NEWSLETTER

VOLUME 12 | Apr 2019

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OCEANS PAST INITIATIVE

OCEANS PAST NEWS No.12

APRIL 2019

OCEANS PAST INITIATIVE

The impact of technological change

For some fishing and angling communities around the world, globalization can happen in one single moment. And this moment - more often than not – people remember. Local angling communities are submerged in a world-wide flow of goods, ideas, techniques, and even living creatures that move around, migrate, and interact, thus shaping fishing trends, posing risks, and at the same time, providing fresh opportunities in the human-environment equation.

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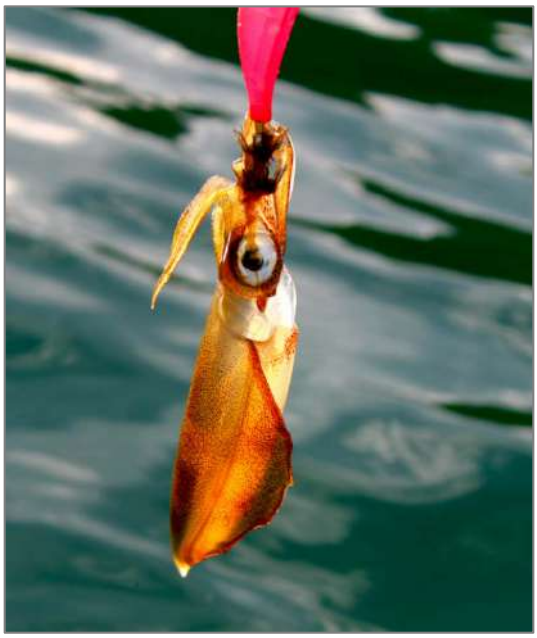
It is easy to recall these moments of globalization and industrialized marine use in the modern era – but are there equally impactful moments in the past, as well? In this special edition of the *Oceans Past News*, we'll start with a more modern – but for many fisheries scientists an historical – case study in our Spotlight that exemplifies the dramatic and often sudden impact of globalization and technology on human and ecological communities. We then asked our colleagues – **is this a wholly modern phenomenon**?

Emily S. Klein

Boston University/SWFSC & The Farallon Institute, USA / OPN Editor



OCEANS PAST SPOTLIGHT*

Tyrikos Ergas and Ioannis Giovos: **Globalizing Shore Angling Techniques: an ecology-oriented narration on the interaction between local and international technological change.**

The mid-nineties in Kalymnos, a rocky, barren island of the Southern Aegean Sea, Greece. Most of its inhabitants have something to do with the sea, the only generous resource around. The island holds one of the country's largest fishing fleets, mostly related to sponge fisheries. In addition to the professional fishermen, a score of anglers hit the coast almost every day. It is autumn, late October, and the first Mediterranean south winds that bring the annual first rains after three dry summer months have started to blow. It's time for squid fishing.

The fishing method is simplicity itself. Fresh horse mackerels or other very cheap fish are bought at the market: ten to fifteen fish for less than the cost of a packet of cigarettes. Fifty or sixty meters of nylon line (0.40mm) are wound around a stick or a coiling plate and on to that the horse mackerel is tied up through its eyes or tail. It is hurled into the sea as far as one can hurl it and it is left to sink. Large squids attack the bait and cling on to it, chewing, while the angler softly pulls them close to the shore. When close enough a landing net or a gaff is used to grab the squid and land it. All around the coast one can spot other squids which are so small that are known locally as "kondiloforoi", meaning "school-pens/pencils". These small squids are may but extremely illusive: they cannot be caught using horse mackerel as they are often too small to grab the bait. Consequently, these "kondiloforoi" have found a safe nursery where they can grow unharmed. The coastal anglers don't even mind about these "baby squids" which cannot be caught; they know they will grow and they will eventually be caught next season or the following…

Each issue of Oceans Past News includes a feature article, as either an* ***Oceans Past Spotlight* *or as* ***10 Questions****. If you would like be considered for either, or to nominate a colleague or mentee, please contact Emily Klein at emily.klein04@gmail.com.*

