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I. Scientific and political precursors of the late 19th century facilitating the establishment of ICES, and subsequent scientific and political events influencing the continued evolution of ICES

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Overfishing, science, and politics: the background in the 1890s to the foundation of the International Council for the Exploration of the Sea

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The world of the 1890s was a very different place in which to live and work compared with the present and needs to be taken into account when considering the accomplishments made then in a fisheries research context. In various places, but notably in Scandinavia, scientists had begun to realize that there was a connection between the distribution of fish and the properties of the water in which they lived. With this in mind, Otto Pettersson organized the first multinational survey of a sea area in 1893–1894, and then, apparently, became obsessed with the idea that such joint international schemes were the wave of the future. Over the next five years, he worked tirelessly to bring about a scheme that took in the seas of northwestern Europe by making contacts in all its coastal nations. His German colleagues supported him from the beginning, providing that the research findings would be related to the development of a rational fishing policy. British colleagues were, however, divided in their opinions about his proposals, having been engaged in an internal argument about "overfishing" throughout the latter half of the 19th century. Great Britain, at the time, had a fishing industry that dwarfed those of the rest of Europe combined. Pettersson's plans really needed British participation if they were to lead to meaningful international agreements about fishing in the North Sea in particular.

Keywords: international cooperation, northwestern Europe, Otto Pettersson, overfishing.

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Introduction

We think that it is important to have some sense of the daily lives of the people in the 1890s as a background to the work carried out in a fisheries research context during that decade. For example, reading and writing at night had to be done by candlelight or oil lamps: the 5700 electric light bulbs set in the Palace of Electricity at the 1900 Paris Exposition were the most concentrated man-made light ever seen and very much a "special case" (Preston, 1999). In the plays of Chekhov, a servant seems to be either lighting or snuffing out the candles all the time. Steel nibs were then the norm for writing with in that flickering half-light though "reservoir" pens, or fountain pens, had begun to appear. Copies of correspondence were made meticulously by hand in the various ministries and business offices across Europe with people employed specifically for this work. Ibsen (1918), in *The Wild Duck*, has a pensioned-off army officer only too pleased to copy material from a local office to eke out his money. There were some telephones on local networks, but even when he died in 1912, Strindberg had only twelve numbers on the personal directory in his Stockholm flat. Cable or telegraph services had, for 25 years, been the current miracle for rapid, long-distance communication. In June 1897, for example, Queen Victoria pressed a button in the telegraph room of Buckingham Palace to send a simple Diamond Jubilee message around the world in a little over two minutes. Cable was, in fact, the Victorian Internet. The postman brought the more mundane day-to-day messages, with deliveries in the bigger towns and

cities being made hourly between 8 am and 9 pm each day in many cases. Railways were well developed, but horse-drawn vehicles, or the horse itself, remained just about the only means of making shorter journeys as the alternative to walking. Neither the power of electricity nor that of the internal combustion engine had yet been harnessed for any practical purpose. For some reason, men wore hats most of the time when they were outside of buildings, and women were dressed very elaborately by today's standards. This was, in fact, the world of the plays of Ibsen, Strindberg, and Chekhov and, whilst we may think things happened at a fairly leisurely rate, it did not seem so to those involved as D'Arcy Thompson records in a letter written just after the turn of the 20th century (R. D'Arcy Thompson, 1958, p.159):

> The conditions under which we work, against time, in the midst of controversy, and with everything about us insecure, are so worrying and laborious, so different from the conditions under which scientific work ought to go on, that the toil and responsibility are greatly increased.

It was also a time of atrocious conditions for factory workers all over Europe and for sailors, merchant seamen, fishermen and, especially, fisherlads at sea. Great fortunes had been made quite recently by trawler-owners everywhere, but especially in Great Britain, as the railways carried fresh fish quickly from the coast to the inland cities where there were ready markets. These cities were growing in political entities different, in some cases, from those of today. Sweden and Norway, for example, was one country as far as foreign affairs were concerned and ruled by the same monarch. Great Britain and Ireland were one country *per se*. Germany and Belgium were both relatively new countries, and Finland was still a Grand Duchy of Russia. Moreover, even as the planning meetings for ICES were taking place in 1899 and 1901, relations between Great Britain, Germany, and The Netherlands were strained by the war in South Africa. On 1 January 1900, there were serious articles in the British newspapers about the possibility of France taking the chance offered by Britain's involvement in South Africa to launch a combined forces raid on London. On the same day, Kaiser Wilhelm promised the rebirth of the German navy.

