

Fishing up the past

What historical records can tell us about marine populations today

Overfishing is a constant concern. But what is a normal, unfished population? As **Ruth Thurstan** reveals, concerns about overfishing started early – and can help to quantify the fish that were once in the sea.

Fishing today remains what it essentially always has been: the hunting of a wild population. Managing fisheries therefore contains many challenges. Most of them stem from the fact that in order to appropriately regulate a harvested fish stock we need to answer two rather difficult questions: how many fish *are* there, and how many fish *were* there? Even the first question is not an easy one, given that we can rarely count fish directly. So in many cases fisheries models have been developed to provide guidance on what fish and how many it is safe – that is, sustainable – to take.

The models will take into account such things as breeding cycles and patterns of the species,

their growth rates and their age to reproduce. Typical data required for these models include the amount of catch landed for a given amount of fishing effort, the length and age of fish in the catch and the spatial structure of the fish population – that is, does the population have lots of genetically separate populations or do sub-populations mix? Such information is collected for many of our more economically important fisheries, but records typically span just 20–40 years at most¹. This makes it very difficult to estimate how many fish there used to be; hence, our understanding of how much we have altered fish abundance over many years of fishing is also very limited.

Whilst there is no easy way to provide past estimates of fish abundance, we can go some way towards improving our understanding of past change by looking back into the historical records. Until recently, scientists and resource managers often disregarded such data. They could claim some reason: it is difficult to compare historical and modern data, and old data may be seen as less reliable. However, old data may be the only data that we have; and in recent years it has become increasingly accepted that historical data can provide us with valuable information on past environments and past abundance that may help us interpret whether we are managing marine environments sustainably today. Historical marine ecology has become a field of research in itself. It aims to reconstruct past environments; it uses a range of different materials and techniques. Timelines can span from several decades to hundreds or even, using deductions from the fossil record, millions of years. What has been shown from this type



A sail-powered boat of the Hastings fishing fleet approaching the beach in heavy weather, circa 1890. A trawl net is visible in the stern of the boat. Image courtesy of The Fisherman's Museum, Hastings

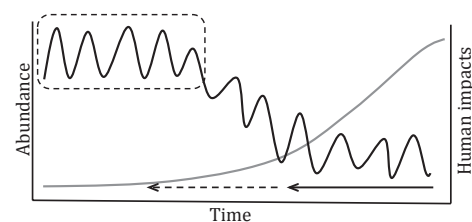


Figure 1. Conceptual diagram showing a species abundance (black line) as human impacts (e.g., exploitation levels, habitat destruction) increase (grey line). The solid arrow shows current temporal depth of knowledge, perpetuating the notion that contemporary (low) abundances are normal. The dashed arrow shows the temporal depth of knowledge required to establish appropriate environmental baselines (dashed box). Unless we can push the limits of our knowledge back into the past, we cannot know the past states of our seas and fisheries

of research is that by expanding our timescales we may gain a completely different perspective on the current status of an environment or the natural abundance of a species that we are trying to manage (Figure 1).

In the UK, statistical records began to be collected from 1886 onwards. They provide a wealth of information on quantities of fish landed and numbers of vessels fishing. However, the marine environment around the UK has been exploited for its fish resources for much longer than this². Indeed, some of the most dramatic impacts

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most likely occurred during the mid-nineteenth century, several decades before the start of UK fisheries statistics. During this period a combination of a rapidly growing human population in industrial cities and improvements in transport networks (the railways) led to an increasing demand for fish; and this in turn resulted in the expansion of bottom trawling, a method of fishing where a net is towed along the seabed behind a heavy wooden beam³ (Figure 2). Such fishing methods were widely perceived even at the time to be damaging to fish populations, their feeding and breeding grounds; hence, this initial expansion of trawling was highly controversial. One consequence was a Royal Commission of Inquiry in 1866⁴. But those first sustainability concerns counted for little: the success of the trawl in enabling greater quantities of fish to be caught meant that trawling quickly proliferated across the UK, and by the time fisheries statistics began to be collected in 1886 the majority of fish was caught using this method.