One day, everything changes. Someone arrives with a magical new tool, an **egi**. This person has relatives in Australia who sent him this "new squid lure", supposedly "ten times as effective" as the traditional method - and "ten times deadlier". This lure and other squid fishing methods came to Australia mainly from Japan (where "egi" means "artificial squid lure"). In Kalymnos, the angler with the strange looking lure does something unseen and unheard of: instead of a fresh horse mackerel, he riggs the egi onto the nylon line. As soon as it is hurled into the water a small "kondiloforos" attacks, gets caught and is landed. Globalization has just occurred.

One of the authors, T. Ergas, demonstrates the success of squid fishing with an egi.

Within a month, Kalymnos is inundated with egis; everyone needs this wondrous artificial lure that can even catch the abundant smaller squids. Their price in the local market reaches 1.500 drachmas each – a day's salary. In time, professional fishermen change their tackle as well, also adopting the small, versatile, and effective lines of egi.

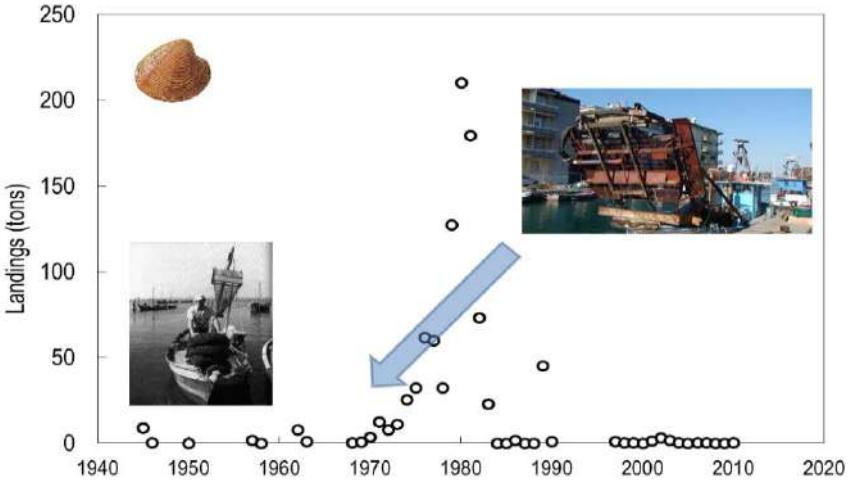
During the 90s, loliginids and other squid families suffered a steep decline in the Greek waters. Their population did not fail solely due to the introduction of egies from abroad – but it played a significant role. By the end of the 90s, no more small "kondiloforoi" can be found, when once they lurked by the dozens. Large squids no longer exist. Instead, egies can be found aplenty in the local fishing stores, their shapes, types, colours and specs evolved and proliferated.

RESEARCH NEWS: TECHNOLOGICAL CHANGE

Instead of our typical Research News, this special edition of the Oceans Past News highlights research on the impact of technological change and globalization through time. Related references are included at the end of the News.