Anarchism, meanwhile, was rampant. In the 1890s, Spanish and French presidents and an Austrian empress were assassinated, and in 1900, an Italian king. One of the reasons was the gross inequality of life within each of what are now the nations of the ICES community. In Britain, for example, fifteen of the nobility earned over £100 000 a year from land rents, while a senior British ambassador was paid only £5000 a year, a vice admiral £1460, and an ordinary sailor £32. Tradesmen, clerks, and teachers earned about £80 a year. In the United States, half of the wealth was owned by 1% of the population. The Commandant of the Marine Corps was paid $5500 a year, a captain $2000, and a private $166. Clerks averaged $1320 and chambermaids $480 a year (Preston, 1999).

When these and other facts of daily life are taken into account, it seems to us that the accomplishments of the founders of ICES become much more formidable than when considered in a scientific vacuum. This is because it becomes clear that they managed to get nations working together – against all odds – nations which, in most other spheres of life, both internally and externally, were not at all inclined to cooperate.

The need for cooperation

During the 19th century, various people in northwestern Europe began to think that there was a connection between the spatial distribution of fish in the sea and the changing character of the sea itself. With this in mind, Scandinavian scientists had undertaken more or less scattered hydrographic and biological investigations of the sea surrounding their countries in the 1870s and 1880s. For example, when the Bohuslän herring reappeared off the west coast of Sweden in the winter of 1877–1878 after an absence of seventy years, Gustaf Ekman was asked by the Agricultural Society for the Gothenburg and Bohuslän County to investigate the oceanographic background to see if it could account for the phenomenon (see also Corten, 1999, for a recent view). Then again, in July–August 1887, Oscar Nordqvist was in charge of a Finnish expedition looking into all aspects of the Gulf of Bothnia and adjacent waters (Simojoki, 1978).

The most important of these ventures, however, took place in February 1890 when Otto Pettersson, a Swedish chemist, extended Ekman's studies by organizing an investigation of the Skagerrak and the northern part of the Kattegat by using five Swedish vessels at the same time. Because of the number of ships in use, the necessary observations could be made in a few days and thus a quasi-synoptic view obtained (Pettersson and Ekman, 1891). It was also realized that it was important to obtain information about the variation in hydrographic conditions during each year and from year to year. To be of real value, therefore, the observations had to be repeated regularly and, ideally, extended into the northern North Sea. Since this required cooperation with other countries, Pettersson, after giving a lecture at the meeting of the Scandinavian Naturalists in Copenhagen in 1892 on the general characteristics of the North Sea and the Baltic (Pettersson, 1892a), broached the subject. The advantages to be gained from joint hydrographic investigations of these seas by Denmark, Norway, and Sweden (Pettersson, 1892b) had been made so obvious by the multi-ship exercise of 1890 that the meeting agreed that he and his colleague, Gustaf Ekman, should sketch out a plan of campaign (Ekman and Pettersson, 1892).

Consequently, when the Swedish Royal Academy of Sciences received a grant in 1893 to be used for hydrographic investigations of the seas surrounding Sweden,

it asked Otto Pettersson, a member of the Academy, together with Gustaf Ekman and August Wijkander, to be in charge of the investigations. They established themselves as the Swedish Hydrographic Commission and asked Scottish and German colleagues to join the project so that the observations could be extended to cover the region north of Scotland as well as the southern Baltic. The main investigation took place in May, August, and November 1893 and February 1894 (Smed, 1990a). The cooperation was successful and was continued to some extent after the year covered by the plan.

The idea of permanent cooperation germinates in Scandinavia

Pettersson now felt that there was a need for a more permanent arrangement. He proposed a scheme for an international hydrographic survey of the North Atlantic, the North Sea, and the Baltic based on the experience gained from the cooperative investigations in 1893–1894. He expressed the hope that this experience would "lead to an international agreement about the division of labour, and satisfactorily settle the question of methods and measures to be adopted in the course of future hydrographic survey" (Pettersson, 1894).

