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Fisheries

CHANGES IN MAGNITUDE AND STRUCTURE OF WORLD MARINE FISHERIES CATCH WITHIN 1960–1980

ZMIANY WIELKOŚCI I STRUKTURY ŚWIATOWYCH POŁOWÓW MORSKICH W LATACH 1960–1980

Total world marine fish catches within 1960–1980 are analysed, based upon 5-year mean catch. A marked increase in the perciform (*Perciformes*) and salmonid (*Salmoniformes*) catches along with increasing yields of molluscs, crustaceans, and algae are observed. At the same time, the catches of clupeids (*Clupeiformes*), gadoids (*Gadiformes*), redfish (*Scorpaeniformes*), and flatfish (*Pleuronectiformes*) tended to become stabilised, while there was a well-marked decrease in catches of marine mammals, the decrease being particularly pronounced in terms of biomass.

After the last 12-year period of stabilised overall marine catch, a gradual slow increase can be predicted. Most probably, as soon as in the nearest future, the role of clupeids in the world fisheries will make way for the perciforms.

INTRODUCTION

Since times immemorial, man has been harvesting various algae, and invertebrate and vertebrate animals (particularly fish and mammals) from the marine environment. At first, only those marine species were exploited which were the most accessible and attractive in terms of their utility, mainly intertidal molluscs and algae, larger school-forming fishes, and the most timid whale species. At present, the list of marine species subject to commercial exploitation contains several thousand entries, covering

mainly fish, molluscs (bivalves, cephalopods, and gastropods*), crustaceans (mainly shrimps and crabs), and algae (brown and red algae).

The excessive exploitation of marine resources resulted in a considerable reduction of numerous stocks and populations of sea-dwelling organisms, and – in extremal cases – in a total extinction of a number of species. In most cases the species were, however, able to avoid extinction because the exploitation of such diminished resources became, fortunately, not feasible. The cessation of exploiting small organisms, particularly those having a rapid growth rate, usually makes their recovery possible; on the other hand, the recovery of larger animals' populations, particularly those of marine mammals, proceeds at a very slow pace – measured in decades and even centuries.

The peak period of hunting for marine mammals belongs to the past now. The „golden age" of whaling occurred in the second half of the nineteenth and the first half of the twentieth centuries, particularly in the 80's of the first and the 30's of the other. At present, a recession in whaling is observable, as evidenced mainly by the total biomass of the marine mammals caught; this decrease has been brought about by an excessive exploitation in the past and by too vague conservation and protection procedures used. Still earlier, numerous stocks of pinnipeds (seals, fur seals, and walruses) and sirens had been decimated. Some of them, however, were saved by protective measures undertaken in the right time, which makes systematic hunting possible at present.

Many indicators point out to a fact that the peak catches of marine fish have been already attained, because since late 60's they have been remaining on a more or less stable level oscillating aroung 50 million t a year (from 45 to 56 million to a year in various years). Although there were and are predictions assuming a further increase in marine fish catches, such an increase will involve species less and less valuable, particularly small pelagic fish of a negligible utility for direct consumption.

Fortunately, there still are huge reserves in the form of numerous invertebrate species, as evidence by, i.a., a constant increase in marine mollusc and crustacean catches. Of course, those groups, too, contain species exploited already to the highest degree or even over-exploited, but they are accompanied by numerous other species that can contribute to a further significant increase of the world's marine catch. At present, many hopes are being associated with intense exploitation of krill, underexploited so far, and of squids. Huge stocks of these animals inhabit turbulent and inhospitable Antarctic waters and migrate over vast areas of other parts of the world ocean.

Contemporary trends in the world's fisheries and marine hunting are best elucidated when analysing mean values for several-years periods, as some, overall not very significant short-term fluctuations become obliterated then. The present paper summarises pentade (5-yr) mean catches of marine animal and plant species, starting from the year 1960.

The study is based upon the FAO annual statistics for world fisheries. The statistics are, however, worked out in a rather nonuniform manner and in many cases the present

* In the present paper, the taxa are listed in order of their decreasing contribution to the world's marine fisheries.

taxonomical status of organisms is not taken into account, which is particularly evident in the basic group, i.e., the fish. The generalised treatment of the subject is also rendered difficult by not infrequent cases of publishing, by the FAO statistics, different data for the same organisms in identical years.

In 1980, a total biomass of 68.3 million t was harvested from the world ocean, 56.3 million t being contributed by fish; molluscs accounted for almost 5.0 million t, crustaceans and algae – 3.2 million t each, and mammals yielded ca 0.3 million t. In the same year, the inland waters supplied 7.6 million t of organisms, almost exclusively fish. Thus the total worldwide catch (including mammals) was almost 76 million t, 90% of which being harvested in the marine environment. More than 82% of the marine catch was contributed by fish, more than 7% by molluscs, while crustaceans and algae accounted for about 5% each; the percentage contribution of marine mammals biomass to the total catch amounted to a fraction of per cent. It is worthwile to remember that in the sixties and thirties, mammals accounted for 2–5% and more than 10% of the total marine biomass harvested, respectively.

EXPLOITATION OF FISH

The total marine catch in the sixties, similarly to the previous decade, showed a rapid growth, the doubling time amounting to about 12 years. Since late sixties, however, the catch growth rate is observed to become retarded and even temporarily decreased in terms of marine fish biomass caught (Fig. 1). When considering the averaged pentade catches the attention is drawn to stabilised catches of clupeids (*Clupeiformes*), gadoids (*Gadiformes*), redfish (*Scorpaeniformes*), and flatfish (*Pleuronectiformes*) and to a more or less rapid growth of catches of percomorphs (*Perciformes*) and salmonids (*Salmoniformes*).

Currently, the most important role in the world fishery is played by clupeids, percomorphs, and gadoids; considerable amounts of salmonids and flatfish as well as redfish and milkfish (*Gonorhynchiformes*) are being caught, too (Fig. 1). One should note that the last entry in the FAO statistics as „Various and unsorted marine fishes"; in reality it covers the species belonging to the orders listed above, particularly the *Perciformes* and *Clupeiformes*, which makes the actual catches of individual orders higher than the values given in the world's fishery statistics.

Clupeids have been from the times immemorial the most important item in landings all over the world. However, it is interesting to note that they have been gradually giving way to gadoids at first and to percomorphs later. In as much as in the sixties the total annual clupeid catch contributed 40–43% to the world's total marine fish landings in various pentades, this contribution decreased to 30–31% in the seventies, falling down to less than 29% in 1980. The mean pentade catch of clupeids remained at the level of 15–17 million t a year, except for the second half of the sixties when the catch temporarily increased up to an annual 19 million t, the increase ending with a crash of

