pictus	Painted goby	
Lopiiformes			
Lopiidae	*Lophiidae*	Other Anglerfishes	Commercial
	Lophius budegassa	Blackbellied angler	Commercial
	Lophius piscatorius	Angler (Monk)	Commercial
Mugliformes			
Mugilidae	*Chelon labrosus*	Thicklip grey mullet	
	Chelon ramada	Thinlip mullet	
	Mugil cephalus	Flathead grey mullet	
	Mugilidae	Other mullets	
Perciformes			
Blenniidae	*Blenniidae*	Combtooth blennies	
	Blennius	Blenny	
	Blennius ocellaris	Butterfly blenny	
Bramidae	*Brama brama*	Atlantic pomfret	
Callionymidae	*Callionymidae*	Other dragonets	
	Callionymus	Dragonet	
	Callionymus lyra	Dragonet	
	Callionymus maculatus	Spotted dragonet	
	Callionymus reticulatus	Reticulated dragonet	

Order / Family	*Genus species*	Common name	
Labridae	*Ctenolabrus rupestris*	Goldsinny-wrasse	
	Labrus bergylta	Ballan wrasse	
	Labrus mixtus	Cuckoo wrasse	
	Symphodus melops	Corkwing wrasse	
Moronidae	*Dicentrarchus*	Seabass	
	Dicentrarchus labrax	European seabass	Commercial
Mullidae	*Mullus surmuletus*	Surmullet	
Sparidae	*Pagellus erythrinus*	Common pandora	
	Sarpa salpa	Salema	
	Sparidae	Other porgies and seabreams	
	Spondyliosoma cantharus	Black seabream	
Pleuronectiformes			
Bothidae	*Arnoglossus*	Scaldfish	
	Arnoglossus imperialis	Imperial scaldfish	
	Arnoglossus laterna	Mediterranean scaldfish	
	Arnoglossus thori	Thor's scaldfish	
	Bothidae	Other lefteye flounders	
Pleuronectidae	*Glyptocephalus cynoglossus*	Witch flounder	
	Hippoglossoides platessoides	Long rough dab	
	Limanda limanda	Common dab	Commercial
	Microstomus kitt	Lemon sole	Commercial
	Platichthys flesus	European flounder	
	Pleuronectes platessa	European plaice	Commercial
	Pleuronectidae	Other righteye flounders	
Scophthalmidae	*Lepidorhombus boscii*	Four-spot megrim	
	Lepidorhombus whiffiagonis	Megrim	Commercial
	Scophthalmus maximus	Turbot	Commercial
	Scophthalmus rhombus	Brill	Commercial
	Zeugopterus	Topknot	
	Zeugopterus norvegicus	Norwegian topknot	
	Zeugopterus punctatus	Topknot	
	Zeugopterus regius	Eckström's topknot	
Soleidae	*Buglossidium*	Solenette	
	Buglossidium luteum	Solenette	
	Microchirus	Sole	
	Microchirus variegatus	Thickback sole	
	Solea	Sole	
	Solea solea	Common sole	Commercial
	Soleidae	Other soles	

Order / Family	*Genus species*	Common name	
Rajiformes			
Rajidae	*Leucoraja circularis*	Sandy ray	Commercial
	Leucoraja fullonica	Shagreen ray	
	Leucoraja lentiginosa	Freckled skate	
	Leucoraja naevus	Cuckoo ray	Commercial
	Raja	Rays	
	Raja brachyura	Blonde ray	
	Raja clavata	Thornback ray	Commercial
	Raja microocellata	Small-eyed ray	
	Raja montagui	Spotted ray	Commercial
	Raja undulata	Undulate ray	
	Rajidae	Others rays and skates	
Scorpaeniformes			
Agonidae	*Agonus cataphractus*	Hooknose	
	Leptagonus decagonus	Atlantic poacher	
Anarhichadidae	*Anarhichadidae*	Wolffish	
	Anarhichas	Wolffish	
	Anarhichas lupus	Atlantic wolffish	Commercial
	Anarhichas minor	Spotted wolffish	
	Anarrhichthys ocellatus	Wolf-eel	
Cottidae	*Artediellus atlanticus*	Atlantic hookear sculpin	
	Cottidae	Other sculpins	
	Icelus bicornis	Twohorn sculpin	
	Micrenophrys lilljeborgii	Norway bullhead	
	Myoxocephalus	Sculpin	
	Myoxocephalus scorpius	Shorthorn sculpin	
	Trigloporus	Sculpin	
	Triglops	Sculpin	
	Triglops murrayi	Moustache sculpin	
Cyclopteridae	*Cyclopteridae*	Other lumpfishes	
	Cyclopterus lumpus	Lumpfish	
Liparidae	*Liparidae*	Other snailfishes	
	Liparis	Seasnail	
	Liparis montagui	Montagus seasnail	
Pholidae	*Pholis gunnellus*	Rock gunnel	
Psychrolutidae	*Cottunculus microps*	Polar sculpin	

