

4. INDUSTRIAL FISHERIES

4.1 Port History

4.1.1 *Benoa*

The commercial port at Benoa was first established in 1920, but its development into a major fishing port did not begin until fifty years later. Although exploratory ‘test fishing’ for tunas was done by Japanese longline vessels in Indonesian waters as early as the 1930s, the first commercial operation did not commence until 1952 (Ishida et al. 1994). Through the 1950s and 1960s the Japanese longline activity was primarily focused in the Banda Sea. Indonesia’s first commercial longline operation began in 1965 with one company (B.P.U. Perikanan) that had two vessels (modified pole and line vessels of 167 and 185 GT), gifts from the Japanese Government (Simorangkir 1993). In 1969 the first Indonesian longline vessel, “KM Tuna I”, was built which was used primarily for research and training in a United Nations Development Program (UNDP) with the Indonesian Government.

Assisted by a US\$5,498,308 credit agreement from the Japanese Government to the Indonesian Government, in 1972 the state-owned fishing company PT. Perikanan Samudera Besar (PT. PSB) commenced operations to further develop tuna long-lining in Indonesia. Research by the Japanese Overseas Technical Cooperation Agency (OTCA) had identified Sabang on the island of Weh (Banda Aceh, North Sumatra) and Benoa in Bali as good ports to base operations. PT. PSB’s fleet quickly expanded to 18 vessels by 1975 and its primary base was Benoa (Simorangkir 1993). Largely because of its remoteness, the port of Sabang did not develop to be an important base for large-scale commercial long-lining operations (Ishida et al. 1994). The PT. PSB vessels primarily fished in Indian Ocean waters, but also in areas to the east (Timor and Arafura Seas) and north-east (Flores Sea, Banda Sea).

In 1985 the Japanese sashimi market opened to fresh tuna imports from Indonesia and in the years that followed Indonesia’s commercial tuna longline fishery underwent dramatic expansion. From only 36 vessels (34 Indonesian) in 1986, the number of longline vessels based in Indonesia (at Benoa and Muara Baru), operating in the Indian Ocean waters had by 1991 increased to 536 (158 Indonesian) (Herrera 2000)⁴. The majority of foreign vessels were Taiwanese, but there were also vessels from Japan, Korea, Honduras, and Philippines. In 1998 the Indonesian government introduced regulations requiring all fishing vessels based in Indonesian ports to be Indonesian flagged, and by 2000 all vessels were officially classed as Indonesian-owned vessels. During recent years the number of longline vessels operating out of Benoa has continued to increase – 529 in 1999 (DGCF 1999), 618 in 2001 (staff WASKI pers. comm.) and 705 in 2002 (Simorangkir 2003).

⁴ Herrera’s review (Herrera 2000) includes an analysis of the historical expansion of Indonesia’s longliner operations in the Indian Ocean, based on several sources of information (PT. PSB, RIMF, CSIRO, IOTC, IPTP).

4.1.2 Muara Baru

In recognising the increasing importance of fish and the fishing industry to the people of Java, in 1973 the Indonesian Government asked the Japanese Government to provide technical assistance in the form of a feasibility study into a major redevelopment of the existing fishing port in North Jakarta (PCI 2001). The study was done by the Overseas Technical Cooperation Agency (OTCA), known at that time as the Japan International Cooperation Agency (JICA). In 1978 the process of planning for the port development was furthered by Pacific Consultants International who prepared detailed plans. The construction of what is now known as Jakarta Fishing Port⁵ or PPSJ (*Pelabuhan Perikanan Samudera Jakarta*) was done with funds provided by the Overseas Economic Corporation Foundation (OECF) of Japan (Ishida *et al.* 1994). Stage I began on the northern side of the port in 1980 and finished in 1982, and Stage II began in 1982 and was completed in 1984. The port was officially opened on 17 July 1984.

Since that time the port has undergone several development stages in both facilities and operations, to meet the needs for a rapidly expanding fleet of fishing vessels (primarily longline vessels) and the demands of the new industry of export of fresh and frozen whole tuna and tuna product to Japan and other international destinations.

These developments included (PCI 2001):

- 1986, export of frozen tuna to Japan commenced
- 1986 a large (9856 m²) Fish Marketing Centre (Pusat Pemasaran Ikan) opened at PPSJ
- 1987, a centre for fish processing was established
- 1987, the export of fresh, sashimi quality tuna to Japan commenced
- 1992, fish auction activities commenced
- 1998 to early 2001, a Stage IV development including construction of the Tuna Landing Centre (Tempat Pendaratan Ikan), the Fish Auction Centre (Tempat Pelelangan Ikan), a waste processing unit, new wharves, retaining walls, a ‘foul-seawater’ cleaning facility, and new slipway/docking facilities.

All the major development of the port has been done with funding assistance from OECF.

In 1988 there were 48 Indonesian longline vessels based at Muara Baru (Ishida *et al.* 1994). By May 1990 this number had increased to 150. The majority were small <100GT. Large numbers of Taiwanese vessels were also using Muara Baru as a base at this time, but numbers varied even over short periods of time e.g. 156 Taiwanese vessels used the port in June 1989, 92 in January 1990, and 77 in May 1990. There were also small numbers of longline vessels from Japan, Korea, Philippines and Honduras (Ishida *et al.* 1994).

⁵ For the purposes of this report Jakarta Fishing Port is simply referred to as “Muara Baru”.

Attempting to establish how the numbers of longline vessels based at Muara Baru changed over the following years is difficult, using the available statistics (see comments by Herrera 2000). DGCF statistics (provided to DGCF by the provincial fisheries office, *Dinas Peternakan, Perikanan dan Kelautan Propinsi DKI Jakarta*^{SS1}) for Muara Baru are highly inconsistent across years (Table 4.1.1). Also, vessel statistics reported annually by the PPSJ Port Authority (see Section 4.3.2) are for vessel activity (monthly totals of number of vessels entering port, numbers unloading catches, numbers leaving port) rather than number of vessels actually registered to the port. Vessel lists on the DGCF website^{SS2} (<http://www.pelabuhanperikanan.or.id/>) for fisheries ports, dated 2001, show 578 longline vessels based at Muara Baru. A vessel registry list provided to us by PPSJ Port Authority for 2002 contains entries for around 810 longline vessels. However, as vessels are able to have more than one port registered as their home base and as some vessels on this list may be registered but currently inactive, this number is almost certainly an overestimate of number of longline vessels based and active at Muara Baru.

Table 4.1.1. Number of longliner vessel (“fishing units”) at Muara Baru (Propinsi DKI Jakarta), 1993-2001 according to annual DGCF statistics (provided to DGCF by the provincial fisheries office, Dinas Peternakan, Perikanan dan Kelautan Propinsi DKI Jakarta^{SS1}).

Year	Longliner vessels
1993	212
1994	193
1995	72
1996	76
1997	600
1998	172
1999	188
2000	122
2001	269

4.1.3 Cilacap

By comparison to Bena and Muara Baru, the main fishing port of Cilacap has only a relatively short history. Prior to 1995, Cilacap’s primary fishing vessel landing centre was located at Sentolo Kawat, close to the Pertamina oil refinery. Pertamina (the Indonesian Government owned oil company) expressed serious concerns about the negative impacts of fishing port activities on their refinery operations, including safety concerns about fishers smoking in the vicinity of their volatile products. As a result, the local and provincial governments decided to move the fishing port activities to the port’s current location, east along the coast to Kelurahan Tegal Kamulyan Peny. With financial assistance from Pertamina, development of the new port began in 1993 and was formerly opened for commencement of operations in May 1995. Initially the port was Class B (*Pelabuhan Perikanan Nusantara Cilacap*), but with a steady increase in the number of ‘ocean’ fishing vessels using PPNC, the port was upgraded to

Class A status in May 2001, and is now known as *Pelabuhan Perikanan Samudera Cilacap*⁶, PPSC (“Oceanic Fishing Port of Cilacap”).

4.2 Port facilities and management

4.2.1 Benoa

As noted in Sect. 3, the Port of Benoa is not under the regulation of DGCF, but instead is one of 37 ports in Indonesia that are managed by companies that are State owned enterprises. There are four of these companies and the one that manages Benoa is “PT. (Persero Terbatas) Pelabuhan Indonesia III” (= Indonesia Port Corporation III). The central office of Indonesia Port Corporation III is in Surabaya. The fishing industry is only one of several maritime activities accommodated at Port of Benoa. In addition to the main fishing vessel unloading wharves and processing facilities in the western sector of the port, there are other areas with facilities and services dedicated to container cargo vessels and passenger liners.

The land area of the fishing section of the port is around 23 hectares (Fig. 4.2.1). Indonesia Port Corporation III has well developed plans (contingent on available funding) to increase this to almost 80 hectares by year 2025. The majority of processing companies lease an allocation of space along the main fisheries wharf on the western side of the port. These allocations vary from 20 to 128 metres in length. Only one processing company, PT. PSB, has its own private wharf.



Figure 4.2.1. A section of the fishing vessel area of Port of Benoa.