He presented his scheme to the International Geographical Congress held in London in 1895. The Congress passed a resolution to the effect that "the Congress recognises the scientific and economic importance of the results of recent research in the Baltic, the North Sea and the North Atlantic, especially with regard to fishing interests, and records its opinion that the survey of these areas should be continued and extended by co-operation of the different nationalities concerned on the lines of the scheme presented to the Congress by Prof. Pettersson" (Anon., 1895).

In Sweden, Pettersson had received some support for his plans from the fishermen's organizations. He had, however, also met with strong opposition. The influential fishery biologist and politician A. V. Ljungman, for example, argued that such investigations had nothing to do with fishery questions. Pettersson was now able to refer to the "London Resolution", stressing that he had not proposed its specific mention of the fisheries' interest in such investigations, but rather, as he wrote to Ekman, "It was two of the greatest fishery bosses from Grimsby who firmly demanded that the matter should be slanted towards fisheries problems and they made sure that it was clear that there was an urgent need to investigate the North Sea on this count .... sometimes one gets support from unexpected quarters" (Smed, unpubl. ms).

Pettersson was encouraged by the Swedish government to proceed with his plans and found that the Norwegian biologist Johan Hjort, who had been involved in the 1893–1894 joint investigations, was also interested in more permanent cooperation. In 1895, Hjort wrote from Jena inviting Pettersson to take the necessary steps to establish an international investigation programme. He intimated that a plan might be presented to various countries such as "England – (i.e. Great Britain and Ireland) – Sweden, Norway, and others?" in the autumn of 1896 (Smed, unpubl. ms). Hjort reported, after a visit to Great Britain in 1896, that Sir John Murray, a participant in the British "Challenger" expedition, who was then writing the scientific report of the voyage, was prepared to start international work if Fridtjof Nansen would take the lead in Norway and Otto Pettersson in Sweden (Smed, unpubl. ms). This was confirmed when John Murray visited Norway in the summer of 1897 and met with Nansen and Hjort. Murray suggested that Nansen should organize a conference on the matter in Kristiania (now Oslo). If this was not possible, he would take it upon himself to invite to Edinburgh a number of experts from the Scandinavian countries, Great Britain, Germany, and France to obtain agreement about the methods and instruments to be used. The conference would embrace physical as well as biological investigations.

On 19 October 1897, the Swedish Hydrographic Commission approached King Oscar II of Sweden and Norway suggesting that the Swedish government should propose to the governments of Norway, Denmark, and Great Britain a joint investigation of the hydrographic and biological conditions of the Baltic, the North Sea, and the Norwegian Sea in the interest of fisheries. The main task of this cooperative venture would be to study the currents and the nature and quantity of food in the upper 800–1000 m in all seasons. The area to be investigated would be divided among the participating countries, and each nation would establish an observation system in a certain part of its adjacent sea. The investigations should be continued for at least five years in order to study the year-to-year variations. It was suggested that the respective governments should designate delegates to meet for the preparation of detailed plans. It was thought that good results would be obtained via cooperation, as the experience in 1893–1894 had shown, and that, if the selected countries joined with Sweden, others were also likely to follow. In that case, the Swedish government might consider whether negotiations should be extended to other North Sea countries as well as to Russia and France (Smed, unpubl. ms).

The King requested a statement on the matter from the Swedish Academy of Sciences, which asked two of its members, H. H. Hildebrandsson and Hjalmar Théel, to consider the pros and cons and draft it. In their paper, they referred to the international cooperation that had taken place in meteorology since 1872 and that was now considered indispensable. They explained that there was the same need for cooperation in oceanography. The Academy forwarded these views to the King (Smed, unpubl. ms), and in March and April 1898, the governments of Denmark, England, and Norway were asked if

