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# ANALYSIS OF THE VESSELS OVER 100 TONS IN THE GLOBAL FISHING FLEET

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by

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## PREPARATION OF THIS DOCUMENT

This document was prepared as a contribution to the ongoing discussion on the capacity of the global fishing fleet. The analysis of the fishing vessels in the Lloyd's database gives an independent view of the trends in numbers and other parameters of the larger vessels of the world's fishing fleet. The document does not discuss the technical aspects of the control of fishing capacity, but merely presents the information on how national fleets contribute to the global fleet numbers and how the trends that are presently being experienced in fleet statistics will influence fishing fleet sizes in the future.

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### ABSTRACT

This publication analyses the data on fishing vessels over 100 Gross Registered Tons from the database maintained by Lloyd's Register of Ships. The data analysed is from the period 1985 to 1997; it lists the main fishing countries and describes how their fleets of large fishing vessels have changed during this period. The age of fishing vessels, in addition to their size and horsepower, should be taken into account when measuring the fishing capacity of fishing fleets. A method is introduced whereby the age of the fleet is taken into consideration. This method can be extended to the size and horsepower of the vessels or even a combined measure. The effect of reflagging on national fleets is described and it is shown that this factor now has greater influence on national fleets than either building or scrapping.

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# 1. INTRODUCTION

Global fish landings have been reported by FAO for several decades and a well established system of data collection has been set up to collect fish catch data. The data series from the fishing fleets of the world continues to show increasing yields from marine resources despite continuing concern being expressed about the sustainability of production. Fears have been expressed about overfishing, overcapacity of fishing fleets and non-sustainable fishing practices. Yet marine fish catches continue to increase inexorably towards the 100 million tons, a level that was considered to be a theoretical maximum in the 1950s. Nevertheless, no long-term analysis has been carried out on global fishing capacity and its effect on the sustainability of the marine resources. The fact that the rate of increase in fish landings has decreased in recent years has been interpreted as a sign that the fishing fleets of the world are considered to be overcapacity, overcapitalised and generally regarded as economically inefficient.

The global fishing industry is undergoing a period of unprecedented change. The United Nations Law of the Sea, which was agreed in the early 1980s, allocated rights and obligations to most States to manage and harvest the living marine resources within their 200 nautical mile Exclusive Economic Zone (EEZ). It has been estimated that 90% of the marine resources of the world occur within the jurisdiction of these EEZs, so that the provisions of UNCLOS redistributed the rights to the world's fish resources amongst the countries of the world. This period of readjustment was termed "A Decade of Change" at the beginning of the 1990s. However as we approach the end of the millennium, it would appear that the last ten years have witnessed just as dramatic and influential changes to the fishing fleets as happened in the 1980s.

The fishing industries of the world have experienced major difficulties in the past, and changes in the relative costs of production of the price of the raw product can create conditions that affect the fishing industry globally, creating "boom and bust" conditions similar to the "stop and go" phenomena in economics. Such conditions were apparent in the fuel crises of the 1970s and 1980s, and the effects of these have left their mark on the age profile of the global fishing fleet in much the same way as favourable or unfavourable environmental conditions are reflected in the "growth rings" on trees.

Current empirical evidence indicates that the fishing industries of the world have now recovered from the unfavourable economic climate that existed in the early 1990s. Readjustments in fleet sizes and better fisheries management regimes, incorporating property rights and limited entry, are now establishing conditions that are more conducive to more responsible and profitable fisheries. This study looks at the long-term trends in the global and national fishing fleets and at the factors, which are expected to influence investment and profitability of the fishing, fleets in the near future.

FAO reports biannually on changes in the global fleet in the State of Fisheries report to the FAO Committee on Fisheries. The National Marine Fisheries Service carried out the last comprehensive analysis of the global fishing fleet in 1993.

The present analysis was carried out on a database derived from the Lloyd's Maritime Information Service[1] (hereafter termed the Lloyd's database) which lists information about all classes of vessel of 100 tons and over. The latest database is considered to be the most comprehensive available, but it does have some weaknesses. For instance, the information is submitted on a non-mandatory basis, but is augmented by the extensive information that Lloyd's have on vessel insurance. In areas where this is not the case (e.g. the People's Republic of China) the records are incomplete. For such cases the data has been supplemented by the FAO fishing fleet data.

The lower limit of 100 tons for vessels in the Lloyd's database is very convenient for fisheries purposes, as it is recognised that most vessels over this size are capable of operating beyond the 200-nm EEZ limits. These are the vessels that are most likely to be covered by the Compliance Agreement, the UN Fish Stocks Agreement and to be involved in changes to the nationality of the vessel (i.e. reflagging). Nevertheless, it must be emphasised that the majority of these fishing vessels operate on the continental shelf within the EEZs of their own flag state.

Comparison of the data with other sources such as the FAO fleet statistics and national registers is difficult because of differences in the time of reporting. It is estimated that on national registers, 10% of the records change each year so that the time of reporting is important. In this context, the extracts from Lloyd's database which has been used in the present analysis has been made in August of each year. It is estimated from a comparison with the FAO statistics that the Lloyd's data contains details of 80% of the vessels reported to FAO by fisheries administrations. On the other hand the comparison also revealed that about 2,000 vessels in Lloyd's database were registered in countries that were not covered in the FAO fleet statistics. This means that while the numbers of vessels recorded in the Lloyd's database are almost certainly an underestimate, the trends that the data describe are statistically significant.

In the Lloyd's database, "SHIPTYPE" data is not very consistent and many vessels are classified as "SIDEFISHER" or "SIDE/STERN?" which in the context of a fisheries analysis is not very useful. Nevertheless an attempt to summarise these and to outline the main characteristics of the fleets by nationality and fishing method have been made.

The database structure held by FAO is in the form of 7 separate datasets covering the period from 1985 to 1997. This allows an analysis of the trends in the global fleet and the national fleets over the 12-year period.

The Lloyd's data and the FAO fleet statistics are complementary and comparison of the data held in each, can give useful information as to where more data needs to be collected. A comparison of the two sources of data are given below in Table 1.1

[1]Lloyd's Maritime Information Services (LMIS) Singer Street, London compiles data on ships of all classes and nationality. The records have been derived from a world wide intelligence network of agents, ship classification societies, shipbuilders, owners and keepers of public records. Its data are used extensively by the International Maritime Organization, underwriters, classification societies, owners and charterers. In general, the lower limit of the records held is 100 GT, although there are exceptions, particularly where fishing vessels of a lesser tonnage are in class with a recognised ship classification society.

**Table 1.1 A comparison of the Lloyd's database and the FAO Fishing Fleet Statistics**[2]

| | **FAO Fleet Statistics** | **Lloyd's data** |
|---|---|---|
| **Source** | National Fisheries Departments | National Registers of Ships |
| **Type of data** | Aggregated Statistics | Individual Vessels |
| **Measurement** | Gross Registered Tonnage but increasingly Gross Tonnage | 90% Gross Registered Tonnage 10% Gross Tonnage |
| **Vessel Identifier** | Not Applicable | Lloyd's Number |
| **History (e.g. Reflagging)** | No | Yes |
| **Type of vessel** | Given by some countries | Weak categorisation |
| **Size of vessel** | All vessels | Only vessels above 100 Gross Tons |
| **Coverage** | Most countries | Weak data from China, Taiwan, Prov. of China and Korea (DPR) |

A comparison of the numbers recorded in the two sources has been carried out on a regional basis and the results tabulated below in Table 1.2. It can be seen that the results are variable and where major differences in the numbers of vessels are evident, the reasons for such differences should be sought.

**Table 1.2 Comparison of numbers of vessels between Lloyd's database and FAO Fishery Fleet Statistics**

| | **FAO 1995** | **Lloyd's 1994** | **% Coverage by Lloyd's** |
|---|---|---|---|
| **Africa** | 1660 | 1307 | 78 |
| **N. America** | 6527 | 5028 | 77 |
| **S. America** | 2287 | 1575 | 68 |
| **Asia (-China)** | 9783 | 4959 | 50 |
| **Europe** | 5667 | 4939 | 87 |
| **Oceania** | 342 | 322 | 94 |
| **ex USSR** | 3873 | 2985 | 77 |
| **Total (-China)** | 30139 | 21115 | 70 |
| **China** | 15000 | 253 | 1 |

The difference between the Lloyd's database and the FAO Fishery Fleet Statistics should not be entirely attributed to a lack of coverage by the Lloyd's data. In many cases, Fisheries

[2] The reference "FAO Fishery Fleet Statistics" used in the text corresponds to the following publication:
FAO Fishery Information, Data and Statistics Unit /Unité de l'information, des données et des statistiques sur les pêches/Dependencia de Información, Datos y Estadísticas de Pesca.
Fishery fleet statistics, 1970, 1975, 1980, 1985, 1989-95.
Statistiques des flottes de pêches, 1970, 1975, 1980, 1985, 1989-95.
Estadísticas de las flotas de pesca, 1970, 1975, 1980, 1985, 1989-95.
*Bulletin of Fishery Statistics/Bulletin statistiques des pêches/Boletín Estadístico de Pesca.*
No. 35. Rome/Roma, FAO. 501p.

Departments report to FAO on the number of fishing licences issued and to the type of vessel that the licence was issued. In many cases vessels are scrapped or laid up and the Fisheries Department still retains the data on the fishing licence and this information is reported to FAO.

One area of concern that has arisen is that of Tonnage measurement. Gross Registered Tonnage (GRT) was the original measurement that was superseded by Gross Tonnage (GT) under the London Convention on the Tonnage Measurement of Ships (1969). The Convention entered into force in 1982, however administrations were allowed to retain measurement in GRT up until 1994. Despite the fact that the London Convention only applies to ships over 24 metres (about 100 GT) engaged on international voyages, it would appear that many national registers are adopting this form of measurement for all vessels, including small fishing vessels. Hence there will be a gradual change from GRT to GT for the next few years which will tend to indicate that the fleet of large vessels is increasing, even though the fleet remained the same in numbers and size. Paradoxically, the tonnage of about 90% of the fishing vessels in the Lloyd's database is given in GRT although theoretically they should be in GT. This is because the GRT of the older vessels is still retained in the Certificate of Registry. (When necessary these vessels have to carry a separate document called an International Tonnage Certificate). This means that we can compare the tonnages of the fleet in recent years in Lloyd's database without being too concerned about the bias introduced through this change in measurement. Likewise the FAO statistics currently in GRT are going to have to change to GT as GRT is phased out. The only problem delaying this change is the lack of continuity, which will result when the data classes are changed. There are already indications in the FAO fleet statistics that some countries are reporting in GT as is shown by sharp increases in numbers of vessel tonnage classes of some reporting countries. The effect of these changes will eventually increase the number of vessels over 100 tons both in the Lloyd's database and in the relevant class of vessels in the FAO fleet statistics. This effect is shown in a diagrammatic form below in Figure 1.1. It must be emphasised that this is a statistical correction and not a real increase in the number of vessels of a particular size.

