


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RESOURCES AND MARKETS

Presentation to Ground Fish Forum, October 2001

**Dr. Stuart Barlow, Director General,
International Fishmeal and Fish Oil Organisation, UK**

FISHMEAL AND OIL – SUPPLIES AND MARKETS

Fishmeal and fish oil are important as feedstuffs in agriculture and increasingly also in aquaculture, worldwide.

Figure 2 World fishery production

The world fishery production, according to FAO fishery statistics, was close to 126 million MT in 1999 and included 93 million MT from capture fisheries and 33 million MT from aquaculture. In effect, the capture fisheries have levelled off in recent years, while aquaculture has shown dramatic growth since the mid 1980s.

Figure 3 Utilization of the world fishery resources

The figure shows the proportional utilization of the world fishery resources in the 1990s and includes utilization of both the capture fisheries and aquaculture production. Reduction, i.e. fishmeal and oil production, represented 18- 27% of the resource disposition in this period. About 23-30 million MT of fishery resources have been used annually for fishmeal production in recent years.

The question may be asked: Why produce fishmeal rather than human food?

The fact is that fishmeal production remains the best method of utilizing small, bony, oily fish when there are limited food outlets for this catch and it is also the best way to use waste fish from food processing. It is a valuable use of resources, which otherwise would contribute little to the human food chain. It is also noteworthy that, wherever possible, fishmeal factories are run in parallel with food fish facilities such as canning or filleting. During the past decade there has been a gradual tendency to reduce the amount of fish going to reduction and increase in that directed to human food.

Figure 4 Fisheries control

The figure lists the world's major resources for fishmeal production and shows the controls imposed on their utilization. Almost all the resources are subject to TAC limits, area catch

limits, minimum mesh sizes, fleet capacity controls, closed areas and seasonal bans. Some are also subject to minimum landing sizes. The notable exception is blue whiting, an international fishery that is still being debated among the nations having a stake in this North Atlantic fishery.

Figure 5 World fishmeal production - major producers

The figure shows the world's production of fishmeal in the past 11 years and an estimate for 2001. The average world production is 6.5 million MT (product weight) except in 1998, when the El Niño phenomenon dramatically decreased production in Peru and Chile. The El Niño also affected production in 1992 but to a much smaller degree. Peru is the dominant producer of fishmeal but others are Chile, Japan, US, Russian Federation and Scandinavian countries, i.e. Denmark, Norway and Iceland. Other producers include China and Thailand.

Figure 6 World fishmeal consumption

The figure shows the world's consumption of fishmeal in the past 11 years. Fishmeal usage is now dominated by the Far East, particularly China, with about half of the world's total consumption. Usage is increasing in countries such as Chile and Canada included in the Americas.

Figure 7 World fish oil production - major producers

The average world production of fish oil is about 1.3 million MT and the figure shows the 1990-2000 trend for the production. This year, production is likely to be close to 1.2 million MT. Peru is the largest producer, followed by Scandinavia and Chile. Production in Japan has decreased markedly in the past decade. The effects of the El Niño in 1992 and 1998 are particularly noticeable in fish oil production.

Figure 8 World fish oil production - major consumers

The figure shows the world's consumption of fish oil in the past 11 years. Europe used to dominate the consumption of fish oil but has become progressively smaller while fish oil usage has increased in the Americas, particularly because of the growth of salmon production in Chile and Canada. Fish oil consumption has also increased in Scandinavia because of salmon production in Norway. Overall, there has been a significant change in the markets and an interesting change of fish oil usage. Another point of interest is the relatively low usage of fish oil in the Far East, in spite of their dominance of the fishmeal markets. The main reason for this apparent discrepancy is that fish species farmed in the Far East are fed on low-oil diets, unlike salmon, where the feed may be up to 30% fish oil.

Future challenges and opportunities

The use of fishmeal and fish oil has been changing significantly in recent years and that has brought both opportunities and challenges to the fishmeal industry.

Figure 9 Summary of fishmeal use for the period 1988 to 2010

Two main changes are apparent, the decrease in use of fishmeal for poultry and the very significant increase of fishmeal in aquaculture. In 1988, fishmeal consumption was divided 90% in agriculture and 10% in aquaculture. About 60% of the total were in poultry diets. In 2000, fishmeal use in agriculture was 65% and in aquaculture 35%. Usage in poultry diets had by then decreased to 24%.

In year 2010 it is estimated that this trend will have continued and that 56% of fishmeal will be utilized in aquaculture and the remaining 44% split between the agricultural sectors, including only about 12% in the poultry industry. The changes in utilization of fishmeal represent a major development for the fishmeal industry.

Figure 10 Summary of fish oil use for the period 1990 to 2010

Even more significant changes have occurred in the consumption of fish oil. In 1990, 76% of fish oil were being used in margarines and bakery fats, mainly in Europe. At that time 16% were used for aquafeed, and 8% for various industrial purposes. In 2000, the proportion for aquafeed had increased to nearly 60%, the industrial and pharmaceutical usage had not changed much but the use of fish oil in hardened edible fats had decreased to 31%. In year 2010, it is expected that practically all of the fish oil production will be used in aquafeed.

Overall, it is therefore expected that fishmeal and fish oil will be used mainly in aquaculture. Both products, of course, have always been important in the food chain but it can be shown that the use of fishmeal as aquafeed is increasing the efficiency of the use of the marine protein. In terms of feed efficiency for poultry, it can be said that 20% of fishmeal protein are converted to human food. In aquaculture, however, this figure is almost double, and 30-40% of the fishmeal protein is converted to human food through the production of salmon fillets.