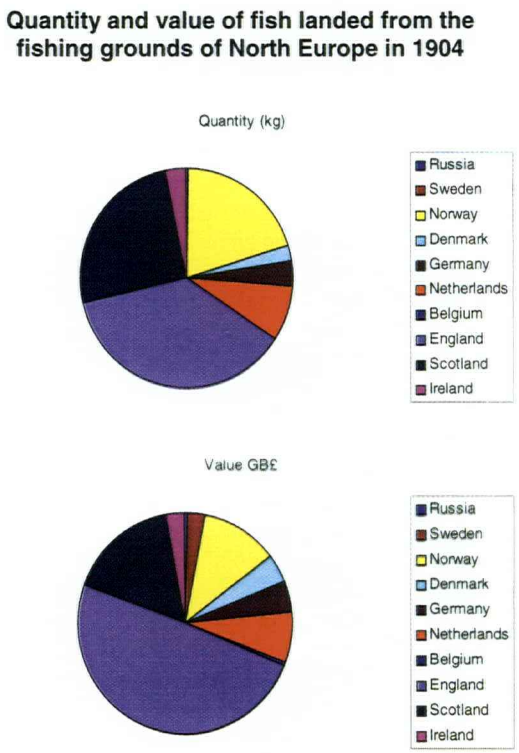

Figure 1. The quantity and value of fish landed from the fishing grounds of Northern Europe in 1904 (ICES, 1906).

their support for the idea of sustained cooperation in the investigation of the sea might be expected.

The reactions were positive, in principle, from Denmark and Norway; the problem was Great Britain. The British Foreign Secretary and Prime Minister, Lord Salisbury, wanted, in advance, more specific information about the scope of the proposed inquiry. It apparently seemed to him that a strictly scientific and technical investigation of the physical and biological conditions of the waters was all that was being contemplated. However valuable such an inquiry would be in itself, it should, in the opinion of the British government, only be conducted as ancillary to the study of "whether any existing methods of fishing are or are not exercising a detrimental effect on the supplies of fish in the waters of the seas in question."

If this were to be the main object of the proposed research, the British government would be willing to participate (Smed, unpubl. ms).

The overfishing argument in Great Britain

The reason for this interest in whether fishing was having a detrimental effect on North Sea fish stocks was based on harsh political and economic facts. For over 40 years, there had been a continuous argument in Britain as to whether trawls were both damaging the seabed and killing the small fish before they had a chance to recruit to the main fisheries. Phenomenal growth of the fishing industry along the North Sea coast of Great Britain had occurred during the period 1845–1865 after the railway network was in place to take fish daily to the new cities that had formed around the steam-driven industries of Victorian Britain. The trawler owners of Grimsby, Hull, and Aberdeen, in particular, had made fortunes in a matter of 10–20 years. Figure 1 shows that, as late as 1904, the British fishing industry was bigger, both in value and in the weight of fish taken, than the rest of the North Sea fishing nations combined. This situation was even more marked throughout the second half of the 19th century.

The concept of "overfishing", as used in the modern sense, was first mooted in Britain in 1854. Official Commissions of Enquiry into Sea Fisheries of various levels of formality were established in the years 1863,1876,1883, and 1893, with at least three others on a smaller scale during the period 1867–1880. The line-fishers complained about the arrival of the trawlers and sought the enquiries initially, but then, in the late 1870s, the trawler owners themselves saw their catch rates falling and wanted the government to do something about it.

The Commissions of Enquiry were non-trivial exercises, with the first of them being typical of the rest. Some 62 000 questions and answers are listed in the minutes of evidence after the three commissioners had travelled the length of the coasts of Great Britain. An example of the procedure adopted is the examination of Thomas Ramster in Hull on 3 October 1863 (Report Comm.,1865):

> 7330 (Mr Caird) Have you long been connected with the fishing trade in Hull? – Yes, for these last 20 years.
>
> .....
>
> 7344 Does a boat bring as many fish to the market now as it did then? – Yes.
>
> 7347 Are the fish caught now the same kind of fish that were caught then? – No, there are larger fish caught now.
>
> 7348 Do you find that you get as many soles on the average as you did 20 years ago? – Not so many now, owing to our having had mild winters. The winters used to be more severe than they are now. If we had a severe winter now there would be as many soles as we ever caught.
>
> .....
>
> 7376 Do the Dutch use a smaller mesh? – Yes.
>
> 7377 Do they catch smaller fish? – Yes.
>
> 7378 Is that advantageous to the fishery in general? – I don't know that it is, but such fish would be of no use in our markets.
>
> .....