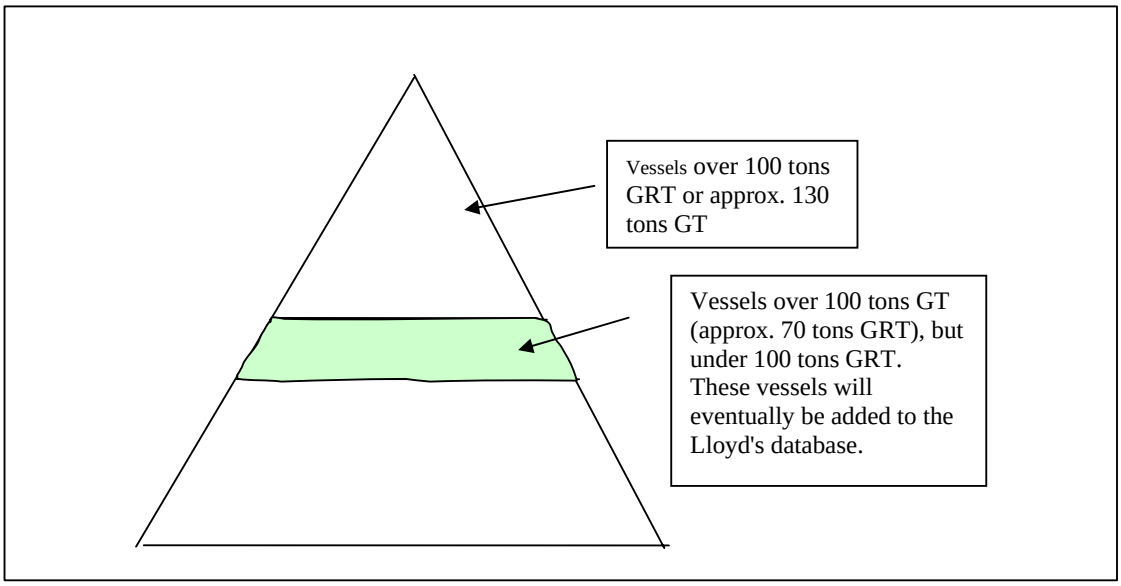



**Figure 1.1 Effect of change of measurement from Gross Register Tonnage to Gross Tonnage**

The Lloyd's data is made up of the records of individual vessels, which contain the following data for each vessel

Record Information in extract from Lloyd's Database held by FAO

- Lloyd's Number
- Vessel Type
- Vessel Name
- Former Name
- Owner
- Beneficial Owner (only 1997)
- Flag
- Date Built (only since 1993)
- Length
- Tonnage (only since 1993)
- Power
- Call Sign

Lloyd's number is a unique seven-digit number for each vessel. This number remains unchanged throughout the life of the vessel and can be used to track changes in ownership and flag. The Vessel Type is coded, but it provides a weak description of the Fishing Vessel Type. This description can be improved with data from other sources but will take some time and effort. The name is self-evident and the Former Name, if applicable, helps to trace the previous history of the vessel. The owner is usually a short company name or that of a private individual, however it should be remembered that the ownership of vessels is in the form of shares divided into sixteenths or even sixty-fourths. The beneficial ownership gives an indication of the nationality of the principal owner or company. In many cases this is not the same as the nationality of the flag of the vessel and where this is the case indicates the possibility of a "flag of convenience". The date built gives information on the age of the vessel, which is useful for looking at the age of the fleet. Various criteria for the size and power of the vessels include length, tonnage and horsepower along with several other criteria related to the size of the vessel.

The International Radio Call Sign has been found to be particularly useful for the identification of vessels at sea. The Call Sign in its simplest form is a four-character code with the first two letters indicating the nationality of the vessel. This two letter code is allocated to the country by the International Telecommunications Union (ITU), and the subsequent letters or numbers allocated to the vessels by the country's national administration. Under the recommendations of the Marking of Fishing Vessels the Call Sign is to be displayed in large letters on the side of the vessel and on the bridge top or on a horizontal deck (so that they can be recognised by aircraft). In this manner the Call Sign can be read from a distance of more than one mile at sea, long before the name of the vessel or even the flag of the vessel can be read. It is interesting to note that the International Telecommunications Union now has a page on the Internet where vessels can be identified by their Call Sign. This will be of immense benefit to patrol vessels to identify foreign vessels if they have radio equipment that can access the Internet.

## 2. NUMBER OF VESSELS IN THE FLAG STATES

The primary interest in the Lloyd's database is to analysis trends in the fishing fleets and the main breakdown is by flag State. This breakdown by most flag States is given in Appendix 1. The total numbers of vessels in the database shows a gradual rise from 1985 to a peak in 1991 and then for the first time a drop in 1993 and a further fall up to 1997 (Figure 2.1). Figure 2.2 shows the numbers of vessels being added or deleted from the database. Up until 1991 the vessels being added exceeded those being deleted. Since then this trend has reversed. The numbers of vessels being built have shown a long-term decrease to around 200 vessels in 1997.

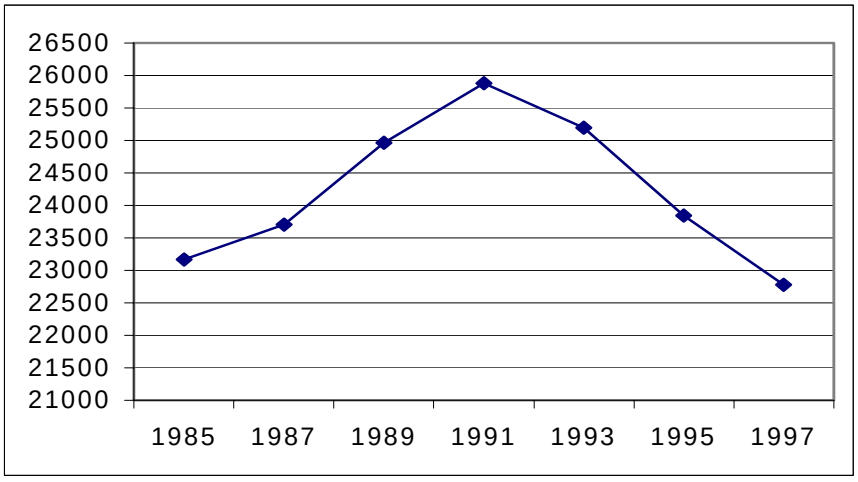



**Figure 2.1 Number of fishing vessels over 100 tons (Lloyd's database)**

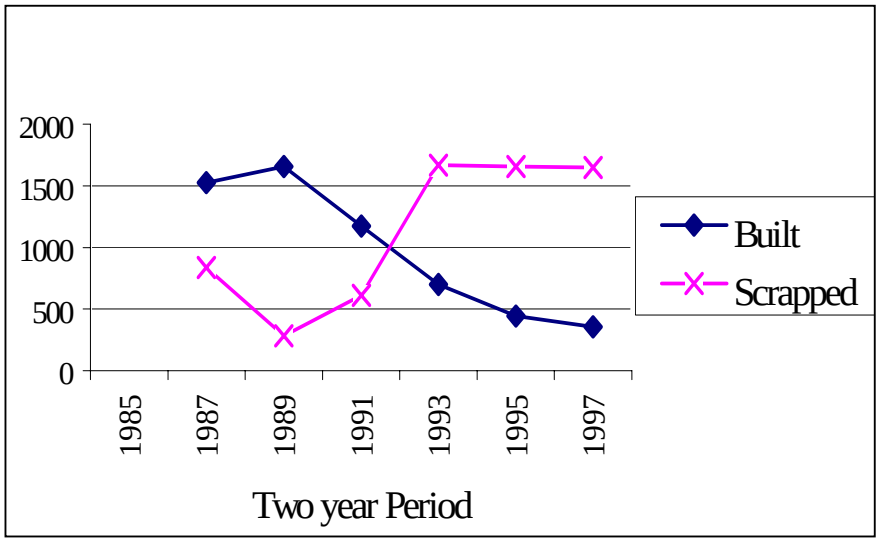



**Figure 2.2 Fishing Vessels added and deleted from Lloyd's database in the preceding two years**

In considering the main fishing countries of the world (with more than 500 fishing vessels over 100 tons), it can be seen that the numbers of these vessels have decreased. (See Figure 2.3). The slight increase in South Korea vessels during the last reporting period is due to Korean owned vessels being reflagged from the Honduras flag back to the Korean flag.

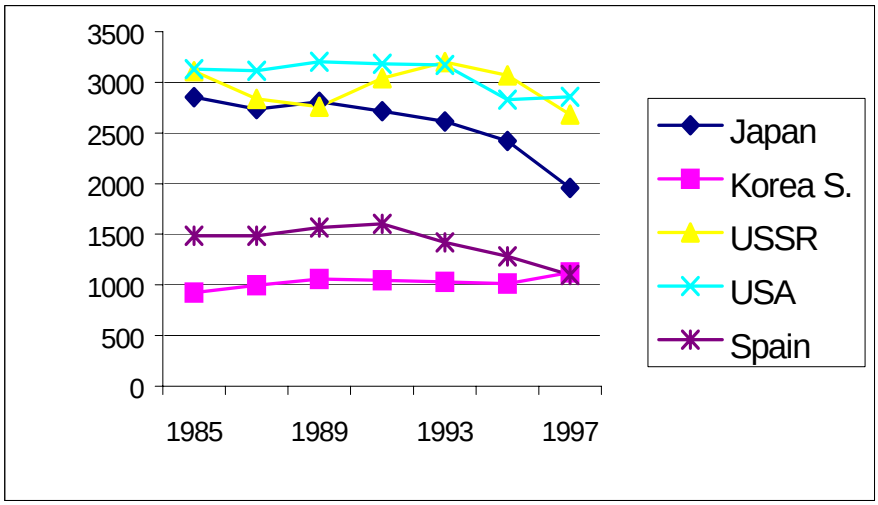



**Fig 2.3 Fleet of vessels from the main fishing countries (Lloyd's database)**

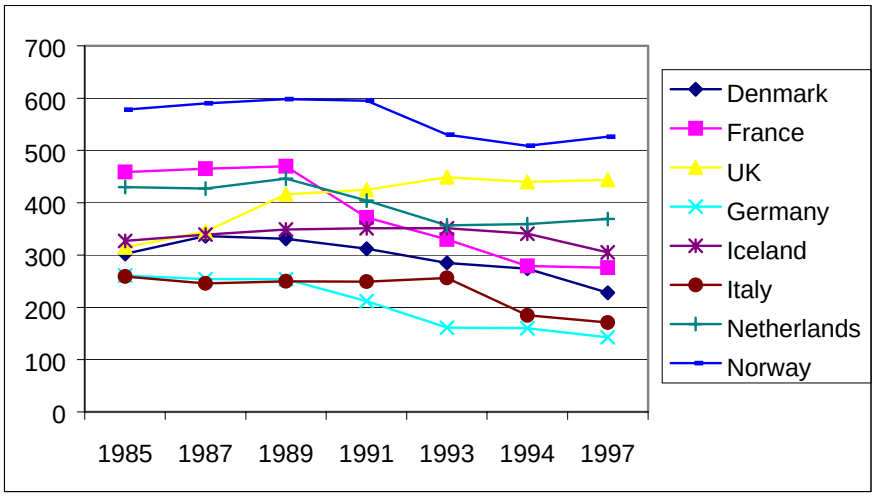



**Figure 2.4 Fleet of fishing vessels of European countries (Lloyd's database)**

The number of fishing vessels in Europe has shown long term decreases, in some cases dramatically like that of France. In most of these countries the decrease can be explained the decommissioning policies of the EU, however the fleets of large vessels have also decreased in Iceland and Norway. On the other hand, the fishing fleets of Latin American countries and the developing countries of Africa are still increasing.