In addition to the ownership and associated management of the port by Indonesia Port Corporation III, the management of fishing vessel activity at Port

⁶ For the purposes of this report, the fishing port is simply referred to as “Cilacap”

of Benoa is also the responsibility of other offices. WASKI (*Unit Pengawas Kapal Ikan*) is the office that has primary responsibility for day to day management of fishing vessel activity, including the monitoring of arrivals and departures of vessels, the checking of vessel licences, collecting and collating longline vessel log-book forms (see Section 6) and the issuing of ‘license to sail’ (*Surat Penangkapan Ikan*) following checks on vessel seaworthiness. WASKI also manages a fisheries school on-board observer program (see Section 6.2.4). WASKI in Benoa is a subdivision of the Provincial Fisheries Office (*Dinas Perikanan dan Kelautan Propinsi Bali*) in Denpasar. Prior to year 2000 WASKI’s ultimate responsibility was to DGCF but it is now to the Directorate General of Marine Resources and Fisheries Control (within the Agency of Marine Affairs and Fisheries).

There is also a Port Authority Office (*Kantor Penguasa Pelabuhan Benoa*) at Benoa whose responsibility includes the management of fishing vessel traffic within the port precinct, in addition to the activities of vessels in the other port sectors (cargo and passenger). However, compared to the port authorities at Muara Baru and Cilacap (see below), the actual management of fisheries related activity by this office is relatively minor.

4.2.2 Muara Baru

The Jakarta Fishing Port is a large port by any standards. It is a Class A fishing port – Pelabuhan Perikanan Samudera (“Oceanic Fishing Port”) (see Table 3.1). The total land area is around 80 hectares (Murdiyanto 2003). The port has two main fish landing wharves, one 236m long (2832 m² area) and the other 775m long (9300m² area). There is also a “transshipment wharf” of 100m (2000 m²) and 903m of provisioning wharves (DGCF 2001a).

Port facilities include the Fish Landing Centre (*Tempat Pendaratan Ikan*, 3400m²) that houses the 25 processing rooms used by the different fishing companies, a large (9856m²) Fish Marketing Centre (*Pusat Pemasaran Ikan*), and a central Fish Auction Place (*Tempat Pelelangan Ikan* 3500m²), and a 1000 ton capacity cold storage facility (PCI 2001).

The port is under the management of the Port Authority, *Pelabuhan Perikanan Samudera Jakarta* (the port authority bears the same title as the port itself), which is under the responsibility of DGCF. PPSJ employs around 70 staff. Working closely with PPSJ in the collection, collation, and reporting of fishing vessel activity is the office of WASKAN (*Pengawas Perikanan* = Supervision of Fisheries). Prior to 2002, WASKAN was “WASKI”, and, as described for Benoa, WASKAN/WASKI used to be an office of DGCF, but now is under the Directorate General of Resources and Fisheries Control. WASKAN have 5 inspection vessels of 60 GT that are used for monitoring vessel activity within the port.

The provincial fisheries office, *Dinas Peternakan, Perikanan dan Kelautan Propinsi DKI Jakarta*, and its branch office that supervises the Fish Auction Place, *Dinas Tempat Pelelangan Ikan*, also have important roles in the management and day-to-day running of the port.

4.2.3 Cilacap

All public facilities and the day-to-day operations of the fishing port of Cilacap are under the ownership and responsibility of the Port Authority, whose offices operate under the same title as the port, i.e. Pelabuhan Perikanan Samudera Cilacap. PPSC is a *Unit Pelaksana Teknis* (Technical Operations Unit) and is responsible to the Directorate General of Capture Fisheries. PPSC has a staff of approximately 70 personnel^{SS5}.

There are two main unloading wharves at Cilacap, each approximately 43 metres in length that together can accommodate a maximum of 4 large liner vessels (>100 GT) berthed and unloading at the one time. Adjacent to these wharves is an undercover processing/auctioning facility, Tempat Pelelangan Ikan (TPI) (= Fish Auction Place). The TPI is owned by PPSC but managed by a local fishers' cooperative, Koperasi Unit Desa (KUD) Mina Saroyo. This cooperative manages all the port facilities associated with the commercial fishing industry, but does so under the supervision of the Provincial Fisheries Office (Dinas Perikanan Propinsi Jawa Tengah). The actual running of the auctions at the TPI are done by Pusat Koperasi Unit Desa (PUSKUD) "Mina Baruna" Propinsi Jawa Tengah, a company appointed by the provincial government of Central Java in 1978 to run the fish auctions at all the TPI facilities in Central Java.

There is also a branch of WASKI in Cilacap, whose primary responsibility is to monitor fishing vessel activity but not fish landing or auction activities. This responsibility includes checking that vessels have a current registration certificate (which has to be renewed every 3 years) and checking that vessels are seaworthy prior to issuing a 'license to fish' (SPI = *Surat Penangkapan Ikan*) for each fishing trip.

During the last few years PPSC has experienced increasing problems associated with siltation of the port entrance and berthing facilities. The original depth of water available to vessels using PPSC was at least 3-4 metres, but the siltation generated by the prevailing easterly winds and associated wave action has restricted entry to vessels of maximum 3 m draft, and the problem is particularly restrictive during low tides. Dredging of the port entrance and channels is viewed as only a short-term solution, and, contingent on available funding, the port authority at PPSC has plans to extend the port entrance breakwalls to reduce the amount of silt transport and build-up and to create additional berthing facilities for larger vessels. However, in the meantime, the restricted entry imposed by the siltation problem is forcing the larger long liner vessels to unload their catches at wharf areas at two nearby locations – Seleko (approximately 3 km from PPSC) and Bateriai (approximately 1 km from PPSC).

4.3 Fleet structure and vessel operations

4.3.1 Bena

Tuna longline vessels make up the large majority of vessels based at the port of Bena (Table 4.3.1). According to records of the Association Tuna Indonesia (Simorangkir 2003), in 2002 there were 705 Bena-based longline vessels. Since 1998-1999, they are all Indonesian flagged and officially classed as Indonesian owned. There are currently 53 vessel owner companies in Bena. Gill-net, hand-line, and carrier-vessels (primarily for shrimp and non-pelagic species of fish) make up the remainder of the fleet.

The average length of fishing trips in Indian Ocean waters for Bena based longline vessels is 15-30 days, with 2 to 3 days spent transiting to the fishing grounds. The average stay in port is 4-6 days and the long liner vessels do an average of 8 to 10 fishing trips per year. The crew, usually numbering 8 to 10, are primarily Javanese.

The fishing master (and sometimes also the electrician) on tuna longline vessels is often non-Indonesian and often Taiwanese. The approximate location and extent of the longline fishing grounds accessed from the port of Bena are shown in Figure 4.3.1.

Table 4.3.1. Fleet structure by vessel size and gear type at the port of Bena in 2002. Source: Simorangkir (2003) and vessel list provided by WASKI Bena.

Vessel size (GT)	Vessel gear type				
	Longline	Gill-net	Hand-line	Carrier	Fish trap
0-30	138	19	22	14	2
31-60	160	10	-	1	2
61-100	209	3	-	1	-
101-200	195	-	-	4	-
>200	3	-	-	6	-
Total	705	32	22	26	4

4.3.2 Muara Baru

In common with Benoa, the predominant vessel gear type at Muara Baru is longline (Table 4.3.2). The longline vessels are all greater than 30 GT, and the majority are between 100 and 200 GT. There are also a large number of gill-net (majority drift gill-net) vessels that operate from the port. In monthly and annual reports^{SS3} the Port Authority (PPSJ) reports the number of vessels by gear type that have used the port (as noted above this does not equate with the number of vessels registered to the port). During 2001 902 different longline vessels used the port and a similar number (908) during 2000 (Table 4.3.3).

Table 4.3.2. Total number of vessels, by gear type and vessel size, that used Muara Baru during 2001. Totals also provided for 2000. (Source: Statistics provided by PPSJ^{SS3}).

Vessel size (GT)	Vessel gear type					
	Longline	Gill-net	Carrier	Purse seine	Fish trap	Lift net
0-10	-	54	43	-	3	-
10-20	-	53	11	-	1	-
20-30	-	179	7	4	12	8
30-50	61	8	5	4	31	7
50-100	294	4	4	4	1	4
100-200	521	-	31	1	5	-
>200	26	-	21	5	-	-
Total	902	298	122	18	53	19
2000 Totals	908	468	78	3	43	31

Statistics provided by PPSJ (Table 4.3.3) include the number of entries into port by longline vessels for each month, but figures for the number of catch unloads are reported by vessel size and not by gear type. These statistics for 1999-2000 show May to October to be the busiest period in the port, and February and March the quietest months.

There was steady increase in the annual total of entries by longline vessels into Muara Baru, from 2010 entries in 1998 to 3462 entries in 2001 (Table 4.3.4). Interestingly, the total for 2002 was only 2991, a 14% decrease from the 2001 total.