Figure 2. "Professor Huxley, LL.D., F.R.S., L.S.D., Professor of Natural History, Naturalist, Inspector of Fisheries, etc. 'There is more in heaven and earth, O ratio, than is dreamt of in your philosophy' – (so perhaps he'll find it in the rivers)." This is the caption used by *Punch*, 19 March 1881, when it caricatured Thomas Huxley as a money-grabbing scientist via the "L.S.D." in his list of honours. This stood for Pounds, Shillings, and Pence in the monetary sense.

> 7424 How long has an inspector existed here? – I don't know.
> 7425 Has he been here ever since your time? – Yes, ever since I was here.
> 7426 Have you ever heard of fish being seized? – Yes, it has been seized at different times, principally owing to the vessels having met bad weather.
> The witness withdrew.

Unfortunately, the Chair of this commission, Thomas Huxley (Figure 2), the public face of Charles Darwin as well as an eminent scientist in his own right, gained the idea from the answers given by such "practical men" that their evidence was not to be trusted. They had little idea, it seemed to him, of how the trawls of first the new sailing smacks and then the steam-driven vessels might be destroying spawn on the seabed. What to them was firm evidence was quite obviously a case of mistaken identity to him, and his opinions carried the day with his colleagues because he was the generally accepted "maid of all work" in natural science to the government. If anything, his view hardened over the years so that by 1883, he was reiterating his 1866 ideas that "probably all the great sea fisheries are inexhaustible; that is to say, nothing we do seriously affects the number of fish. And that any attempt to regulate these fisheries seems consequently from the nature of the case to be useless" (Lee, 1992).

Whilst this is a simplification of his views, it was the general perception and by 1883 was not accepted by the trawler owners and some of the younger generation of fisheries workers. However, other "experts" did agree with him, and the government between 1883 and 1898 found itself being offered greatly differing advice from scientists. This was mainly because previous governments had not followed the recommendations of the successive commissions to begin the systematic collection of fisheries statistics at the main ports in England and Wales so that the analyses made by one worker would not only be based on reasonable data, but also

Figure 3. Frank Buckland – a pioneer of fisheries research in Great Britain and Ireland. This photograph shows Frank at work with an oyster-settling tray.

Figure 4. Ole Olsen – "fixer", visionary, and practical man who produced charts of the North Sea fishing grounds, a *Piscatorial Atlas of the North Sea*, and a Fisherman's Almanac that still comes out each year.

could be checked by others. The situation was better in Scotland. The details of the arguments that took place between Huxley, Lankester, McIntosh, D'Arcy Thompson, Holt, Garstang, and other fisheries scientists during the period 1883–1898 are fully documented by Southward (1996), Adams (1996), Smed (1996), and Lee (1992).

Frank Buckland (Figure 3) was, for a time, a co-worker of Huxley in the fisheries field. In 1867, he had become one of the fisheries inspectors whose appointments had been recommended by an earlier enquiry and, between 1875 and his death in 1880, he sat on four Royal commissions that looked into fish and fishing. He held views different from Huxley's on fisheries matters in many regards, but particularly in that of the need for the government to fund fisheries science. For example, he wrote in 1867:

> What objection can be reasonably argued against the employment of revenue cruisers for the accommodation of naturalists, appointed by Government...in order that they make a thoroughly practical examination of the dark and mysterious habits of food fishes. The trawl and tow net, we firmly believe, if judiciously and persistently employed over an extended area of the sea, by men able to identify what the nets drag up and entangle, would do more to bring to light what is now hidden and unknown than all the evidence collected by the Sea Fisheries Commission. It is a Government question, and not one of private or individual research. We feel confident that the time is not far distant when properly-equipped naturalists will be sent by Government to investigate the habits of deep sea fish (Burgess, 1996).