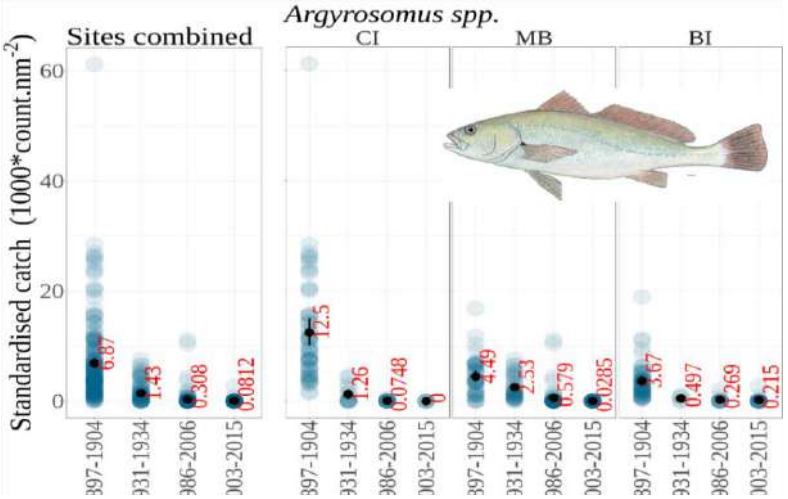
Rise and fall of striped venus clam fishery in the Adriatic Sea. The striped venus clam (*Chamelea gallina*) dwells in sandy coastal bottoms typical of the Mediterranean. In the Adriatic Sea, Faber (1883) described it as "V ery common on sand-banks and along the shore of the gulfs of Venice, and Trieste, and in Dalmatia; less common in the Quarnero; it is found imbedded in the sand, and is caught by hand or the voleghetta, and in deep water by the cassa; is good eating, but is only eaten by the poorer classes". Indeed, it was historically targeted by artisanal fishermen with traditional hand-maneuvered gears used to harvest different species of clams in lagoons and coastal areas. The fishery gave low yields and it was mainly a substantial activity practiced by poor people. In the early 1970s, the first hydraulic dredge was used -- and the clam fishery quickly became one of the most valuable fisheries along the Italian Adriatic coast (Fortibuoni et al. 2017). Fishing pressure radically increased, peaking alongside economic value in the early 1980s at 100,000 tons (Papetti et al. 2018). After this peak, catches dramatically decreased to one sixth their previous level. This intense past fishery resulted in profound changes in clam populations, including decreases in mean size and substantial reductions in biomass (Morello et al. 2011). These impacts, driven by sweeping changes to technology and fishing effort, have not been mitigated by various measures adopted to limit fishing effort (reductions in landings allowed and fleet size, creation of local fishermen consortia). For example, in Italy, the clam fishery was the first to be controlled through licenses, but technical improvements in fishing gear allowed the boats to sweep greater areas per unit time, resulting in an increased exploitation rate (Romanelli et al. 2009). Concluding, even past management procedures have not been enough to protect the striped venus clam in the Adriatic. Today, it still shows strong signs of depletion.

~ Tomaso Fortibuoni & Sasa Raicevich, Italian Nat'l Institute for Environmental Protection &



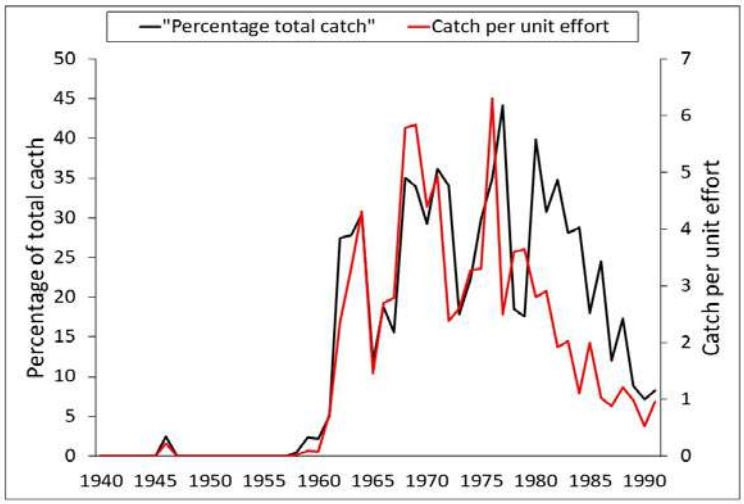
At left: Annual landings of Chamelea gallina at the Chioggia fish market (Northern Adriatic Sea; Mazzoldi et al. 2014; Clodia database, 2017) showing the rapid boom of clam landings after the introduction of the hydraulic dredge in the 1970s. Nowadays, this category presents alternative ways of marketing that are not recorded by the Fish Market. Therefore, the trend of the statistics does reflect the real catch.