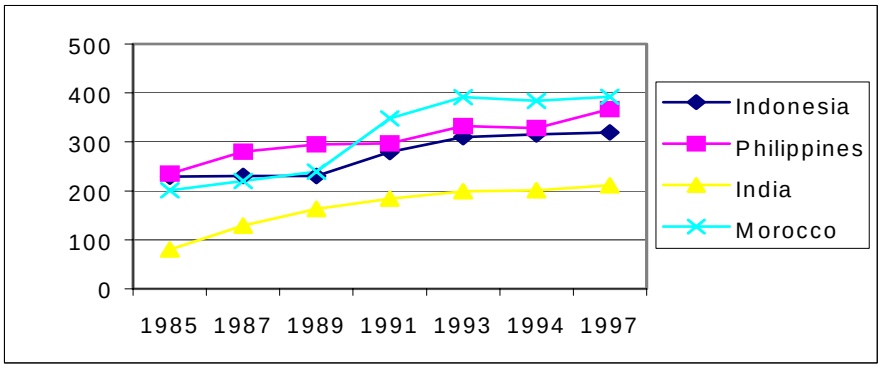



**Figure 2.5 Countries with increasing fleets (Lloyd's database)**

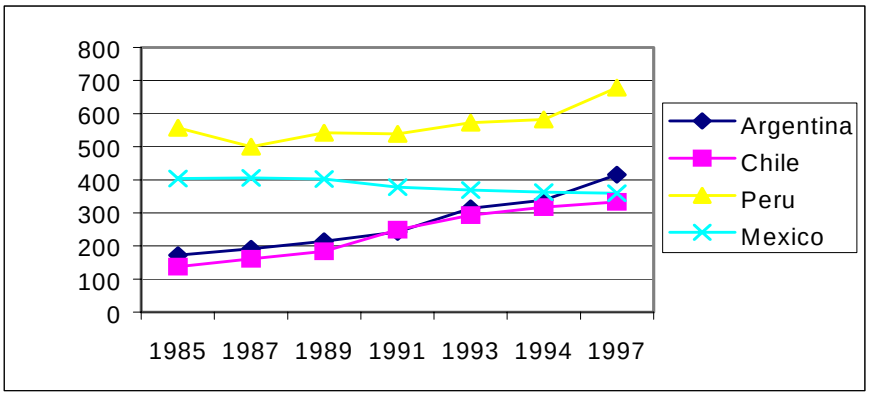



**Figure 2.6 The increasing fishing fleets of Latin America (Lloyd's database)**

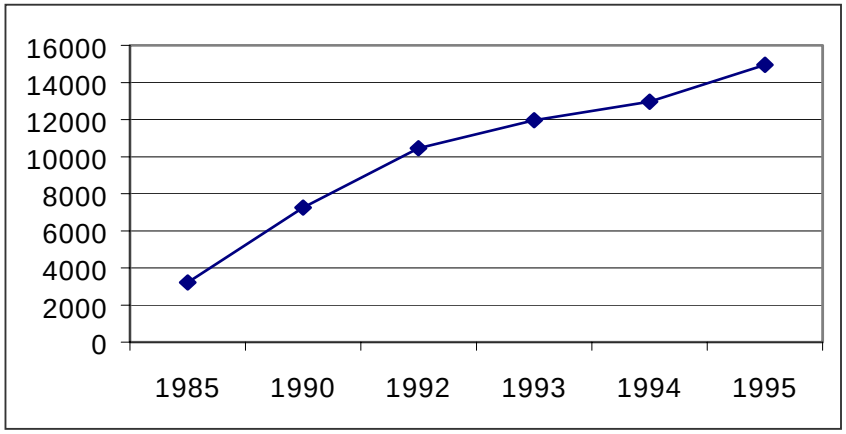



**Figure 2.7 The increasing fishing fleet of China (FAO Fishery Fleet Statistics)**

China is not well represented in the Lloyd's database, nevertheless because of the very large fleet size it does have a large impact on the global fleet. Data from FAO Fishery Fleet Statistics show a huge increase in the Chinese fleet. This fleet more than doubled from 3,219 to 7,265 vessels between 1985 and 1990 and then again more than doubled to 14,985 by 1995. This means that with regard to the number of vessels over 100 tons, China has around 40% of the world's fleet. Anecdotal evidence indicates however, that the vessels are of low horsepower and could not be regarded as having the same fishing capacity as the same sizes of vessel in the European fleet. Although we cannot analyse the Chinese fleet because we do not have the level of detail that we have for the rest of the global fleet, nevertheless it should be noted that the increase of 7,500 vessels is greater than the decrease of around 3,000 vessels in the period 1991 to 1997 recorded in the Lloyd's database. Figure 2.8 gives the increases in the Chinese fleet from 1986 to 1995 (data averaged between 1985-1990 and 1991-1992). Note that this is not the number of vessels built, which would be greater, but because there is no data on the number of vessels scrapped or lost the numbers cannot be calculated.

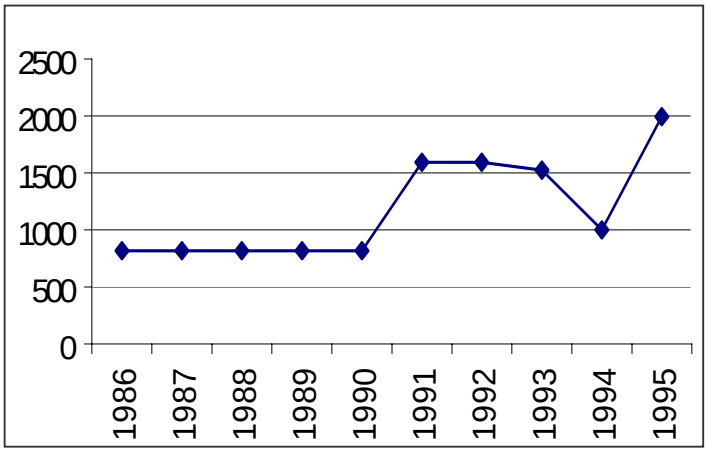



**Figure 2.8 The increases to the Chinese fleet of fishing vessels (over 100 tons) (FAO Fishery Fleet Statistics**

## 3. ANALYSIS OF THE FISHING FLEET BY FLAG STATE AND AGE OF VESSEL

It is difficult to determine the building rate of fishing vessels prior to 1985, because of losses of vessels prior to that date. The database records the vessels in existence at these particular time intervals so the vessels that were lost or decommissioned prior to 1985 cannot be calculated. However from the data from existing vessels (Figure 3.1), the rate of building seems to have peaked around 1972 with well over 1,000 fishing vessels per year being built at this time. The effects of the oil crises of 1973 and 1979 are clearly identifiable by the decreased building in the periods 1975-78 and in 1980-1985. Fuel is normally 15-20% of the running costs of a fishing vessel and the increase to 30-40% of running costs meant that the profitability of the global fleet was severely affected at these times. One has to remember that this last period was also the time the United Nations Law of the Sea was being discussed and agreed and many countries were very optimistic about the potential resources in their extended EEZs. The number of vessels being built subsequently increased to nearly 1,000 in 1988 and since then steadily declined to around a preliminary estimate of 200 in 1997.

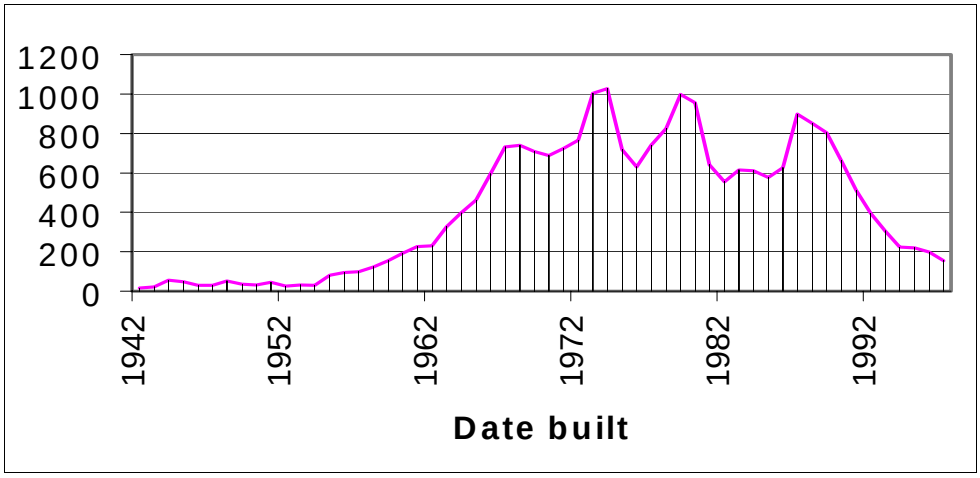



**Figure 3.1 Date of build of vessels in the 1997 dataset**

It is interesting to note that the fuel crises did not have the same effect on the fishing fleets of the Soviet bloc. The building rates during this period does not exhibit the decreases shown by the other countries as the fuel was maintained at a subsidised level (Fig 3.2)

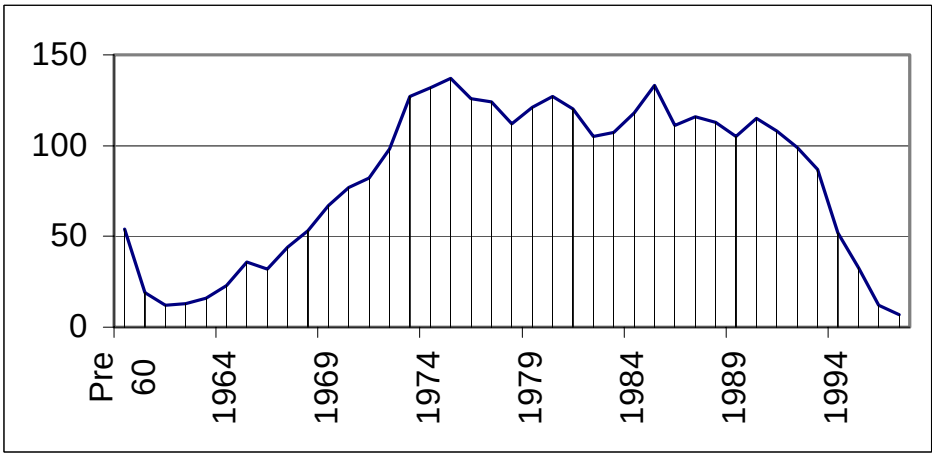



**Figure 3.2 Date of build of Soviet bloc fleet in 1997 dataset**

The decrease in building is obvious in the number of vessels less than five years old (in fact an analysis on a year by year basis shows a very steep downward trend). The majority of the world's fleet is over 20 years old and this has serious implications on safety of life at sea and a possible decline in fish production. This lower rate of building is likely to be due to the overcapacity of the world fleet in the early 90's and to the imposition of licensing systems by many of the developed countries. Some countries, such as Japan, have been able to maintain a healthy age profile of many new vessels and relatively few old vessels. The reflagging of older second-hand vessels to the Philippines and Indonesia has assisted this and both countries, as a consequence, have a very old fleet.