Table 4.3.3. Monthly totals of entries by tuna longline vessels into Muara Baru and catch unloads (all vessels) during 1999-2001. Catch unload statistics not available for 1999. (Source: Statistics provided by PPSJ^{SS3})

Year	1999	2000		2001	
<i>Month</i>	<i>Entries</i>	<i>Entries</i>	<i>Catch unloads</i>	<i>Entries</i>	<i>Catch unloads</i>
Jan	200	240	424	319	381
Feb	168	194	361	192	345
Mar	172	198	394	252	411
Apr	199	238	422	281	381
May	179	228	442	314	465
Jun	241	289	361	309	443
Jul	214	263	466	298	412
Aug	323	308	501	365	534
Sep	258	240	496	285	453
Oct	265	267	477	324	502
Nov	219	221	421	257	407
Dec	214	213	448	266	368
Total	2652	2899	5213	3462	5102
Mean/Month	221.0	241.6	434.4	288.5	425.2

Table 4.3.4. Total number of entries into Muara Baru by tuna longline vessels, 1998-2002. (Source: Statistics provided by PPSJ^{SS3})

Year	Total longline entries
1998	2010
1999	2652
2000	2899
2001	3462
2002	2991

The review by Ishida et al. (1994) provides a general 'operational plan' of longline vessels working out of Muara Baru based on results of a survey of 20 Taiwanese flagged vessels that were based at the port in 1989. The average length of fishing trips is listed as 13 days, with vessels doing on average 22 trips per year. However, at the time of that survey, the majority of the Taiwanese and Indonesian longline vessels using Muara Baru were less than 50 GT in size. Nowadays the majority of longline vessels are between 50 and 200 GT (Table 4.3.2). The larger vessels have the ability to fish further from shore with increased fish and ice holding capacity. Generally the average period for fishing trips is significantly longer than 13 days, with vessels often at sea for anywhere between 25-45 days.

The primary fishing grounds for tuna longline vessels operating from Muara Baru are Indian Ocean waters to west and south of both Sumatra and Java (Figure 4.3.1) (Ishida *et al.* 1994, Marcille *et al.* 1984). Historically, the most productive fishing grounds of Muara Baru based vessels, for bigeye tuna in particular, were between latitude 5° and 11° S and longitude 95° to 105° E. Jakarta based vessels have also been known to fish areas as far north as latitude 3° N along the West Sumatra coast, on the western side of Mentawai Island chain (Ishida 1994, Uktolseja 1997). Marcille *et al.* (1984) provided a review discussion of the dynamics of the current systems (primarily the convergence zones that shift with season) and associated thermocline patterns that characterize this region of the Indian Ocean – factors that are believed to strongly influence the behaviour of bigeye tuna. The peak fishing season for tuna off the west coast of Sumatra is reported to be from June to November while in the south off Java it is from February to December (Uktolseja *et al.*, 1997).

4.3.3 Cilacap

Longline vessels commenced activity at Cilacap in 1996, firstly as modified gill-net boats. One hundred and fourteen longline fishing vessels currently use this port, although some of the larger vessels, as described above, experience restricted access (Table 4.3.5). Longline vessels make up about one third of the vessels that are based in PPSC^{SS6}. The remaining two thirds are gill-net (115) and trammel-net vessels (100). The gill-net boats catch the occasional large tuna but their primary target catch is skipjack tuna. The trammel-net boats fish for shrimp.

Of the 114 longline vessels, 10 are less than or equal 30 GT and as such are licensed by the province. All vessels >30 GT are licensed by DGCF. Forty of these larger longline vessels are 50-100 GT, and 24 are 100-150 GT. There is only one vessel larger than this, with a weight 169 GT. One vessel owner has six longline vessels, but this is considered unusual. The majority of vessel owners only have one or two vessels – there are no large vessel companies based in Cilacap.

Table 4.3.5. Fleet structure at PPS Cilacap, 2002. Data provided by PPSC^{SS6}.

Vessel size (GT)	Longline	Gill-net	Trammel-net	Purse-seine
0 - 15	-	16	35	-
16 – 30	10	78	63	1
31 – 60	45	21	2	1
61 – 100	34	1	-	-
101 – 200	25	-	-	-
Total	114	116	100	2

The average length of fishing trips for Cilacap based longline fishing vessels is 10-15 days. The average stay in port is 3-4 days and the longline vessels do an average of 11 fishing trips per year. The crew are primarily Javanese and most are from Central Java.

The primary area fished by longline vessels operating out of Cilacap are Indian Ocean waters between latitude 9⁰ and 11⁰ south and longitude 107⁰ and 111⁰ east (Figure 4.3.1) (information provided by staff PPSC).

Some vessels act as carrier vessels and bring in catch from other similar-sized vessels although they are not actually dedicated mother-ships. These carrier vessels can be other longline vessels but may also be gill-net vessels that were fishing in the same area. Catches caught by one or more vessels that are carried into port by another vessel usually arrive in port tagged with coloured plastic ribbon around the caudal region that indicates the vessel-of-origin of individual fish.

4.4 Catch distribution and markets

4.4.1 Bena

The majority of 14 processing companies lease an allocation of space along the main fisheries wharf on the western side of the port of Bena. These allocations vary from 20 to 128 metres in length. Only one processing company, PT. PSB, has its own private wharf. Vessels dock in the space of their affiliated/chosen processing company and the catch is unloaded directly from the vessel into the processing area. Unloading from the vessel's hold, where the fish have been stored on ice is routinely done by hand, with the assistance of ropes and pulleys (Fig. 4.4.1). The fish are lifted from the vessel onto a shaded slide or conveyor for transfer into the processing area or onto trucks to be transported to the processing rooms. At PT. PSB, where their wharf is approximately 70 metres away from the processing area, tuna are lifted from the vessel hold several at a time by crane, placed in large crate and transferred to the processing by fork-lift truck.

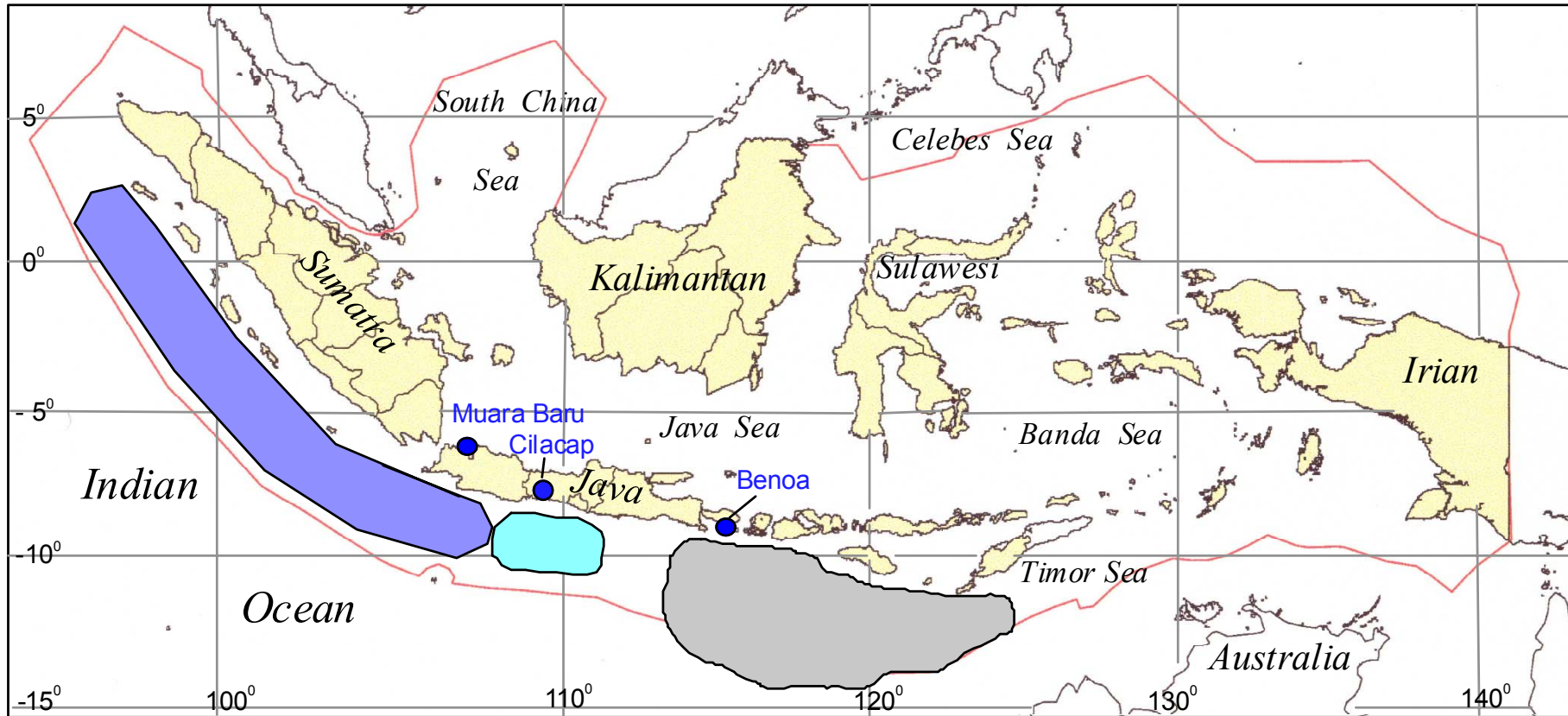


Figure 4.3.1. Approximate location and extent of the Indian Ocean longline fishing grounds serviced by the ports of Muara Baru (dark blue), Cilacap (light blue) and Bena (grey). Indonesia's EEZ boundary marked in red.