Trawling technology alters nearshore fish abundances within three decades in South Africa. Nearshore ecosystems on South Africa's Agulhas Bank have been exposed to trawling pressures for ~120 years. Yet prior to initial government-led surveys (1897-1904) and the development of trawl fisheries that followed, most of these demersal ecosystems had seen very few direct human impacts (Currie, 2017). Since then, industrialised fisheries and other human impacts have substantially changed the abundances and composition of the demersal fish community (Currie, 2017). Further, although comparisons among trawl vessels and trawl gear needs to be treated with caution, some of the stark abundance changes appear to have largely taken place within the first three decades following the arrival of trawling (see figure). Such abrupt catch declines were seen for *Argyrosomus* spp., *Pterogymnus laniarius*, *Argyrozona argyrozona*, *Austroglossus pectoralis* and a notable increase in the number of *Merluccius capensis* caught. In particular, 'kob' (*Argyrosomus* spp.) are large and commercially valuable Sciaenids that dominated early trawl catches (by number and certainly by weight), but these days make up small catch proportions in the trawl and line fisheries. Their numbers declined heavily from initial trawl survey catches (1897-1904) to those made in the 1930s (Fig 1). Such notable early changes pre-date the expansion of line-fishing facilitated by outboard engines and more recent impacts of climate change and pollution. It seems the arrival of trawling technology contributed towards drastic changes in the abundances of certain species - likely leading to broader ecosystem changes in time and space. Kob is a large predator and consumes a wide range of pelagic and demersal prey (Smale and Bruton, 1985) and, in its earlier numbers, must have contributed a formidable predation pressure in these nearshore ecosystems. Such early changes were compounded by the growth of fishing and other impacts later in the 20th century, resulting in transformed demersal commun-ities from those initially encountered (Currie, 2017). *~ Jock Currie, Nelson Mandela University & South African National Biodiversity Institute (S. Africa)*



Swept-area standardised kob catches from research survey trawls over different periods, observed mean and 95% confidence intervals (estimated by bootstrap) are indicated in black, mean values in red. 3 survey sites are combined (left) and plotted separately (right); CI Cape Infanta, MB Mossel Bay, BI Bird Island. See Currie (2017) for details.

Off road vehicles and the red-listing of white Steenbras. European settlers introduced the sport of angling to the western Cape, South Africa, in the 19th century, originally with cane rods and centre pin reels. The fish they found were nothing like what they left behind, but catching them was simple enough. The rather clumsy tackle by today's standards limited their casting distance, and the sport initially developed along rocky shores, which shelved quickly into deep water. They found an abundance of reef fish, and many of the species they targeted fell into the seabream family (South Africa has the highest diversity of seabreams of any country). Famous locations on rocky shores became crowded and catch rates dropped – but access to beaches was initially limited. Rocky shorelines make up 41% of the western Cape's coastline; high energy sandy beaches interspersed with wave cut platforms make up the rest. These sandy shores are backed by extensive eolianite sand dunes which are unsuitable for development, agriculture and even roads. Access was initially restricted, until the advent of the off-road vehicle after World War II. Modelled on the four-wheel drive American Jeep, British Landrovers opened access to the beaches in the 1950s followed by the American Ford F-Series in 1960s, but it was the versatile and



Annual percentage contribution to the total catch, and catch per unit effort (fish per 100 hours), of white steenbras in the records of angling clubs in the western Cape, South Africa (Bennett 1995)

affordable Japanese Toyota Hilux and Isuzu KB that really put off-road capability into the hands of anglers in the mid-1970s. A whole new habitat awaited, with enough space for everyone. And just in time too, because the reef fish had become very scarce. On beaches fishermen found the home of the white steenbras (*Lithognathus lithognathus*), a large seabream that excavates its invertebrate prey from the sand. Beach anglers used longer rods to cast further, and the prawn pump, an Australian invention, to extract the bait organisms from the sand. White steenbras catches increased from almost nothing in 1950 to a peak in 1977, followed by an equally abrupt decline; Today the IUCN lists the steenbras as endangered. For reasons unrelated to fish protection, off-road vehicles were banned from South African beaches in 2002, but white steenbras show no sign of recovery in the western Cape. ~ *Colin Attwood, University of Cape Town (S. Africa)*