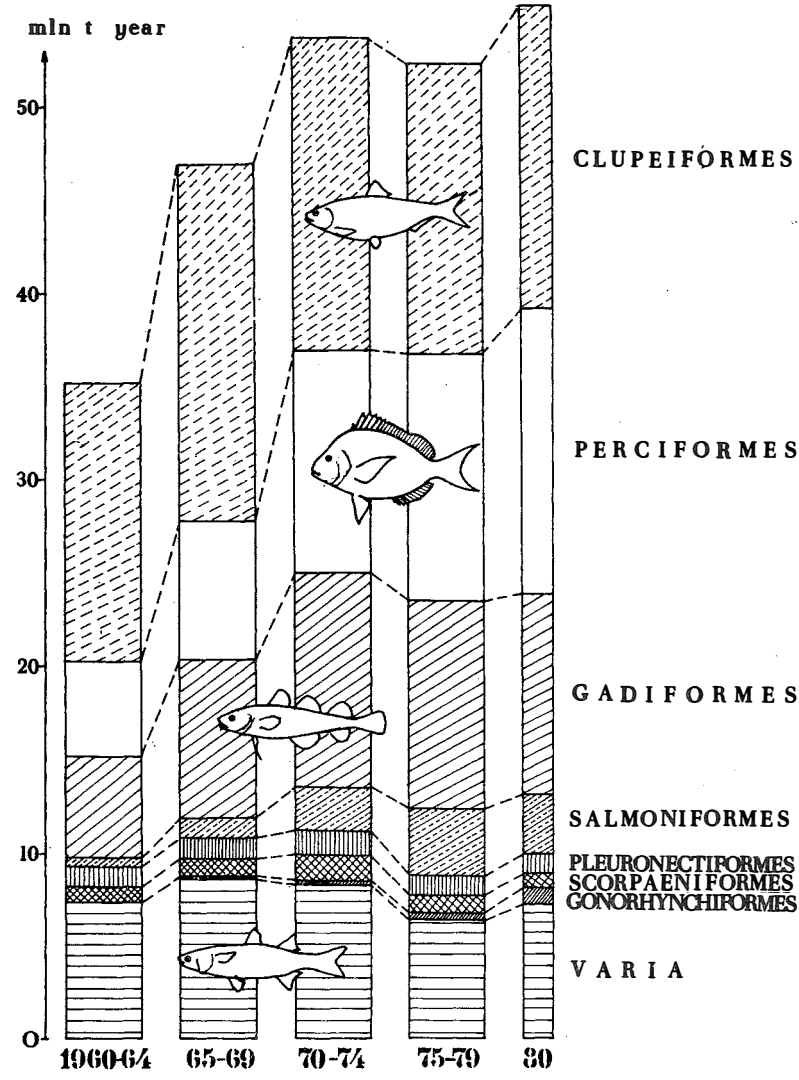


Fig. 1. World catches of marine fish in 1960 – 1980; the most important fish orders are indicated

fisheries of several basic species of the order, particularly the anchoveta (*Engraulis ringens*) and Atlantic herring (*Clupea harengus*). Effects of this crash are still noticeable (Fig. 2).

Over the recent several years the clupeid catches have been dominated by species of the family *Clupeidae* accounting for 70% and 80% of the catch within 1975–1979 and 1980, respectively. The bulk is contributed by small pelagic species, mainly pilchards (*Sardinops spp.*); of those, the Chilean pilchard (*S. sagax*) caught off the west coast of South America, and the Japanese pilchard (*S. melanostica*) caught in the northern Pacific,

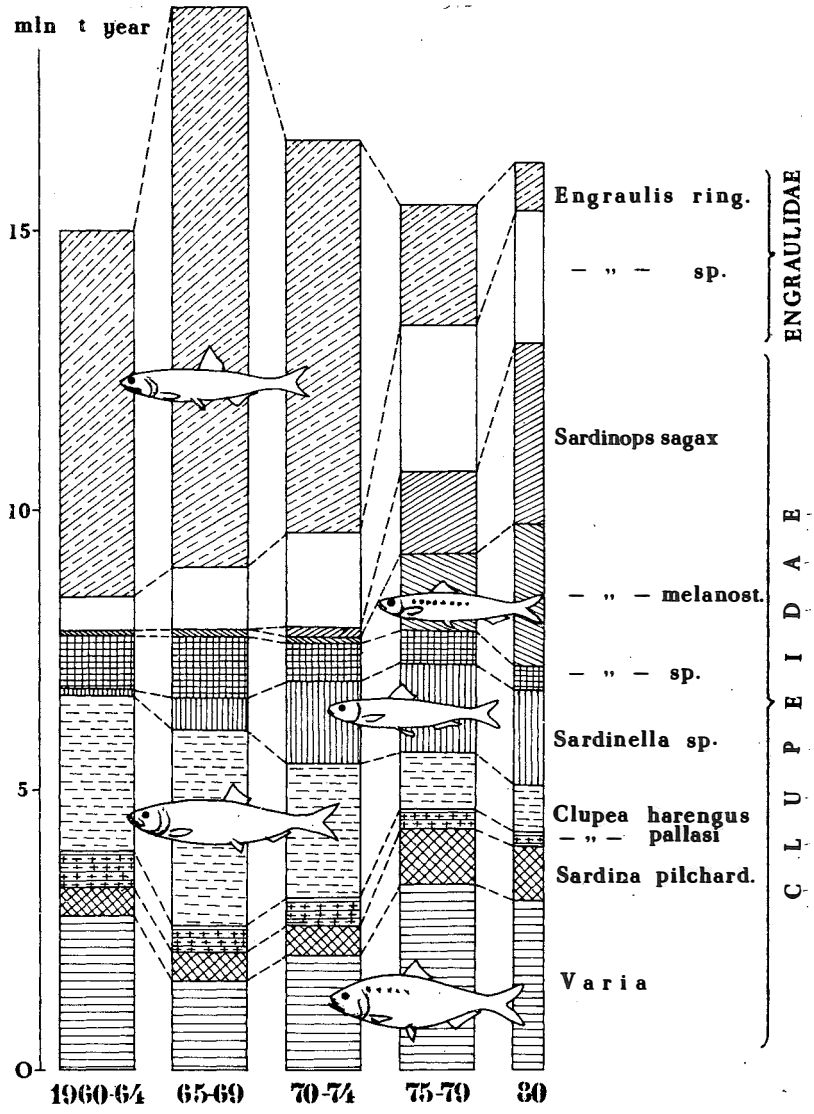


Fig. 2. World catches of the *Clupeiformes* by families and species in 1960 – 1980

are of a particular importance. Economically valuable are also: sardinellas (*Sardinella spp.*), particularly the oil sardinella (*S. longiceps*) inhabiting the northern Indian Ocean; herring (*Clupea spp.*), mainly the Atlantic herring (*C. harengus*) from the northern Atlantic; and sardine (*Sardina pilchardus*) encountered off the NW Atlantic coast. Characteristic is a more or less well marked increase in catches of pilchards, sardinellas, and the sardine and a systematic decrease in landings of herring and some other representatives of the family (Fig. 2).

