3. Development of the Indian Ocean tuna fisheries

3.1 DATA SOURCES AND PREPARATION

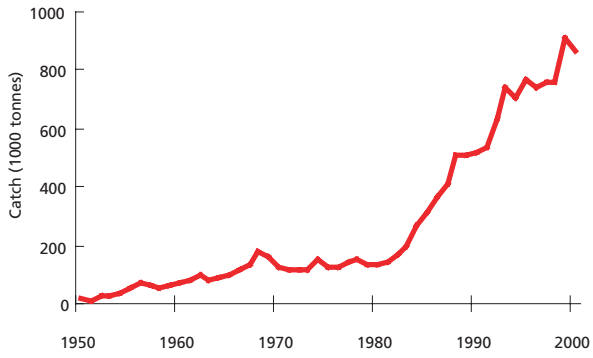
The data source used in this study is the IOTC fishery statistics issued in January 2003, which cover the 1950-2000 period. It should be noted that there are no bluefin tuna in the Indian Ocean. Therefore the "major tunas" in this chapter refers to only four species of tunas (albacore, bigeye, skipjack and yellowfin). Swordfish are also reviewed in the section on species. However, the figures in Section 3.2 swordfish are not included.

3.2 GENERAL OVERVIEW

3.2.1 Total catch

Figure 3.1 shows the combined reported catches of the four major tuna species in the Indian Ocean, 1950–2000. The catch increased gradually to about 200 000 tonnes in the early 1980s, and thereafter rapidly to 700 000 to 900 000 tonnes by 1999. The rapid increase is mostly due to the introduction by France and Spain in the early 1980s of purse-seine fisheries targeting skipjack and yellowfin tunas.

FIGURE 3.1
Catches of major tuna species in the Indian Ocean



3.2.2 Catch by species

Figure 3.2 shows the catches in the Indian Ocean of the major species of tunas, and Figure 3.3 shows the species composition of the catches. The catch trends of each species are discussed in the following sections, and only their relative importance is described in this section. Until the early 1980s, the amounts of tuna caught were relatively small, less than 50 000 tonnes for each species. The combined catch of skipjack and yellowfin increased rapidly up to the 300 000 to 400 000 tonnes level in the 1990s, largely due to the introduction of purse seines in the western Indian Ocean by France and Spain. These two species have each accounted for more than 40 percent of the total catch during most of the period covered by this study. The catch of bigeye has also increased, to around 150 000 tonnes, because of increased targeting of tunas for the

FIGURE 3.2
Catches of major tuna species in the Indian Ocean, by species

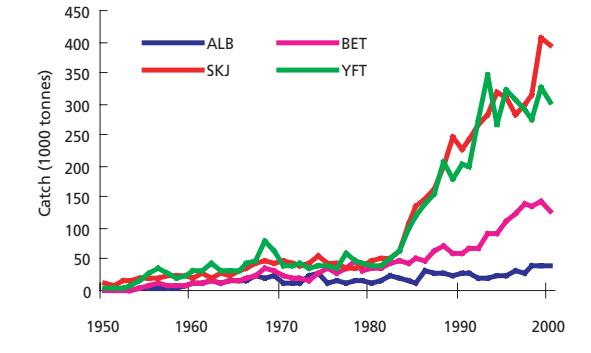


FIGURE 3.3
Species composition of the Indian Ocean catches of major tuna species

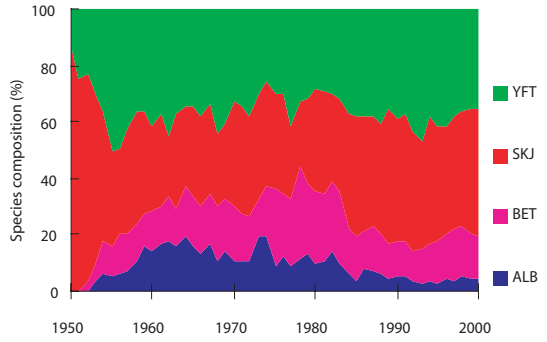
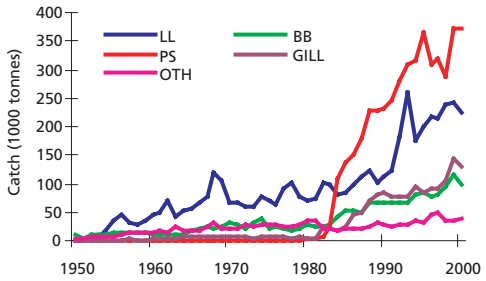


FIGURE 3.4
Catches of major tuna species in the Indian Ocean, by fishing gear



sashimi market by longline vessels and the use of FADs in the surface fishery. Although the catch of albacore increased gradually in the past five decades, its relative importance decreased rapidly.