In considering the age structure of a national fleet, what should a good fleet age profile look like? The profitability of fisheries are liable to fluctuate with the changes in the health of fish stocks, so it is difficult to make long term plans as to when a vessel should be built. However it would appear that sustainable development would require a steady rate of building funded from profits from the existing fishery, as far as possible. Vessels would be scrapped or decommissioned after 20 - 30 years of service and, if appropriate, be replaced by new vessels. This would give rise to a fleet with an age profile with the highest number in the most recent period, slowly decreasing in subsequent time periods due to inevitable vessel loss, eventually with a sharp decrease at around 25 years. This type of age profile is shown in Figure 3.3.

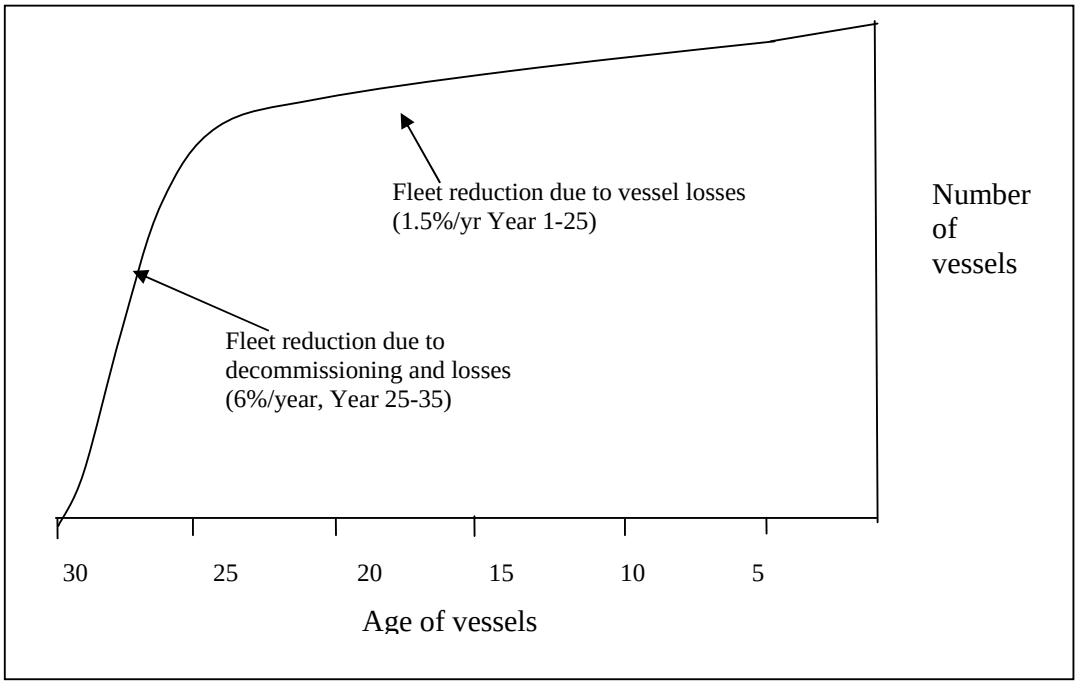



**Figure 3.3 Idealized age profile of global or national fleet**

It is clear from Figure 3.1 that the global fleet does not have this type of profile. Figure 3.4 and 3.5 show the age profile of the global fleet in 1993 and 1997. Taking the existing building rates, the predicted scrapping rates and a loss factor of 7% every 5 years (i.e. approx. 1.5%/year), an estimate of the age profile of the fleet in 2008 can be made. This is shown in Figure 3.6. The predicted amount of vessels in the database (assuming no improvement in coverage of the database) will have fallen to 14,000 vessels. This does not take into account the Chinese fleet.

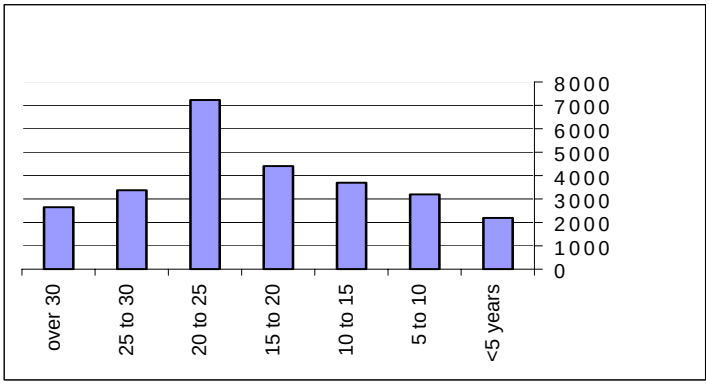



**Figure 3.4 Age profile of the global fishing fleet in 1993 (Lloyd's database)**

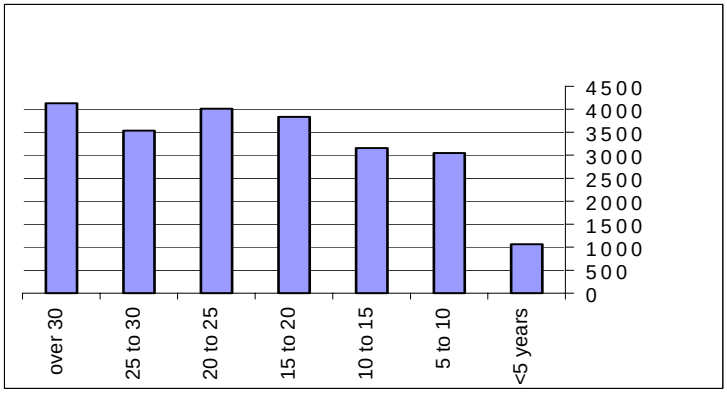



**Figure 3.5 Age profile of the global fishing fleet in 1997 (Lloyd's database)**

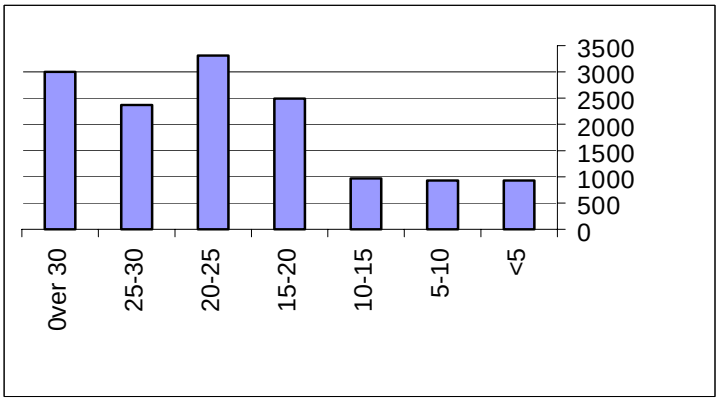



**Figure 3.6 Predicted Age profile of the fleet in 2008 (Lloyd's database) -Present rate of building extrapolated**

The global fleet of this class of vessel is presently decreasing at a rate of 2% per year (or 1,000 vessels per year), and the rate of scrapping will continue at around this rate for the next 10 years. It is clear that the decrease in building of new fishing vessels, even though partially justified, has resulted in a far lower level than is consistent with the optimal level of shipbuilding for a fleet with a good age profile, shown in Figure 3.3. Just as the high levels of building in the early 1970's is influencing current fisheries management policies, so to the present low levels of replacement of fishing vessels will be felt for the next 30 years. It is somewhat ironical that the high building rate of the early 1970s is currently making large numbers of vessels available for scrapping, thereby assisting fleet adjustment and fisheries management policies. Conversely, the present low building rates will make fleet adjustment very difficult in 2020-2030. If the current trends in shipbuilding continue to decrease and the rate of scrapping follows previous years, in 10 years time, there will be a fleet of vessels, which is only 60% of the present fleet size, the majority of which will be very old.

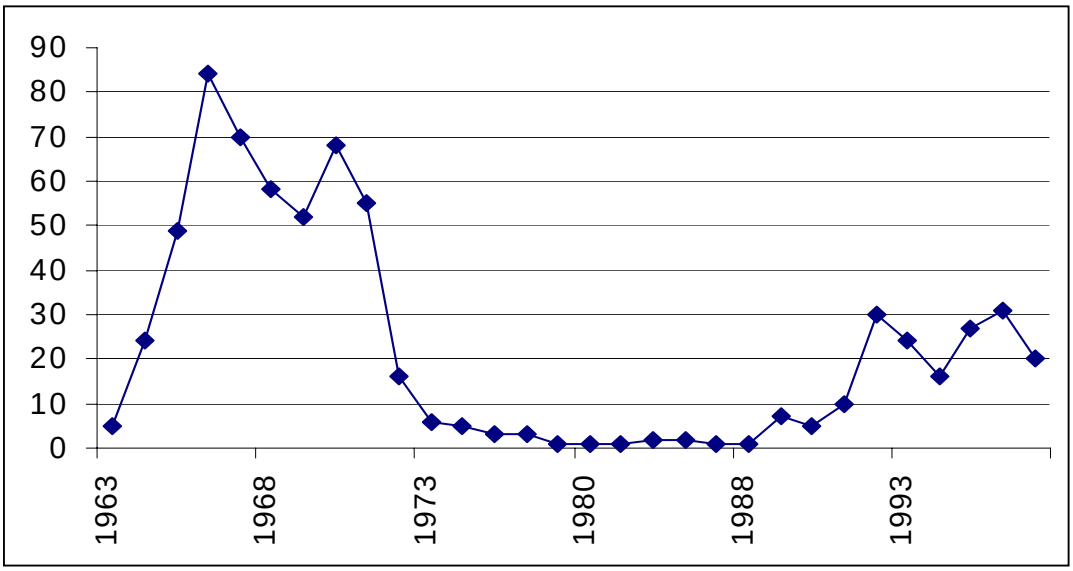



**Figure 3.7 Age profile of the Peruvian fleet**

Such an analysis is relatively simplistic, as it deals with the global fleet as an open system, because national fleets, which are dependent on national resources, mean that decisions on fleet capacity are a national prerogative. Considering that 90% of fish resources are estimated to occur within EEZs, each country will decide on its optimum fleet capacity taking into account political and social objectives, in addition to biological and economic concerns. It is the developments within national fleets that determine the global statistics. National fleets are not solely determined by building rates and scrapping rates, but are also influenced greatly by the flow of vessels into and out of their register from other flag States (i.e. reflagging). It must also be recognised that there is not a free flow of vessels. Each flag state requires a fleet that is consistent not only with the resources available, but with the type of resources and the fishing method. A simple example of this type of constraint on a national fleet is the case of fisheries in Peru. The age profile of the fleet is shown in Figure 3.7. Bearing in mind that the average age of steel vessels when they are scrapped is less than 30 years, there is an immediate requirement to replace the ageing fleet of medium sized American style purse seiners fishing for small pelagics. There are relatively few sources of second-hand vessels for this type of fishery, so the only solution is to build new vessels. (There is a source of second hand European purse seiners.