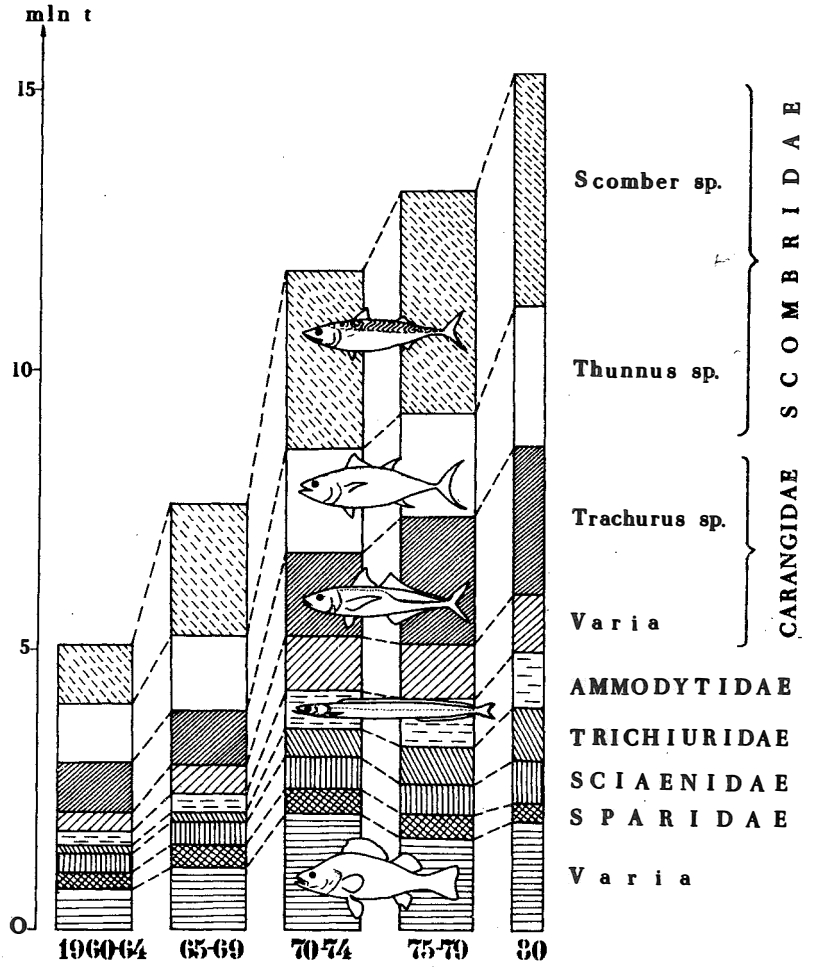


Fig. 3. World catches of the *Perciformes* by families and species in 1960 – 1980

The remaining part of the clupeid landings consists almost exclusively of the family *Engraulidae*. In the sixties they comprised the bulk (50–60%) of the clupeids caught, the anchoveta (*Engraulis ringens*) being the basic species utilised; its catches of 6–12 million t a year were effected off the west coast of South America. Since the early seventies, the anchoveta have been systematically dropping; at present, the engraulid fishery is based on other species obtained from various parts of the Atlantic and Pacific Oceans.

Percomorphs have been growing in importance in the world's fisheries. Over the period analysed, the annual catch increased from 5 to 15 million t (Fig. 3); a systematic increase has been recorded also in their per cent contribution to the world's marine fish catch from 14% in the first pentade up to 27% in 1980. There are many indicators of the trend being maintained in the nearest future; thus percomorphs are likely to occupy the foremost position in the world's fisheries in the nearest future.

Increased catches are evident in all the economically basic families: *Scombridae, Carangidae, Ammodytidae, Trichiuridae*, and *Sciaenidae* (Fig. 3). It is symptomatic that the per cent contribution of each family to the total catch of the order is fairly uniform in various pentades: it is most often slightly above 40% in the *Scombridae*, 20–25% in the *Carangidae*, and usually 4–6% in the remaining three families. It is only in less important, economically, families that the catches have been either stabilised, e.g., sea breams (*Sparidae*) or slightly decreased, e.g., gobies (*Gobiidae*).

The percomorph catches have for a long time been dominated by the family *Scombridae* yielding an annual average of 2.2 million t in the first half of the sixties and 5.6–5.7 million t a year in 1975–1980. The catch consists basically of two groups: mackerels and tunalike fish, each being formed by fairly numerous species. In the former pentade the mackerel (*Scomber spp.*) catch was similar to that of tunalike fish (*Thunnus spp.*); with time, the tunas were giving way to the mackerels (Fig. 3). The latter are dominated by the widely distributed Spanish mackerel (*Pneumatophorus colias*) with its 2.3 million t a year caught at present, and partly by the mackerel (*Scomber scombrus*) supplying 0.9 million t a year in the seventies and 0.6 million t in 1980. Among the tuna-like fish, the greatest economic importance is ascribed to the skipjack (*Katsuvonus pelamis*) and yellowfin tuna (*Thunnus albacores*), both widely distributed in tropical seas. The first yields at present 0.6–0.8 million t a year, and the other 0.5–0.6 million t.

Economically, the dominating position in the carangid family (*Carangidae*) has for years been occupied by the horse mackerel (*Trachurus spp.*) caught in warmer zones of all the oceans and seas. Over a few recent years the Chilean horse mackerel (*T. murphyi*) has been the basic species, caught mainly along the Chilean coast; annually, the catches averaged 0.8 and 1.2 million t within 1975–1979 and in 1980, respectively.

The sandeels and launces (*Ammodytidae*), distributed over the northern parts of the Atlantic and Pacific Oceans, have been recently caught in the amounts of 0.8–1.0 million t a year. The species of a fundamental economic utility is the Japanese sandeel (*Ammodytes personatus*), caught so far exclusively by the Japanese.

The hairtails (Trichiuridae), warm-water species, have been for a few years caught in the amounts of 0.8–0.9 million t a year. The basic species of economic importance is the common hairtail (*Trichiurus lepturus*), widely distributed and known from all the oceans, supplying 80% of the total family catch.

Not smaller is the economic importance of warm-water croakers and drums (*Sciaenidae*), yielding an annual average of 0.5–0.6 million t in the seventies and 0.8 million t in 1980. The catches are based on a few genera and a number of species caught mainly from the Pacific and tropical Atlantic Oceans.

The catches of sea breams (*Sparidae*) have been for years maintained on a more or less stable level oscillating around an annual average of 0.3 million t. They comprise a number of genera and species caught in warm areas of various oceans.

The remaining percomorph families contribute negligible quantities to the marine catch, not exceeding 0.1 million t a year in most cases.

The gadoids (*Gadiformes*) were the second most important item in the catches of the