Figure 4.4.1. Tuna being unloaded at the Port of Benoa.



Figure 4.4.2. Tuna being graded in processing room at the Port of Benoa.

The separation of tunas and billfish into product suitable or not suitable for export is either done at sea, prior to landing, or at the time of catch unloading. This varies from company to company. Generally all fish of less than 20 kg individual weight are classed as not suitable for export i.e. 'non-exportable'. The 'exportable' tuna are usually gilled, gutted and tailed, and then weighed. These larger fish are graded by the buyer/exporting agents in the processing rooms as – "A" (highest quality), "B", or "C" (lowest export quality) grade, depending on the quality of the flesh (based on inspection of colour and fat content) and the overall condition of the carcass (Fig. 4.4.2). Some of the processing companies are also the exporters, but often the buyer/exporter agent will be from an export company that is using the processing rooms of another company. There are currently 14 processing companies in Benoa that process tuna and tuna-like fish (sailfish, swordfish, marlin). A summary of the processing and distribution of tuna landed at the Port of Benoa is shown in Figure 4.4.3.

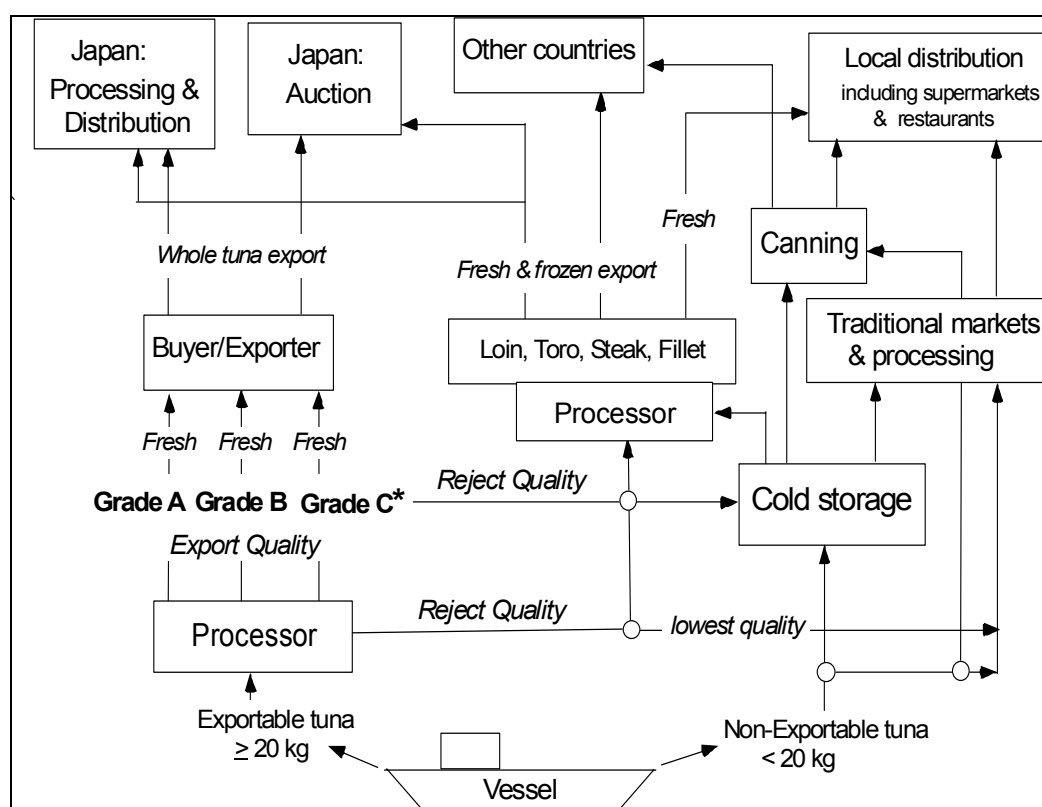


Figure 4.4.3. Processing and distribution of tuna landed at Port of Benoa. Circle points indicate multiple distribution routes.

Not all of the larger tuna will be of sufficient quality for export. 'Reject', non-exportable (i.e. less than "C" grade) whole tuna, are usually placed off to one side of the processing room while the export quality fish are placed into an ice slurry, prior to being packed into cardboard cartons (Fig. 4.4.4) with dry ice, ready for export. As Japan is the primary destination (see below) for whole, sashimi quality, fresh tuna the market price of tuna in Japan on any particular day has an impact on whether all or only some of grade C tuna is exported

whole. If the current market price is depressed, and the freight costs and overheads associated with export begin to outweigh the likely returns on these lower quality fish, the grade C tuna may not be exported whole and instead be classed as reject, non-exportable fish.



Figure 4.4.4. Sashimi grade tuna (whole, fresh) being packed for export.

All of the whole tuna exports from Bali occur as air freight, leaving from Ngurah Rai International Airport, only 12 km from the Port of Benoa. There are, on average, 3 direct flights to Japan each day from Bali and the average duration, from the time whole fresh tuna are packaged at the processor/exporter to the time of arrival in Tokyo is around 10 hours. The volume of tuna freight carried by each flight will vary from 8 to 15 tonnes.

Up until recently there has been no export of whole frozen tuna to international destinations from Bali, largely because Indonesia's fishing vessels have not had the -60°C (or colder) on-board freezer facilities required to store sashimi grade, whole tuna as frozen product. However, at least one Benoa-based company (PT. Damarina) now has one large (500 GT) longline vessel with such facilities and is sending frozen whole tuna to Japan.

The reject whole fish (including billfish) are generally processed into loin, toro, steak and fillet products, either at the same processing company where the export fish have been processed, or at other Benoa based processing companies. There are around 12 processing/export companies in Bali that specialise in processing reject quality fish purchased from other processing companies. These tuna or billfish products are either exported fresh, or frozen and placed into cold storage, before export as frozen product. Loin is exported both fresh and frozen, whereas steak and fillet for international destinations (see below) is generally all frozen product. Some of the fresh loin, toro, steak, and fillet product supply the domestic (Bali and Jakarta) restaurants, hotels, and supermarkets. The reject fish of lowest quality are sent direct to cold storage without being processed into the smaller products. Most of these fish go to canning, but also to local traditional markets and processing (e.g. boiled and salted "*pindang*"). Reject

whole fish in poor condition are sometimes also sent unfrozen, direct to canning and to the traditional markets. Canned tuna products are supplied to both international and domestic markets.

The small (<20 kg) non-exportable tuna either go through cold storage or direct (fresh) to canning and local traditional markets and processing.

4.4.2 Muara Baru

The ways tuna are processed at Muara Baru and distributed to international and domestic markets are very similar to that described above for Benoa. The initial grading of tuna into export or reject quality product generally takes place either at sea prior to landing, or in the processing/grading rooms of individual companies (Fig. 4.4.5) – at Muara Baru these facilities are known collectively as “Tuna Landing Centre” (*Tempat Pendaratan Ikan*).

After grading, the sashimi quality whole fresh tuna are exported by airfreight from Jakarta International Airport to international destinations (majority to Japan – see below). The ‘reject’ tuna i.e. that classed as too low a quality for international export as whole fish, are then proceed along one of three processing/distribution routes: 1. Direct to processing companies for conversion into fresh and frozen tuna product (loin, steak, fillet etc.), 2. To the port’s auction centre known as Tempat Pelelangan Ikan (TPI) (= “*Fish Auction Place*”), or 3. Direct to canning factories. As in Benoa, the higher quality fresh and frozen tuna products are exported to international markets. The middle and lowest quality product are distributed to local domestic markets (including the Fish Market Centre, *Pusat Pemasaran Ikan* at Muara Baru) and to the canneries and other forms of processing. Depending on quality, tuna that are too small for export (<20kg) usually goes to auction at TPI, direct to canneries, or to cold storage.