The major changes to fish populations that took place during the initial expansion of trawling occurred too early to be recorded using conventional statistics. Yet understanding the extent of change during this period is key to understanding how our fisheries and wider marine environment have been altered as a result of intensive fishing. In the absence of quantitative data, other methods must be found to describe the magnitude of changes that occurred. Luckily for us, the outcry caused by the proliferation of trawling led to two Royal Commissions of Inquiry being undertaken, one beginning in 1863 (which took three years to report)⁴ and one in 1883, completed in 1885⁵. Each Royal Commission interviewed witnesses from all parts of the fishing industry about their

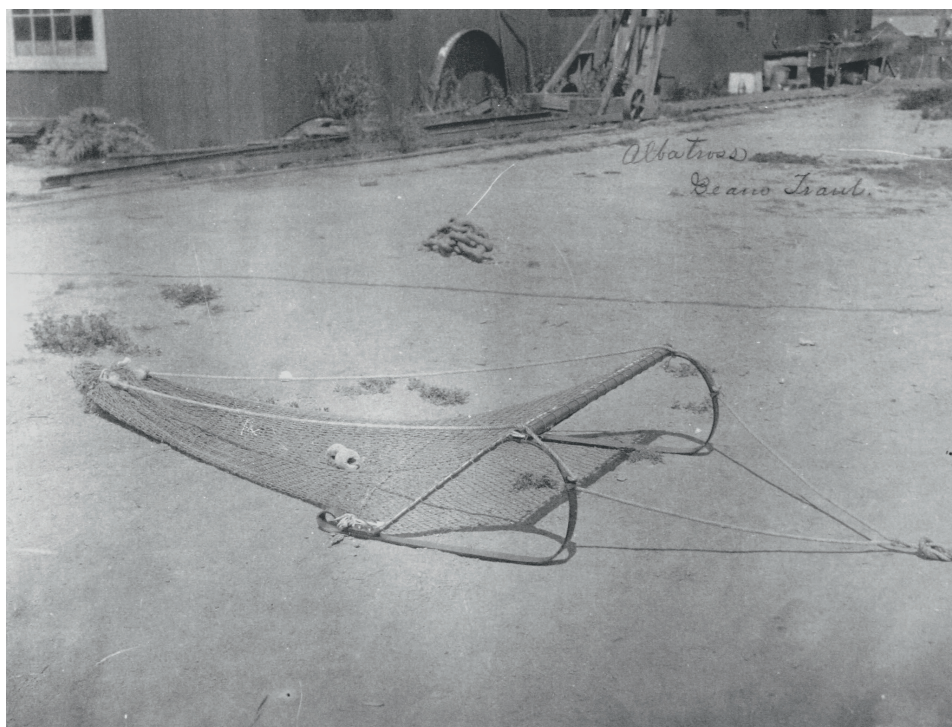


Figure 2. Photograph of a beam trawl taken in 1895, Gulf of Maine Cod Project, NOAA National Marine Sanctuaries. Reproduced courtesy of National Archives and NOAA Fisheries

fishing activities, changes to their catch and their perceptions of trawling, recording their testimony word for word. Today, these voices from the past deliver vital clues to how our marine environment looked before bottom trawling came in; they provide some of the earliest evidence of the influence of intensive fishing.

Most of witnesses talked of changes in a qualitative sense – along the lines of “There are fewer fish than there used to be” and “Catches are not what they were in my father’s day”; but some witness statements gave quantitative measures of change. I used these witness statements to quantify early changes in catch rate, and the adaptations that fishermen made to continue to earn a living from declining inshore fish stocks⁶.

During the nineteenth century, the use of the trawl spread from the south of England, northwards along the east and west coasts of the UK. By the 1860s the bottom trawl had become a regular feature on the northeast coast of England, and by the 1880s its use had spread to the east coast of Scotland. The initial impacts of trawling were therefore still within recent memory for fishermen on these two coasts during the time of the two inquiries. I collected all statements from these regions that quantitatively described changes. Some were in terms of fish catch, some described fishing effort (the numbers of vessels or distances travelled to find worthwhile catches); others were about prices

paid or obtained. Some representative examples are given in Table 1. Because most statements used different units of measurement I converted each statement to relative change; thus R. Stibbs’s statement indicates a 113% increase in the size of the fleet over 40 years, and C. Abbs describes a doubling of the price of cod. In this way different testimonies in each category could be directly compared.

In total, 35 witnesses from the northeast and south coasts of England provided quantitative statements of change to the 1866 inquiry. By the 1860s, bottom trawling had been established in the northeast of England just 20 years, but had been present on the south coast for much longer. Figure 3 shows the contrast between the two regions in witnesses’ perceptions of changes in catches of fish. Declines were more commonly perceived in the northeast (85% of witnesses), compared with only 27% of witnesses on the south coast. Furthermore, witnesses on the northeast coast perceived much greater declines than fishermen on the south coast. For example, one northeast line fisherman complained of a 20-fold decline over a 15-year period, whilst another line fisherman stated he had experienced a 25-fold decline in catch rates of whitefish (i.e. cod and haddock) over 35 years (Figure 3a). Yet the maximum perceived decline on the south coast was just a fivefold decrease in catch rate (Figure 3b) and many perceived no decline at all. Figure 3c shows changes in catch from the east coast