In some ways, Ole Olsen (Figure 4) carried on Buckland's work after the latter's early death in 1880 at the height of his influence in some regards. Olsen was a Norwegian who was born in Kristiansand in 1839, became a fisherman at the age of 14, and then, in 1871, established himself in Grimsby as a compass adjuster. He also began publishing *Olsen's Fisherman's Almanac*, which still appears yearly. Later in the 1870s, he published, as a complementary venture to his *Almanac*, *Close's Fisherman's Chart of the North Sea*, which summarized the practical man's state of knowledge about the North Sea grounds at that time. In 1880, he started selling logbooks in which fishermen noted down anything about their daily experiences whilst fishing which they deemed to be of general interest. Frank Buckland was sponsor of the prize of £25 for the logbook judged to be the best. This kind of material had already been used by Close and Olsen to produce the North Sea chart and would be used by Olsen in 1883 in his *Piscatorial Atlas of the North Sea*. In the introduction to that work, he wrote: "Seeing that fishery questions are now regarded of high importance, I trust my 'Atlas' may help to supply reliable information of a practical kind for consultation at a moment's notice." It would be difficult to better the spirit of this "mission statement" for the aims of fisheries science today. Indeed, the scope of the work—and the vision that brought it into being—is quite remarkable given the state of academic knowledge at that time of the distribution of fish in the North Sea and of its currents and topography.

That same vision appears time and again at critical moments in the 1890s as Olsen unswervingly supported the need for more fisheries science with his support for Pettersson's 1895 "London Resolution" (cf. Anon., 1895) being a prime example. Another is the fact that Olsen, as the secretary of the Grimsby Fisheries Society, ensured that, in 1892, Ernest Holt had laboratory space at the Society's hatchery and aquarium in nearby Cleethorpes when he began his classic work on the state of the Grimsby trawl fishery (Holt, 1895). In 1888, when the Society was started, the town had been indisputably the biggest fishing port in the world with landings of 60 000 t of fish a year caught by 800 vessels. By 1895, it was vying for first place with Hull on the other side of the Humber. Olsen, then, working from the heart of the world's commercial fishery, not only produced marvellously practical products, but also found time to influence politically what was happening in the wider world and to advance fisheries research by actively helping the new breed of scientists that Holt personified. In sum, he has to be seen as one of the most influential men working on the sidelines of European fisheries science of that decade.

Since 1883, the National Sea Fisheries Protection Association, an influential group of English trawler owners, skippers, and fish merchants, with also some Members of Parliament in membership, had been lobbying for international action in the North Sea to regu-

late the catching of immature, unmarketable fish. An international convention of 1882 had dealt with such things as the width of territorial seas, fishing vessel registration, and other "housekeeping" matters, but not with the amount of fishing itself. The British government agreed to host a meeting in July 1890 about size limits and fishing regimes. The meeting proved abortive because there was no common ground between the British delegates and those from the other countries about acceptable size limits. Moreover, the few statistics and fledgling marine science used by the German delegation underlined yet again that decisions could not really be taken in the present state of ignorance of the fundamentals of marine ecology and fishing theory. The international scheme proposed in 1898 offered a possible solution to the dilemma facing Lord Salisbury and his government. Therefore, after second thoughts, a message was sent to Sweden that Great Britain was "deeply interested in the result of any enquiry which may be undertaken into the hydrographic conditions prevailing in the seas and oceans which wash the shores of this country and those of the adjacent parts of Europe" and would participate in the proposed cooperation (Smed, unpub. ms) without pre-conditions, but stressing the need for an early solution to fishery questions. The British authorities were assured that nothing would hinder inclusion of a study of fishing methods in the proposed cooperation. At the same time, though, it was pointed out that an investigation of the physical and biological conditions was seen as a necessary prerequisite (Smed, unpubl. ms).

Parallel developments in Germany and The Netherlands

Smed (1990b) noted that Walther Herwig, an influential member of the Deutscher Fischerei-Verein (DF-V), succeeded in 1885 in forming a subgroup of this national association with a specific interest in coastal and high-seas fisheries. The association was then 15 years old and had been founded to strengthen all aspects of the German fishing industry because most of the fish consumed were imported from The Netherlands and Great Britain (Lenz, unpub. ms). Professor Victor Hensen had been working in Kiel since 1875, in fact, as a marine fisheries scientist looking at both the environmental and fish population aspects, and Friedrich Heincke wrote about the overfishing problem in 1888. It was Herwig's vision, however, that led to a more systematic development of the fishing industry in Germany.