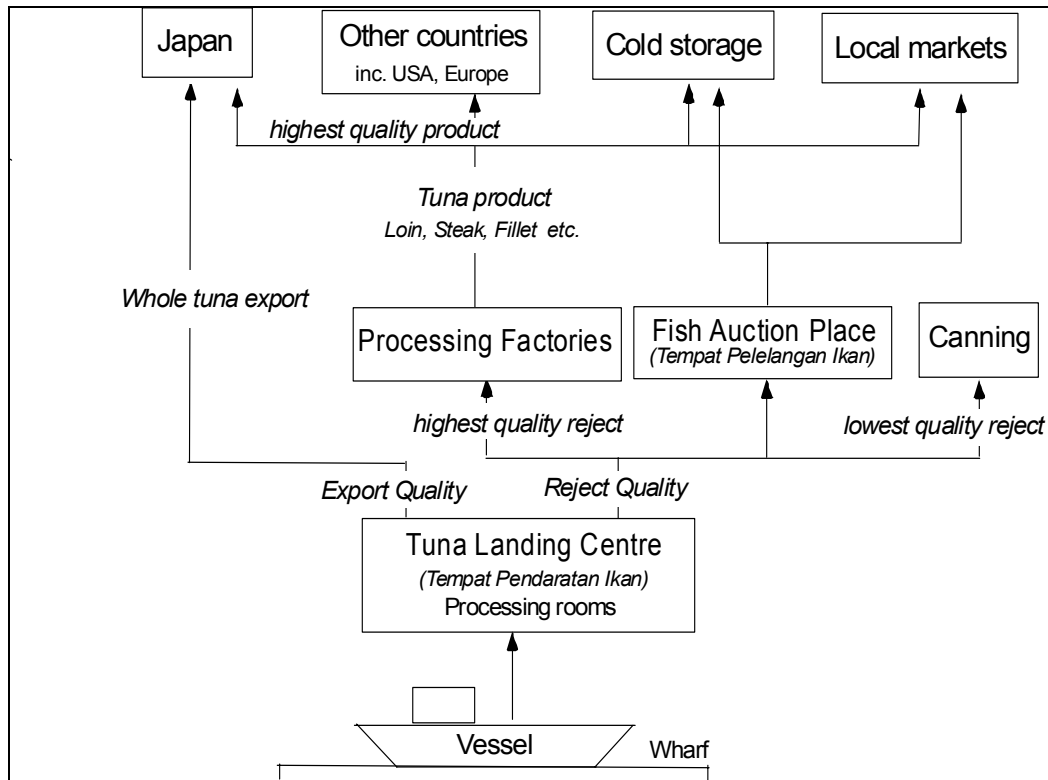


Figure 4.4.5. Grading and distribution routes of tuna at Muara Baru.

4.4.3 Cilacap

In common with Benoa and Muara Baru, unloading of catches from tuna fishing vessels is generally all done by hand, without assistance from wharf or vessel davits, nor conveyors. Ropes and pulleys are often used to raise the catch from the vessel's hold onto the deck and ramps are used to slide large plastic barrels full of smaller tuna (mainly skipjack) and occasionally the large tuna, billfish, and sharks from the vessel deck up onto the wharf (Fig. 4.4.6).



Figure 4.4.6. Catch being unloaded from longline vessel at Cilacap.

From the vessels, all catch is wheeled by hand-trolley (Fig. 4.4.7) along the wharves through to the large processing/auctioning area (TPI). All large tunas are taken directly, without a weighing stop, through TPI to waiting trucks (Fig. 4.4.8) and loaded for transport to Jakarta. These trucks are insulated, but not refrigerated, and the tuna cargo is packed in crushed ice. The trucks usually depart Cilacap late morning or early afternoon and arrive at Muara Baru by 7-8 am the following morning. The actual driving time is only 10 hours, via Cirebon, but the drivers usually have a rest stop on route. On the return journey the trucks often carry a cargo of frozen bait. There are at least six processing companies at Muara Baru that receive truck shipments of tuna from Cilacap.

The majority of billfish, sharks, rays, and small and juvenile tuna (yellowfin, bigeye, skipjack) are weighed in the processing area and then taken to local markets for sale and auction. Large 'reject' quality tuna are also auctioned at the local markets either as whole fish or as steaks. Billfish in good condition are often included in truck shipments to Muara Baru. All albacore tuna are weighed and those of sufficient quality are sent to the cannery on the outskirts of Cilacap.



Figure 4.4.7. Tuna catch unloading at Cilacap fishing port.
Note PPSC staff member at far left recording catch information



Figure 4.4.8. Transport truck (left) waiting to be loaded with fresh tuna and crushed ice (right) at TPI in Cilacap.

4.5 Catch composition

4.5.1 *Benoa*

Information on the catch by the Benoa-based longline fishery presented here is based on two collaborative research monitoring programs. The first between CSIRO and RIMF was set up in August 1992 to monitor the catch of tunas caught by longline fisheries operating out of Benoa, Bali. In June 2002 this program was replaced by the second and more comprehensive monitoring program that met the requirements of IOTC and CCSBT. The methods used in these programs are described in Davis and Andamari (2003a) and IOTC (2003). We have not presented DGCF/Dinas production estimates for Bali as it is considered that the CSIRO/RIMF catch estimates are more reliable (see Section 6).

The annual estimated catch of tunas and billfish for the years 1993 to 2002 are shown in Table 4.5.1 and Figure 4.5.1. The Benoa based fishery has undergone major changes since 1993 when the CSIRO/RIMF catch monitoring began. Yellowfin tuna dominated catches in 1993 (62%), but have become less important in recent years largely due to the increase in catch of bigeye tuna. Bigeye tuna which was only 26% of the catch in 1993, reached 43% of the catch in 2002. The other species were minor components of the catch, ranging in contribution from 1.6% to 9.5% of the catch.

Changes in size of key tuna species

The mean size of each species was determined monthly using the monthly total weight and number of each species monitored in landings. The mean size of yellowfin tuna decreased dramatically from mid-1999 to mid-2001 and was especially small during April to August 2001 (Figure 4.5.2). Since then there has been a recovery in mean size to levels found before mid-1999. The average monthly weight of yellowfin over the period was 38.7 kg.

Bigeye tuna mean weights showed a marked seasonality being lowest in May to August and highest during November to March (Figure 4.5.3). The latter period corresponds to the southern bluefin tuna spawning period (Farley and Davis, 1998), and based on larval surveys (Nishikawa et al. 1985), is the period that bigeye tuna spawn on the fishing grounds. There is a possibility that the larger fish either become more vulnerable to fishing during their spawning season, but it is more likely that they are exposed to the fishery after having migrated from more southerly areas onto the spawning ground. Superimposed on the strong seasonal pattern is a decline in mean size depicted by the trend line with the average monthly weight dropping from 39.1 kg in 1994 to 30.6 kg in 2002. It appears that the mean weight during the non-spawning period has declined more than the mean weight during the spawning season in recent years. While we do not have corroborating information, this might indicate heavier fishing all year on smaller fish that remain resident on the fishing grounds throughout the year, and less fishing pressure on the larger fish which appear to leave the grounds during the non-spawning period. This would result in a shorter exposure of

larger fish to the Benoa longline fishery which is likely to be subject to more intensive fishing pressure than other areas that large bigeye frequent during the non-spawning season.

Table 4.5.1. Estimated total landings (GGT) at Bena by species and year and percentage species composition.

	1993		1994		1995		1996		1997		1998		1999		2000		2001		2002	
	Tonnes	%	Tonnes	%	Tonnes	%	Tonnes	%	Tonnes	%	Tonnes	%	Tonnes	%	Tonnes	%	Tonnes	%	Tonnes	%
Bigeye	6192	26.3	5360	30.0	6543	34.4	10536	41.3	10115	35.8	12611	39.0	9945	30.2	8676	34.3	9362	36.2	11646	43.5
Yellowfin	14596	62.0	10815	60.6	10590	55.6	11061	43.4	12047	42.6	15735	48.7	16128	48.9	12596	49.8	12165	47.1	10380	38.8
Bluefin	1191	5.1	786	4.4	721	3.8	1404	5.5	1922	6.8	1151	3.6	2178	6.6	1046	4.1	1419	5.5	1631	6.1
Albacore	716	3.0	338	1.9	463	2.4	1035	4.1	2372	8.4	905	2.8	1687	5.1	2238	8.8	2461	9.5	2257	8.4
Billfish	850	3.6	542	3.0	723	3.8	1467	5.8	1813	6.4	1934	6.0	3016	9.2	752	3.0	425	1.6	833	3.1
Total	23545		17841		19039		25503		28269		32336		32954		25307		25832		26748	

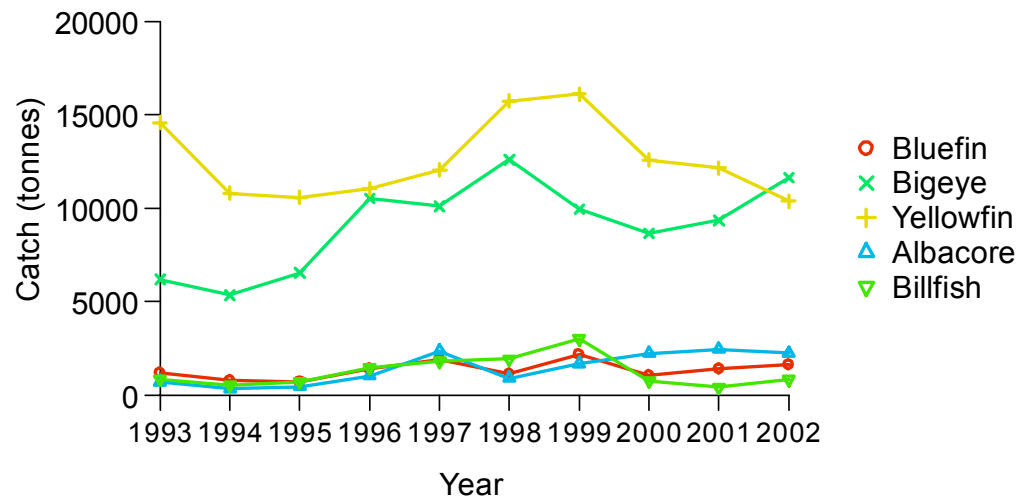


Figure 4.5.1. Estimated total catch (GGT) of tuna and billfish by year at Bena.