Walter Garstang: an early advocate of understanding changes in fishing technology. *"In the present essay I have endeavoured to bring together the most precise and reliable evidences available as to the recent and present condition of the great trawl and line fisheries of England and Wales."* So begins the 69-page essay by Walter Garstang (Fig. 1), published in 1900 in the *Journal of the Marine Biological Association of the United Kingdom*. Previously, other notable marine scientists had publicly argued that the sea fisheries, including the trawl fisheries, were either inexhaustible or highly unlikely to become exhausted. Garstang thought otherwise, and he used this essay to set the record straight. He explicitly examined, for the first time in the formal scientific literature, the effect technological change was having on the ability of fishers to catch fish for a given amount of effort. Using the traditional sail trawler as a base unit of fishing power, Garstang demonstrated that the rapidly expanding numbers of steam trawlers were increasing the relative amount of fishing power (Fig. 2, top). Without taking into account these increases in power, the decline in U.K. bottom fisheries was being masked due to the greater amounts of landed fish (Fig. 2, bottom). Garstang illustrated that these patterns were occurring throughout British fisheries: "*We have, accordingly, so far as I can see, to face the established fact that the bottom fisheries are not only exhaustible, but in rapid and continuous process of exhaustion; that the rate at which sea fishes multiply and grow, even in favourable seasons, is exceeded by the rate of capture.*" In so doing, over a century ago, he demonstrated the necessity of documenting and understanding technological developments, and their influence on fishing behaviour and masking declines in fish catch. ~ *Ruth Thurstan, University of Exeter (UK)*

Fig 1. Walter Garstang, 1868-1949. Source. Wikipedia.

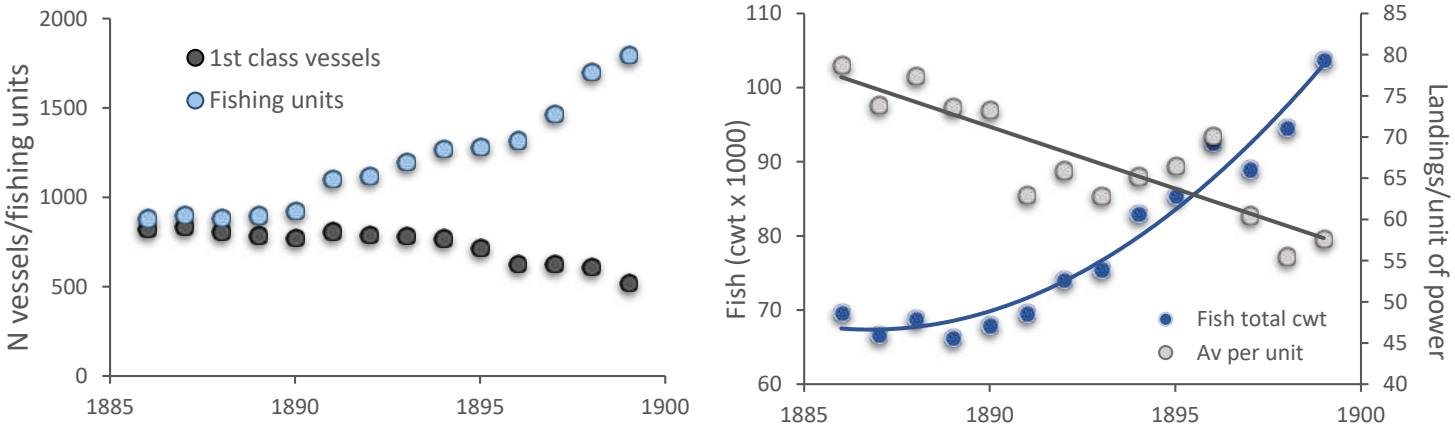
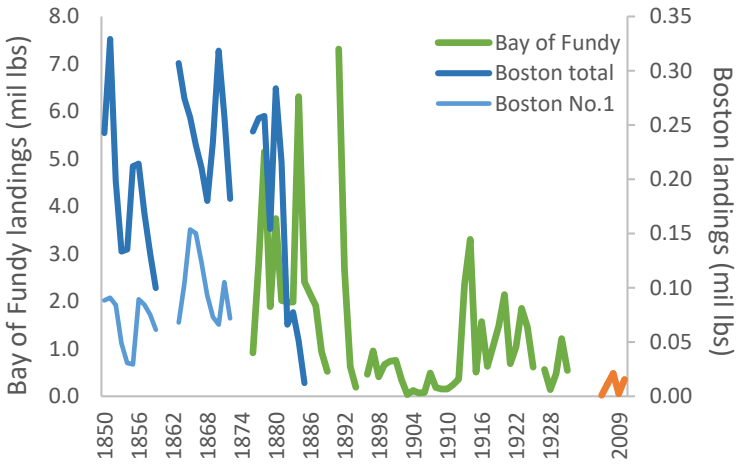