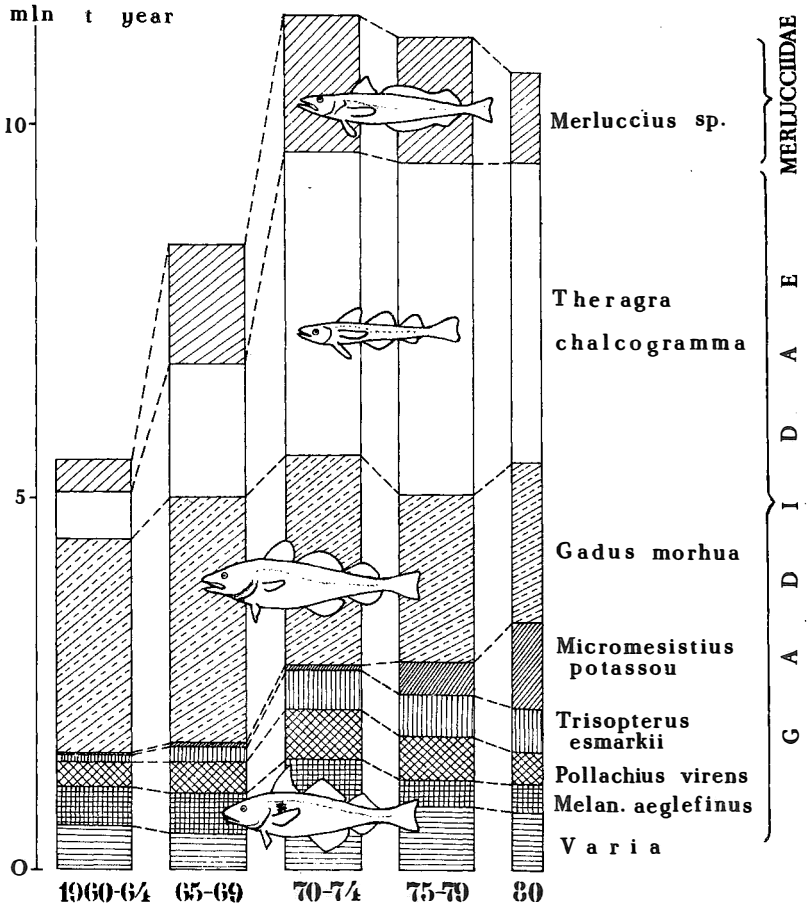


Fig. 4. World catches of the *Gadiformes* by families and species in 1960 – 1980

sixties, temporarily occupying even the first place in terms of the magnitude of catches. For several years, however, their catches have been remaining on a similar level oscillating around 11 million t a year (Fig. 4). Their mean per cent contribution to the world's marine fish catch varied in individual pentades from 16 to 21%.

The catches of the order have for years been on the family *Gadidae*, yielding annually 5–9 million t over the past 20 years, and accounting for 80–92% of the catch from the order. At first, i.e., in the sixties, the gadid catches were dominated by the cod (*Gadus morrhua*) (Fig. 4). Since the beginning of the seventies, however, the species has been giving way to the Allaska pollack (*Theragra chalcogramma*) from the North Pacific. Recently, a significant increase has been recorded in catches of the poutassou (*Micromesistius poutassou*) from the North Atlantic, little exploited so far. Fairly important commercially are also: the Norway pout (*Trisopterus esmarkii*), the saithe (*Pollachius virens*) and haddock (*Melanogrammus aeglifinus*) from the North Atlantic.

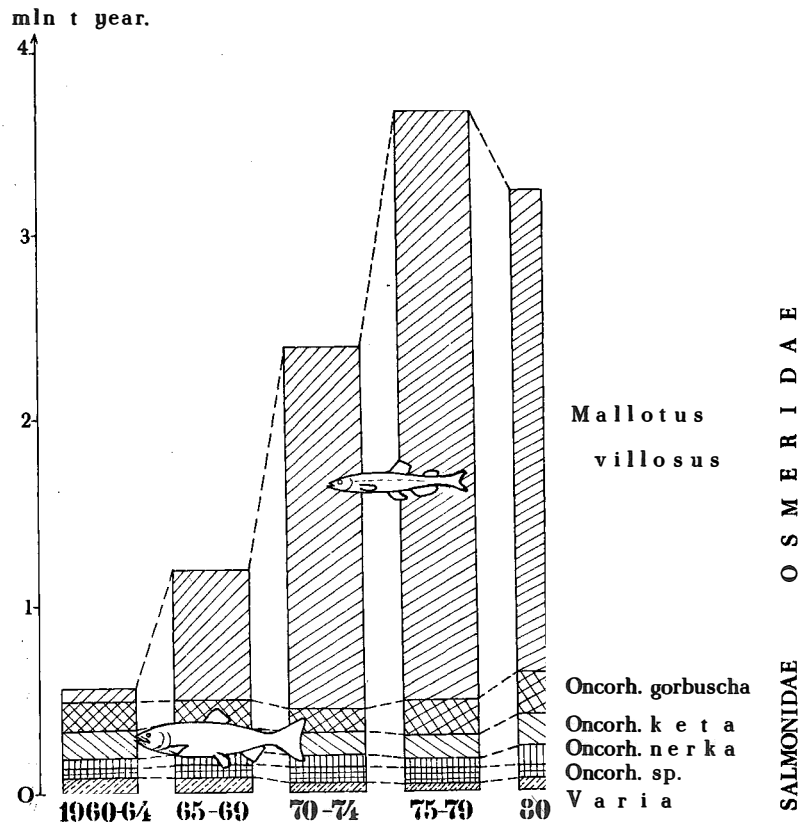


Fig. 5. World catches of the *Salmoniformes* by families and species in 1960 – 1980

Over the last 20 years, a general increase in the Alaska pollack and Norway pout catches, and particularly of those of the poutassou could be observed, along with reduced catches of the cod, haddock, and recently also the seithe (Fig. 4).

The secondary position within gadoids belongs to the hake family (*Merluciidae*), its catches in the seventies increasing to 1.7–1.8 million t a year and decreasing to 1.2 million t in 1980 (Fig. 4). The most important hake fishing grounds are located off the South Africa where the Cape hake (*Merluccius capensis*) and South-Atlantic hake (*M. hubbsi*) are fished for.

The salmonids (*Salmoniformes*) are represented in marine fisheries by two families consisting of totally different fish: small smelts and large salmons. The first, in spite of large catches, are less valuable commercially as they are mostly processed into fish meal.

In terms of the catch magnitude, the basic salmonid species are the smelts (*Osmeridae*); their catches rapidly increased over the pentades discussed, from 0.1 to 3.2 million t a year, subsequently dropping down to 2.6 million t in 1980 (Fig. 5). The only species of an economic value is the capelin (*Mallotus villosus*) from the North Atlantic.

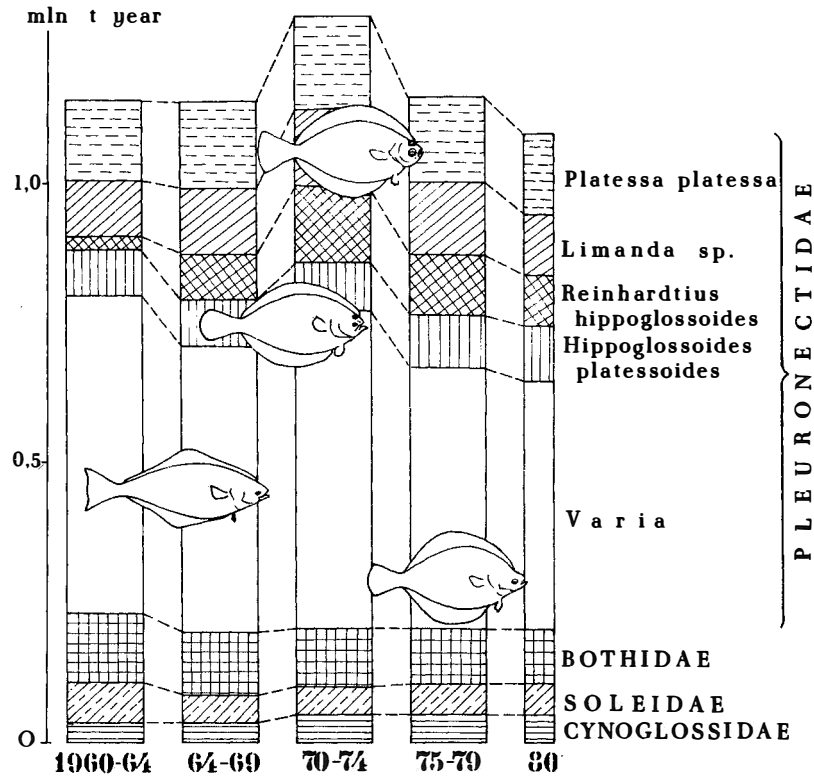


Fig. 6. World catches of the *Pleuronectiformes* by families and species in 1960 – 1980

In spite of their relatively small catches (0.4–0.6 million t a year), the salmon family (*Salmonidae*) occupies a much more significant position in the world's fisheries, Pacific salmons (the genus *Oncorhynchus*) being of a particular importance here. The genus is represented in marine catches by a few species, the foremost of which being the pink salmon (*Oncorhynchus gorbuscha*), chum salmon (*O.keta*), and the sockeye salmon (*O.nerca*). It is worth mentioning that the importance of the Atlantic salmon (*Salmo salar*) is at present lower than that of *Oncorhynchus spp.* by the factor of 10.