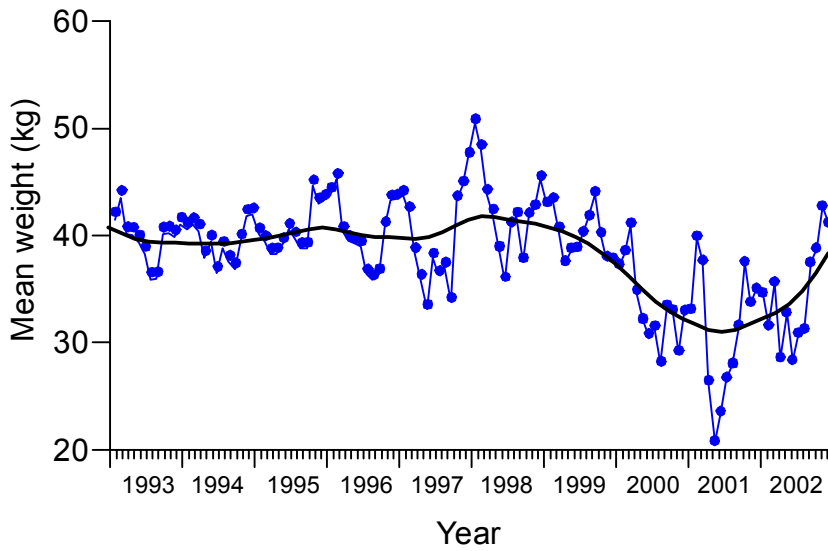


Figure 4.5.2. Mean weight (GGT) of yellowfin tuna in monthly landings monitored at Benoa for the years 1993 to 2002. The trend line was smoothed using distance weighted least squares.

In SBT (Figure 4.5.4) there was considerable intra-annual variability (noise) largely due to small sample sizes in months of low catches (a consequence of its seasonal migration onto the fishing grounds to spawn). There has been a dramatic decline in mean size since 1998 reflecting a fish-down of the larger size classes and an increased recruitment of smaller fish from year classes that are now reaching maturity (Farley and Davis 2003). The average monthly weight in 1994 was 109 kg and this has declined to 95.8 kg in 2002.

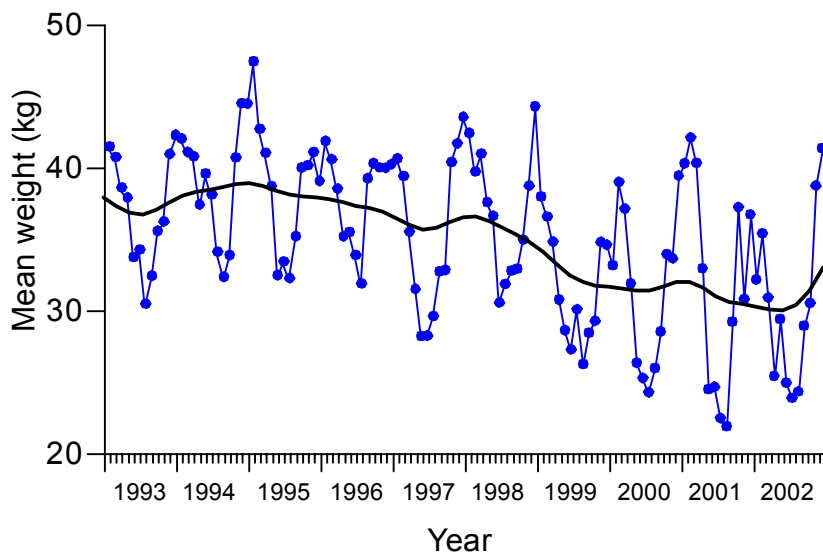


Figure 4.5.3. Mean weight (GGT) of bigeye tuna in monthly landings monitored at Benoa for the years 1993 to 2002.

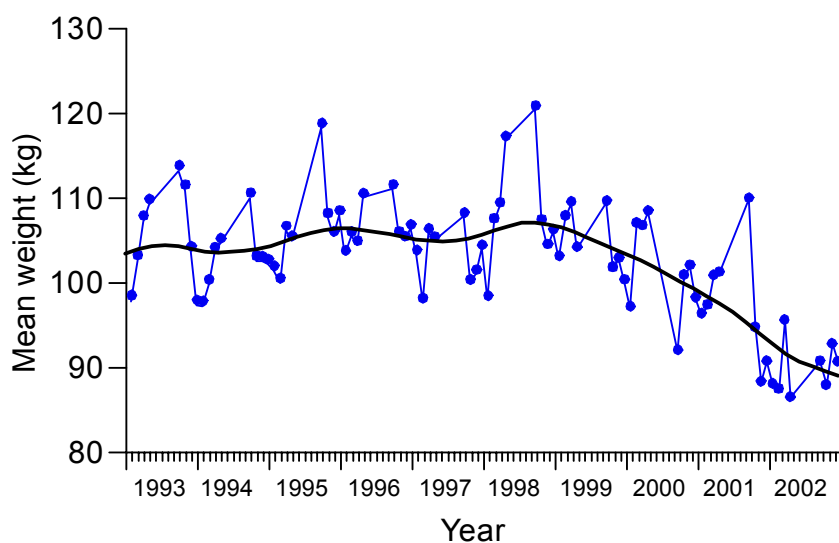


Figure 4.5.4. Mean weight (GGT) of SBT in monthly landings monitored at Bena for the years 1993 to 2002.

Export destinations

The following analysis is based on data from the provincial fisheries office in Denpasar, which in turn are based on records from the Laboratory of Inspection and Quality Control. The data was obtained through Japanese agencies, the Fishery Agency of Japan and the National Research Institute of Far Seas Fisheries, as part the CCSBT Indonesian Catch Monitoring Review Workshop held in Queenstown, New Zealand 10-11 April 2003.

The tuna exported as fresh and frozen by month and year is presented in Table 4.5.2. The largest fraction of tuna is exported as fresh product, usually whole. Exports rose steadily from 14,734 tonnes in 1996 to a peak of 20,411 tonnes in 1999. Since then exports have declined but remain above 18,000 tonnes in 2002.

The countries of destination to which fresh tuna are exported are presented in Table 4.5.3. Japan is the main importer of fresh tuna at 94% (actually about 95% as the 2002 countries category would be mainly Japan). About 1% is also exported to the UK and USA. The countries of destination to which frozen tuna are exported are presented in Table 4.5.4. Japan was the main importer of frozen tuna from Bali up until 1998 but has been second to the USA since then. 34% of frozen tuna exports from Bali go to USA, followed by Japan (27%), Singapore (8%) and the Netherlands (7%). Most frozen tuna is exported as loin, and the majority of export to the USA is frozen loins of yellowfin tuna (Davis and Andamari 2003b).

Table 4.5.2. Tuna (tonnes) exported by month and year from Bali to all countries
[data from provincial fisheries office (Bali) via Fishery Agency of Japan].

Year		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1996	Fresh	802.2	1,088.3	1,280.5	775.3	802.1	648.3	570.1	574.7	875.3	958.4	1,118.5	1,351.4	10,845.2
	Frozen	323.3	329.3	681.3	198.1	344.3	250.5	179.1	186.8	385.7	262.2	394.5	354.0	3,889.2
	total	1,125.5	1,417.5	1,961.8	973.4	1,146.4	898.9	749.2	761.5	1,261.0	1,220.7	1,513.0	1,705.4	14,734.4
1997	Fresh	1,598.1	778.9	527.2	1,524.9	742.4	686.6	834.7	537.3	798.8	795.1	1,220.9	1,310.7	11,355.6
	Frozen	943.9	135.7	150.5	506.0	251.3	161.5	335.2	498.7	463.3	517.2	393.6	213.8	4,570.9
	total	2,542.0	914.6	677.7	2,030.9	993.7	848.1	1,169.9	1,036.0	1,262.2	1,312.3	1,614.5	1,524.5	15,926.5
1998	Fresh	1,247.4	1,023.9	963.3	1,113.8	1,203.2	978.8	1,135.4	1,023.9	1,042.6	1,366.9	985.4	1,397.9	13,482.4
	Frozen	376.7	306.3	524.9	349.3	364.1	236.7	997.1	513.0	891.8	273.9	890.9	458.1	6,183.0
	total	1,624.1	1,330.2	1,488.1	1,463.1	1,567.3	1,215.5	2,132.5	1,536.9	1,934.4	1,640.8	1,876.4	1,856.1	19,665.4
1999	Fresh	1,341.5	1,425.5	1,370.0	1,078.3	1,394.6	1,514.3	1,338.4	820.2	912.1	807.0	1,227.4	1,168.3	14,397.6
	Frozen	457.2	317.0	737.2	346.5	333.9	578.9	555.1	470.4	409.3	435.8	643.4	729.4	6,014.2
	total	1,798.8	1,742.5	2,107.2	1,424.8	1,728.5	2,093.2	1,893.6	1,290.5	1,321.5	1,242.8	1,870.8	1,897.7	20,411.8
2000	Fresh	1,091.4	1,152.4	1,061.6	1,136.3	999.2	1,293.3	926.4	741.6	696.2	551.6	1,129.6	920.7	11,700.1
	Frozen	571.0	576.0	487.4	587.8	930.0	388.3	898.7	954.6	391.6	741.9	323.3	346.1	7,196.6
	total	1,662.4	1,728.4	1,549.0	1,724.1	1,929.2	1,681.5	1,825.0	1,696.2	1,087.7	1,293.5	1,452.9	1,266.7	18,896.7
2001	Fresh	1,344.3	1,294.8	636.1	462.4	557.0	608.6	907.3	844.8	791.6	927.1	946.3	1,351.6	10,671.9
	Frozen	304.0	313.8	240.6	845.3	323.8	433.4	430.3	944.4	761.0	560.2	884.6	560.6	6,601.9
	total	1,648.3	1,608.6	876.7	1,307.7	880.8	1,042.0	1,337.6	1,789.1	1,552.6	1,487.3	1,831.0	1,912.2	17,273.9
2002	Fresh	1,053.6	1,230.9	1,540.9	947.7	625.3	1,013.1	660.7	869.9	746.1	788.9	807.1	837.7	11,122.0
	Frozen	767.3	847.3	622.1	478.7	651.9	386.0	870.2	397.2	559.5	545.5	327.6	436.2	6,889.5
	total	1,820.9	2,078.2	2,163.0	1,426.5	1,277.3	1,399.1	1,530.9	1,267.1	1,305.6	1,334.5	1,134.7	1,273.8	18,011.5