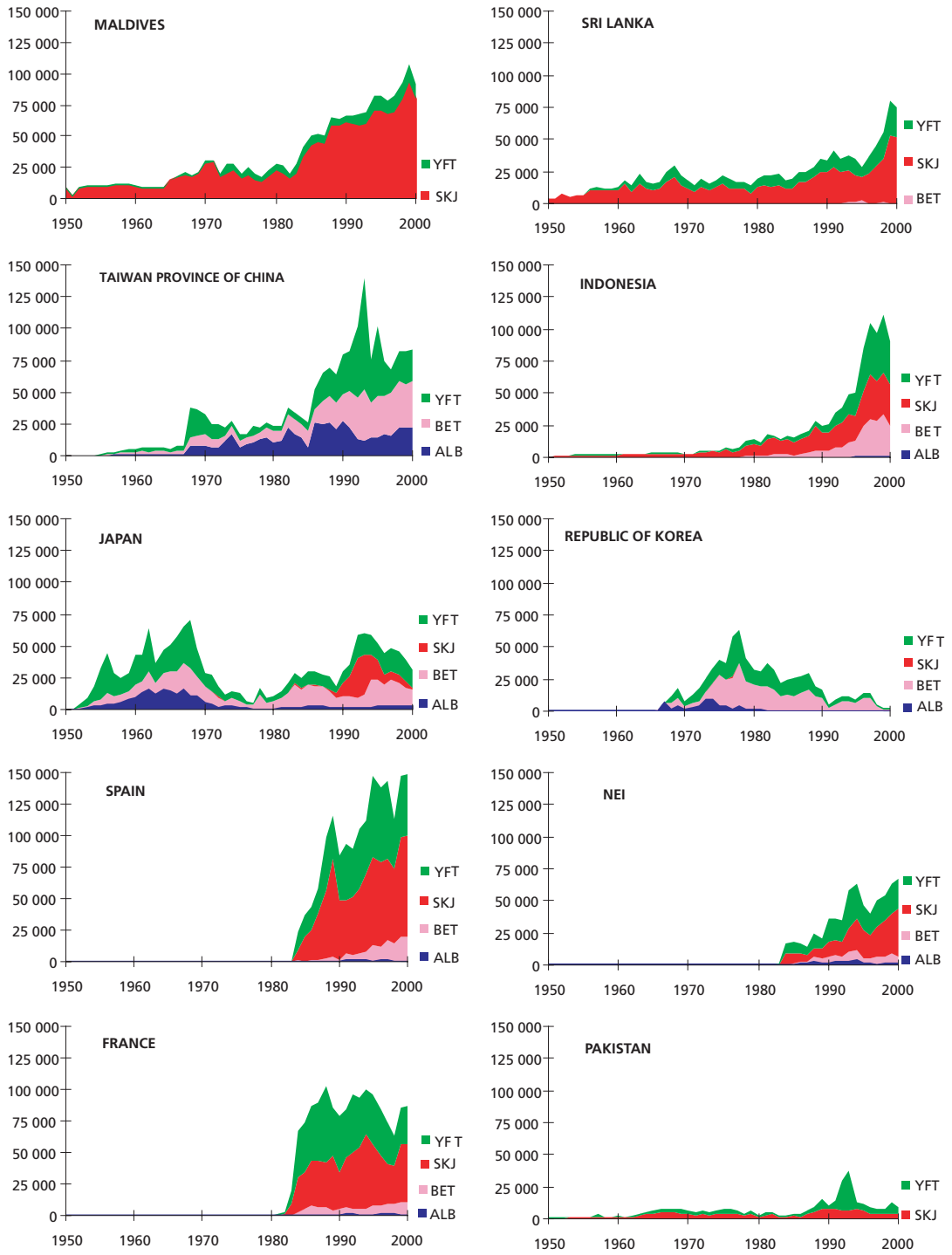
3.2.3 Catch by fishing gears

Compared with other oceans, longlines contribute to the catch much more significantly (Figure 3.4). The Japanese, Taiwanese and Korean longline fishery and small artisanal fisheries (baitboat, troll and gillnet) of coastal nations (Maldives, Sri Lanka and some others) were the major fisheries in the Indian Ocean until the early 1980s. Predominant were the Japanese longline catches, which fluctuated around 20 000 tonnes. The longline catch then started increasing, due to the increase in the number of longline fishing vessels of Taiwan Province of China, the Republic of Korea, and Indonesia, and reached almost 260 000 tonnes by 1993. However, the development of the purse-seine fishery was even faster, and its catches have exceeded the longline catch since the early 1980s. The catches in the purse-seine fishery targeting skipjack and yellowfin, introduced in the western Indian Ocean by France and Spain in the mid-1980s, together exceeded 350 000 tonnes in 1995. Baitboat catches have increased gradually since the mid-1980s, due to the increase of the catch by the Maldives.

3.2.4 Catches by country

The combined catches of the major tunas from the Indian Ocean during 1950–2000 by the ten main fishing fleets are shown in Figure 3.5. Maldives historically caught skipjack with baitboats, and the catch level increased from the 1980s. The catch by Taiwan Province of China was mostly made by longliners; and consisted of albacore, yellowfin and bigeye in almost equal amounts. Until the 1960s the Japanese catch was mostly for canning. After low catches in the 1970s the Japanese longliners started targeting tunas for the *sashimi* market, mostly bigeye (the major target of Japanese longliners in the Indian Ocean is southern bluefin tuna, discussed in Chapter 5). Spain and France introduced an industrial purse-seine fishery targeting yellowfin and skipjack in the western Indian Ocean in the 1980s, and the catch increased rapidly since then. Sri Lanka catches mainly yellowfin and skipjack in artisanal fisheries, and catches have exceeded 80 000 tonnes in the last two years. Indonesia developed a longline fishery for bigeye in the late 1980s, and its combined catch of all species has exceeded 60 000 tonnes in 1997 and 1998. The Republic of Korea is also a longline fishing country; it started fishing in the Indian Ocean in the late 1960s, and made its peak catches between the late 1970s and 1980s, since when its catch have decreased to around 5 000 tonnes in 1998. NEI includes mostly purse seiners and some longliners, all of "flag of convenience"; their catches occur only since the mid-1980s. Pakistan catches yellowfin and skipjack tunas by artisanal fisheries.

FIGURE 3.5
Indian Ocean catches (tonnes) of major tuna species by the ten main fishing fleets



3.3 ALBACORE

3.3.1 General overview

Albacore inhabit pelagic waters in the temperate area of the Indian Ocean, and are mainly caught by the longline fishery. The catch of albacore in the Indian Ocean is shown in Figure 3.6. Starting in the 1950s, it increased gradually from less than 5 000 tonnes to levels of 10 000 to 30 000 tonnes during the 1960s to 1980s. It further

FIGURE 3.6
Catches of albacore in the Indian Ocean

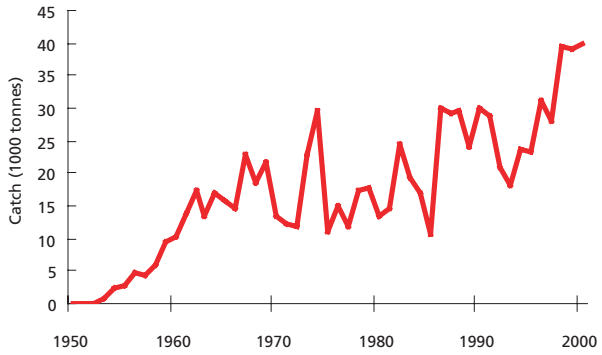
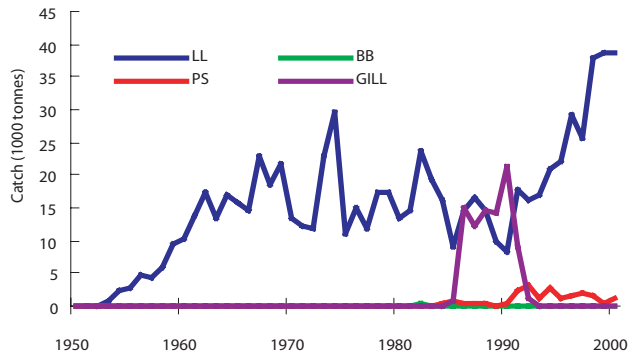


FIGURE 3.7
Catches of albacore in the Indian Ocean, by fishing gear



increased in the 1990s, up to its highest level of 40 000 tonnes in 1998–89.

3.3.2 Catch by fishing gears

Figure 3.7 shows the Indian Ocean albacore catches by major fishing gears. The main fisheries catching albacore are the large-scale longline and driftnet fisheries. Since the end of 1992 the driftnet fishery has been under the moratorium imposed by the resolution of the United Nations, and at present the longline fishery is the only major fishery catching albacore.

Longline fishery

In the early 1950s, Japanese longliners entered the Indian Ocean and started fishing in tropical and temperate waters, targeting yellowfin and bigeye; albacore was a subsidiary target. After the introduction of super-cold freezers in the late 1960s, the fleet shifted its target from those tunas to southern bluefin in the Indian Ocean, which inhabit the cold waters around 40°S. Due to this change in fishing pattern, the Japanese albacore catch decreased.

Taiwan Province of China started longline fishing in the Indian Ocean in the late 1960s, targeting primarily fish for canning. The catch increased to 20 000 tonnes in the early 1980s. Driftnet fisheries also started in the 1980s, and the longline catch decreased to between 5 000 and 13 000 tonnes. However, after the moratorium on the driftnet fishery in 1992, the longline catches increased again to over 20 000 tonnes.

The Republic of Korea started longline fishing in the Indian Ocean in the late 1960s. The albacore catch peaked at 9 000 tonnes in 1974, then it started decreasing until it reached the level of less than 100 tonnes in the late 1980s and early 1990s. It has remained at that level until the present.

Indonesia started a longline fishery in the 1990s, targeting mainly southern bluefin, but also catching albacore. At present, Taiwan Province of China and Indonesia are the two major longline countries catching albacore in the Indian Ocean.