Figure 11 Production of salmon and cod from capelin

The figure shows the results of work done at the University of Bergen in Norway. It was found that 10 kg of capelin, processed into fishmeal and fed to farmed salmon produced nearly 3 kg of salmon fillets. Capelin is also a food for wild cod and it was also calculated that 10 kg of capelin would produce about 0.7 kg of cod fillets in this way. Salmon farming can therefore be said to be increasing the feed conversion efficiency of the oceans.

Figure 12 Fishmeal production and growth of aquaculture

Environmentalists are now beginning to show concern about the growth of aquaculture production using prepared feeds. As the figure shows the increase has been quite dramatic in the period 1985 – 2000. The figure also shows the static production of fishmeal in the same period. Environmentalists maintain that in the not too distant future and if this trend continues, there will be extra pressure on the wild stocks to utilize them for production of more fishmeal and fish oil for aquaculture.

It must be one of the future challenges of the fishmeal industry to optimise the use of marine resource for aquafeed. One approach is the improved quality of fishmeal production. There is a tendency for substitution of some of the fish oil and possibly some of the fish meal by vegetable oils and vegetable proteins. Fishmeal and oil will still be of paramount importance in the feed but the industry has to ensure that it is offering the aquaculture industry improved quality so that the efficiencies of the aquaculture diets is maintained even on a partial substitution regime. In major fishmeal producing countries there has already been a significant change in production processes with the aim of improving the quality of the product.

Finally, it is very important to make better use of the fishery resources by reducing discards that FAO estimates at 20 million MT annually. The discards are a complete waste of resources and the fishmeal industry will need as much of this as possible. The industry is emphasising to governments that there should be more pressure in the coming years to ensure that all the fish caught is landed, so that some of it can be used directly for human food, and the remainder processed into fishmeal for use in aquaculture.

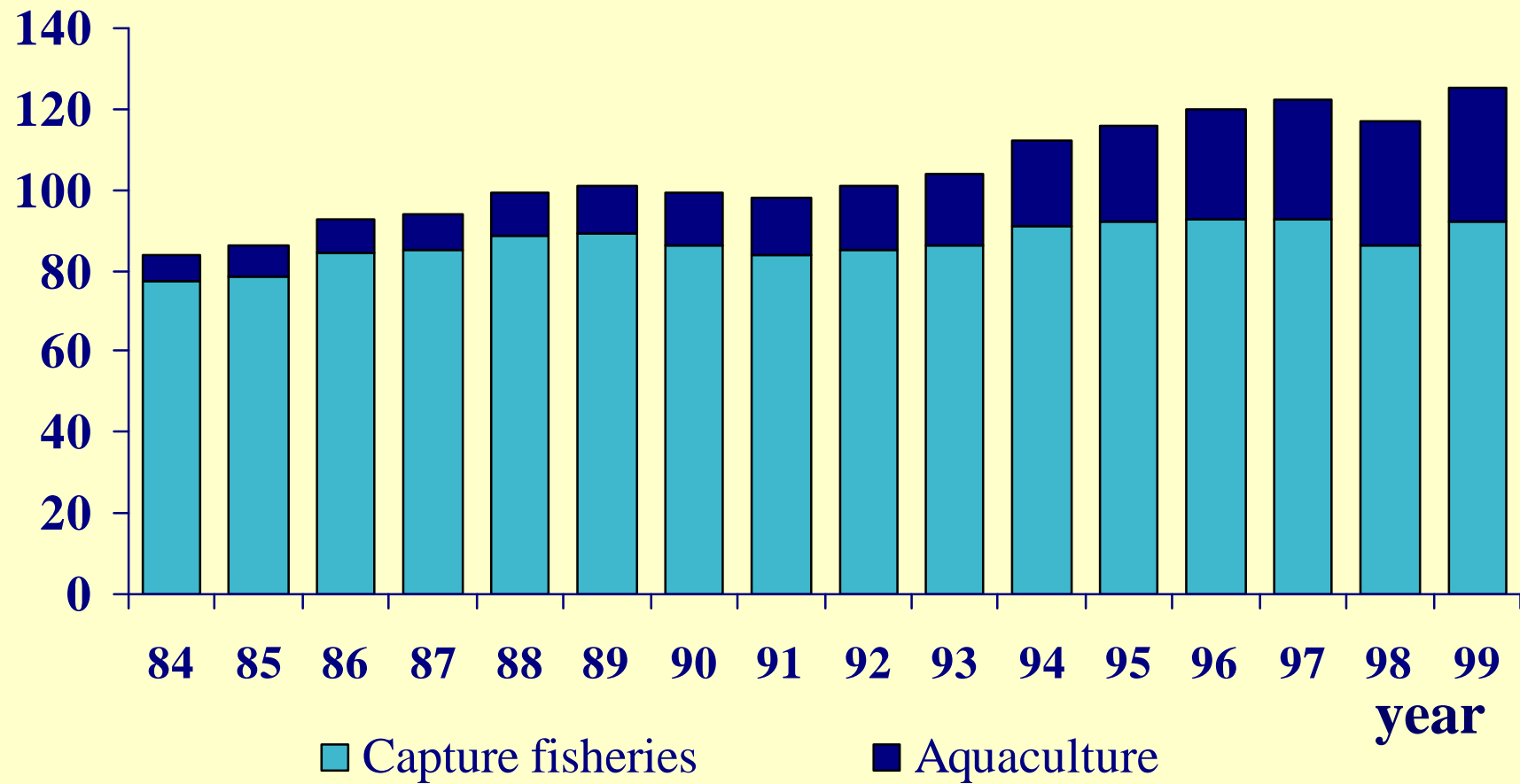
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**FISH MEAL AND OIL
– SUPPLIES AND MARKETS**