However this would require extensive retraining of crews because of the different method of purse seining and it is thought that because of this and other reasons Peru is not following this option). The question is not whether they should build vessels or not. It is what size and how many they should build.

However, the majority of vessels over 100 tons are trawlers and these can be used in most parts of the world, although extensive refits are necessary for the adjustment from arctic or temperate waters to tropical regions. This tends to be a one way flow from developed countries to underdeveloped countries. Nevertheless for each country there is an optimum size and configuration of trawler, or fleet of trawlers, to harvest its resources (usually demersal resources). This restricts the options that are available to countries, which wish to use the lower cost option of flagging in second hand vessels.

Moreover, some flag states have policies that prevent the "importation" of vessels, as a means of protecting their shipbuilding industry. This is the case in the USA, where vessels are not allowed to be registered in the USA if they have not been built there. In others, subsidies have encouraged owners to build vessels in their own country, while some countries have encouraged foreign owners to build vessels in their shipyards by offering substantial subsidies. However taking into account the very low numbers of vessels that are being built at present, the total amount being spent on subsidies is a mere fraction of what it was in the past.

## 4. ANALYSIS OF THE FISHING FLEET BY FLAG STATE AND TONNAGE

Looking at the aggregate tonnage of the fleet of vessels over 100 tons, Figure 4.1 shows a very good correlation to Figure 3.1 which shows the number of vessels. It has generally been accepted that the average size of vessel and the horsepower has increased with time. The analysis of the Lloyd's data does not support this hypothesis.

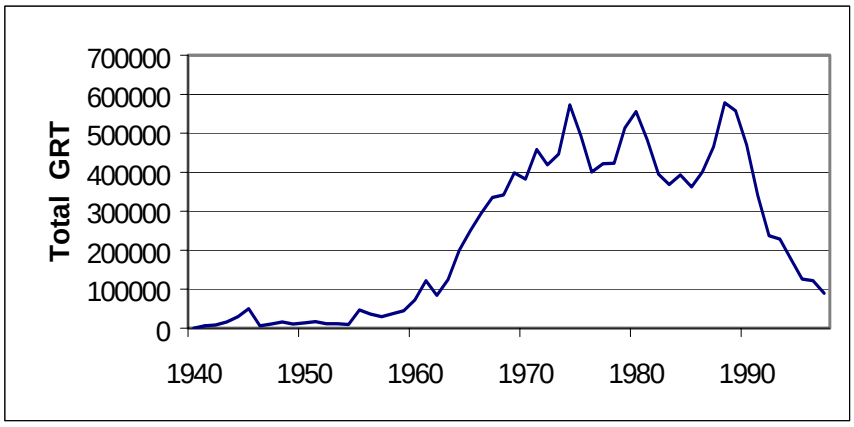



**Fig 4.1 The aggregate GRT by year of build (Lloyd's database)**

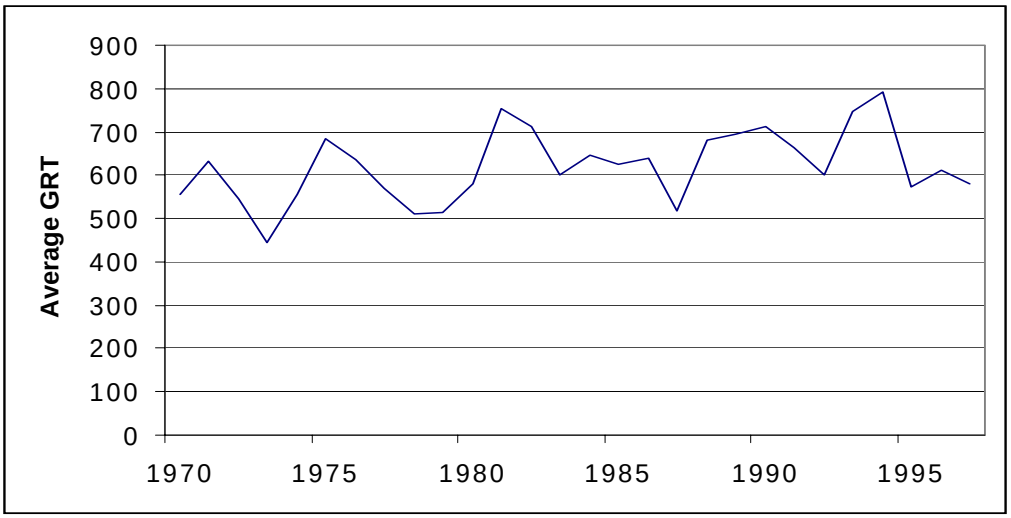



**Figure 4.2 The average GRT of the present fleet by year of build**

Figure 4.2 shows that the average tonnage of vessel in the database has remained remarkably consistent. In fact the average tonnage of vessels built in the period 1994-1997 has been below the 30 year average (621 GRT). The change in measurement from Gross Registered Tonnage to Gross Tonnage would mean that this difference would be greater than that measured.

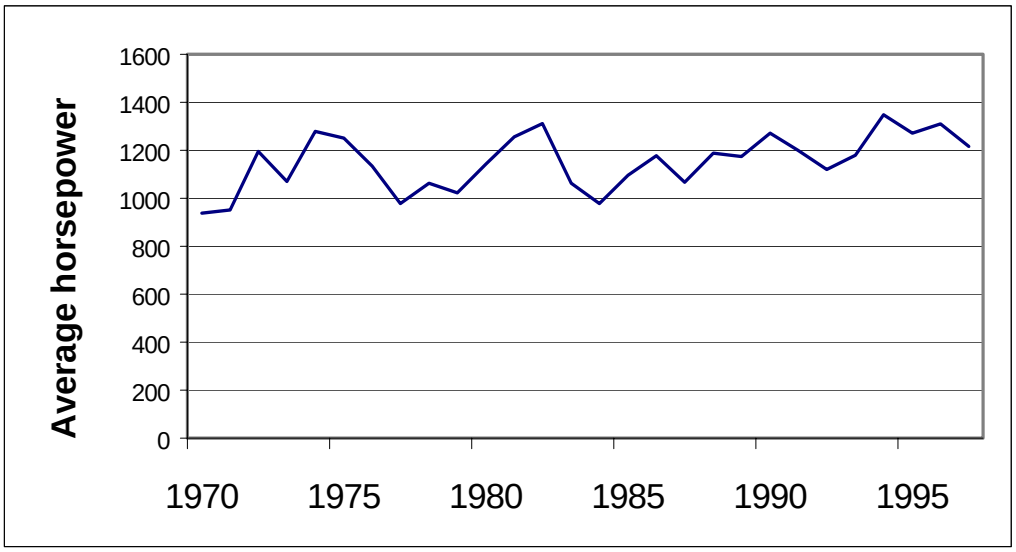



**Figure 4.3 The average horsepower of the present fleet by year of build**

Figure 4.3 also shows very little change in terms of the horsepower of vessels. The last three year average is 1265 HP against the 30 year average of 1151 Hp, a mere 9% increase over a 30 year period.

It should be realised that we are only dealing with a section of the fleet and that the trends in measurements shown above might not be applicable to the parameters of smaller sized vessels or within some national fleets where it is known there have been significant changes.

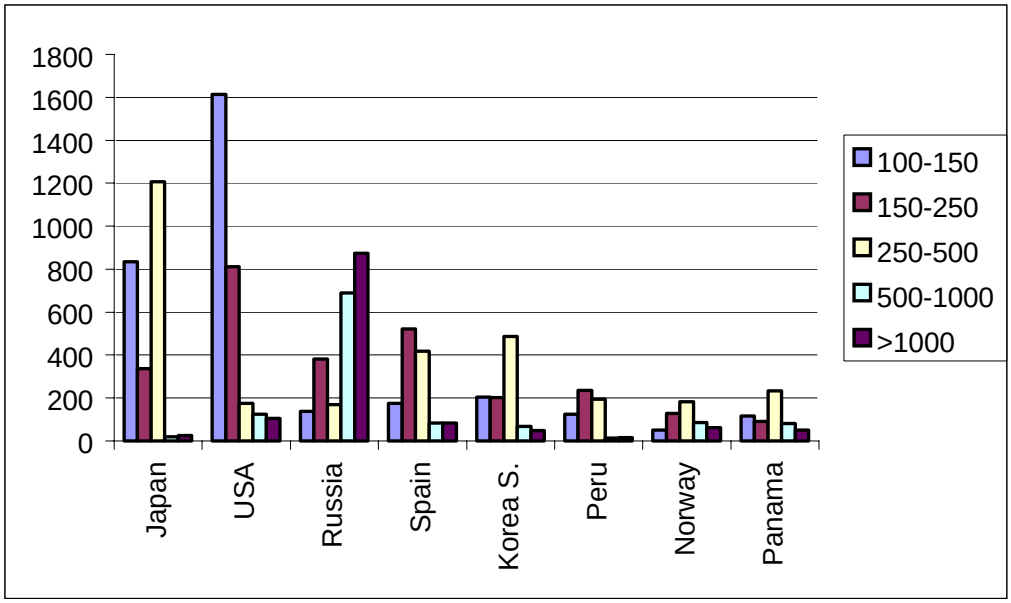



**Figure 4.4 The size of vessel (GRT) by main fishing countries (Fleets of over 500 vessels over 100 tons)**

The breakdown by country and tonnage classes is given in Figure 4.4. Countries which tend to harvest resources within their own EEZ (ie USA, Peru and Norway) have fleet of vessels mainly below 250 tons. The Distant Water Fishing Nations (DWFN) fleets tend towards the larger vessels, with Russia showing a high number of very large vessels usually associated with processing on board. Figure 4.5 shows a similar breakdown by country and tonnage for other countries.