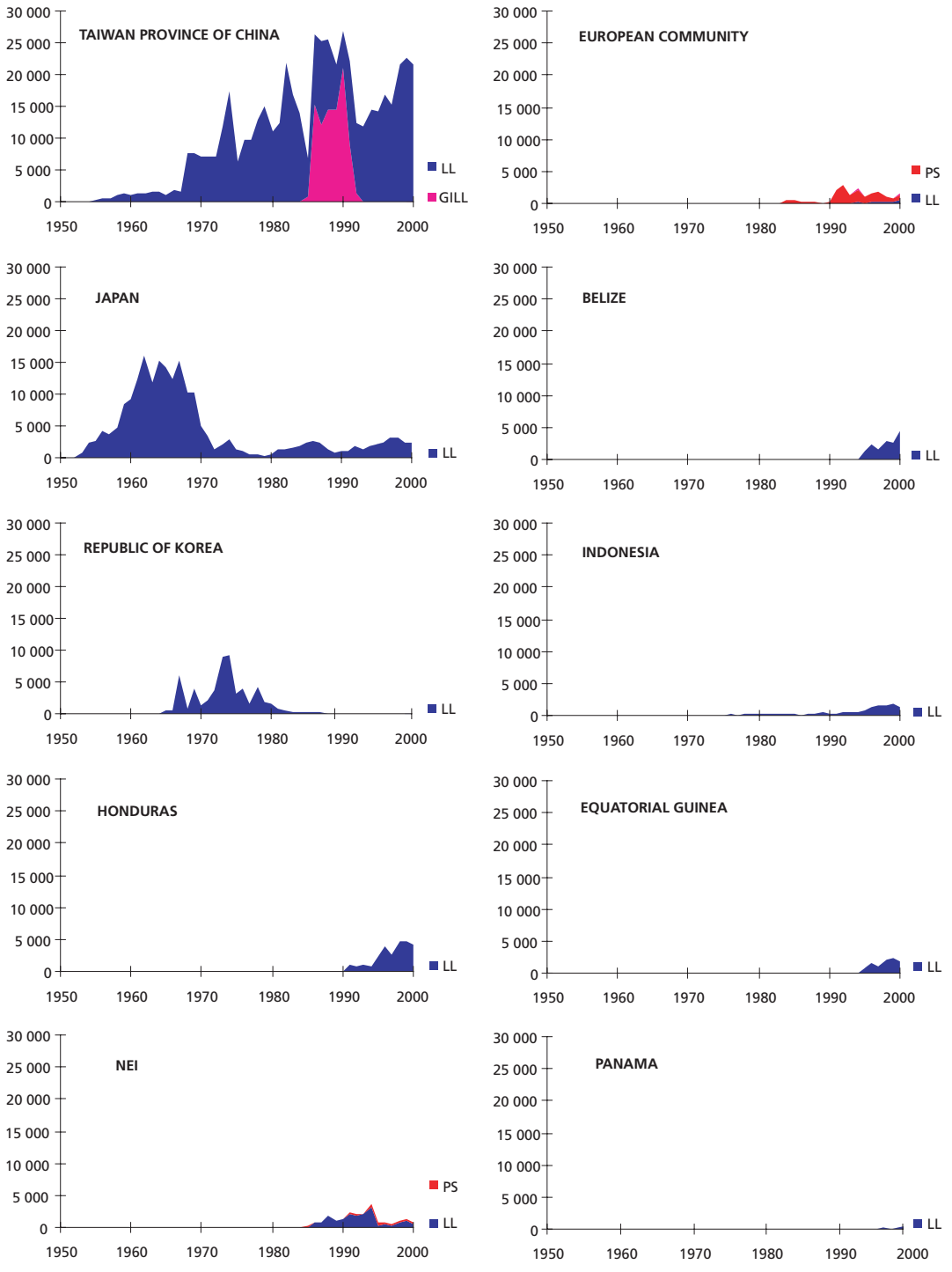
Purse-seine fishery

Spain and France started purse-seine fishing in 1984 in the western Indian Ocean, targeting yellowfin and skipjack. Since albacore are by-catches, the catch level has fluctuated, but is relatively low. Other countries with purse-seine fisheries include the former Soviet Union, Japan and the Islamic Republic of Iran.

Drift gillnet fishery

The other major fishery catching albacore in the Indian Ocean was the Taiwanese drift gillnet fishery. This fishery rapidly expanded in the late 1980s, and catches

FIGURE 3.8
Albacore catches (tonnes) by the ten main fishing fleets in the Indian Ocean, by fishing gear



reached 15 000 to 20 000 tonnes, but fell sharply after the fishery came under the UN moratorium in 1992.

3.3.3 Catches by country

Four longline fishing fleets (Taiwan Province of China, Japan, the Republic of Korea and Indonesia) and two purse-seine fishing fleets (Spain and France) play major roles in albacore fishing in the Indian Ocean (Figure 3.8). **Taiwan Province of China** started

its longline fishery in 1966, and until recently was the only longline fleet targeting albacore; catches of albacore, by both longline and drift gillnet fisheries, increased gradually to 26 000 tonnes in the late 1980s, then dropped to 12 000 tonnes in 1992, but increased again to 22 000 tonnes in 1999. **Japanese** tuna longliners entered the Indian Ocean in 1952, and their albacore catch increased to over 15 000 tonnes in the late 1960s, then dropped to 1 100 tonnes in 1972, and has since fluctuated between 300 and 3 000 tonnes. The **Republic of Korea** began longline fishing in 1965; its albacore catch exceeded 5 000 tonnes in 1967 and over 9 000 tonnes in 1974, then decreased to less than 1 000 tonnes after 1981 and to less than 100 tonnes in some years of the 1990s, as the Korean longline fleet started leaving the Indian Ocean. The **Indonesian** longline fishery started catching albacore in 1982. Catches rose to 1 800 tonnes in 1987 and 3 700 tonnes in 1990, then fell to between 500 and 1 700 tonnes in the 1990s.

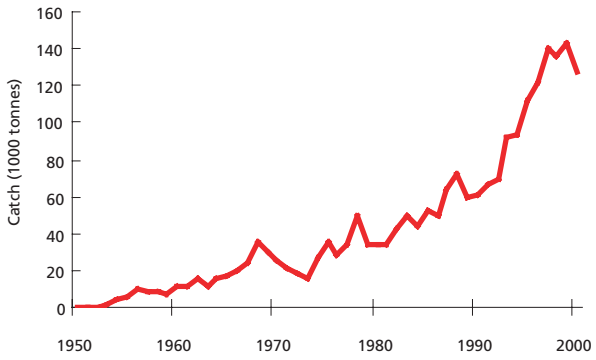
France and Spain started to catch albacore as by-catch in their tropical purse-seine fishery in the Indian Ocean in 1984. Their catches of albacore were relatively low, under 4 000 tonnes. FOC (IUU) longliners have operated in the Indian Ocean only since the mid-1990s.

3.4 BIGEYE TUNA

3.4.1 General overview

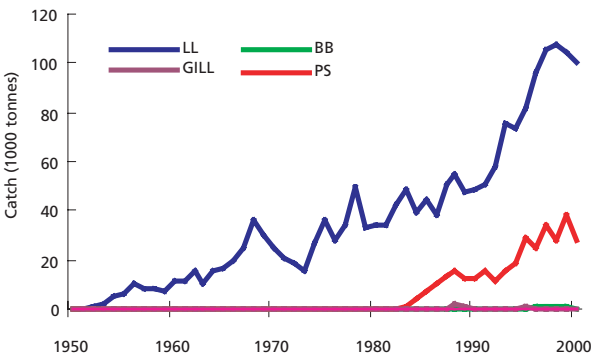
Bigeye tuna inhabit tropical and temperate waters, and generally stay in deeper and colder waters than yellowfin. Bigeye are caught mainly by longlines, but by-catches of bigeye in the purse-seine fishery have also been increasing since seiners started fishing for yellowfin and skipjack associated with FADs.