Walther Herwig's interest in fish and fishing appears to stem from a childhood interest in natural history in general that never left him. Meyer-Waarden (1977) described how, as a young boy, Herwig tracked the movements of salmon up the Weser to their spawning grounds in the Eder and Emmer and was interested even

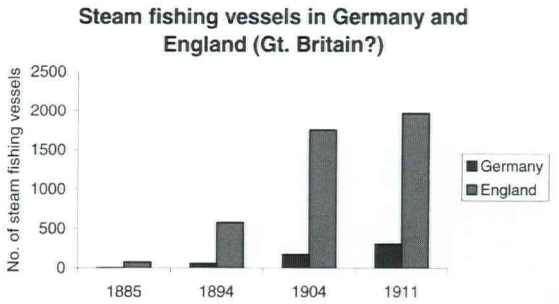

Figure 5. The number of steam fishing vessels at work in Germany and England (Great Britain?) in 1885, 1894, 1904, and 1911, respectively (Carmona, 1990).

then in how the stock might be protected. In later life, he proved to be an able and successful administrator in several quite diverse fields in the new state of Germany. Some of the main reasons for his success in all his posts were his natural friendliness and his down-to-earth personality. Plans of all kinds were developed with enthusiasm, but implemented with caution and level-headedness. He had, his biographer says, "High intelligence paired with broad-based knowledge and a limitless will to work and to get things done. His single-minded determination was coupled with great organisational skills, political delicacy and exceptional diplomacy.....His sense of humour was one of the most endearing sides of his character and with it he built bridges and overcame difficulties" (Meyer-Waarden, 1977). These aspects of his personality have been emphasized to help explain why he was such a great success in the international field.

The international conference in London in 1890 had been called in an attempt to close all the fisheries off the German and Danish coasts to protect the supposed nursery grounds of many North Sea stocks. This aim was not achieved, as was noted earlier, mainly because of the work of Heincke which showed that not enough was known to justify such a move. The German delegation realized that this was only a temporary respite, and Herwig began the deliberate encouragement of the growth of the industry for political reasons, knowing that this could exacerbate the general overfishing problem (Lenz, unpub. ms). Herwig saw the need "not to be a gnome between monsters" (Lenz, unpub. ms) before the inevitable international regulations were tabled, and to this end even forced the DSF-V to suppress complaints in Germany about catch rates and to support Heincke's view that "international protection regulations of any kind seem to be too early at the present and only suited to handicap the growth of the German high sea fishery" (Lenz, unpub. ms). Only in this way, it was reasoned, could Germany itself become the main supplier of the fish needed by its growing population. Figure 5 emphasizes again, however, that the growth was relatively slow compared with the size of the industry in Great Britain.

Great Britain and Germany had agreed amicably in 1890 to exchange Helgoland for Zanzibar as colonial possessions. Two years later, Herwig was instrumental in setting up the Biologische Anstalt Helgoland with Heincke as its first director. From the beginning, it apparently was planned to underpin the rational management of the North Sea with scientific programmes that provided data on which effective legislation could be based that would not ruin the German industry. In 1894, indeed, Heincke was circulating for the first time the idea of extending territorial waters from 3 to 12 miles so that national laws could relate to the coastal zones where young fish were to be found at times. At the third annual meeting of the DSF-V in 1898, which had guest delegates from Belgium, Denmark, France, The Netherlands, and Scotland, Herwig drew attention to the arguments in Great Britain about overfishing and the need for a proper scientific understanding of the situation. This meant, as he saw it, that more financial support was needed for research because the North Sea was such a large and difficult area in which to work.