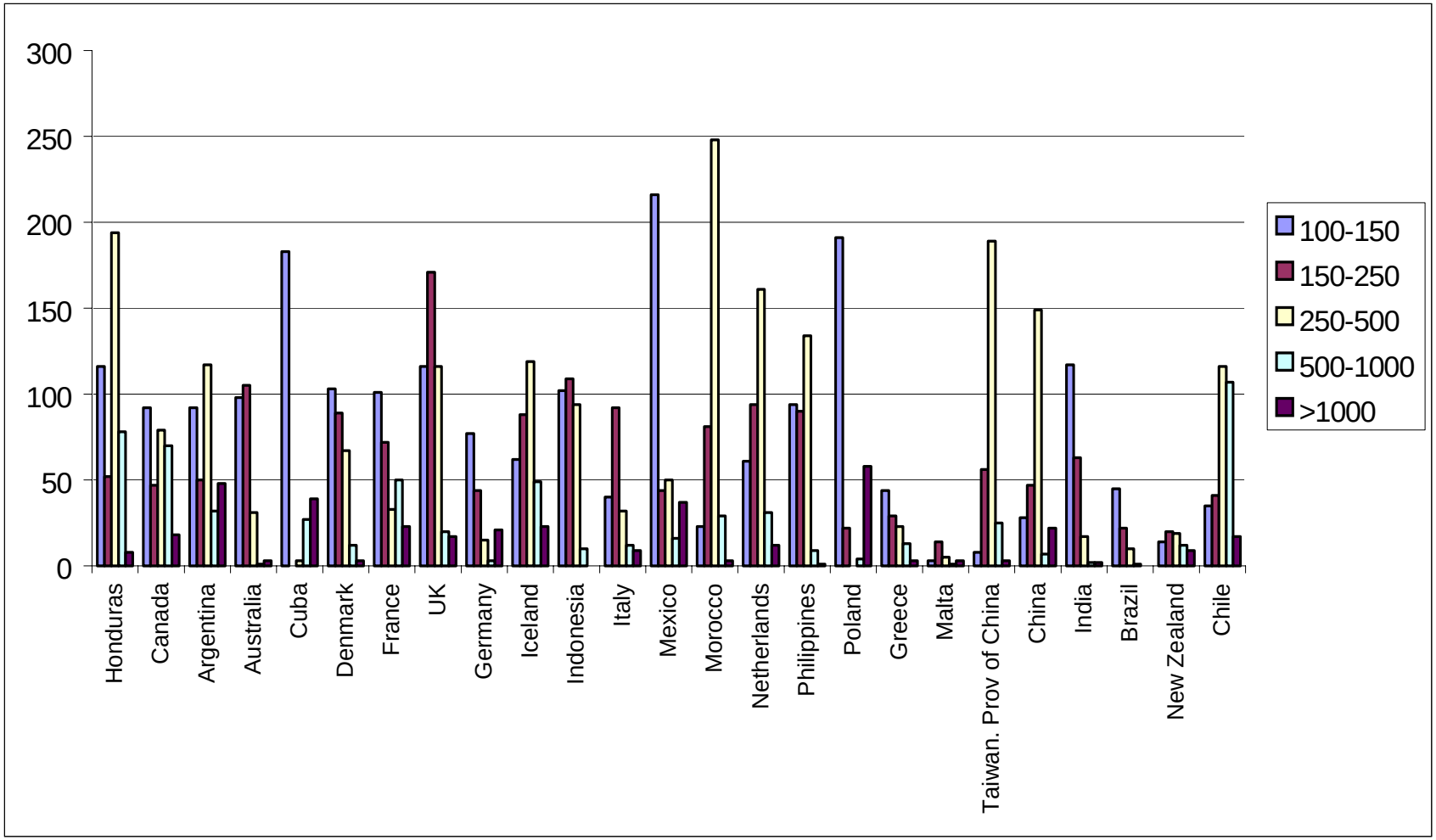



**Figure 4.5 The sizes of fishing vessels of a selected group of countries**

## 5. BUILDING, SCRAPPING AND REFLAGGING OF FISHING VESSELS (1985-1997)

**Table 5.1 Changes to the Lloyd's database in the period 1985-1997**
**(* Vessels flagging from USSR not included.)**

| | Vessels at beginning of period | Addition Av./Yr. | Deletions Av./Yr. | Reflagging Av./Yr. |
|---|---|---|---|---|
| 1985-87 | 23,168 | 762 | 419 | 322 |
| 1987-89 | 23,701 | 827 | 142 | 185 |
| 1989-91 | 24,959 | 587 | 305 | 228 |
| 1991-93 | 25,877 | 350 | 832 | 541* |
| 1993-94 | 25,192 | 224 | 1656 | 366* |
| 1994-97 | 23,843 | 222 | 547 | 617 |
| | 22,779 | | | |

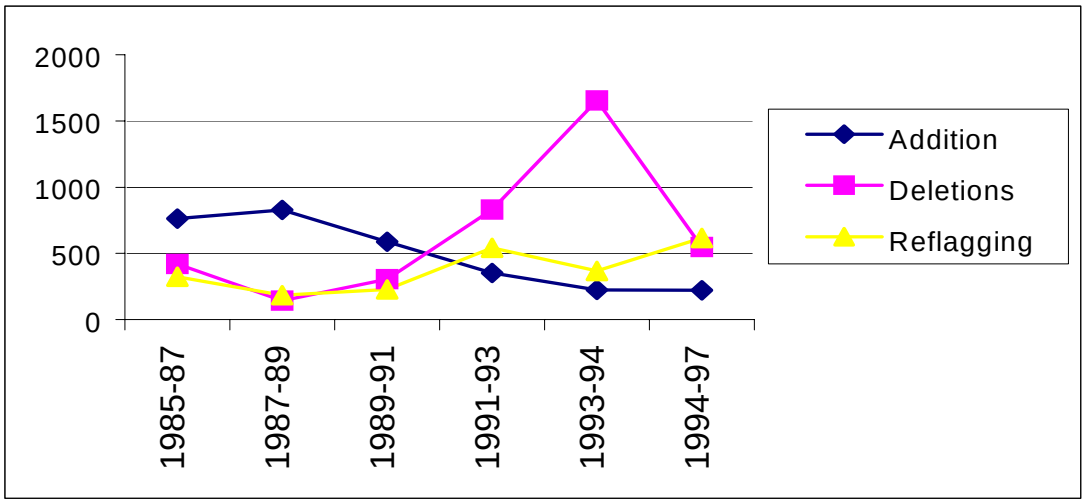



**Fig 5.1 The influence of reflagging on the global fleet**

In comparing consecutive datasets, it is possible to identify the numbers of vessels coming into the database for the first time or being reallocated to the fishing sector (There is a limited exchange of vessels between the fishing industry and the oil rig supply industry). As would be expected the greatest number of vessels is built for the countries, which have the largest fleets.

The deletions from the database are vessels scrapped, lost, decommissioned or moved to other industries. Until 1991, the numbers being deleted were significantly lower than those being built, indicating an increase in total fleet size. Since then the trends have reversed indicating a decrease in the fleet in the database. From the present age profile of the fleet, it is predicted that deletions from the database will remain at 800 -1000 vessels/year during the next decade.

The estimation of reflagging between flags was made difficult because of the introduction of a blank field in the database for the flag in 1989. This was probably because of some doubt on the destination of the vessels and for the analysis it was decided to allocate the last known flag to the vessel. Similarly there was a new category of "Unknown" added in 1997. There is also a slight problem for 1991-1994 where the break-up of the Soviet Union and of Yugoslavia led to vessels changing flags through political reasons, but not changing their port. To avoid large biases the vessels flagging from the USSR or Yugoslavian flag have not been calculated in the total reflagging estimates.

Although not apparent in the data over a two year period, it was noted that the number of vessels being removed from the database, (i.e. being scrapped) showed substantial fluctuations in the short term, whereas additions to the database, (i.e. new buildings) tended to show a very steady trend. It would appear that the number of vessels being built reflects a long term decision and substantial capital investment which take at least two or three years to come to fruition and should show steady trends. On the other hand, decisions to scrap a vessel would tend to be more susceptible to short term contingencies and involve far less capital because of the depreciated value of the vessel. Hence the current economic situation in a particular fishery would have a greater immediate effect on the scrapping rates in the medium term. This would be reflected in steady trends for building and more erratic changes in the number of vessels being scrapped. The change in the percentages of vessels being scrapped could be used as a form of early warning system for change in the profitability of the industry.

A new trend is the current increase in reflagging, as during 1994-1997 over 2,000 vessels reflagged (nearly 10% of the fleet). It should be noted that reflagging involves the changes to two of the national registers, hence the change to national registers during this period is 4,000 changes. During this period, in contrast to earlier years, reflagging into flags of convenience was insignificant, therefore it would appear that for this sector of the fleet there is increasing mobility of vessels between countries. It should also be noted from Figure 5.1, that for the first time, reflagging has become a more important factor than either building or scrapping in the development of national fleets.

A simple analysis might give an indication of whether a national fleet is decreasing or increasing. However the size of a national fleet is not only dependent on vessels being built and scrapped but also on vessels flagging into, and out of the register. For a full understanding of the dynamics of a national fleet all four parameters have to be considered. Due to the long life cycle of vessels, which is generally considered to be around 30 years, sudden changes in fleet sizes are not usual, and when such changes are investigated they are usually found to be due to statistical corrections. The concept of malleability was introduced by Greboval/Munro and considers that investment in fisheries is typically unmalleable, because of the fact that once a vessel is built it is there for 30 years, even though the owner becomes bankrupt and the fishery is uneconomic. The vessel will just be sold on to a new owner for a discounted price - it just will not go away!

On a global scale, reflagging has no effect on the total fleet, for by definition each vessel reflagging, flags in to one state and flags out of another, therefore the global total is the same. However at a national scale reflagging has a profound influence, usually with a flow of vessels from developed countries to underdeveloped countries. In the discussion on capacity of fishing fleets, this has generally been interpreted as "exporting the problem". However we must accept that fisheries exist with different levels of profitability and newly built vessels are generally built for the most profitable fisheries in developed countries. One might question why a vessel, which has ceased to be profitable in a developed country, can be operated profitably in an undeveloped country where the revenue is likely to be lower. However it has to be pointed out that, under present management policies, many of the vessels are not unprofitable - they are being pushed out by the limited-entry licensing systems. They are merely less profitable. The labour costs, which are a substantial proportion of the running costs, are also significantly lower in underdeveloped countries.

At the other end of the scale, there are existing fisheries, which could not operate on a profitable basis if they had to sustain the costs of new vessels. We might term these fisheries as "overflow" fisheries and older vessels, replaced by newer vessels tend to finish up in these fisheries. These fisheries exist in both developed and undeveloped countries and are characterised by the older vessels operating in such fisheries and by the lower gross earnings accruing to these vessels. An example of this is the European nethrops fishery which are usually exploited by vessels which were originally built to target "white fish" or "pressure stock" fisheries.

In the consideration of the transfer of vessels between one flag State and another, the age factor in the vessels being transferred should be taken into account. (i.e. There is a significant difference between "flagging in" a 5 year old vessel and "flagging in " a 25 year old vessel. One vessel will have an anticipated 25-year life expectancy while the other will only have a 5-year life expectancy, compared to new vessel, which has 30-year life expectancy). In considering this problem in terms of capacity, a new concept of "aggregate time capacity" for national fleets is introduced. Under this concept each new vessel would have a "time capacity" of 30 years and other vessels would have a time capacity of (30-vessel age) vessel years. To avoid the obvious contradiction of negative values a vessel older than 30 years will have zero time capacity. By definition, the optimum time capacity of a fleet would be approximately (number of vessels x 15) vessel years, Under these measures the Lloyd's database fleet time capacity would be at an optimum at 15 x 22,000 = 330,000 vessel years. Measuring the existing fleet in the database, the time capacity is presently 240,000 vessel years. Looking at the dynamic situation, the fleet is losing 22,000 vessel years/year (i.e. each vessel loses one vessel year/yr.) which is countered by the new additions to the fleet of 200 vessels x 30 years (i.e. 6,000 vessel years). The result is that the aggregate vessel time capacity of the global fleet is decreasing at 16,000 vessel years/year. This indicates that in terms of vessel time capacity, the fleet is decreasing at 5% per year, in comparison to the decrease in vessel numbers of less than 2%.

In order to take into account changes in tonnage and horsepower in national fleets, such a concept could also be extended to take into account such parameters. It should be noted that although the present analysis indicates that there have been insignificant changes in tonnage and horsepower in the global fleet, such changes are known to have occurred in some national fleets.