**Dr. Stuart Barlow,
Director General,
International Fishmeal and Fish Oil Organisation,
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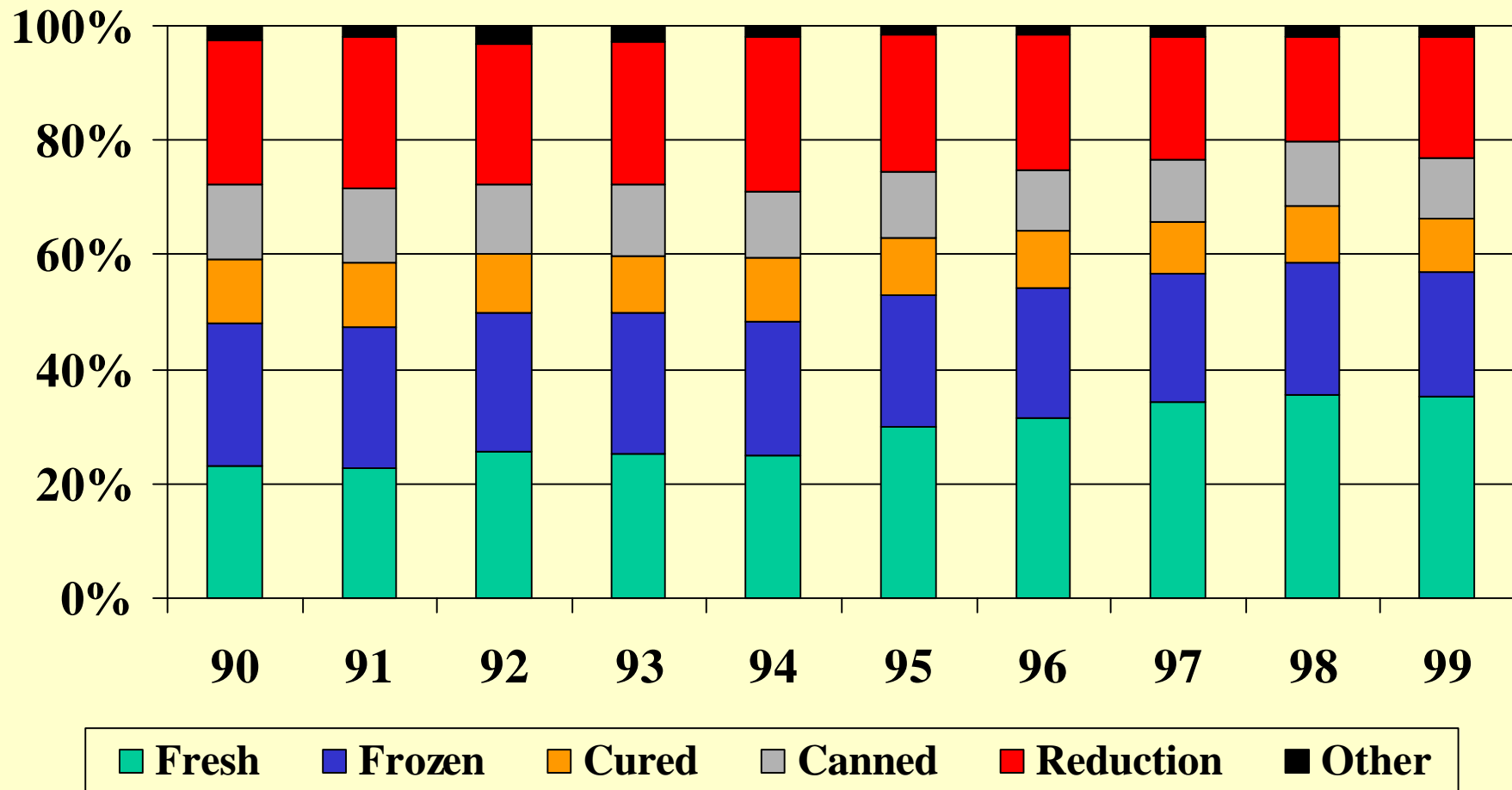
World capture fisheries and aquaculture production