The flatfish (*Pleuronectiformes*) constitute a stable but relatively small object of the world's fisheries (1.1–1.3 million t a year, accounting for 2–3%). The basic role is played by the family *Pleuronectidae* (Fig. 6) with such North Atlantic species as the plaice (*Platessa platessa*), Greenland halibut (*Reinhardtius hippoglossoides*), limands (*Limanda spp.*) (yellowfin, yellowtail flounder, and dab), and the American plaice (*Hippoglossoides platessoides*). Much less important are the other flatfish families (*Bothidae, Soleidae*, and Cynoglossoidae) (Fig. 6).

The role of the *Scorpaeniformes* (redfish, rockfish, etc.) in the world's fisheries is only slightly less important relative to that of the flatfish, as their catches varied from 0.8 to 1.0 million t a year, increasing temporarily in the first pentade of the seventies to an

annual mean of 1.4 million t. In 1980, however, the catches dropped again to 0.8 million t a year (Fig. 1). The basic importance, commercially, is attributed to two families, namely the *Scorpaenidae* with a widely distributed genus *Sebastes* including numerous and diverse species, e.g., redfish, ocean perch, etc., and the *Hexagrammidae* with only one species of importance, the atka mackerel (*Pleurogrammus azonus*) caught off the eastern Asia.

The *Gonorhynchiformes* (milkfish etc.) have only recently gained on importance; however, one can suppose that they were fished for much earlier but they entered the FAO statistics as „unsorted fish". In the seventies, they were supplying at least 0.2–0.3 million t a year, and 0.8 million t in 1980 (Fig. 1). The fishery is based primarily on one, eastern-Asian species of the family *Chanidae*, the milkfish (*Chanos chanos*). The individuals are robust, making a favourite game for anglers; the species is also cultured in isolated sea embayments.

The remaining fish orders are of a lesser commercial importance as their mean annual catches do not usually exceed 0.3 million t and in many cases do not reach 0.1 million t. The orders are: *Beloniformes* (Pacific sauries) with the skipper (*Cololabis saira*) as the foremost species caught mainly off the coasts of Asia; Mugilliformes, with mullets (*Mugil spp.*), widely distributed in warmer marine areas; *Myctophiformes* with the South-Asian Bombay duck (*Harpodon nehereus*); and some others.

EXPLOITATION OF MOLLUSCS

For many years, the world's molluscs catch has been systematically growing. The mean annual catch in the early sixties was 2.6 million t, increasing to 4.4 million t in the second half of the last decade, and to 5.0 million t in 1980 (Fig. 7). This increase is noticeable in all the mollusc classes, i.e., in the bivalves, predominating in terms of commercial value, as well as in cephalopods and gastropods. This is indicated by a more or less stable percentages of bivalves, cephalopods, and gastropods in different pentades amounting to about 60%, 32%, and less than 2%, respectively (the remaining ca 6% can be accounted for by „Varia", i.e., unsorted marine molluscs which, incidentally, consist primarily of bivalves).

Bivalve molluscs (*Bivalvia*) have for years been regarded as the major group of commercially exploited molluscs. Over the analysed period of time, their annual catch was observed to increase from 1.5 million t in the first half of the sixties to 2.9 milion t in the second half of the seventies and 3.1 million t in 1980. These organisms are exclusively bottom dwellers. Economically, the most significant part is played by the three following families: oysters, mussels, and scallops.

Oysters (*Ostreidae*) have been utilised by man from times immemorial. Over the period of study, the catch was remaining on a fairly stable level oscillating around an annual average of 0.8 million t (Fig. 7). In view of a total increase in bivalve catch, the oysters tend to contribute less to it, i.e., from about 50% in the first pentade analysed down to

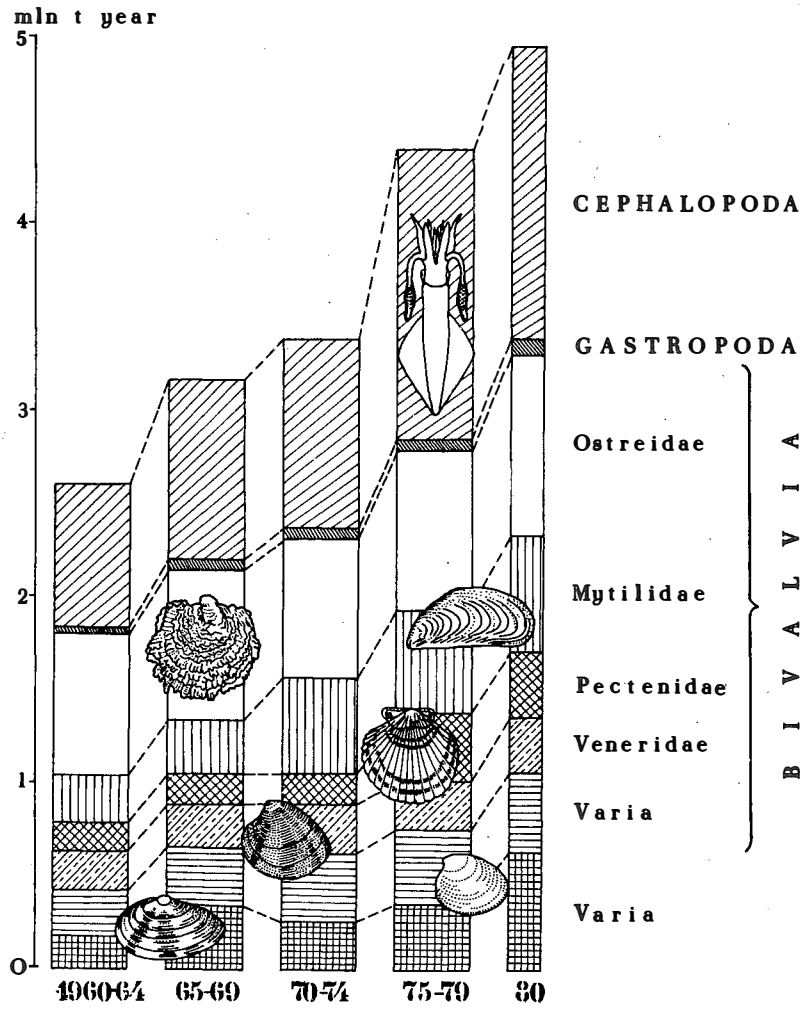


Fig. 7. World harvest of marine molluscs by classes and families in 1960 – 1980

30% in the last. The principal commercial species are: the Japanese oyster (*Crassostrea gigas*) in the Pacific Ocean and the Atlantic oyster (*C.virginica*). The major part of the catch is accounted for by oyster cultures.