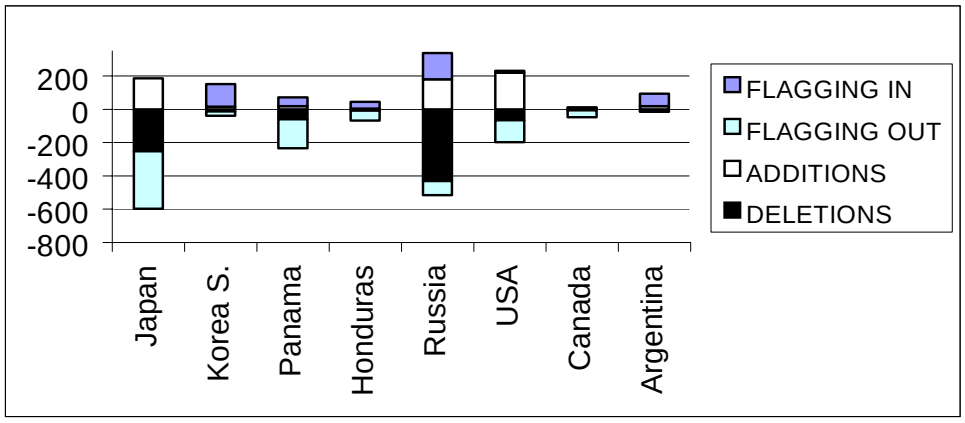
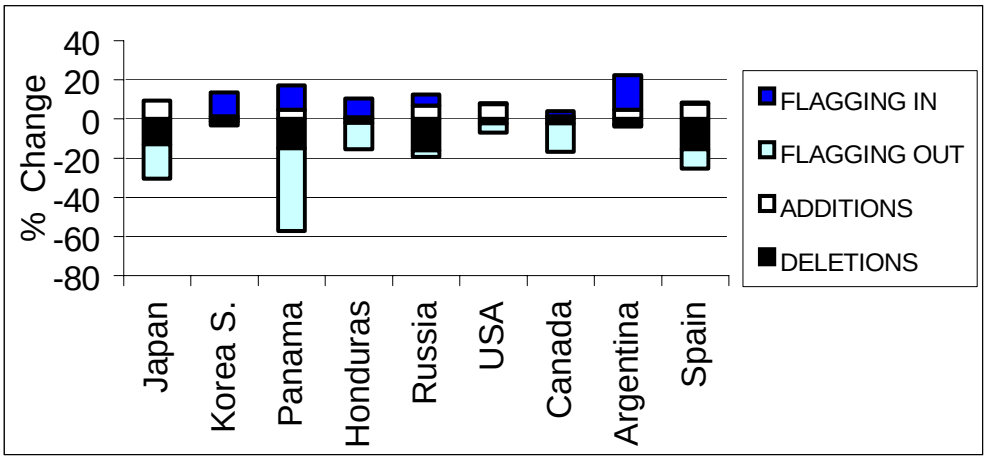



**Figure 5.2 Large changes in national fishing fleets 1994-1997**

**Figure 5.3 Percentage changes in national fishing fleets 1994-1997**




Turning to changes in national fleets in the period 1994-1997, the two graphs above in Figures 5.2 and 5.3 show the major changes that have occurred in the database for national fleets. It can be seen how the four parameters affect the fleets in different ways. As would be expected, the countries with the largest fleet exhibit the largest number of changes (Figure 5.2) and to highlight significant changes the data is better expressed in terms of percentage of the existing fleet (Figure 5.3). Any country exhibiting more than a 10% change in any one reporting period should be subject to particular attention. However even in terms of number, countries with large changes can be readily identified. In terms of restructuring, the fleets of Japan and Spain appear to show the trends necessary for a constructive approach to restructuring the national fleet. (Notwithstanding any ethical judgements on where these fleets should fish in the future) The building rates are counteracted by the decommissioning rates and there is a reduced fleet due to flagging out with very little of no flagging in. Reflagging is shown twice in the diagrams (i.e. as flagging in from one country and flagging out to another). In this context the flagging out of Honduras and Spain can be correlated with the flagging-in of Korea (Rep of) and

Argentina respectively. There is very little flagging-in shown by the USA, because of the legislation preventing the right to fly the flag of the USA, to any imported vessel.

Figures 5.4 and 5.5 show the changes in terms of numbers and percentage changes respectively to a selected number of countries. These show large percentage changes to Cuba, Malta and New Zealand. The changes to the Cuban fleet are thought to be likely to statistical correction, whereby the vessels scrapped might not have been reported for a few years. The large percentage changes to Malta and New Zealand are believed to be due to the relatively small numbers in their existing fleet where a few changes in terms of numbers create a large percentage change. Other countries with substantial additions to their fleets are Chile and Peru (to replace vessels built in the 60's which are now due for replacement) and the Netherlands and the UK, which are the two countries which have failed to meet the EC decommissioning targets. China, as mentioned before, is very poorly covered in the Lloyd's database and an detailed investigation shows that the additions are mainly vessels which were not previously included in the database, being reflagged to China.