FIGURE 3.9
Catches of bigeye in the Indian Ocean



The total Indian Ocean bigeye catch is given in Figure 3.9. Catches started in the early 1950s and increased gradually to over 20 000 tonnes in the late 1960s, 40 000 tonnes in the 1980s, and then rapidly to 140 000 tonnes in 1998, due to the increased catches by both the longline and purse-seine fisheries. The longline catch rose gradually to 100 000 tonnes between 1952 and 1998; the purse-seine catch started to increase much later, in the early 1980s, and reached 40 000 tonnes in 1999.

FIGURE 3.10
Catches of bigeye in the Indian Ocean, by fishing gear



3.4.2 Catch by fishing gears

The Indian Ocean bigeye catch by fishing gears is given in Figure 3.10.

Large-scale longline fishery

The longline catch made up over 70 percent of the Indian Ocean bigeye catches throughout the period covered by this study. Japan started its longline fishery in the Indian Ocean in 1952, targeting yellowfin and bigeye for the canning industry. The Republic of Korea and Taiwan Province of China entered the longline fishery in the Indian Ocean in the late 1960s. In the 1970s,

when many of these longliners shifted their target to fish for the sashimi market, the catch stabilized between 40 000 and 60 000 tonnes. Indonesia started longline fishing in the Indian Ocean in the 1980s. Also, many longliners flying "flags of convenience" increased bigeye catches in the late 1990s. As a consequence, in the 1990s the total bigeye catch started increasing again sharply, to over 100 000 tonnes. There are wide annual fluctuations related to fishing conditions in other oceans and market conditions. For example, when Atlantic bluefin and bigeye and southern bluefin in the Indian Ocean fetch higher prices than Indian Ocean bigeye, and if their catch rates are not too low, longliners prefer to target those fish.

Purse-seine fishery

Bigeye tuna are caught as by-catch in the purse-seine fishery which targets yellowfin and skipjack. French and Spanish purse-seine fleets which had been fishing in the tropical eastern Atlantic entered the western Indian Ocean in the early 1980s. With high fishing rates, this fishery developed very quickly, as did the bigeye by-catch. In the mid-1990s, purse-seine fishing with FADs developed very widely in the Indian Ocean. As more small fish gather around FADs compared with schooling fish, the by-catch of small bigeye in the fishery increased rapidly, to nearly 40 000 tonnes. Those are mostly juvenile fish, while those caught by longlines are mostly adult fish.

Other than France and Spain, Japan started a purse-seine fishery in the Indian Ocean in 1978, and, less importantly, Mauritius has conducted purse-seine fishing since 1980. Liberia, Belize and Seychelles reported purse-seine catches of bigeye exceeding 1 000 tonnes in several years. Purse seiners with the flags of these countries appear to be operating under "flags of convenience", with owners in major purse-seine fishing nations.

Other fisheries

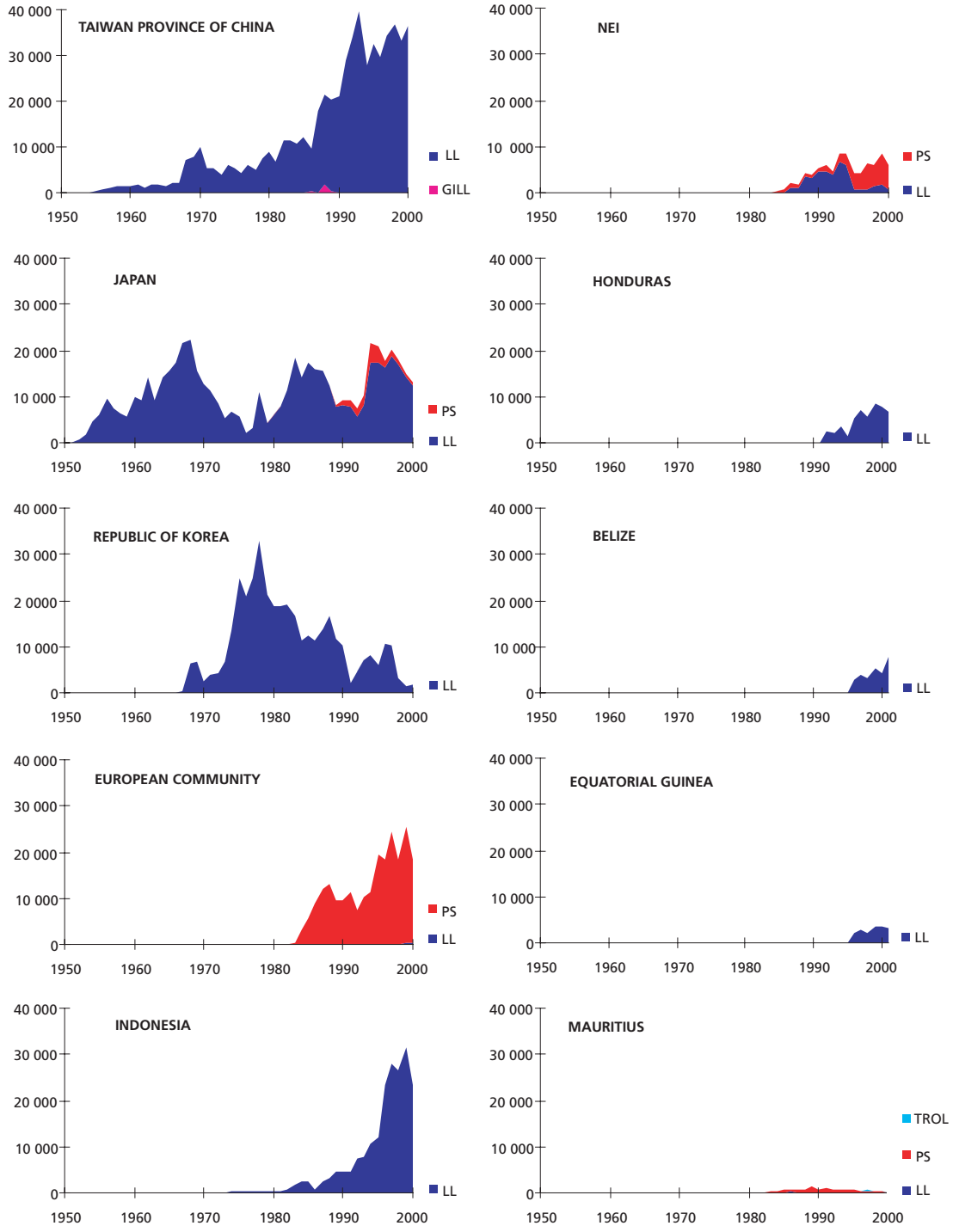
Taiwan Province of China harvested nearly 2 000 tonnes of bigeye in 1988 in so-called "other" fisheries, probably a driftnet fishery. Another "other" fishery has been conducted by Sri Lanka, most likely coastal artisanal fisheries. The baitboat fishery in the Maldives has caught around 600 tonnes in recent years.

3.4.3 Catches by country

The bigeye catches from the Indian Ocean during 1950-2000 by the ten main fishing fleets are shown in Figure 3.11, by fishing gears. Three longline fishing countries (Taiwan Province of China, Japan and the Republic of Korea) contributed almost all the bigeye yield until the mid-1980s. The Indonesian longline catch became significant in the 1990s, while the French and Spanish purse-seine catch became important in the mid-1980s.