Million MT



Source: FAO Fishery Statistics

Utilization of world fisheries resources



FAO Fishery Statistics 1999

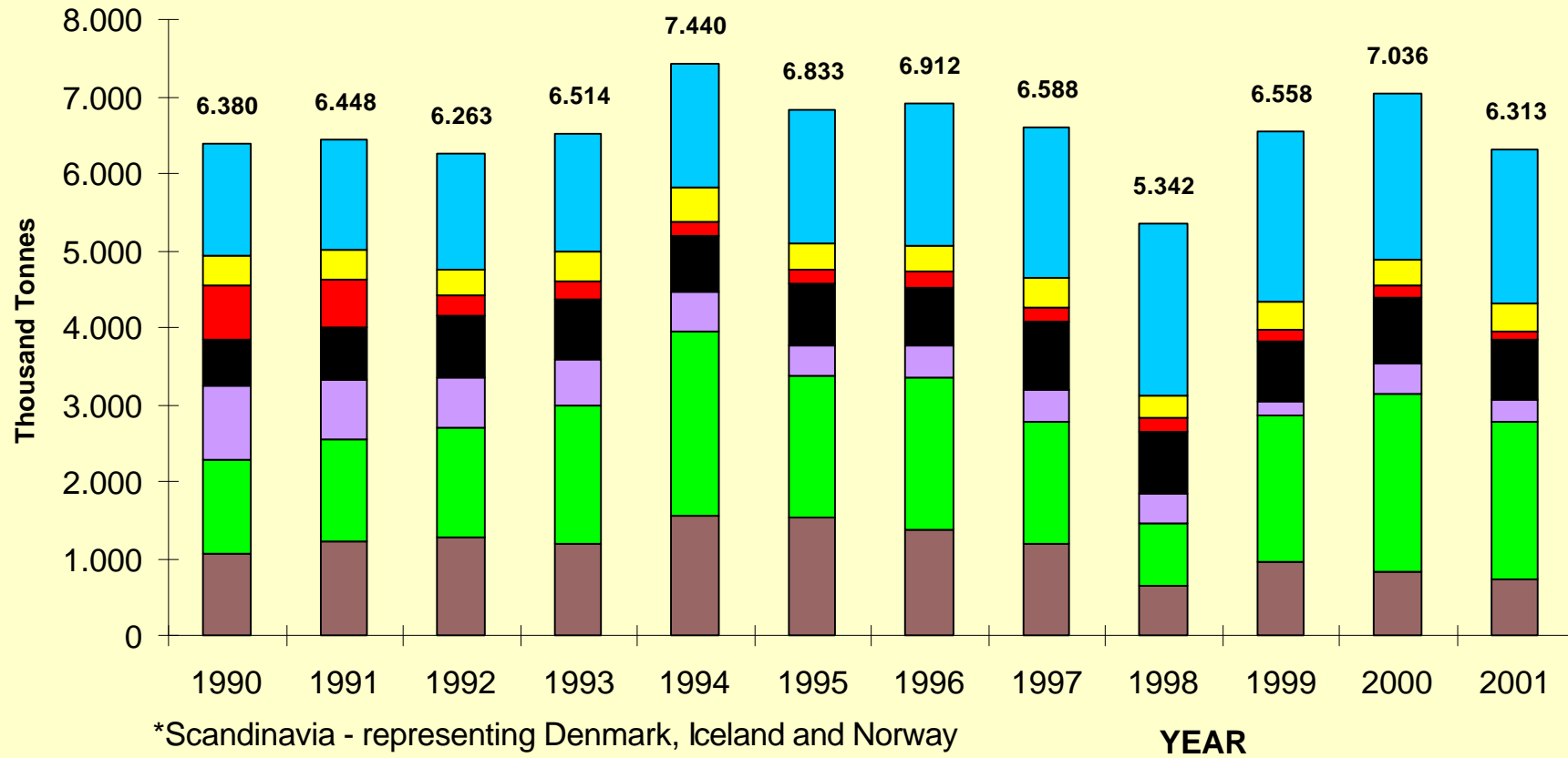
SUSTAINABILITY – FISHERY CONTROLS

| SPECIES | Total Catch Limit | Area Catch Limit | Min Mesh Sizes | Fleet Cap Controls | Closed Areas | Seasonal Bans | Min Landing Sizes |
|-----------------------|--------------------------|-------------------------|-----------------------|---------------------------|---------------------|----------------------|--------------------------|
| Anchovy | ✓ | ✓ | ✓ | ✓ | ✓* | ✓ | ✓ |
| Sardine | ✓ | ✓ | ✓ | ✓ | ✓* | ✓ | ✓ |
| Jack Mackerel | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Horse Mackerel | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Sandeel | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Sprat | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Norway Pout | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| Blue Whiting | | | ✓ | | | | |
| Capelin | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Herring | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

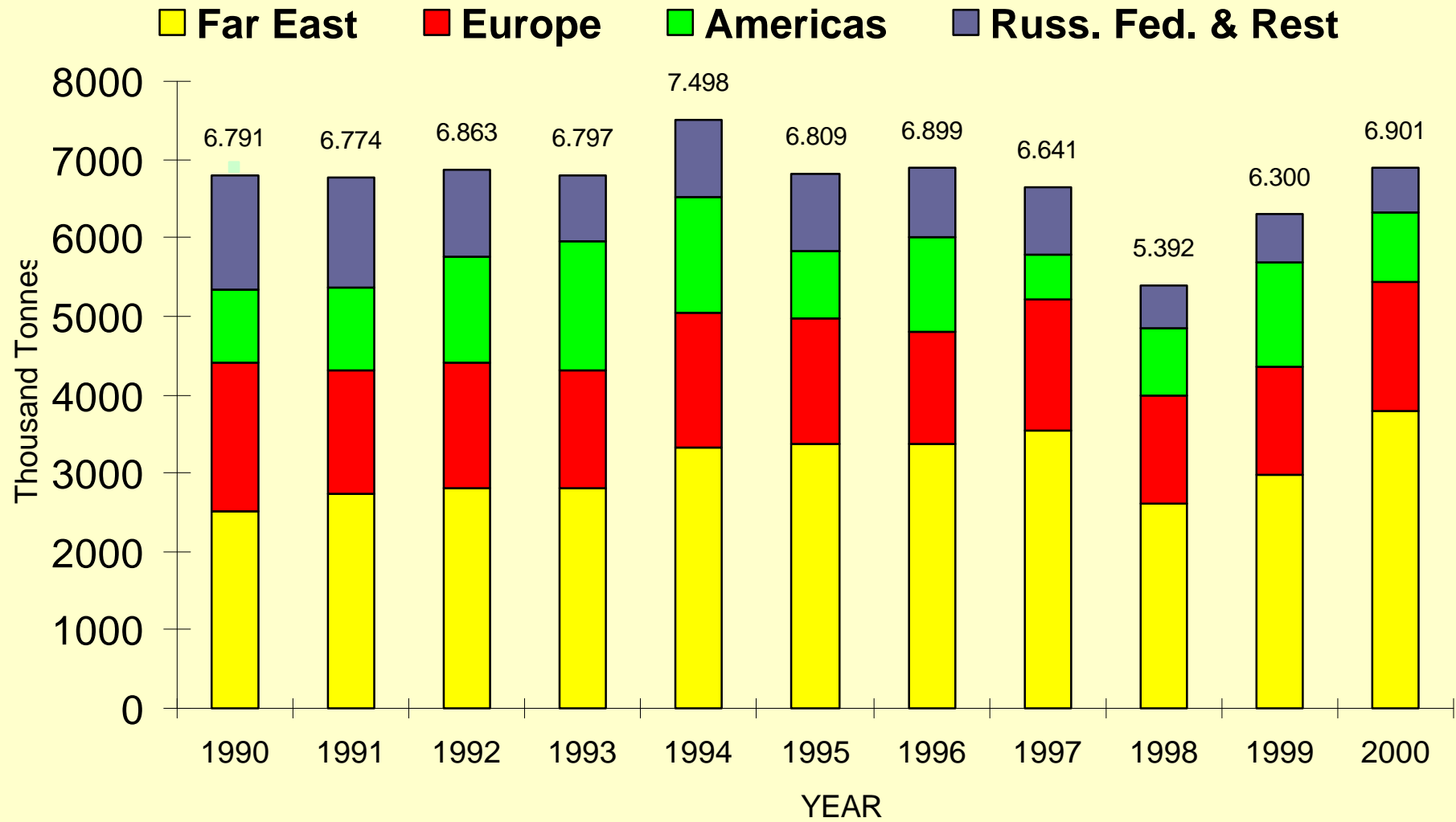
*The closed areas for anchovy and sardine are now enforced by satellite tracking in Peru and Chile