In 1894 and 1896 Pettersson had unsuccessfully approached the German oceanographer Otto Krümmel, who had participated in the joint 1893–1894 project, about continued cooperation (Smed, 1994). By 1897, the situation had changed as a Swedish agricultural scientist, A. Müller, had paved the way for Pettersson in Germany. Müller was interested in the climatological aspect of the project because of its importance to agriculture. Amongst his many influential contacts in Germany was Georg Neumayer, head of Deutsche Seewarte at Hamburg, who promised to work for the project (Smed, unpub. ms). It was Müller, too, who first informed the Swedish/Norwegian Minister in Berlin, Lagerheim, about the plans (Smed, unpubl. ms). In general, the project was well received. Krümmel told Pettersson that the Imperial Minister of the Navy, Admiral von Tirpitz, was very interested. Vessels would be available for regular seasonal observations in the North Sea and perhaps in the Baltic (Smed, unpubl. ms). Therefore, at Pettersson's suggestion, the Swedish government, through Lagerheim, approached Germany at the same time as the other three countries. It turned out that Admiral von Tirpitz had understood from Krümmel that the investigations would cover oceanographic observations for use only in meteorology. Lagerheim was able, fortunately, to correct this impression, and von Tirpitz declared that the meteorological observations could easily be combined with those to be made in the interest of the fisheries without incurring extra expense (Smed, unpubl. ms). This item was now included, therefore, in the applications that went out to the various governments. In the meantime, Pettersson had been in contact with P. P. C. Hoek in The Netherlands. He had been involved earlier in 1897 with Herwig and the DSF-V in confidential plans for an international study of the North Sea specifically to deal with the overfishing problem that were now superseded by the Swedish initiative. He could, therefore, inform Pettersson that an inquiry about participation was likely to be welcomed by his government (Smed, unpubl. ms). Consequently, The Netherlands was added to the list of nations to be approached.

Conclusion

The world of fisheries research before ICES was a mix of pure scientists with scientific axes to grind, scientists with political axes of various kinds to grind, and politicians who were the paymasters of the scientific enterprises that got under way in each of the countries bordering the North Sea. Otto Pettersson's obsession with the idea that oceanography in general and fisheries oceanography in particular "was work not for the narrow waters but for the open sea, and in due time, for all the oceans of the world" (D'Arcy Thompson, 1948) was the key to bringing all these people together because it forced him to overcome all the political and practical problems that arose. Bringing people together to discuss common problems was the first and most important step and, based on our own experience, remains the essential step to the continued development of science within the ICES community.

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[1]Letters quoted from this paper:

a) Otto Pettersson to Gustaf Ekman. Undated (ca. August 1895) letter. LAG.
b) Johan Hjort to Pettersson 18 November 1895 and an undated letter (November 1895). UBG
c) Hjort to Pettersson 17 October 1896. UBG.
d) Otto Pettersson, Gustaf Ekman, and August Wijkander to King Oscar II 18 October 1897. RAS-UD, Vol. 2396, Mål 11.
e) Protocol of the meeting of KVA on 10 November 1897. KVA's archives.
f) Lord Salisbury to the S/N Minister in London (Lewenhaupt) 5 July 1898. RAS-UD, Vol. 2396. Mål 11.
g) Lord Salisbury to the S/N Minister in London (Lewenhaupt) 30 November 1898. RAS-UD, Vol. 2396, Mål 11.
h) Lewenhaupt to the S/N Foreign Minister 2 December 1898. RAS-UD, Vol. 2396, Mål 11.
i) Alex Müller to Otto Pettersson 21 February 1898. UBG.
j) Alex Müller to Otto Pettersson 27 February 1898. UBG.
k) Otto Krümmel to Pettersson 1 April 1898. RAS-UD, Vol. 2396, Mål 11.
l) Lagerheim to Douglas (S/N Foreign Minister) 16 April 1898. RAS-UD, Vol. 2396, Mål 11.
m) Pettersson to P.P.C. Hoek 28 June 1898. Copy in ICES archives.

Abbreviations used:

KVA: Kungliga Vetenskapsakademien, Stockholm.
LAG: Landsarkivet, Gothenburg.
RAS-UD: Riksarkivet, Stockholm. UD 1902 Doss-system.
S/N: Swedish/Norwegian.
UBG: Universitetsbiblioteket, Gothenburg.
UBO: Universitetsbiblioteket, Oslo. Collection of manuscripts, No. 48.