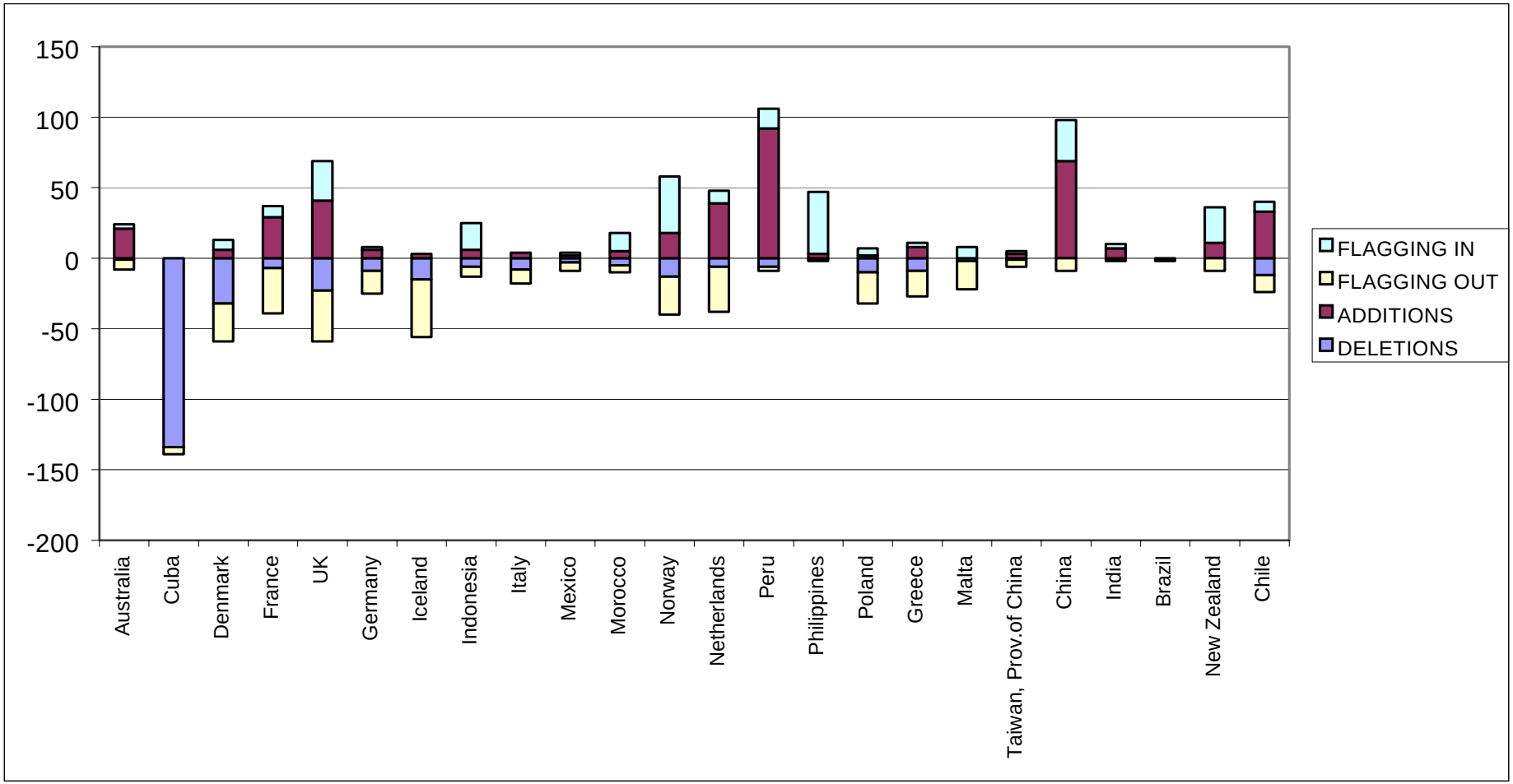



**Figure 5.4 Changes in a number of fishing fleets**

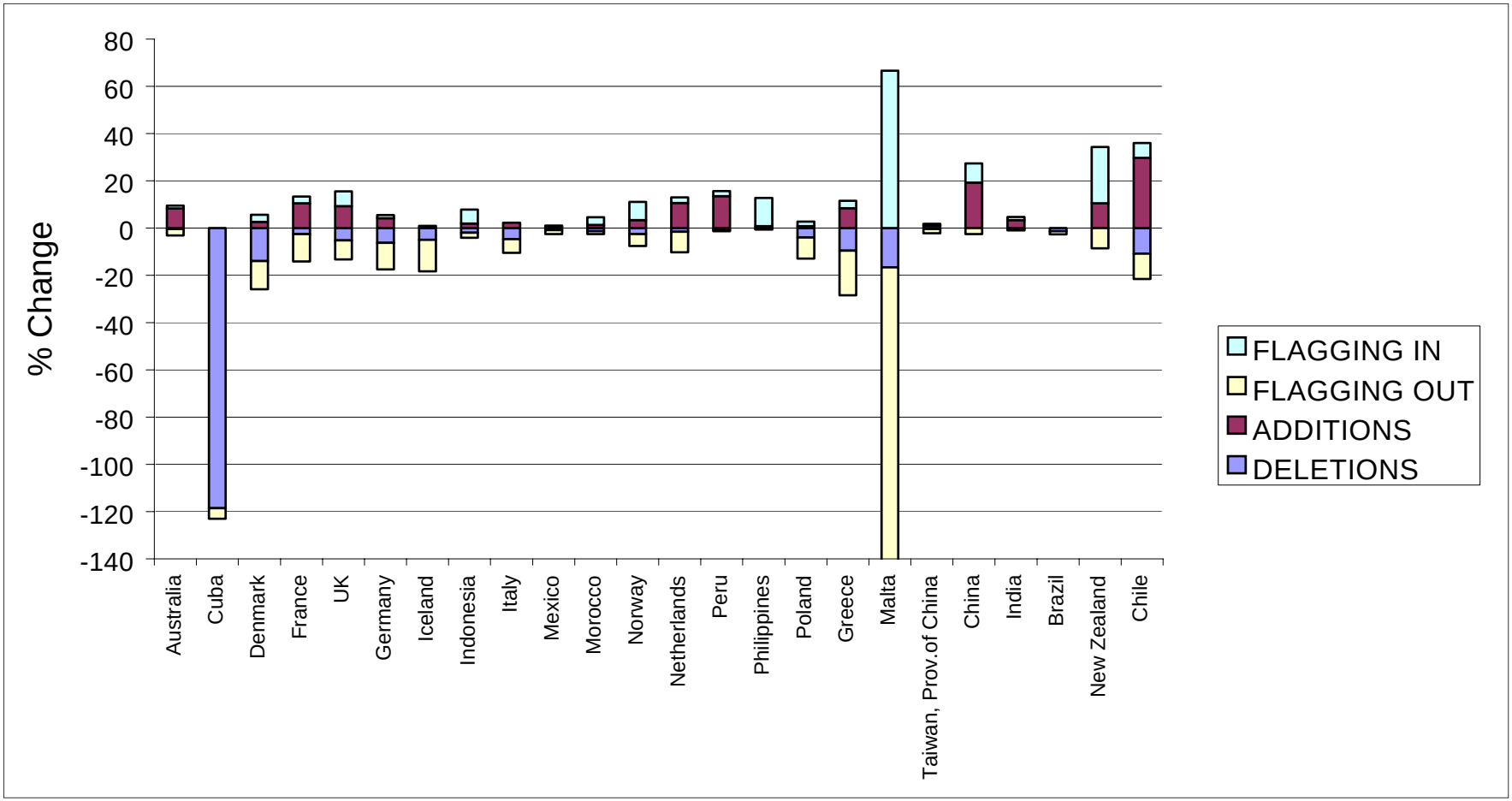



**Figure 5.5 Percentage changes in a number of fishing fleet**

APPENDIX 1

VESSELS (OVER 100 TONS) BY YEAR AND FLAG STATE

| Country | 1985 | 1987 | 1989 | 1991 | 1993 | 1994 | 1997 |
|---|---|---|---|---|---|---|---|
| Japan | 2853 | 2735 | 2809 | 2716 | 2613 | 2423 | 1956 |
| Korea S. | 925 | 996 | 1057 | 1045 | 1031 | 1012 | 1122 |
| Panama | 397 | 422 | 446 | 444 | 562 | 574 | 410 |
| Honduras | 54 | 132 | 179 | 199 | 224 | 448 | 430 |
| USSR | 3108 | 2837 | 2759 | 3042 | 3197 | 3068 | 2680 |
| USA | 3131 | 3113 | 3203 | 3181 | 3172 | 2830 | 2858 |
| Canada | 479 | 476 | 487 | 498 | 470 | 306 | 279 |
| Argentina | 172 | 192 | 214 | 243 | 314 | 339 | 416 |
| Australia | 242 | 264 | 262 | 271 | 244 | 238 | 253 |
| Cuba | 265 | 263 | 261 | 259 | 252 | 252 | 113 |
| Denmark | 302 | 336 | 331 | 312 | 285 | 274 | 228 |
| France | 459 | 465 | 470 | 372 | 330 | 279 | 276 |
| UK | 315 | 345 | 416 | 425 | 449 | 440 | 444 |
| Germany | 261 | 254 | 254 | 266 | 161 | 160 | 143 |
| Iceland | 327 | 339 | 349 | 351 | 351 | 341 | 305 |
| Indonesia | 229 | 230 | 230 | 279 | 310 | 315 | 319 |
| Italy | 259 | 246 | 250 | 249 | 256 | 185 | 171 |
| Mexico | 404 | 406 | 403 | 378 | 369 | 363 | 359 |
| Morocco | 201 | 220 | 239 | 348 | 391 | 384 | 392 |
| Norway | 578 | 590 | 598 | 595 | 530 | 509 | 526 |
| Netherlands | 430 | 427 | 446 | 404 | 357 | 359 | 369 |
| Peru | 557 | 500 | 542 | 539 | 573 | 582 | 679 |
| Philippines | 235 | 280 | 295 | 219 | 332 | 328 | 367 |
| Poland | 314 | 305 | 301 | 300 | 275 | 275 | 249 |
| Spain | 1485 | 1484 | 1567 | 1602 | 1422 | 1284 | 1097 |
| Greece | 90 | 104 | 117 | 129 | 129 | 112 | 95 |
| Malta | 13 | 30 | 32 | 40 | 29 | 26 | 12 |
| Taiwan, Prov. of China | 275 | 277 | 281 | 295 | 286 | 281 | 280 |
| China | 54 | 108 | 111 | 134 | 248 | 253 | 358 |
| India | 80 | 129 | 163 | 184 | 199 | 201 | 211 |
| Brazil | 71 | 82 | 90 | 90 | 67 | 78 | 76 |
| New Zealand | 38 | 45 | 52 | 56 | 71 | 74 | 105 |
| Ecuador | 77 | 84 | 85 | 87 | 91 | 94 | 111 |
| Argentina | 172 | 192 | 214 | 250 | 320 | 339 | 416 |
| Chile | 138 | 161 | 184 | 249 | 293 | 317 | 333 |
| Global Total | 21,432 | 21,759 | 22,540 | 23,606 | 24,068 | 23,064 | 22,699 |

APPENDIX 2

VESSELS (OVER 100 TONS) BY TONNAGE AND FLAG STATE (1994)

| Country | 100-150 tons | 150-250 tons | 250-500 tons | 500-1000 tons | >1000 tons | Total |
|---|---|---|---|---|---|---|
| Japan | 834 | 337 | 1206 | 20 | 48 | 2423 |
| Korea S. | 205 | 203 | 486 | 69 | 49 | 1012 |
| Panama | 117 | 91 | 234 | 81 | 51 | 26 |
| Honduras | 116 | 52 | 194 | 78 | 8 | 448 |
| Russia | 139 | 381 | 169 | 688 | 874 | 2251 |
| USA | 1613 | 812 | 175 | 124 | 106 | 2830 |
| Canada | 92 | 47 | 79 | 70 | 18 | 306 |
| Argentina | 92 | 50 | 117 | 32 | 48 | 339 |
| Australia | 98 | 105 | 31 | 1 | 3 | 238 |
| Cuba | 183 | 0 | 3 | 27 | 39 | 252 |
| Denmark | 103 | 89 | 67 | 12 | 3 | 274 |
| France | 101 | 72 | 33 | 50 | 23 | 279 |
| UK | 116 | 171 | 116 | 20 | 17 | 440 |
| Germany | 77 | 44 | 15 | 3 | 21 | 160 |
| Iceland | 62 | 88 | 119 | 49 | 23 | 341 |
| Indonesia | 102 | 109 | 94 | 10 | 0 | 315 |
| Italy | 40 | 92 | 32 | 12 | 9 | 185 |
| Mexico | 216 | 44 | 50 | 16 | 37 | 363 |
| Morocco | 23 | 81 | 248 | 29 | 3 | 384 |
| Norway | 51 | 128 | 182 | 85 | 63 | 509 |
| Netherlands | 61 | 94 | 161 | 31 | 12 | 359 |
| Peru | 124 | 236 | 194 | 13 | 15 | 582 |
| Philippines | 94 | 90 | 134 | 9 | 1 | 328 |
| Poland | 191 | 22 | 0 | 4 | 58 | 275 |
| Spain | 176 | 522 | 419 | 83 | 84 | 1284 |
| Greece | 44 | 29 | 23 | 13 | 3 | 112 |
| Malta | 3 | 14 | 5 | 1 | 3 | 26 |
| Taiwan, Prov of China | 8 | 56 | 189 | 25 | 3 | 281 |
| China | 28 | 47 | 149 | 7 | 22 | 253 |
| India | 117 | 63 | 17 | 2 | 2 | 201 |
| Brazil | 45 | 22 | 10 | 1 | 0 | 78 |
| New Zealand | 14 | 20 | 19 | 12 | 9 | 74 |
| Chile | 35 | 41 | 116 | 107 | 17 | 316 |
| Zero Flag | 314 | 179 | 264 | 63 | 45 | 865 |
| Global Total | 6841 | 5395 | 6266 | 2263 | 2299 | 23064 |

APPENDIX 3

VESSELS (OVER 100 TONS) BY AGE AND FLAG STATE (1997)

| Country | < 5 Years | 5-10 Years | 10-15 Years | 15-20 Years | 20-25 Years | 25-30 Years | >30 Years |
|---|---|---|---|---|---|---|---|
| Japan | 167 | 527 | 591 | 413 | 180 | 69 | 79 |
| Korea S. | 11 | 133 | 112 | 124 | 183 | 149 | 414 |
| Panama | 8 | 42 | 22 | 65 | 71 | 88 | 116 |
| Honduras | 1 | 74 | 85 | 66 | 89 | 79 | 36 |
| USSR* | 257 | 369 | 401 | 478 | 464 | 218 | 64 |
| USA | 21 | 226 | 364 | 915 | 514 | 439 | 389 |
| Canada | 2 | 57 | 18 | 51 | 36 | 26 | 91 |
| Argentina | 21 | 71 | 18 | 31 | 79 | 65 | 99 |
| Australia | 21 | 15 | 39 | 106 | 32 | 26 | 14 |
| Cuba | 0 | 0 | 0 | 4 | 20 | 22 | 67 |
| Denmark | 4 | 1 | 40 | 13 | 74 | 39 | 57 |
| France | 18 | 66 | 61 | 47 | 38 | 18 | 38 |
| UK | 39 | 58 | 59 | 49 | 90 | 75 | 80 |
| Germany | 7 | 20 | 27 | 4 | 29 | 9 | 47 |
| Iceland | 6 | 33 | 29 | 29 | 71 | 43 | 96 |
| Indonesia | 1 | 12 | 9 | 50 | 116 | 60 | 71 |
| Italy | 0 | 0 | 12 | 47 | 28 | 34 | 31 |
| Mexico | 0 | 0 | 32 | 102 | 121 | 92 | 12 |
| Morocco | 4 | 168 | 69 | 69 | 36 | 28 | 22 |
| Norway | 18 | 57 | 68 | 79 | 75 | 59 | 171 |
| Netherlands | 43 | 74 | 87 | 67 | 38 | 23 | 37 |
| Peru | 118 | 53 | 5 | 3 | 17 | 249 | 234 |
| Philippines | 0 | 1 | 3 | 49 | 80 | 117 | 118 |
| Poland | 6 | 21 | 4 | 46 | 92 | 25 | 56 |
| Spain | 90 | 172 | 58 | 37 | 255 | 162 | 326 |
| Greece | 0 | 19 | 8 | 6 | 12 | 17 | 34 |
| Malta | 0 | 0 | 3 | 0 | 4 | 2 | 3 |
| Taiwan, Prov. of China | 9 | 5 | 18 | 30 | 49 | 143 | 27 |
| China | 54 | 55 | 73 | 58 | 40 | 50 | 28 |
| India | 9 | 58 | 67 | 39 | 18 | 14 | 6 |
| Brazil | 0 | 5 | 13 | 14 | 18 | 16 | 17 |
| New Zealand | 7 | 22 | 11 | 30 | 22 | 7 | 6 |
| Chile | 51 | 46 | 21 | 21 | 27 | 64 | 98 |
| Zero Flag | 4 | 20 | 57 | 131 | 221 | 242 | |
| Global Total | 1066 | 3048 | 3153 | 3835 | 4013 | 3538 | 4126 |

* USSR figures for 1994