WORLD FISH MEAL PRODUCTION MAJOR PRODUCERS

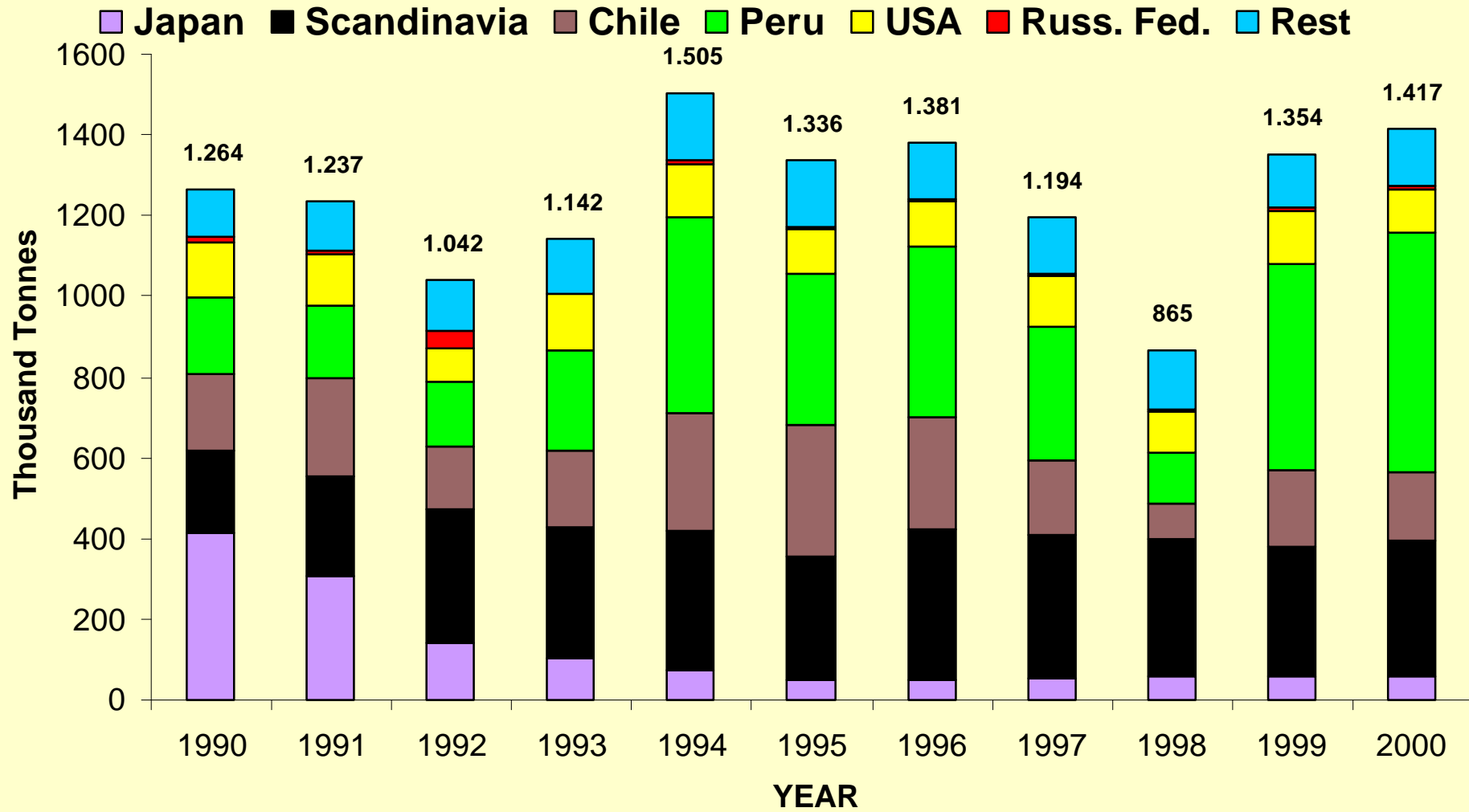
Chile
 Peru
 Japan
 Scandinavia*
 Russ. Fed.
 USA
 Rest