Japan started its longline fishery in the Indian Ocean in 1952, and its catch increased to over 20 000 tonnes in 1967 and 1968. Initially the longliners were equipped with freezers of –20 °C capacity, and the catch was mostly for canning; therefore, albacore and yellowfin were the preferred species. In the late 1960s the Japanese fleet changed its strategy to catch fish for the domestic sashimi market, and was equipped with super-cold freezers of –40 ° to –50 °C. The catch of bigeye then decreased sharply until the late 1970s, as the fleet preferred to fish in other oceans for bluefin and southern bluefin. However, in the 1980s Japanese vessels returned to the Indian Ocean, and the catch rose again to 20 000 tonnes in the mid-1980s. **Taiwan Province of China** started catching bigeye in 1967; its catches started increasing in the late 1970s, as it followed the Japanese fleet in fishing for the sashimi market, and reached about 40 000 tonnes in 1993 and 1998. The **Republic of Korea** started its longline fishery in the Indian Ocean in 1965; catches of bigeye increased rapidly, to 33 000 tonnes in 1978, then gradually decreased to less than 10 000 tonnes in the early 1990s, as the fleet left the Indian Ocean.

FIGURE 3.11
Bigeye catches (tonnes) by the ten main fishing fleets in the Indian Ocean, by fishing gear



The **Spain** and **France** started a purse-seine fishery in the early 1980s, when the catch rate of tropical tunas declined drastically in the eastern Atlantic. However, a significant increase in bigeye catches occurred only when these seiners started fishing with FADs (see Section 3.4.2). **NEI** (i.e. **Honduras**, **Belize** and **Equatorial Guinea** "flags of convenience") started fishing only in the 1990s, but their catches are increasing rapidly.

3.5 SKIPJACK TUNA

3.5.1 General overview

Skipjack is one of the most abundant pelagic tuna species, inhabiting tropical waters. Skipjack are caught by variety of fisheries – purse seine, baitboat and many kinds of small-scale coastal fisheries – but by far the majority of the catch is made by purse-seine and baitboat fisheries, and is supplied to the canning industry.

The total skipjack catch in the Indian Ocean is shown in Figure 3.12. Catches stayed at a relatively low level until the early 1980s, but thereafter increased rapidly, to almost 300 000 tonnes in the early 1990s and over 400 000 tonnes by the end of the 1990s. This sudden increase in catch is due to the development of the purse-seine fishery. Catches by baitboats and other fisheries also increased in the 1990s, but not as rapidly as in the purse-seine fishery.

3.5.2 Catch by fishing gears

Figure 3.13 shows skipjack catches by fishing gears. Until the early 1980s, the baitboat catch was the most important and stable as a single gear category. It started increasing in the mid-1980s, but the purse-seine catch, started in 1981, increased more rapidly, exceeding the baitboat catch and accounting for over half of the total skipjack catches since 1990. The gillnet catch has also increased in recent years, getting close to that of baitboats.

Longline fishery

The longline fishery targets large tunas, hence the skipjack by-catch by longliners (both large-scale and coastal) is negligible.

Purse-seine fishery

France and Spain developed the purse-seine fishery in the western Indian Ocean in the early 1980s. Since then, the skipjack catch has kept increasing, with a slowdown in the mid-1990s. Recently the most important part of the skipjack catch in the Indian Ocean has been made by the purse-seine fishery using FADs. As these purse seiners also fish in the eastern Atlantic, the catches from both oceans are interdependent, depending on the catch rates in both oceans and the prices paid in various markets.

FIGURE 3.12
Catches of skipjack in the Indian Ocean

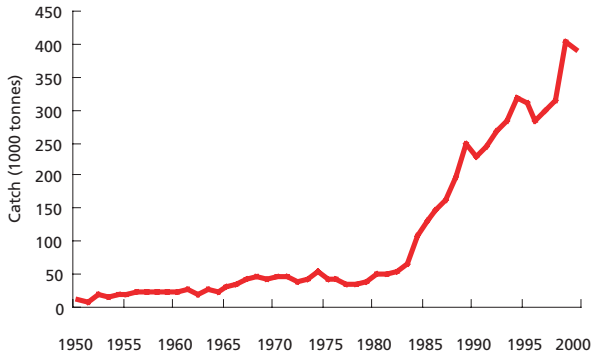
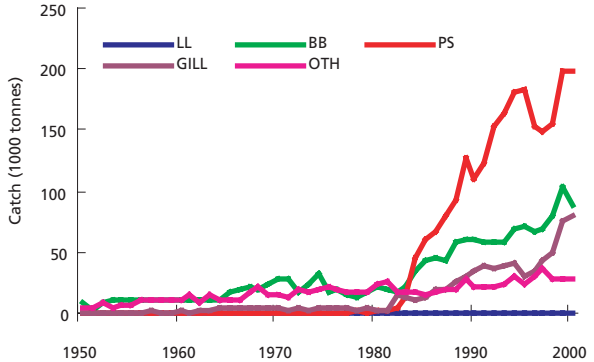


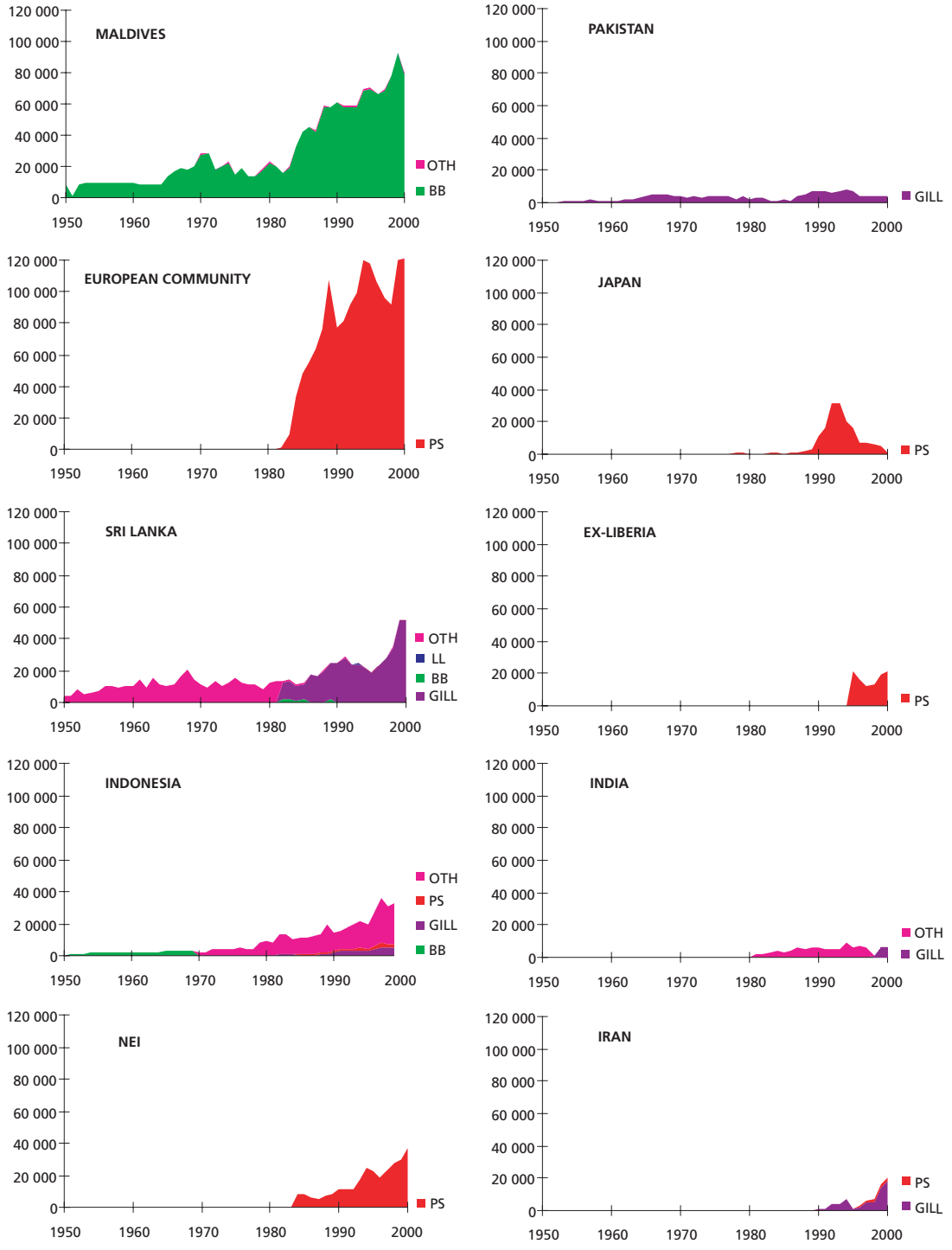
FIGURE 3.13
Catches of skipjack in the Indian Ocean, by fishing gear