Order / Family	*Genus species*	Common name	
Scorpaenidae	*Helicolenus dactylopterus*	Blackbelly rosefish	
	Scorpaena scrofa	Red scorpionfish	
	Scorpaenidae	Other scorpionfishes	
	Sebastes	Redfish	
	Sebastes mentella	Beaked redfish	
	Sebastes norvegicus	Golden redfish	
	Sebastes viviparus	Norway redfish	
Triglidae	*Chelidonichthys*	Gurnard	
	Chelidonichthys cuculus	Red gurnard	Commercial
	Chelidonichthys lastoviza	Streaked gurnard	
	Chelidonichthys lucerna	Tub gurnard	
	Eutrigla	Gurnard	
	Eutrigla gurnardus	Grey gurnard	
	Trigla	Gurnard	
	Triglidae	Other gurnards and searobins	
Zoarcidae	*Zoarces viviparus*	Eelpout	
	Zoarcidae	Other eelpouts	
Trachiniformes			
Ammodytidae	*Ammodytes*	Sandeels	Industrial
	Ammodytes marinus	Lesser sand-eel	Industrial
	Ammodytes tobianus	Small sandeel	Industrial
	Ammodytidae	Other sandlances	Industrial
	Ammodytoides	Sandeels	Industrial
	Gymnammodytes semisquamatus	Smooth sandeel	Industrial
	Hyperoplus	Sandeels	Industrial
	Hyperoplus immaculatus	Greater sand-eel	Industrial
	Hyperoplus lanceolatus	Great sandeel	Industrial
Trachinidae	*Trachinus draco*	Greater weever	

Appendix 3

ALL Fish	Q1 CPUE	Q1 SE	Q3 CPUE	Q3 SE	Both CPUE	Both SE
1974 - 1978	42.1	12.2				
1979 - 1983	19.3	1.9				
1984 - 1988	25.0	1.8				
1989 - 1993	35.6	3.1				
1994 - 1998	35.1	3.8	45.2	2.7	40.2	2.9
1998 - 2003	40.5	10.0	60.6	11.0	50.6	8.8
2004 - 2008	21.5	2.4	36.5	3.5	29.0	2.3
2008 - 2013	28.1	1.4	46.5	4.5	37.3	2.1
2014 - 2018	31.2	3.8	64.8	8.0	48.0	4.7
2019 - 2023	38.2	3.7	79.0	8.0	58.6	4.4

Table 1

The average catch rates (and the standard errors of the means) of all fish in the Q1 and Q3 North Sea IBTS surveys and across both surveys in 5-year time periods from 1974 to 2023. (*See Appendix 2 for species.*)

Commercially Important Fish	Q1 CPUE	Q1 SE	Q3 CPUE	Q3 SE	Both CPUE	Both SE
1974 - 1978	92.1	11.6				
1979 - 1983	69.0	7.7				
1984 - 1988	107.4	7.7				
1989 - 1993	156.3	10.2				
1994 - 1998	120.0	9.4	180.4	27.5	150.2	11.0
1998 - 2003	173.4	45.7	253.4	45.2	213.4	36.3
2004 - 2008	79.9	7.1	130.7	6.9	105.3	4.1
2008 - 2013	87.0	9.3	129.4	17.8	108.2	9.0
2014 - 2018	96.2	9.8	191.1	21.0	143.6	14.2
2019 - 2023	154.2	22.9	275.7	22.9	215.0	19.9

Table 2

The average catch rates (and the standard errors of the means) of commercially important fish in the Q1 and Q3 North Sea IBTS surveys and across both surveys in 5-year time periods from 1974 to 2023. (*See Appendix 2 for species.*)

Industrial Fish	Q1		Q3		Both	
	CPUE	SE	CPUE	SE	CPUE	SE
1974 - 1978	443.0	177.8				
1979 - 1983	137.2	24.7				
1984 - 1988	132.0	30.3				
1989 - 1993	179.6	34.8				
1994 - 1998	250.7	64.0	270.0	29.1	260.3	25.2
1998 - 2003	203.0	56.0	334.0	71.0	268.5	57.0
2004 - 2008	109.2	25.5	215.7	30.2	162.5	22.9
2008 - 2013	206.1	42.7	385.5	45.8	295.8	30.7
2014 - 2018	231.0	41.6	536.4	96.2	383.7	44.9
2019 - 2023	223.6	40.4	581.3	92.2	402.4	56.9

Table 3

The average catch rates (and the standard errors of the means) of industrial fish in the Q1 and Q3 North Sea IBTS surveys and across both surveys in 5-year time periods from 1974 to 2023. (*See Appendix 2 for species.*)

Non-Commercial Fish	Q1		Q3		Both	
	CPUE	SE	CPUE	SE	CPUE	SE
1974 - 1978	1.5	0.1				
1979 - 1983	1.1	0.2				
1984 - 1988	1.6	0.2				
1989 - 1993	2.5	0.1				
1994 - 1998	2.8	0.3	3.0	0.4	2.9	0.3
1998 - 2003	3.7	0.1	4.1	0.4	3.9	0.2
2004 - 2008	4.1	0.2	5.3	1.2	4.7	0.7
2008 - 2013	3.4	0.4	4.8	0.6	4.1	0.4
2014 - 2018	3.7	0.3	4.7	0.3	4.2	0.2
2019 - 2023	2.6	0.1	3.9	0.2	3.2	0.1

Table 4

The average catch rates (and the standard errors of the means) of species that are neither industrial nor commercially important in the Q1 and Q3 North Sea IBTS surveys and across both surveys in 5-year time periods from 1974 to 2023. (See Appendix 2 for species.)

These papers are published by the Shetland Fishermen's Association to promote debate and stimulate further research on issues of relevance to Scotland's fishing industry.

Shetland Fishermen's Association
Mair's Quay, Holmsgarth, Lerwick, Shetland, ZE1 0PW
Telephone: +44 (0) 1595 693197 Fax: +44 (0) 1595 694429 Email: info@shetlandfishermen.com
www.shetlandfishermen.com