Table 1. Descriptions of change

Fisher	Subject	Description
1866 Royal Commission		
B. Simpson	Catch	"[Off Spurn Point] twenty years ago we used to get 600 or 700 head of fish a day there; now they cannot get above 20 head, or 3 or 4 score at the outside."
T. Bulmer	Catch	"On the average, we brought ashore 3 quarters or a ton of fish in a boat Now, on the average, 15 or 16 stones will be the outside."
R. Stibbs	Vessels	"40 years ago there were 30 trawl vessels, now there are 64."
C. Abbs	Price	"I could buy haddocks formerly at 3d.* and I have now to pay 6d. Cod ... I could formerly get for 1s. and 1s. 8d. I am now obliged to pay 2s. 6d. and 3s. 6d."
1885 Royal Commission		
G. Morrice	Catch	"[7 years ago] boats here can say they have got half a ton, 12 cwt†, and as high as 14 and 15 cwt [haddocks], but the highest catch we had last year was 5.5 cwt, at about, I may say, 6 miles farther offshore than formerly."
R. Rowntree	Catch	"I have been going [to sea] 34 years ... and when I commenced we would get from 40 to 50 stone of fish, and now ... we cannot get over 4 or 5."
A. W. Ansell	Catch	"Up to 1855, a vessel would capture as much as 60 stones in a night from the Silver pits ... it is unusual now to get more than 6 or 8 stone, which is a good haul."
D. Cole	Distance	"[When first began fishing, we went] 25 to 30 miles, and now we have to go 60 and 70."

*Prior to 1971, the pound (£) was divided into shillings (s.) and pence (d.). There were 20 shillings, or 240 pence, in one pound.
†cwt stands for 'centum weight' or hundredweight. In the UK 1 cwt was equal to 112 lb, or 50.8032 kg.

of Scotland recorded in the 1885 inquiry, with perceptions of decline very similar to what had been experienced 20 years previously in England. At first glance, the testimony provided by these witnesses appears to show little trend: the number of years an individual had been fishing did not seem to matter, fishermen with less experience had experienced declines just as fishermen with greater experience had (Figure 3). However, whilst no particular trends were observed over

time, these graphs still provide an important message: that in locations where trawl fishing had only recently begun, big declines in catches were observed. Whether this was directly due to bottom trawling, or just to overfishing more generally, is hard to say. Certainly, in these regions, fishermen's views of trawling were very polarised, with some predicting the extinction of fish along the coast if trawling were to continue (see box). Yet despite these extreme views it is likely that they were seeing real declines in catches during this period, as many fishers described having to increase the quantity or size of fishing gear or move further offshore to unexploited grounds, to keep catch rates maintained (Figure 4). By converting these testimonies of those who earned their living as fishermen to relative change, I have shown that major changes in

Some fishermen predicted the extinction of fish along the coast if trawling were to continue

catch were perceived to have occurred as trawling expanded along the coast of the UK. However, the Commissioners of the 1866 inquiry attributed more importance to the immediate demand for fish that trawlers were able to meet⁴. Rather than try to manage this rapidly growing fishery, they recommended that fishing become completely unrestricted, believing that simple economics (i.e., low returns as fish became harder to catch or as supply of fish caught up with the increased demand) would halt overfishing long before it managed to reduce fish populations down to low levels. Unsurprisingly, this (in)action did not end the problems of declining coastal stocks or conflict between different classes of fishermen, and just 20 years later a second inquiry was established to try to understand if declines

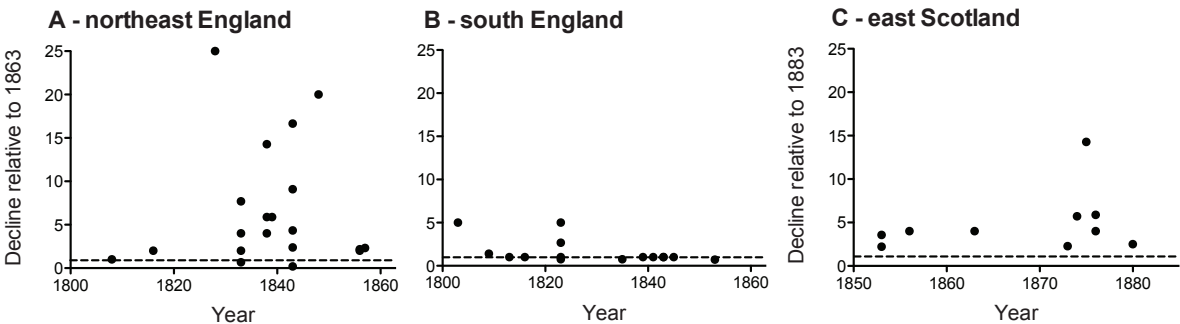


Figure 3. Witness perceptions of changes in catch rate of whitefish: (a) northeast England, relative to 1863 ($n = 20$); (b) south England, relative to 1863 ($n = 15$); (c) east Scotland, relative to 1883 ($n = 10$). Each datum point represents an interviewed fisherman's perception of change from the earliest year they can recall. Thus the highest dot in 3A represents a fisherman in 1863 recalling that in 1825 catches were 25% higher