For a long time, mussels (*Mytilidae*) have also been very important to the total bivalve supply. Their commercial value has been steadily growing; the mean annual catch in the sixties was 0.3 million t, increasing to 0.5 and 0.6 million t in the seventies and in 1980, respectively (Fig. 7). Economically, the most important species is the common mussel (*Mytilus edulis*) of the North Atlantic. A part of its total supply is contributed by cultures.

Scallops (*Pectenidae*) have been growing in economic importance, too. Until the

mid-seventies the annual mean catch was less than 0.2 million t as contrasted by the current 0.4 million t (Fig. 7). The main commercial species is the sea scallop (*Placopecten magellanicus*) distributed over the Nort-East Atlantic.

Relatively significant in the total bivalve catch is also the contribution of clams, the family *Veneridae* in particular. Their yield has been gradually increasing over the period analysed, from 0.2 to 0.3 million t a year (Fig. 7). The bulk of the catch consists of the hard clam (*Venerupis japonicus*) harvested off eastern Asia.

Of other commercially valuable bivalves, the mention should be made of the pearl oyster shells (*Pteriidae*), commonly cultured in the tropical seas. Although they do not contribute much to the bivalve biomass harvested, the value of their product is much above that of all other families.

Cephalopods (*Cephalopoda*) were exploited by man in ancient and medieval times. Within the period discussed in this work, the annual catch doubled from 0.8 to 1.6 million t (Fig. 7). The major commercial value is that of squids, the secondary part being played by the remaining two orders, cuttlefish and octopuses, comprising members of the benthos.

Among the cephalopods the most important commercially are the *Theuthida* squids, their annual catch increasing within the analysed period from 0.6 to 1.1 million t. Economically speaking, the principal species is the Japanese flying squid (*Todarodes pacificus*) inhabiting the North-West Pacific and belonging to the family *Ommastrephidae*. In various pentades of the last two decades, the cuttlefish (*Sepiida*) were being caught in the amounts of 0.1–0.2 million t a year, while in 1980 the annual catch was almost 0.3 million t. The exploitation is based mainly on the common cuttlefish (*Sepia officinalis*) of the East Atlantic Ocean.

The least important part in the world fishery is played by octopuses (*Octopoda*), as their annual catch within the last 20 years oscillates from 0.1 to 0.2 million t. One of the more important species is the common octopus (*Octopus vulgaris*) occurring along the eastern coasts of the Atlantic Ocean.

COMMERCIAL CRUSTACEANS

The catches of marine crustaceans grow even faster than those of molluscs, as they double every 17 years. In so far as in the early sixties the annual catch did not exceed 1.1 million t, ten years later it amounted to 1.6 million t, the last pentade yielding 3.2 million t a year. Owing to a fairly large morphological diversity of commercial crustaceans and complex taxonomy of the class, for the sake of clarity of the present analysis six taxa of unequal status will be treated in order of their economic importance: the *Natantia, Euphausiacea, Brachyura, Anomura, Astracura,* and *Palinura*. It should be mentioned that all the taxa belong to the highest organised crustacean subclass of *Malacostraca*; the *Euphausiacea* only are an independent order, while the remaining ones belong to the *Decapoda*. This order comprises two suborders, the *Natantia* and *Reptantia*.

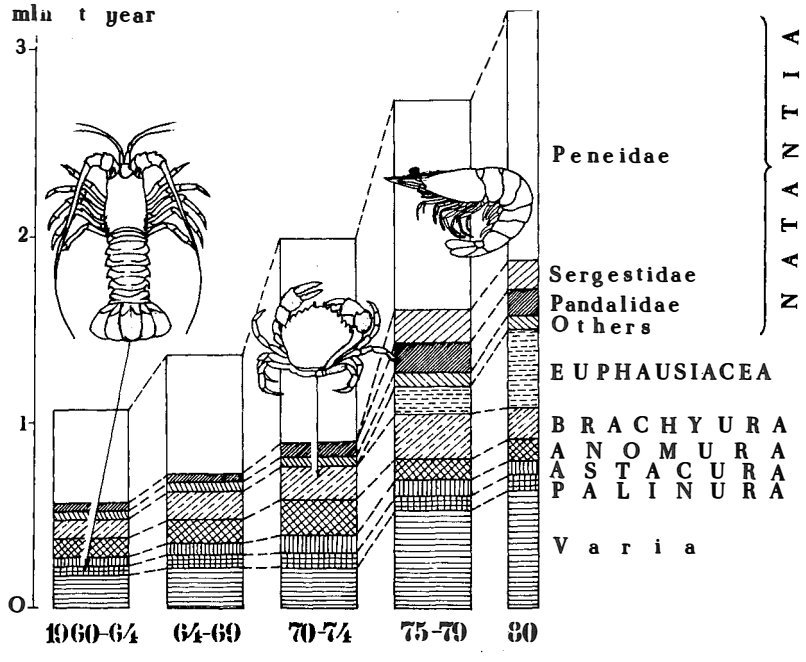
The latter is divided into four sections: the *Brachyura, Anomura, Astacura,* and *Palinura.*

The *Natantia*, i.e., prawns and shrimps, are the basic commercial crustacean group accounting for more than 50% of the class yield. Dominant is the family *Peneidae*, widely distributed over the tropical parts of the world ocean, and containing several commercial species caught in the warmest waters of the Pacific, Atlantic, and Indian Oceans.

The *Euphausiacea* (Euphausids) are the most promising commercially group of crustaceans, represented by immense stocks distributed mainly in the circumantarctic waters. For a few years now the Antarctic krill (*Euphausia superba*) of the family *Euphausiidae* has been exploited, the catches rapidly growing; the 1980 catch was 0.4 million t.

The *Brachyura* (crabs) catch increased over the period discussed from 0.1 to 0.3 million t a year. Economically, the greatest importance is attributed to representatives of the three following families: swimming crabs (*Portunidae*) with the Atlantic blue crab (*Callinectes sapidus*), spider crabs (*Majidae*) with the American snow crab (*Chionectes opilio*) caught off the North America, and edible crabs (*Canceridae*) with the European edible crab (*Cancer pagurus*) and the Dungeness crab (*C.magister*) caught off the North America.

In the *Anomura*, the basic economical importance is ascribed to the king crab family of *Lithodidae*, the foremost species being the king crab (*Paralithodes kamtschatica*) from



the North Pacific. A secondary part is played by squat lobsters (*Galatheidae*), particularly the squat lobster (*Galathea spp.*) inhabiting the oceanic warm waters.

The total world catch of the *Astacura* reaches 0.1 million t a year and consists basically of members of one family only, the lobsters, represented in the FAO statistics by the following North Atlantic species: the Norway lobster (*Nephrops norvegicus*) and the northern lobster (*Homarus americanus*).

The total world catch of the *Palinura* approaches slowly 0.1 million t a year. The principal economic importance has the spiny lobster family (*Palinuridae*) with the main genera of *Palinurus* and *Panulirus* comprising numerous tropical species harvested from all oceans.