Baitboat fishery

The baitboat fishery is another important fishery catching skipjack; it is dominated by the Maldives fishery, which now accounts for almost all the baitboat catches in the Indian Ocean. Baitboat fishing is an old traditional method, and catches showed increasing trends even in the 1950s to 1970s, but never exceeded 40 000 tonnes. Since the mid-1980s, catches have increased rapidly, due to the fast development of the Maldives fishery. This fishing method is very much limited by the

FIGURE 3.14
Skipjack catches (tonnes) by the ten main fishing fleets in the Indian Ocean, by fishing gear



availability of bait, and that is possibly the reason that only the Maldives fishery has developed.

Other fisheries

Skipjack tuna is caught by other fisheries by a variety of countries. Among these, the Sri Lankan gillnet fishery is the most important, and has been increasing rapidly in recent years.

3.5.3 Catches by country

The skipjack catches from the Indian Ocean during 1950–2000 by the ten main skipjack fishing fleets are shown in Figure 3.14. The largest cumulative skipjack catch in this period was made by **Maldives**, which has reported catches, almost exclusively by baitboats, since the beginning of the fishery statistics series in 1950. Catches stayed around 10 000 tonnes until the mid-1960s, then increased to 30 000 tonnes by the 1980s and 90 000 tonnes in 1999 and 2000.

Currently, the largest skipjack producers are the **French** and **Spanish** purse-seine fleet. The French fleet started the purse-seine fishery in 1981, and its catches reached almost 60 000 tonnes in 1994; however, it decreased to around 30 000 to 50 000 tonnes in the 1990s. The Spanish purse-seine fleet entered the Indian Ocean in 1984, a little later than French fleet; its catch rapidly increased to 77 000 tonnes by 1989, then decreased to 41 000 tonnes in 1991, but increased again to 76 000 tonnes in 1999 and 2000. Together, as the EC fleet, their catches of skipjack increased very rapidly during the 1980s to a peak of more than 100 000 tonnes in the 1990s. **NEI** and **Ex-Liberia** boats are seiners with "flags of convenience", and the fishery is very similar to that of the EC seiners.

Sri Lanka has reported skipjack catches since 1950. The gear used to catch skipjack was listed as "unclassified" until the 1980s, and thereafter as gillnet; it is therefore suspected that all previous catches were also made by gillnets. Catches increased from 4 300 tonnes in 1950 to 10 000 tonnes in 1956, then stayed between 10 000 and 20 000 tonnes until 1988, after which they gradually increased to over 40 000 tonnes in 1999 and 2000.

Indonesia has reported skipjack catches since 1950. The major part of the catch was reported as caught by "other" gears, with small portions by purse-seine and gillnet fisheries. The catches gradually increased to several thousand tonnes by 1982 and to 27 000 tonnes in 1998.

Japan started an experimental purse-seine fishery in 1977. The skipjack catch stayed at a low level until 1989, then increased to more than 30 000 tonnes in 1992 and 1993. However, it decreased to less than 10 000 tonnes after 1996.

Pakistan and **India** have reported skipjack catches constantly, but at a low level. The Pakistani catch is mostly by gillnetting, while the Indian catch has been made by a variety of gears.

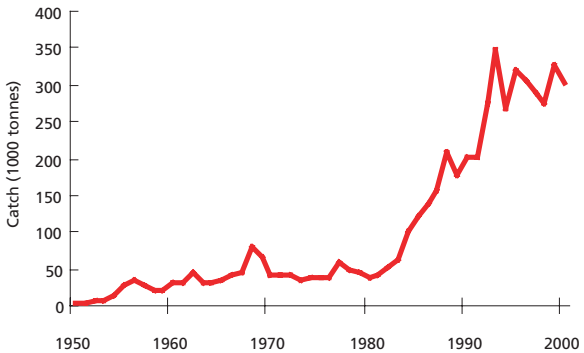
3.6 YELLOWFIN TUNA

3.6.1 General overview

Yellowfin tuna are widely distributed in tropical waters. They are caught by a variety of gears – purse seines, longline, and baitboats – and in many kinds of small-scale coastal fisheries.

Figure 3.15 shows the total yellowfin catch in the Indian Ocean. The catch stayed at a relatively low level, around 50 000 tonnes, until the early 1980s, then increased to over 350 000 tonnes in 1993. This sudden increase was due to the rapid development of purse-seine, gillnet and longline fisheries. Yellowfin caught by longliners in recent years are utilized for the *sashimi* market, while those caught by purse seine are for canning.

FIGURE 3.15
Catches of yellowfin in the Indian Ocean



3.6.2 Catch by fishing gears

Figure 3.16 shows Indian Ocean yellowfin catches by fishing gears.

Longline fishery

Japanese (since 1952), Korean (since 1966) and Taiwanese (since 1954) large-scale longliners were the major producers of yellowfin in the Indian Ocean until the early 1980s. The catch fluctuated widely between 20 000 and 60 000 tonnes. In the mid-1980s the longline catch started increasing, to a peak of 166 000 tonnes in 1993, the only year since 1983 in which the longline catch exceeded the purse-seine catch. The increase was mostly by Taiwan Province of China (large-scale longline), and partially by the increase of the Indonesian (small-scale longline) catch. After that peak it dropped to about 90 000 tonnes.

Purse-seine fishery

Recently the majority of the yellowfin catch has been made by the purse-seine fishery using FADs. The purse-seine fishery was developed by French and Spanish vessels, starting in 1981 and 1984, respectively, and catches increased very rapidly to 150 000 tonnes in 1995. In last five years the catch has fluctuated at a high level. Some other countries, such as Japan, Seychelles, the Russian Federation, Iran, Mauritius, and Liberia, reported purse-seine catches, but at a relatively low level.

Other fisheries

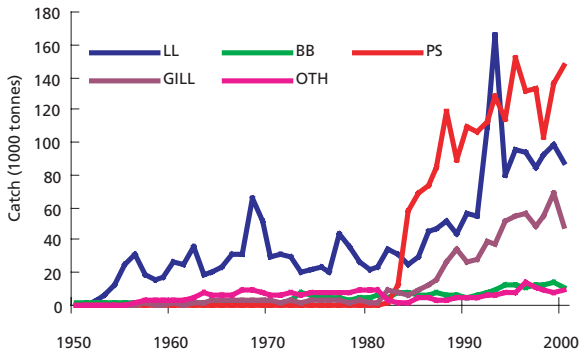
Maldives has been fishing with baitboats since the early 1950s. The catches were less than or equal to 2 000 tonnes until 1972, then gradually increased and exceeded 12 000 tonnes in 1994. After that they stayed at around the same level. The gillnet fishery has also become important since the early 1980s: the catch, mostly by Sri Lanka and Iran, reached 68 000 tonnes in 1999.

3.6.3 Catches by country

The yellowfin catches from the Indian Ocean during 1950-2000 by the ten main fishing fleets are shown in Figure 3.17.