WORLD FISH MEAL CONSUMPTION

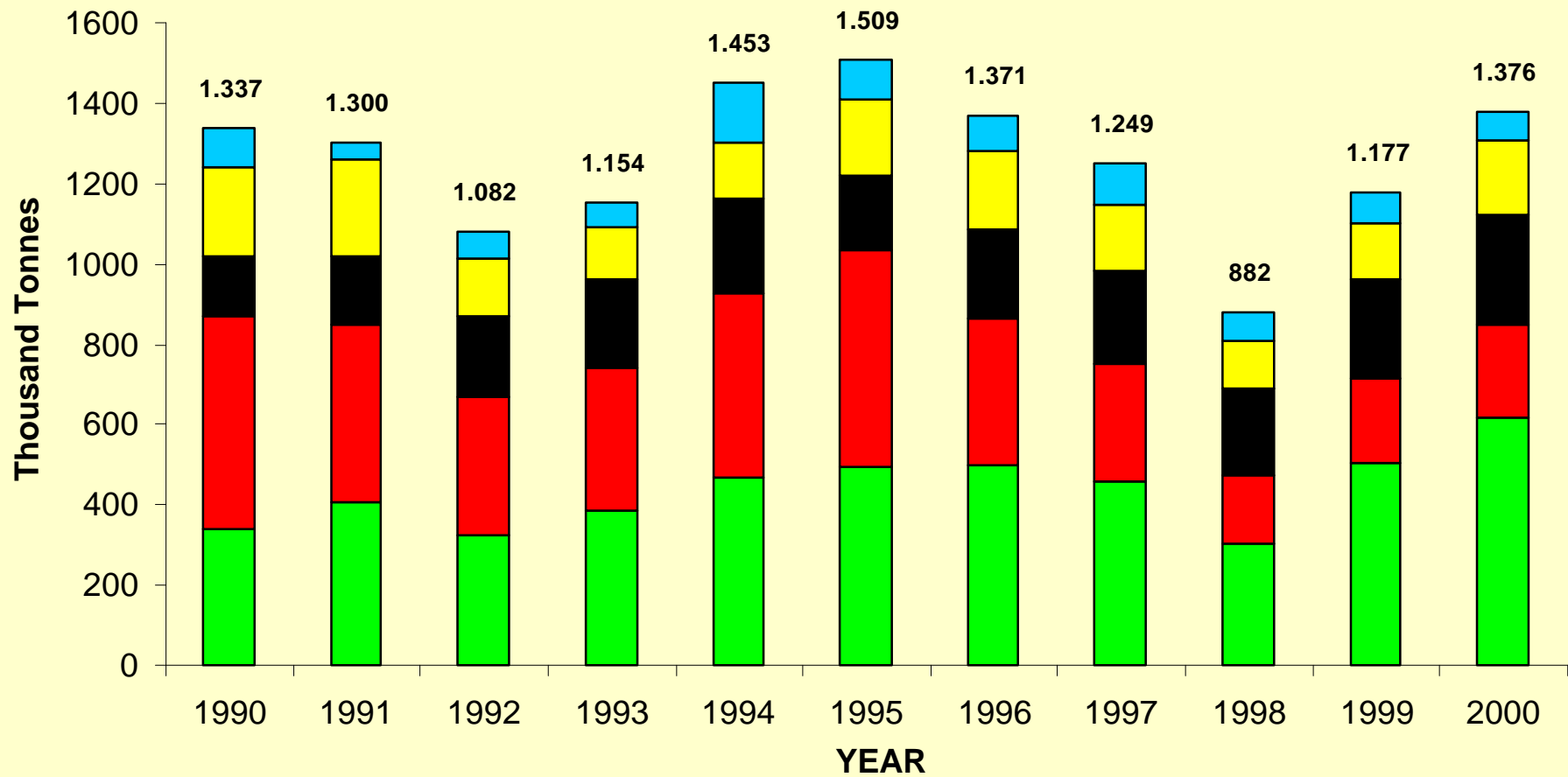


WORLD FISH BODY OIL PRODUCTION MAJOR PRODUCERS



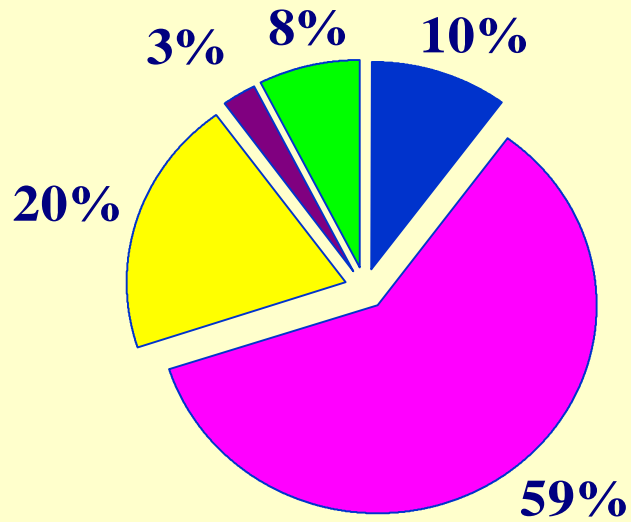
WORLD MARINE OIL CONSUMPTION MAJOR CONSUMERS