Fig 2. Left panel: Total large trawl vessels registered at port of Grimsby, 1886-99, and their equivalent fishing power as estimated by Garstang (each sail trawler = 1 unit of fishing power, each steam trawler = 4 units of fishing power). Right panel: Total landings of fish (closed circles) against landings of fish corrected for units of fishing power (open circles).

"Tarbert" by Andrew Black (1850-1916). Scottish Maritime Museum

Seining for pelagic species impacts both sides of the pond, I: Herring in the Firth of Clyde, ca.1833-1850: By the early years of the 19th century, Scotland was one of the preeminent producers of cured herring in Europe. The most valuable herring came from Loch Fyne, in the Firth of Clyde: so fat and oily, they were known locally as 'Glasgow Magistrates'! For centuries Scottish fishermen had relied on the age-old technology of drift-netting, setting vast acreages of static gill nets overnight to ensnare herring as they rose in the water column to feed. But in the mid-1830s a few fishermen from Tarbert, in Argyll, began experimenting with rudimentary seine nets. Initially, these were simply stitched lengths of drift net with draw-ropes attached. But within a very short time they had refined their design and were using what we would was described as a ring net – a seine set by paired boats, drawn together to form a bag. From the start, this method was condemned by almost all the herring fishermen in the Clyde who felt it caught too many fish at a draft and, because of its bag-like structure, caught all the fish in a shoal regardless of size or maturity. Fishermen campaigned vociferously to have it outlawed, but despite their best efforts, and local by-laws prohibiting it, the Tarbert men continued to use the ring net, with drastic local consequences. Within a decade, herring were reported as much scarcer in Loch Fyne and in the western Clyde more generally, and by 1850 they had disappeared from the upper loch spawning grounds entirely. The use of the ring-net was seismic in the nationally important herring fisheries of the Clyde. It set neighbour against neighbour, creating generations of ill-feeling; it overturned centuries of consensus around sustainable fishing methods; it is very likely to have significantly impacted available stocks of this most valuable fish, as the vast majority of fishermen asserted; and it rumbled on for generations: a century later, the *Glasgow Herald* reported that: "*[ring-netting] sweeps in whole shoals, taking up mature and immature fish, the catch being picked over and the immature and unsaleable fish dumped in the sea.*" *~ Peter Jones, Univ of Leicester (UK)*