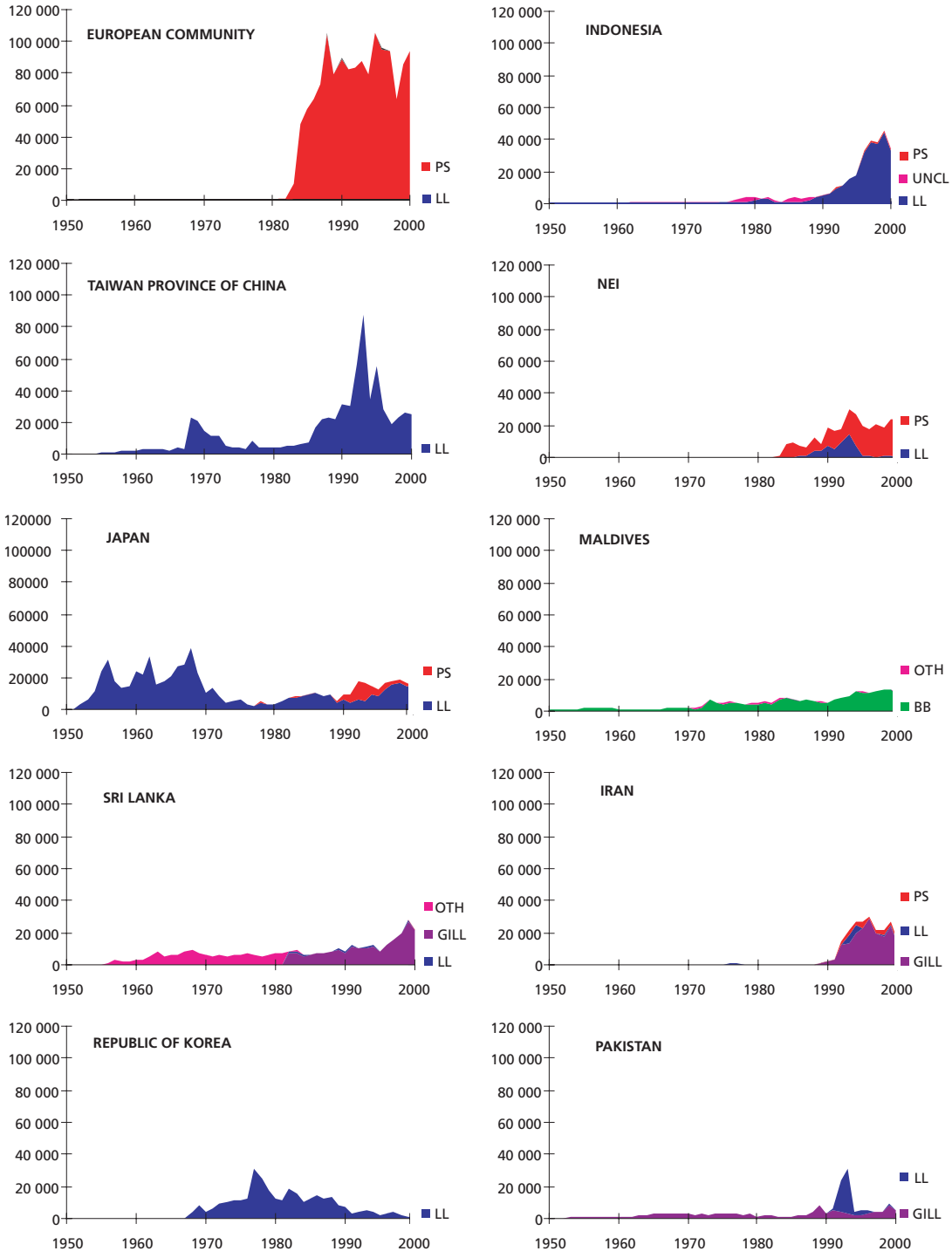
The **French** and **Spanish** purse-seine fleet caught yellowfin at a high level of over 80 000 tonnes since the mid-1980s. France started catching yellowfin in 1970, and began the purse-seine fishery in the Indian Ocean in 1981. The yellowfin catch remained at a low level before the start of the purse-seine fishery, then it increased dramatically to more than 10 000 tonnes in 1983, exceeded 40 000 tonnes in 1986, and reached almost 60 000 tonnes in 1988. After that it stayed around 40 000 tonnes, and then decreased to 20 000 tonnes in 1998. Spain started catching yellowfin in the Indian Ocean in 1981, and began a purse-seine fishery in 1984. The yellowfin catch by the Spanish fleet increased to 65 000 tonnes in 1995, then decreased to 37 000 tonnes in 1998. NEI ("flag of convenience") and Iranian seiners show very similar trends, although at a level much lower than the EC catch.

FIGURE 3.16
Catches of yellowfin in the Indian Ocean, by fishing gear



Taiwan Province of China started longline fishing in 1966 in the Indian Ocean. After the catch had increased to 22 000 tonnes in 1968, it decreased to less than 6 000 tonnes in 1973, and stayed at a low level of less than 10 000 tonnes until 1985. After that it increased again rapidly to reach 88 000 tonnes in 1993, but then dropped to the level of around 20 000 tonnes. **Japan** started longline fishing in the Indian Ocean in 1952, targeting yellowfin and bigeye tunas. Japanese yellowfin catches increased to 30 000

FIGURE 3.17
Yellowfin catches (tonnes) by the ten main fishing fleets in the Indian Ocean, by fishing gear



tonnes in the mid-1950s, then fluctuated widely between 10 000 and 40 000 tonnes until 1970. After that, they decreased to less than 10 000 tonnes, because most of their longline effort was shifted to the southern bluefin tuna fishing grounds. However, they increased again to a level of over 10 000 tonnes since 1986. A limited purse-seine catch was also made in the 1990s. The **Republic of Korea** started longline fishing in the Indian Ocean in the late 1960s. The Korean catch increased in the late 1970s, exceeding 30 000

FIGURE 3.18
Catches of swordfish in the Indian Ocean

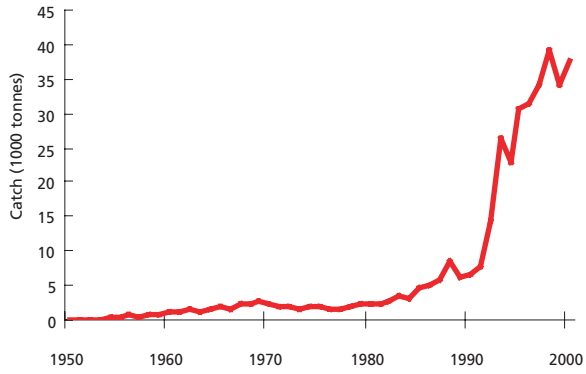
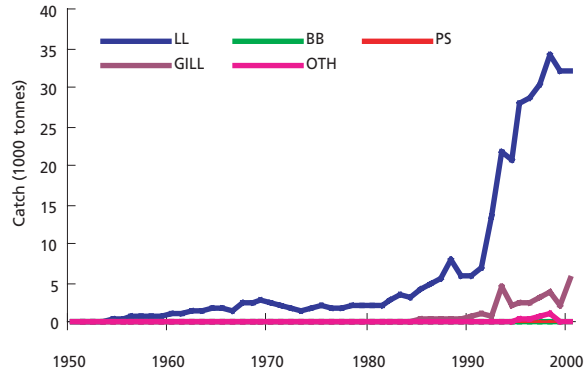


FIGURE 3.19
Catches of swordfish in the Indian Ocean, by fishing gear



tonnes in 1978; after that it gradually decreased to less than 10 000 tonnes in the 1990s, as many Korean boats left the Indian Ocean.