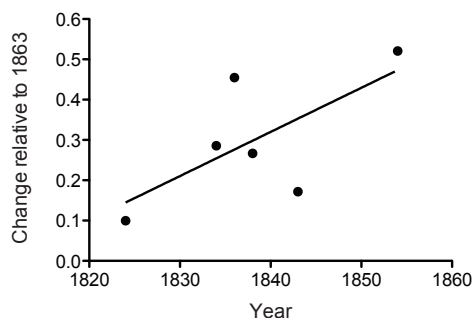


Figure 4. Witness perceptions of relative changes in distance travelled to fishing grounds during the 1866 inquiry ($y = 0.0109x - 19.824$, $n = 6$, $R^2 = 0.46$). The y-axis shows the perceived relative increase in the distance travelled offshore

were occurring⁵. However, although documented records were still few and far between, by the 1880s it was not just the line, net and pot fishermen who were worried about declines. By this time many seasoned trawl fishers and owners – those who had a vested interest in the industry – were also concerned about the declines they were seeing in fish stocks. Many even requested that trawl fishing be halted close inshore in order to protect fish feeding and breeding grounds. These two east coast trawl owners put their views succinctly:

This decrease I attribute to trawling as carried on within these territorial waters and within the rivers and bays ... I think that the best legislative remedy would be the prevention of such trawling by an Act of Parliament stopping all trawling within

The net drawn along the bottom of the sea is pretty heavy in itself, but in order to save it, they attach aprons to it, and make it twice as heavy again. The sand being volatile, these nets harrow into it, and they tear up the spawn, and crush it so much that it never can come to maturity. They crush the spat and spawn of the crustaceous fish, such as shrimps, crayfish, and whelks; very large whelks, horse-cockles, and all kinds of shell-fish of that description are destroyed by them. I may say that beds over which the trawl-nets are used are alive with animalcule, which is the reason why the fish resort there. ... I think that the whole of these spawning grounds have been destroyed, and that by degrees the fish are becoming extinct on the coast.
(W. Brabazon, ex-trawl fisherman, in evidence to the Royal Commission of Inquiry of 1866)

a limit of three miles. (W.L. Robins, trawl owner from Hull)

Where scientific men determine that there are breeding grounds, or nurseries as we might term them, I think it might be judicious to limit the trawling operations. (J. Alward, trawl owner from Grimsby)

I think that the best legislative remedy would be an Act of Parliament stopping all trawling within a limit of three miles

Records kept by two trawl owners also backed up the concerns of many (Figure 5), showing that returns of trawlers had gradually been declining throughout the last 20 years. As a result, this second inquiry recommended that annual records should start to be kept, and in 1886 fisheries statistics began to be collected.

For us today, these witness statements from the Royal Commissions of 1866 and 1885 provide a window into the changes that took place long before fisheries statistics began. Despite the long period of time that has elapsed since

these testimonies were collected, they are still of relevance today as they provide us with vital information on the earliest impacts of intensive fishing activities. Without these data we might make the mistake of believing that our contemporary marine environment is the same as it has always been. Clearly, this is not the case. Fisheries today are facing unprecedented challenges as a result of human impacts; only by looking back can we hope to gain a clearer understanding of what our goals for future marine environments should be.

References

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Trawl fishermen and their boat, Hastings, southeast England. Photograph by George Woods, circa 1890. Image courtesy of The Fisherman's Museum, Hastings

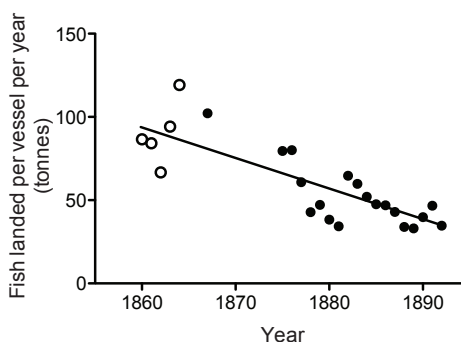


Figure 5. Average landings per vessel per year for trawl vessels owned by H. Knott (1866 inquiry) and G. Alward (Garstang, 1900) ($y = -1.9427x + 97.489$, $R^2 = 0.68$)