Americas **Europe** **Scandinavia** **Far East** **Rest**

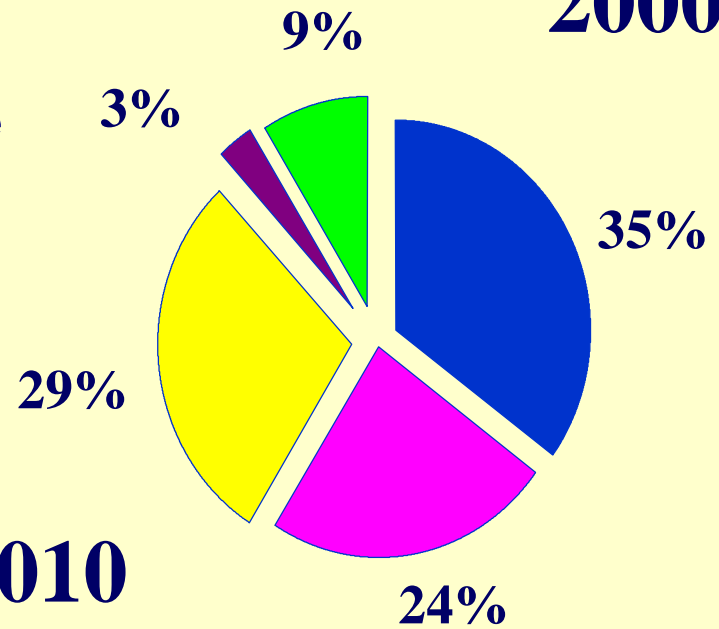


SUMMARY OF FISH MEAL USE FOR THE PERIOD 1988 TO 2010

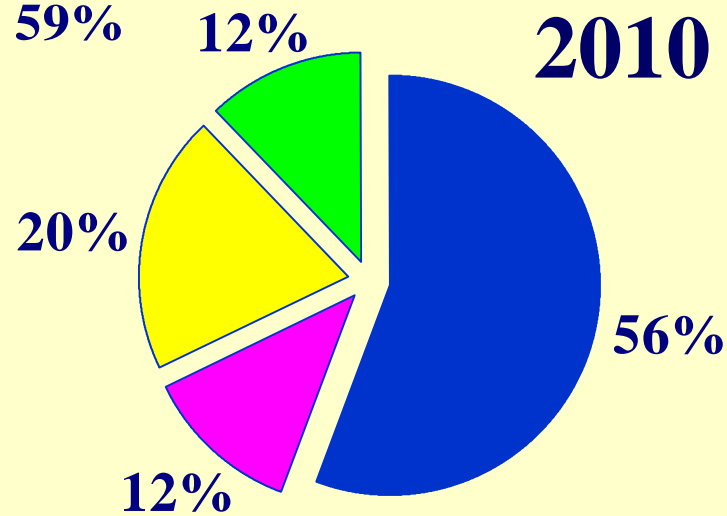
1988



2000

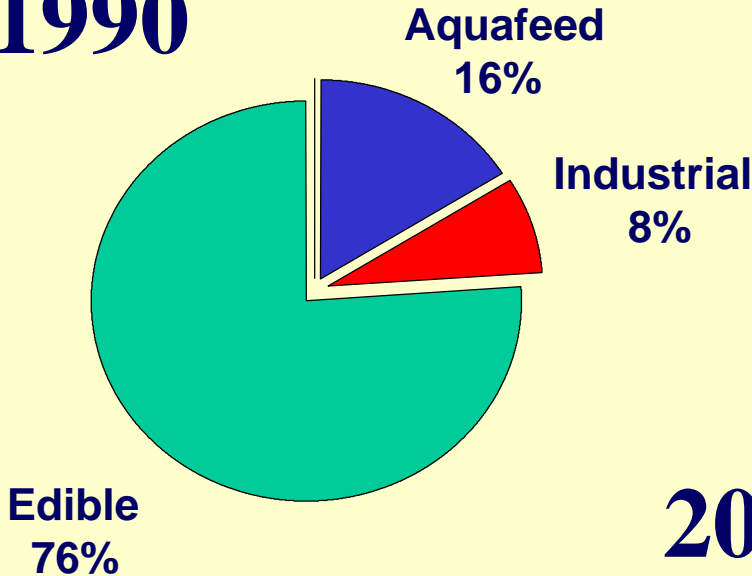


2010

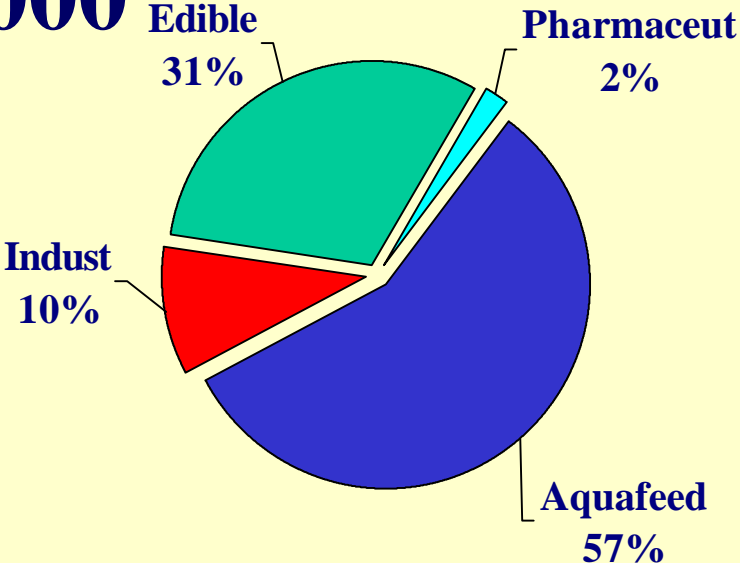


SUMMARY OF FISH OIL USE FOR THE PERIOD 1990 - 2010

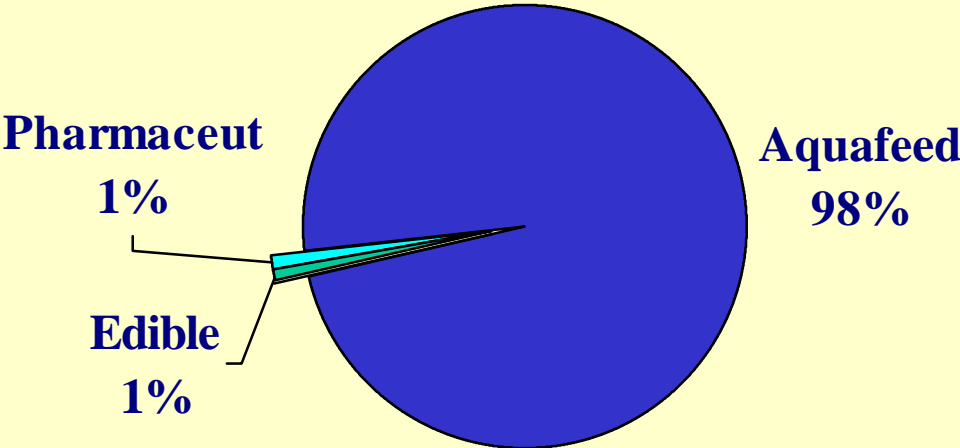
1990



2000

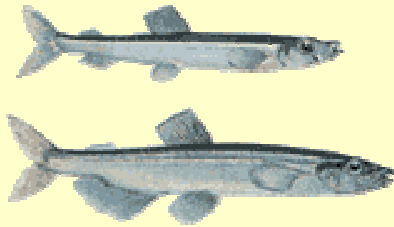


2010