Table 4.5.3. Fresh tuna exports by destination and year
 [data from provincial fisheries office (Bali) via National Research Institute of Far Seas Fisheries, Japan]. "Countries" refers to data in January 2000 in which no destination information was recorded.

Destination	1996	1997	1998	1999	2000	2001	2002	Total
Arab								
Australia	1.4	22.2	6.8	5.0	0.2		1.4	36.9
Belgium	14.6	58.0			0.0			72.7
Brazil								
China			0.4	1.4	2.2	0.5	0.4	4.9
Countries					1,091.4			1,091.4
Denmark								
Finland							0.1	0.1
France	9.1	4.1	5.1			9.2	0.6	28.0
Germany	3.7	1.5	4.1	126.4	20.1	46.5	123.9	326.3
Greece								
Hong Kong	3.1	134.0	40.1	3.8	5.2	3.8	6.1	196.1
Italy			25.9	60.4	0.8		9.2	96.2
Japan	10,427.4	10,844.8	12,982.2	13,600.4	10,334.0	10,124.3	10,386.0	78,699.0
Korea	0.9	0.0		3.9	32.0	2.1	3.1	42.0
Malaysia	1.6	3.0	77.9	92.9	7.0	1.3	0.0	183.8
Netherlands	54.9	54.3	177.0	97.6	26.0	82.9	175.1	667.9
Philippine								
Portugal								
Re Union								
Russia								
Singapore	67.4	36.5	65.9	154.4	36.6	9.4	56.5	426.7
Spain				8.4				8.4
Sweden					1.0	1.5	5.9	8.4
Swiss						27.0	23.2	50.2
Taiwan	22.7	4.4		0.5		5.8	1.3	34.6
Thailand						13.3		13.3
UK	3.6	25.8	12.5	178.1	98.7	296.7	247.9	863.3
USA	234.9	167.0	84.4	64.4	44.8	47.7	81.4	724.7
Grand Total	10,845.2	11,355.6	13,482.4	14,397.6	11,700.1	10,671.9	11,122.0	83,574.9

Table 4.5.4. Frozen tuna exports by destination and year
 [data from provincial fisheries office (Bali) via National Research Institute of Far Seas Fisheries, Japan]. "Countries" refers to data in January 2000 in which no destination information was recorded.

Destination	1996	1997	1998	1999	2000	2001	2002	Total
Arab							0.2	0.2
Australia	8.1	16.5	17.4	15.0	30.8	70.5	8.4	166.7
Belgium	55.0	131.0	115.6	106.3	190.7	190.7	234.0	1,023.2
Brazil		171.1						171.1
China		3.5	6.4	44.2	77.2	58.4	27.6	217.3
Countries					571.0			571.0
Denmark						32.2	88.5	120.7
Finland								
France	29.8	32.7	130.0		33.8			226.3
Germany	109.2	90.2	73.4	245.4	10.0	1.0	62.0	591.3
Greece	12.8	107.8	51.3	9.3		31.5	47.3	259.9
Hong Kong	21.0	106.7	108.8	63.4	47.2	180.1	158.5	685.7
Italy			11.5	63.1	245.5	200.0	77.4	597.5
Japan	2,146.6	1,286.4	2,178.1	1,531.5	1,172.8	1,456.5	1,272.8	11,044.8
Korea	35.7				26.1	16.5		78.2
Malaysia	19.3	0.5	26.1	21.5	87.2	141.8	11.5	307.9
Netherlands	89.0	113.7	703.7	584.4	296.2	513.0	487.8	2,787.8
Philippine	0.7	37.7	62.5	38.4			10.7	150.0
Portugal					6.7			6.7
Re Union			45.0		10.3	10.0		65.3
Russia							2.6	2.6
Singapore	680.2	1,031.6	798.3	234.6	319.1	105.7	218.0	3,387.5
Spain		52.3	19.2	150.7	419.1	392.7	463.4	1,497.4
Sweden						35.7	11.9	47.6
Swiss								
Taiwan	90.9	208.7	298.2	256.2	225.3	31.3	117.8	1,228.4
Thailand		336.6	18.5	333.6	174.0	75.9	101.4	1,040.1
UK	84.4	104.0	167.8	256.1	100.3	108.1	52.7	873.4
USA	506.5	740.0	1,351.0	2,060.4	3,153.2	2,950.3	3,435.0	14,196.5
Grand Total	3,889.2	4,570.9	6,183.0	6,014.2	7,196.6	6,601.9	6,889.5	41,345.2

Trends in export tuna

There have been dramatic shifts in the fraction of tuna that has been graded as export quality at processors since the start of monitoring in 1993 (Figure 4.5.5). Bigeye tuna has always had the highest fraction of export grade followed by

yellowfin and southern bluefin tuna. The difference between bigeye tuna and yellowfin has reduced with time and both have a lower fraction of export grade in 2002. The fraction of export grade southern bluefin tuna has dropped steadily from the start of monitoring, with an accelerated decrease in export grade after 2000. The fraction of export grade southern bluefin tuna was only 0.16 in 2002 whereas it was 0.66 in 1993. It is likely that the drop in fraction is a result of more stringent grading in recent years. Part of this may be due to the introduction of the Trade Information Scheme in June 2000 by CCSBT. This may have impacted on the export of southern bluefin tuna due to the additional scrutiny and documentation involved in export. Additionally, market pressure has made the export of southern bluefin tuna less profitable for the Bena longline fishery than before and may have led to the reduced fraction of product graded for export.

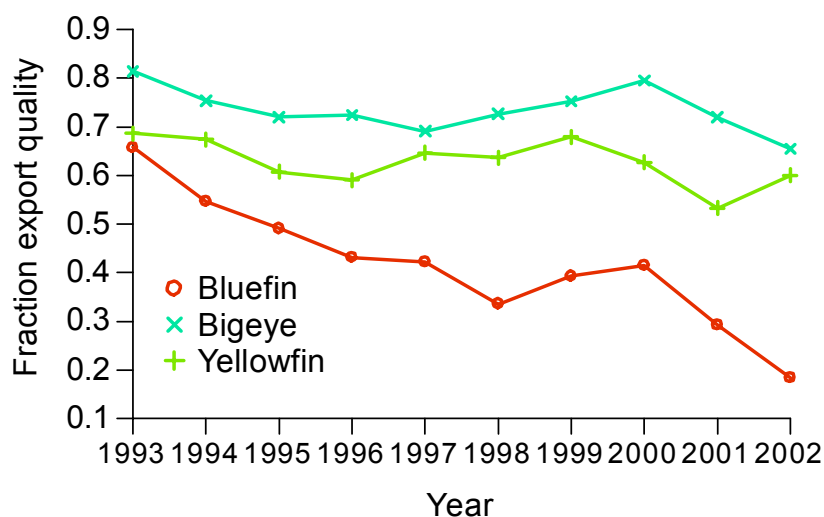


Figure 4.5.5. Fraction of processed tuna graded as export quality by year and species.

4.5.2 Muara Baru

We did not attempt a detailed analysis (as presented for Bena) of the species composition of catches of tunas and tuna-like species landed at Muara Baru, primarily because of the aggregation of tuna species into a single category “Tuna” in the available production statistics, and the known limitations of the methods used to compile those statistics (see Section 6). Since August 2002, the IOTC/RCCF/RIMF/CSIRO port-based monitoring program, mentioned above for Bena, has also been sampling catches unloaded and processed at Muara Baru and Cilacap. At time of writing this review, the results from the first year of this program were still being analysed by IOTC.

Annual production statistics are reported by two offices for Muara Baru: 1. DGCF, from quarterly reports provided by the provincial office of Animal Husbandry, Fisheries and Marine Affairs (*Dinas Peternakan, Perikanan dan Kelautan Propinsi DKI Jakarta*), and 2. Port Authority (PPSJ) – see Section 6 for description of data collection and reporting methods.