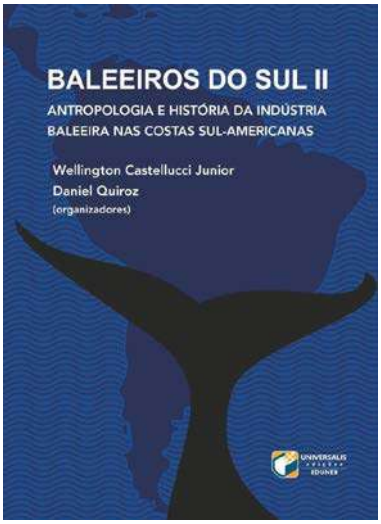
Seining for pelagic species impacts both sides of the pond, II: The decline of mackerel in the Bay of Fundy. In the Bay of Fundy (Canada) before the 1900s, Atlantic mackerel (*Scomber scombrus*) were landed with traps and nets, and in boats near shore with hook and line. In the mid-1800s, reports noted mackerel entered the Bay in "immense" schools, supporting an "excellent" inshore fishery. Yet, by the late 1800s, the Canadian Department of Fisheries began reporting that both quality and abundance of mackerel had declined precipitously, and "the mackerel fishery has been ruined [in the United States and Canada] by the use of the purse-seine." According to reports, the purse-seine was general use by the 1860s, but that it had "been so improved in catching properties that its destruction has been greatly enhanced, more particularly so within the past three or four years", especially with the introduction of steam power. In 1890, managers and fishing communities alike "utterly condemned" the purse seine as "injurious to the fishery and the interests of the fishermen alike." Interestingly, however, the history of the mackerel fishery not only shows the impact of technology – but also of attitudes and a shifting baseline in collective memory. Although initially calling for bans and restrictions, in time and due to its effectiveness elsewhere, fisheries managers began encouraging fishermen to embrace purse seining to deal with local declines. Not two decades after their predecessors reported "the destruction which followed [the purse seine] is incalculable", managers in Canada blamed the depressed mackerel fishery on fishermen avoiding their use, stating that fishermen needed to realize anything except the purse seines were "wholly inadequate" to catching a fish that, just a few years before, was reported decimated by its use. *~ Emily S. Klein, Boston University (USA)*



At right. Mackerel landings on the US east coast, 1800s-early 1900s, for total landed and Boston No.1 (highest quality fish landed at the Boston market). Current landings for the Bay of Fundy at far right in orange.

RECENT PUBLICATIONS

New book summarizes a wealth of research on the history of South American whaling. A group of researchers from different countries, interested in the history, archeology and anthropology of whaling on the South American shores, has been meeting periodically to present the progress of their research and discuss its results. The first general meeting was held October 2013 in the town of Quintay, a former whaling station on the shores of Central Chile. The second was held in Cachoeira, Bahia, Brazil, during May 2017. The presentations in this last event were collected in the book ***Baleeiros do Sul II***, published in 2018 by the Editora da Universidade do Estado da Bahia, Brazil. The book brings together 12 articles, some written in Spanish and others in Portuguese, which address, from different perspectives, the problem of whaling on the South American shores and the narratives that have been developed about this activity over time. It has been possible to identify the presence of four foreign traditions that operate sequentially on the South American coasts: Basques, Americans, Norwegians and Japanese and the presence of an undetermined set of local operations between XVII & XX centuries, that represent singular adaptations of these traditions to new scenarios.



Un grupo de investigadores de distintos países, interesados en la historia, arqueología y antropología de la caza de ballenas en las costas sudamericanas, se ha estado reuniendo en forma periódica para mostrar los avances de sus investigaciones y discutir sus resultados. La primera reunión general se realizó durante el mes de octubre de 2013 en la localidad de Quintay, una antigua planta ballenera en las costas de Chile Central. La segunda se efectuó en la localidad de Cachoeira, Bahía, Brasil, durante el mes de mayo de 2017. Las presentaciones en este último evento han sido recogidos en el libro Baleeiros do Sul II, publicado en 2018, por la Editora da Universidade do Estado de Bahia, Brasil. El libro reúne 12 artículos, algunos escritos en español y otros en portugués, que abordan, desde diversas perspectivas, el problema de la caza de ballenas en las costas sudamericanas y las narrativas que se han elaborado sobre esta actividad a través del tiempo. Hemos identificado cuatro tradiciones extranjeras que operan secuencialmente en las costas sudamericanas: vascos, norteamericanos, noruegos y japoneses y la presencia de un conjunto no determinado de operaciones locales entre los siglos XVII y XX, que representan adaptaciones singulares de esas tradiciones a nuevos escenarios.