The **Sri Lankan** and **Maldives** catches of yellowfin were stable during the 1960s to 1980s. Since the mid-1990s both catches have been increasing. The Sri Lanka catch was reported previously as by unclassified gears, and recently by gillnets, while the Maldives catch was by baitboats. Indonesia started longline fishing in 1982, mostly small-scale, and its catch has exceeded 10 000 tonnes since 1989. The catch level continued increasing, to over 40 000 tonnes in 1999.

3.7 SWORDFISH

3.7.1 General overview

Swordfish are widely distributed throughout the temperate, subtropical and tropical waters. Swordfish inhabit deeper layers in the daytime, and come up to shallower layers for feeding at night.

Figure 3.18 shows the total swordfish catch in the Indian Ocean during 1950–2000. It stayed at a relatively low level of 1 000 to 2 000 tonnes until the 1980s, then suddenly increased in the 1980s and particularly during the 1990s, reaching almost 40 000 tonnes in 1998. This increase is in response to the worldwide increase in price and demand for swordfish, and is also influenced by the catch limitations introduced by the various regulatory measures set for the Atlantic swordfish fisheries.

3.7.2 Catch by fishing gears

Swordfish catch by fishing gears is shown in Figure 3.19. Catches are almost exclusively by longline. In recent years, the gillnet catch has become significant, but is far less than that of longlines.

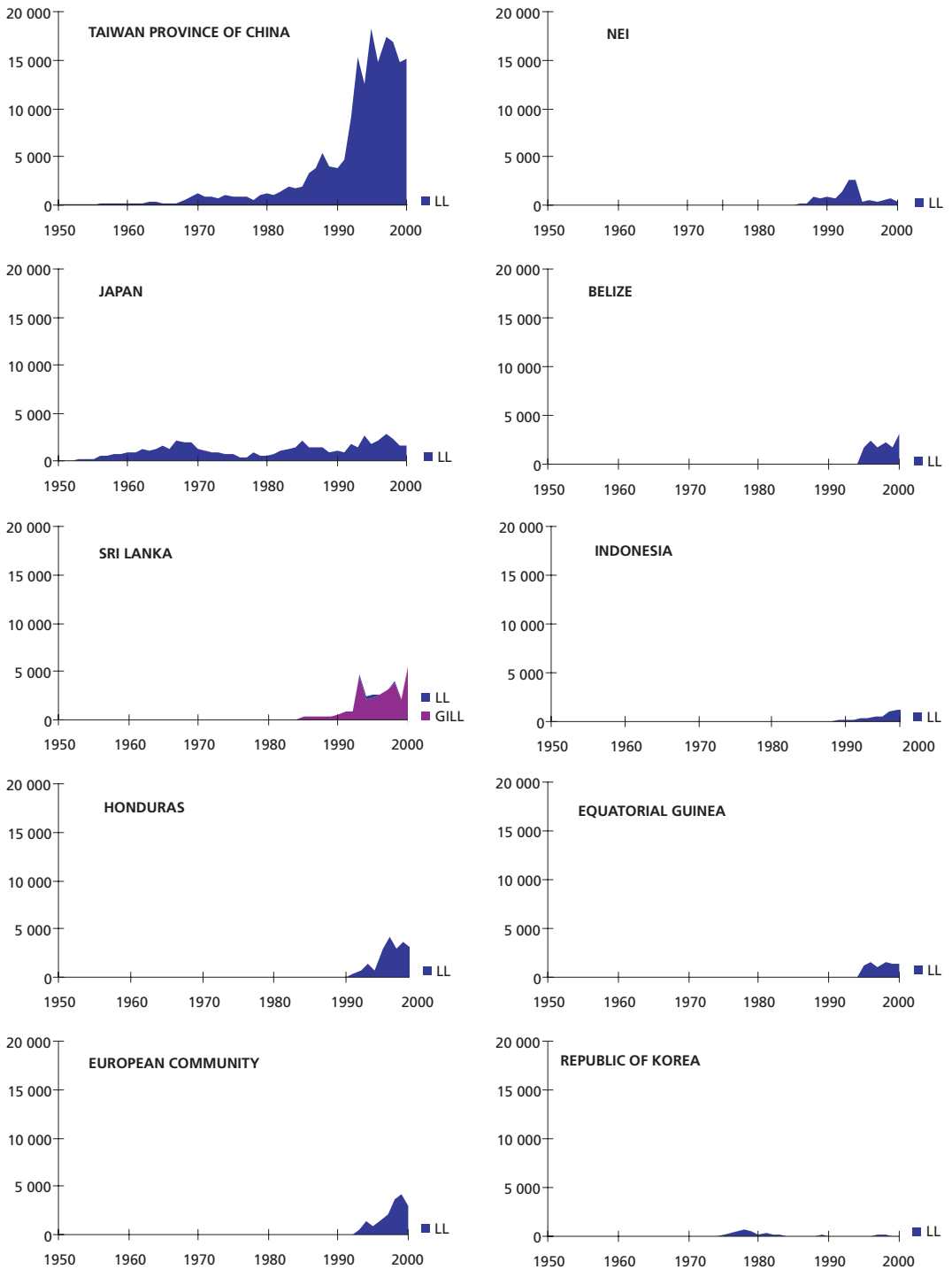
Longline fishery

In the Indian Ocean, most swordfish catch was made by longline fishery. Taiwan Province of China, and to a much less extent, Japan have played major historical role in the longline fisheries. The longline catch stayed at a lower level of 1 000 to 2 000 tonnes until early 1980s. It increased during 1980s and very rapidly in 1990s. The peak was in 1998 at 39 000 tonnes.

Other fisheries

The only other fishery with significant catches of swordfish is the coastal gillnet fishery in Sri Lanka. The reported gillnet fishery started in 1985, and catches stayed at a level of less than 1 000 tonnes until 1992, then suddenly increased to more than 4 000 tonnes in 1993. After that they have been stable at between 2 000 and 4 000 tonnes.

FIGURE 3.20
Swordfish catches (tonnes) by the ten main fishing fleets in the Indian Ocean, by fishing gear



3.7.3 Catches by country

The swordfish catches from the Indian Ocean during 1950-2000 by the ten main fishing fleets are shown in Figure 3.20. **Taiwan Province of China** reported the largest swordfish catch recently by its longline fleet. The first reported swordfish catch was in 1970, and it stayed at less than 3 000 tonnes until 1986, principally as by-catch in the yellowfin and albacore fishery. However, in the 1990s some longliners started

targeting swordfish, and the catch rapidly increased to the record high of 18 000 tonnes in 1995, and has remained at a similar level until now. **Japan** has reported swordfish catches since the start of its longline fishery in the Indian Ocean in 1952. Its catch has fluctuated between 200 and 2 000 tonnes since then, all by-catch of the fisheries for yellowfin, southern bluefin or bigeye tunas.

Sri Lanka has reported swordfish catches since 1985, mostly by the gillnet fishery. Catches stayed at a relatively low level until 1992, but increased to 4 000 tonnes in 1993. Since then they have fluctuated between 2 000 and 4 000 tonnes.

Indonesia has been catching swordfish with longlines since 1974, but at a very low level. The catch gradually increased, and has exceeded 1 000 tonnes since 1997. Spain also started to catch swordfish in 1993 with longlines, most likely targeting swordfish. The catch increased to 2 000 tonnes in 1999.

Longliners from **Honduras**, **NEI**, **Belize** and **Equatorial Guinea** are all flying "flags of convenience", and are often IUU vessels. Their swordfish catches are generally by-catch, mostly in the 1990s. Other longline fishing countries include **Réunion** (France), **Australia** and **South Africa**, which have reported annual catches of swordfish exceeding 1 000 tonnes each in recent years.