EXPLOITATION OF ALGAE

In terms of the harvest rate of increase, marine algae are the most expanding group of all the marine organisms exploited, as over the period analysed their harvest increased by the factor of 5. The mean annual harvest in the two pentades of the sixties was 0.6 and 0.9 million t, and 1.5 and 2.8 million t in the seventies, increasing to 3.2 million t in 1980. A considerable part of the harvest is provided by cultures in coastal waters, carried out mainly off the Japanese islands. Brown algae account for 75% of the harvest, the rest being contributed almost exclusively by red algae.

Brown algae (*Phaeophyta*) have been for a long time the basic commercial group of algae. The total 1980 harvest was 2.4 million t. The basic family exploited for years are kelps (*Laminariaceae*), with the genus *Laminaria* comprising numerous species growing on rocky shores in relatively cold zones of oceans. The bulk of kelp yield is supplied by the coasts of Japan.

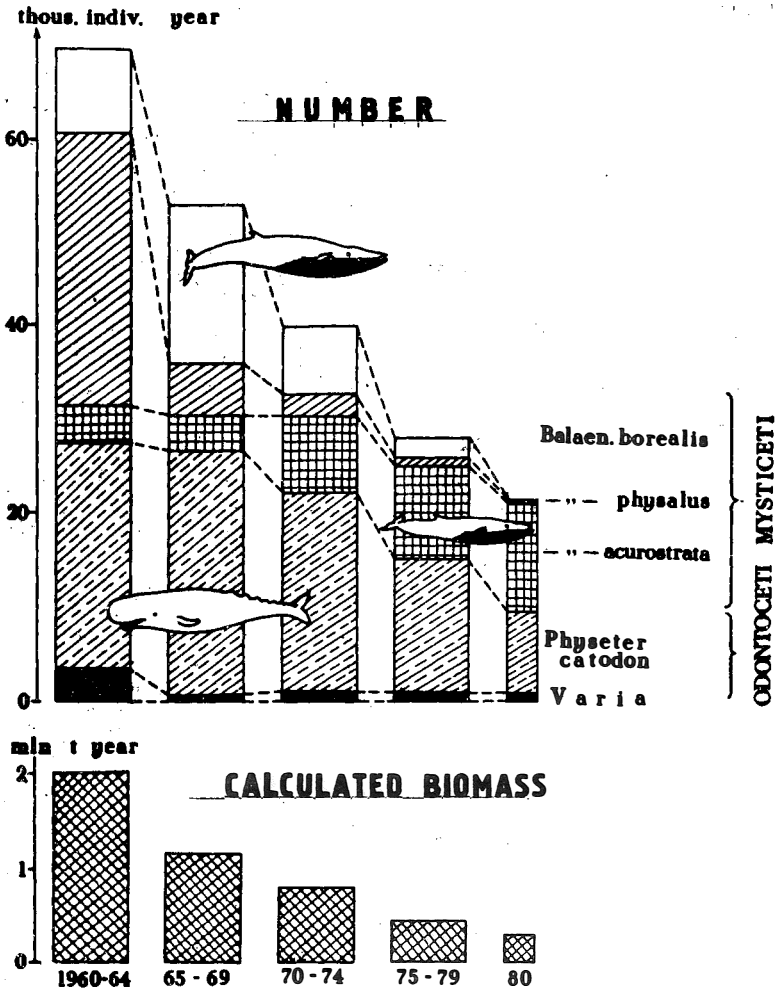
Red algae (*Rhodophyta*) have been harvested by man for more than 1000 years, and cultured for about 250 years. The total 1980 harvest was 0.8 million t. The most important economically is the purple laver family (*Porphyridaceae*) with the genus *Porphyra*.

MARINE MAMMAL HUNTING

Contemporary marine mammal hunting almost exclusively concerns two orders, the *Cetacea* and *Pinnipedia*. The FAO annual statistics present numbers of individuals only. To obtain a better picture of the situation and to render the results comparable with other catches an attempt was made to convert the number of whales caught into their total biomass. When compared to the pinniped biomass, the latter is negligibly low and without any wider significance.

The catch of whales (*Cetacea*) decreased rapidly over the 20 years analysed here, which is particularly evident when total biomasses are compared. The first pentade

(1960–1964) yielded an annual average of 2 million t, while in the second, third, and fourth pentades the annual averages were 1.2, 0.8, and 0.5 million t, respectively. The year 1980 witnessed a further reduction in catch, down to about 0.3 million t. In the first pentade the major contribution to the biomass obtained was by finwhales (*Balaenoptera physalus*) of the bony whales suborder (*Mysticeti*), while in the subsequent years, another species, the spermwhale (*Physeter catodon*) of the dental whales suborder (*Odontoceti*) accounted for 60–70% of the total mammalian biomass obtained. It is worth adding that the number of individuals decreased only slightly in the analysed period, which – when coupled with a rapid reduction in the biomass harvested – indicates a shift in the target hunted from large to small species of whales.



Economical importance of the *Pinnipedia* has been greatly reduced, too, evidencing their overexploitation. In the first pentade a total of 0.5 million t was obtained as opposed to the last pentade when slightly over 0.3 million t catch was obtained. Of major commercial importance is the seal family (*Phocidae*) with the Greenland seal (*Pagophoca groenlandica*) caught in the northernmost parts of the. Atlantic Ocean. A less significant part is played by the fur seal family (*Otariidae*) represented in catches mainly by the Cape fur seal (*Arctocephalus pusillus*) and the North Pacific fur seal (*Callorhinus ursinus*). The first inhabit the southernmost margins of Africa and certain southern islands, while the other are encountered in the North Pacific, particularly the Okhotsk and Bering Seas.

CONCLUSIONS

Based on the FAO fishery statistics, the total world ocean catches for the years 1960–1980 are presented as partitioned between the basic taxa. The mean annual catches for each pentade are compared, which allowed to elucidate general trends in the world fisheries and whaling. The materials analysed make it possible to draw the following conclusions:

1. The contemporary marine harvest is dominated by fish accounting for 90% of the total catch. The most important part is played by the following fish orders: clupeids (*Clupeiformes*), percomorphs (*Perciformes*), and gadoids (*Gadiformes*), the *Perciformes* approaching the foremost position which they will occupy most probably as soon as in the nearest future. Since late sixties, the marine fish catch has been remaining at a more or less stable level oscillating recently around 50 million t a year, with a slight tendency to increase in 1980 when more than 56 million t were achieved.
2. The most important role among the commercial invertebrates is played by molluscs (*Mollusca*) and crustaceans (*Crustacea*), their catches increasing by factors of 2 and 3, respectively, to amount to 5.0 and 3.2 million t in 1980. The mollusc catches were based mostly on bivalves (particularly oysters, mussels, and scallops) and cephalopods (particularly squids). Among the commercial crustaceans, the basic importance is ascribed to the *Natantia* (prawns and shrimps).
3. A still higher dynamics of catch increase is observed in algae, as their mean annual harvest for 1960–1964 was 0.6 million t only, to increase to 3.2 million t in 1980. Almost 75% of the biomass harvested is accounted for by brown algae (particularly kelps), 25% being contributed by red algae (mostly purple lavers).
4. In contrast to the above groups, marine mammals have been for a long time observed to decrease their yield to man. In 1960–1980 the total annual pinniped harvest dropped from 0.5 to 0.3 million individuals. At the same time the total number of whales caught decreased only slightly, their total biomass, however, being reduced by a factor of 7, which indicates that smaller and smaller whale species are being hunted for. At present the basic commercial species of marine mammals are: the Greenland seal and the sperm whale.