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ANNOUNCEMENTS: CONFERENCES

The Call for Papers for the **2nd CONCHA Workshop – Sea and Animals: History, Culture, and Marine Conservation,** is open until the **end of April, 2019**. The Workshop will take place 21-23 October 2019 in Lisbon, Portugal. *http://www.cham.fcsh.unl.pt/ext/concha/concha_2workshop.html*. A video from the 1st CONCHA Workshop can be viewed at *https://youtu.be/8Amc8cNt9dU*.

Honoring the 150-year anniversary, a symposium, "**Challenging the scientific legacy of Johan Hjort: Time for a new paradigm in marine research?"** will convene in Bergen, Norway 12–14 June 2019. Contributions will be published in *ICES Journal of Marine Science* (manuscripts can be submitted at any time until 3 months after the conference, i.e. 14 September 2019). Final registration and abstract submission is **1 May 2019** at *https://www.hi.no/conferences/JohanHjort/*; manuscripts can be submitted at *https://academic.oup.com/ icesjms/pages/General_Instructions*.

Call for Papers - **North Atlantic Fisheries History Association (NAFHA): Re-visiting Fisheries History – Re-visiting Iceland.** Conference will take place October 17th -19th, 2019, University of Iceland, Reykjavik, Iceland. Proposals should comprise the title and abstract of the paper (400 words maximum), as well as the name, contact details and brief biography (200 words maximum) of the author and should be submitted in one pdf or word file to *NAFHA2019@odu.edu*. Deadline for papers is 31 May 2019.

2019 People & the Sea X: Learning from the past, imagining the future. The Conference will take place from the 24th until the 28th of June 2019, at the University of Amsterdam, the Netherlands. *http://www.marecentre.nl/2019-people-the-sea-conference/.*

5th International Sclerochronology Conference in Split, Croatia, June 16th-20th 2019. *http://jadran.izor.hr/isc2019/*.

The CONCHA 1st International Conference, "**Peoples, Seaports and Frontiers: Living the Ocean**", will take place in Barranquilla (Colombia) 10-12 July 2019. Session topics include "Animals and the Sea" and "Currents and Climates of the Sea", among others. *http://www.cham.fcsh.unl.pt/ext/concha/ concha_int_conference.html.*

The **3rd World Congress of Environmental History, "Convergences: The Global South and the Global North in the Era of Great Acceleration"**, will take place from 22 – 26 July, 2019, in Florianopolis, Brazil, at the Universidade Federal de Santa Catarina. More information on the webpage, *http://www.3wceh2019.floripa.br/*.

The **20th Meeting of the Fish Remains Working Group (FRWG)** is set for August 26-30, 2019 in Portland Oregon, USA. FRWG is an outstanding way to meet with scholars from around the world in a small supportive atmosphere. The local organizer and host is Virginia Butler (Portland State Univ, USA), with planning committee: Madonna Moss (Univ of Oregon, U.S.A.), Iain McKechnie (Univ of Victoria, Canada), Elizabeth Reitz (University of Georgia, U.S.A.) and Jen Harland (Univ of the Highlands, Scotland). More at *https://www.2019frwg.com/welcome*.

Down By The Water, and interdisciplinary symposium on the role of water transport points in past societies, will take place in Helsinki, Norway, 6-8 November 2019. More information at *https://blogs.helsinki.fi/downbythewater/.*

TECHNOLOGICAL CHANGE: REFERENCES

Trawling in South Africa – J Currie

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Off road vehicles and white Steenbras in South Africa - C Attwood

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Venus clam in the Adriatic – T Fortibuoni & S Raicevich

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CONTACT

Oceans Past News is a quarterly newsletter that aspires to both unite and inform the worldwide community interested in historical perspectives of marine social-ecological systems by providing insight into the wide-ranging and excellent work being done and the resources available. If you would like to propose work for OPN in the future, please contact **Emily Klein** (emily.klein04@gmail.com).

*The next Oceans Past News will be out mid-July 2019. We **warmly welcome submissions** through June, 2019.*

RESOURCES

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