DGCF statistics^{SS1, SS4} (Table 4.5.5) show a significant fall in “tuna” production at Muara Baru (province DKI Jakarta) in recent years - from almost 12000 tonnes in 1999 down to 7506 tonnes in 2000 and 7611 tonnes in 2001. The figures for skipjack, which are listed as caught by longline vessels, show a steady increase from 411 tonnes in 1996 up to 2468 tonnes in 2000, but then a dramatic decline to only 238 tonnes in 2001. The majority of tongkol and tenggiri landed at Muara Baru are caught by drift gill-net vessels.

Table 4.5.5. Production (MT) of tuna and tuna-like species at Muara Baru, 1993-2001. Source: Annual production statistics – Dinas Peternakan, Perikanan dan Kelautan Propinsi DKI Jakarta^{SS1, SS4}. “Tuna” includes albacore, yellowfin, and bigeye tunas, together with marlin, swordfish, and sailfish species.

Year	Tuna	Skipjack	Tongkol	Tenggiri
1996	13786	411	10268	4328
1997	17840	770	11341	4176
1998	9741	834	10580	2851
1999	11995	1046	14513	4949
2000	7506	2468	15928	3860
2001	7611	238	10231	3066

The production totals for “tuna” reported by PPSJ^{SS3} for 1997-2001⁷ (Table 4.5.6) are significantly higher (by 10-60%) than those reported by the DGCF for the same period. There is also relatively little variability in the annual totals for “tuna” compared to that in the DGCF figures. According to PPSJ, total production of “tuna” has fluctuated between 17.4 and 20.3 thousand tonnes over the past 5 years, (peak being in 1999).

Table 4.5.6. Production (MT) of tuna and tuna-like species at Muara Baru, 1997-2002. Percent data are percent of total “tuna” production. Source: PPSJ annual production statistics^{SS3}. “Tuna” includes albacore, yellowfin, and bigeye tunas, and export components include marlin, sailfish, and swordfish species.

Year	Tuna						Skipjack	Tongkol	Tenggiri	
	Fresh export	%	Frozen export	%	Reject	%				Total
1997	5500	27.8	3000	15.1	11319	57.1	19819	404	8671	1951
1998	5653	30.6	3247	17.5	9603	51.9	18503	473	6557	1893
1999	7185	35.4	5218	25.7	7881	38.9	20284	711	8869	2872
2000	8273	47.4	5474	31.3	3714	21.3	17461	1377	7036	1834
2001	7519	38.9	6368	33.0	5423	28.1	19310	62	2377	798
2002	9532	54.6	4744	27.2	3195	18.2	17471	385	2705	1123

DGCF production totals for skipjack, tongkol, and tenggiri are significantly higher than those reported by PPSJ. It is likely the former includes fish that are transported to Muara Baru by land from other areas, whereas the production

⁷ At time of writing, 2002 statistics were not available from DGCF nor the DKI Jakarta provincial fisheries office for comparison to PPSJ statistics for the same year.

statistics of PPSJ, for these species, are only for fish landed from vessels at Muara Baru.

PPSJ statistics show a trend of increased proportion of fresh export product between 1997 (27.8%) and 2002 (54.6%). The proportion of reject tuna has shown a general decline over the same period – 57% in 1997, and only 18.2% in 2002. These trends are not consistent with the decline in proportion of export quality product (yellowfin, bigeye, and SBT) seen at Bena (described in Section 4.5.1) over the same period and the reason for this difference is unclear.

PPSJ also reports statistics for frozen “tuna” transhipped by foreign (primarily Japanese) longline vessels at Muara Baru – 1789 tonnes in 1999 and 1259 tonnes in 2000. The catch origins of these fish are not known.

PPSJ annual statistics^{SS3} include amount of fresh and frozen “tuna” exported to destination countries, based on the reports it sources from the Laboratory of Inspection and Quality Control (see Section 6). According to PPSJ reports for 1999 and 2000 (Table 4.5.7), Japan was the main importer of fresh tuna product from Muara Baru – 62.1% of total fresh exports in 1999, and 61.3% in 2000. The next largest importers of fresh tuna product were Singapore (15.4%, 26.9%) and UK (15.0%, 5%). In 1999 the Netherlands were shown as the highest proportion (41.8%) destination for frozen tuna product, with USA second (25.9%) and Japan (25.7%). However, for 2000 Singapore appears as the biggest (45.5%) importer of frozen product, followed by Japan (20.5%) and USA (20.2%).

Table 4.5.7. Export destination of fresh and frozen tuna product from Muara Baru, 1999 and 2000.

Data in tonnes. Source: PPSJ annual statistics^{SS3}.

Destination Country	1999				2000			
	Fresh	%	Frozen	%	Fresh	%	Frozen	%
Australia	13.5	0.2	8.1	0.2	6.2	0.1	0.4	<0.1
Austria	-	-	-	-	10.8	0.1	-	-
Belgium	0.5	<0.1	-	-	-	-	101.8	1.9
Canada	-	-	0.4	<0.1	-	-	-	-
China	2.4	<0.1	-	-	0.5	<0.1	0.6	<0.1
Denmark	-	-	11.8	0.2	-	-	70.4	1.3
France	122.2	1.7	48.2	0.9	11.1	0.1	4.1	.1
Germany	76.9	1.1	-	-	62.7	0.8	10.2	.2
Greece	-	-	-	-	-	-	26.0	.5
Hong Kong	2.4	<0.1	5.2	0.1	12.3	0.1	75.8	1.4
Italy	-	-	-	-	3.0	<0.1	23.0	.4
Japan	4458.3	62.1	1339.1	25.7	5073.2	61.3	1120.3	20.5
Korea	0.9	<0.1	-	-	0.4	<0.1	34.9	.6
Malaysia	0.6	<0.1	-	-	1.5	<0.1	11.7	.2
Netherlands	229.9	3.2	2182.4	41.8	320.4	3.9	103.2	1.9
Philippines	-	-	15.2	0.3	-	-	14.3	.3
Puerto Rico	-	-	-	-	-	-	14.5	.3
Singapore	1106.9	15.4	63.6	1.2	2228.4	26.9	2491.0	45.5
Spain	16.0	0.2	25.1	0.5	4.2	0.1	59.0	1.1
Sri Lanka	-	-	-	-	0.3	<0.1	-	-
Sweden	-	-	0.5	<0.1	6.5	0.1	8.3	.2
Taiwan	16.0	0.2	-	-	11.0	0.1	11.4	.2
Thailand	0.1	<0.1	-	-	-	-	21.6	.4
UK	1075.0	15.0	165.8	3.2	410.8	5.0	166.2	3.0
USA	61.4	0.9	1352.4	25.9	109.6	1.3	1105.8	20.2
Total	7185	100	5218	100	8273	100	5474	100

4.5.3 Cilacap

According to production statistics of PPSC Port Authority^{SS7,SS8} (Table 4.5.8), “tuna” (yellowfin and big-eye) and skipjack make up the majority of pelagic species landed at Cilacap (82% in 2002). Albacore, marlin, sailfish, swordfish, tenggiri, tongkol, dolphinfish (lemadang) and sharks make up the remainder. The volume of landings of the large “tunas” at Cilacap increased dramatically between year 1996 (217 tonnes) and year 2001 (2,113 tonnes) as the number of longline landings increased – from 252 landings in 1998 to 3,773 in 2001. During 2000 and 2001 the volume of “tuna” landings was higher than that of

skipjack, but during 2002 the trend was reversed and there was almost twice as much skipjack landed compared to “tunas” (2,827 tonnes and 1,489 tonnes, respectively). The reason for this trend reversal is unclear. The volume of “jabrik” (juvenile tuna, <3 kg) landed at Cilacap has decreased dramatically in recent years (less than 50 tonnes in 2000 to 2002, compared to 241 - 1,481 tonnes in 1995 to 1999). The reason for this decline is also unclear but, if accurate, is cause for concern.

Albacore tuna continues to make up only a small percentage (86 tonnes in 2002, 1.6% of total landings of pelagic species by volume). Surprisingly very few adult SBT are landed at Cilacap. Only 5 individual SBT were recorded during PPSC/RIMF monitoring during August 2001 to April 2002 (Rianto pers. comm.). The fishing area of the Cilacap-based longline vessels is at the western end of the SBT spawning zone and this may account for the low incidence of SBT captures.

Table 4.5.8. Production (tonnes) of tuna and tuna-like species at Cilacap, 1995-2002.
Source: PPSC^{SS7,SS8}

	Tuna	Juv. Tuna <3kg (Jabrik)	Albacore	Skipjack	Marlin, Sailfish (Layaran)	Swordfish (Meka)	Tenggiri
1995	0	589	0	4986	558	0	13
1996	217	267	0	5199	485	0	48
1997	297	1481	44	9263	490	0	37
1998	567	421	77	4118	425	0	5
1999	997	241	231	2000	381	0	5
2000	1648	44	150	1341	318	5	3
2001	2113	22	151	1139	242	88	2
2002	1489	45	86	2827	309	96	25