5. After a 12-yr period of a relative stabilisation in the world marine catch, a slow but systematic increase can be predicted. Algae, molluscs, and crustaceans will increase their respective contributions, as will the *Perciformes*.

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ZMIANY WIELKOŚCI I STRUKTURY ŚWIATOWYCH POŁOWÓW MORSKICH W LATACH 1960–1980

STRESZCZENIE

W oparciu o statystykę rybacką FAO zestawiono ogólnoświatowe połowy morskie w latach 1960–1980 z uwzględnieniem podstawowych jednostek taksonomicznych i najważniejszych gatunków użytkowych, szeregując je wg aktualnego udziału w globalnych połowach. Jako podstawę analizy przyjęto okresy pięcioletnie pozwalające na uwypuklenie zasadniczych trendów w światowym rybołówstwie i wielorybnictwie. Materiały te pozwalają na wyciągnięcie następujących wniosków:

1. We współczesnych połowach morskich dominują zdecydowanie ryby, na które przypada aktualnie 90% globalnego wydobycia. Wśród nich najistotniejszą rolę pełnią kolejno następujące rzędy: śledziokształtne, okoniokształtne i dorszokształtne, przy czym okoniokształtne już w najbliższych latach wysuną się najprawdopodobniej na czołową pozycję. Od końca lat sześdziesiątych połowy wyb morskich utrzymują się mniej więcej na jednakowym poziomie, oscylując od tego czasu wokół 50 mln t rocznie z nieznacznym trendem wzrostowym w roku 1980, kiedy to przekroczyły 56 mln t. Podstawowymi gatunkami użytkowymi są obecnie: mintaj *Theragra chalcogramma*, sardinopsy chilijski i japoński *Sardinops sagax* i *S. melanostica*, gromadnik *Mallotus villosus*, makrela kolias *Pneumatophorus colias* oraz dorsz *Gadus morhua*.

2. Najważniejsze znaczenie pośród bezkręgowców użytkowych mają mięczaki i skorupiaki, których wydobycie w analizowanym okresie wzrosło odpowiednio 2- i 3-krotnie i w roku 1980 wynosiło 5,0 i 3,2 mln t. Połowy mięczaków opierają się głównie na małżach, a w szczególności na rodzinach: ostrygowate *Ostreidae*, omułkowate *Mytilidae*, przegrzebkowate *Pectinidae* i wenerowate *Veneridae*,

oraz na głowonogach, zwłaszcza kalmarach z rodziny strzalikowatych *Ommastrephidae*. Zasadniczą pozycję w gromadzie skorupiaków zajmują krewetki *Natantia* z rodziną krewetowatych *Penaeidae* na czele. Podstawowymi gatunkami użytkowymi są: ostryżyce japońska i atlantycka *Crassostrea gigas* i *C. virginica*, omułek jadalny *Mytilus edulis*, strzalik japoński *Todarodes pacificus* oraz kryl antarktyczny *Euphausia superba*.

3. Największą dynamikę w zakresie tempa wzrostu wydobycia notuje się w grupie glonów, bowiem ich średnie roczne wydobycie w latach 1960–1964 sięgało zaledwie 0,6 mln t, a w roku 1980 zwiększyło się do 3,2 mln t, a więc ponad pięciokrotnie. Niemal 75% pozyskiwanej biomasy przypada na brunatnice, zwłaszcza listownice *Laminaria sp.* i 25% na krasnorosty, wśród których duże znaczenie mają szkarłatnice *Porphyra sp.*

4. W przeciwieństwie do powyższych grup wydobycie ssaków morskich od dłuższego czasu systematycznie maleje. W latach 1960–1980 globalne wyniki polowań na płetwonogi obniżyły się z 0,5 do 0,3 mln osobników rocznie. W tym samym czasie ogólna liczba upolowanych waleni zmniejszyła się tylko w niewielkim stopniu, jednak ich globalna biomasa spadła aż siedmiokrotnie, co wskazuje na obejmowanie eksploatacją coraz to mniejszych gatunków wielorybów. Obecnie podstawowymi gatunkami użytkowymi ssaków są: foka grenlandzka *Pagophoca greenlandica* i kaszalot *Physeter catodon*.

5. Po okresie względnej stabilizacji globalnego wydobycia ze środowiska morskiego, obejmującego ostatnie 12 lat, można przewidywać powolny systematyczny wzrost połowów światowych. Stopniowo wzrastać będzie udział glonów, mięczaków i skorupiaków, a wśród ryb zwłaszcza przedstawicieli rzędu okoniokształtnych.

Л. Жмудзиньски

ИЗМЕНЕНИЯ ВЕЛИЧИНЫ И СОСТАВА МИРОВОГО МОРСКОГО ВЫЛОВА В 1960 - 1980 гг

Р е з ю м е

На основании рыболовной статистики ФАО составили общие выловы Мирового океана за 1960 - 1980 гг. с разделением на основные таксономические единицы.

Основываясь на анализе средних значений морских выловов за пятилетние периоды, которые позволили выделить главные тенденции в мировом морском рыболовном и китобойном промысле. На основании полученных материалов установлено:

1. В современных морских выловах решительно преобладают рыбные объекты, на долю которых выпадает в настоящее время 90% валовой добычи. Среди них самую существенную роль играют следующие отряды: Clupeiformes, Perciformes Gadiformes, причем окунёвые уже в ближайшие годы передвинутся, по всей вероятности, на ведущее место. С конца шестидесятых лет добыча морских рыб удерживается на почти одинаковом уровне и в последнее время варируют около 50 млн. тонн в год с незначительным ростом к 1980 году, когда она составила 56 млн тонн.

2. Среди промысловых видов морских бєзпозвоночных самое большое значение имеют моллюски и ракообразные. За исследуемы период добыча обеих групп соответственно возросла 2 и 3 раза и в 1980 г. составила 5,0 и 3,2 млн тонн. Выловы моллюсков в основном составли двухстворчатые (особенно устрицы, мидии гребешки), а также головоногие моллюски (особенно кальмары). Среди промысловых видов ракообразных основные значение имеют Natantia (креветки).

3. Ещё большую динамику роста вылова отмечается в группе водорослей (Algae) поскольку их средняя добыча в 1960-64 гг. составляла лишь 0,6 млн тонн в год, а в 1980 г достигла 3,2 млн тонн. Почти 75% получаемой биомассы составляют бурые водоросли (особенно ламинария) и 25% красные водоросли особенно съедобонные пурпурные водоросли).

4. В отличие от вышеуказанных групп добыча морских млекопитающих в течение длительного времени систематически падает. В 1960-1980 гг. валовая добыча ластоногих уменьшилась с 0,5 млн. до 0,3 млн. особей в год. В тоже время общее число отловленных китообразных уменьшилось в незначительной степени, однако их общая биомаса сократилась в семь раз. Это свидетельствует об отлове всё меньших видов китообразных. В настоящее время основными промысловыми видами млекопитающих являются; гренландские тюлени и кашалоты.

5. После периода (охватывающего последнее 15 лет) относительной стабилизации валовой добычи в водах Мирового океана можно предполагать медленный систематический рост мирового вылова. Постепенно будет рости доля водорослей,моллюсков и ракообразных, а среди рыб отряд окуневых ((Perciformes).

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