HOW MUCH FARMED SALMON OR WILD COD CAN BE PRODUCED FROM 10KG CAPELIN?

10 kg CAPELIN



FARMING:
4.6 kg SALMON



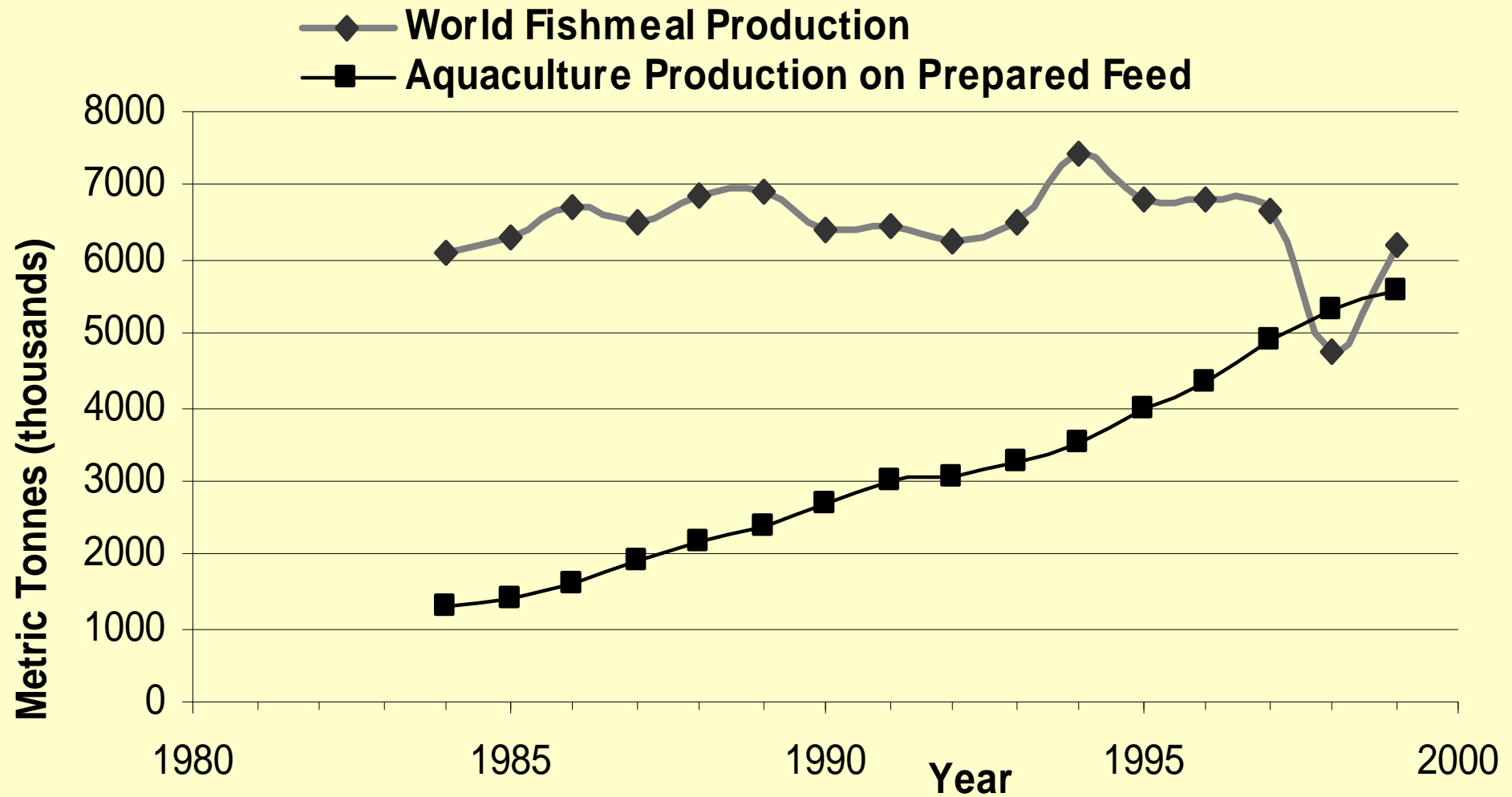
2.8 kg SALMON FILLET

NATURE:
2.0 kg COD



0.7 kg COD FILLET

FISH MEAL PRODUCTION AND GROWTH OF AQUACULTURE



Annual time series of worldwide fishmeal production and production of fed aquaculture species including salmon, shrimp, eels, marine fish, diadromous fish, and tilapia (carp, bivalves, and plants are excluded; 1999 figures are projected)