5. ARTISANAL FISHERIES

There is no universal definition of "artisanal fisheries" but common criteria (SEAFDEC 1999) include 1. Small scale and often decentralized operations, 2. A predominance of small vessels (often <10 GT), 3. A predominance of traditional fishing gears (but may include trawl, seine, gill-net, and longline vessels), 4. Fishing trips are generally short and inshore, and 5. The fisheries are often largely subsistence fisheries, but there may be some commercial component. The ports surveyed for the artisanal component of this report only meet these criteria to varying degrees, with some being home to many vessels >10 GT, and with centralized commercial operations. However, for the purposes of this study, "artisanal ports" includes not only the smallest scale of landing place at the fishing village level (i.e. what most readers would consider truly artisanal), but also these larger landing places where fishing vessels are primarily owned by fishing households, but not by fishing companies, and where the majority of vessels are smaller than 25 GT.

A summary of key features of the artisanal landing places surveyed are shown in Table 5.0.1. More detailed descriptions are provided in the sections that follow.

5.1 Bungus – Padang, Pariaman, and Painan (West Sumatra)

There are 5 provinces on the west coast of Sumatra – from north to south, the provinces of Nanggroe Aceh Darussalam (formerly Daerah Istimewa Aceh), North Sumatra (Sumatra Utara), West Sumatra (Sumatra Barat), Bengkulu, and Lampung. Numerous islands are located off this coast - Banyak Archipelago islands in the north, Nias Island, Tanahmasa and Tanahbala Islands, the Mentawai Islands (that include Siberut, Sipura and Pagai Islands), and Enggano Island in the south.

The district of Padang consists of 6 coastal sub-districts (i.e. kecamatan) that are spread along 84 km of coastline. These sub-districts are: (1) Kecamatan Bungus Teluk Kabung, (2) Lubuk Begalung, (3) Padang Selatan, (4) Padang Barat, (5) Padang Utara, and (6) Koto Tengah. The fishing port in Bungus, located 16 km south of Padang, is the largest fish landing site on the west coast of Sumatra (Figure 5.1).

Development of Bungus fishing port began in 1981, as part of a fisheries development project for Sumatra (Sumatra Fisheries Development Project) as a whole. The port was officially operated and managed by a special technical unit under the Directorate General of Fisheries. In 1993, the port was declared a main facility to support fishing boats operated in Indonesia EEZ and to provide facilities for exporting fresh tuna and fresh tuna product such as loin and steak (Bungus is 27 km from Tabing Airport). The fishing port of Bungus is actually classed as a Class A port ('Ocean Fisheries Port'), the same class as Muara Baru, Benoa and Cilacap. However, the perceived potential of Bungus as an export centre for fresh tuna product has not been realised. The majority of tuna caught and landed in the ports along the West Sumatra coast are small and their landed condition too poor to support an export industry.

Figure 5.1. Sumatra, showing provinces and the location of 3 of the artisanal ports surveyed for this review - Padang (Bungus), Pariaman, and Painan. NAD = Nanggroe Aceh Darussalam. Red line marks the boundary of the Indonesian EEZ.

Pariaman is located approximately 90 km to the north of Padang in the district of Pariaman. Painan is located 76 km to the south of Padang in the district of Pesisir Selatan. Both these places, by comparison to Bungus, are relatively small landing places, Class D ('Fish Landing Centre'), but are the largest landing places within their respective districts. Characteristically, coastal districts will support a large number of coastal villages, but only a few have landing centre facilities such as a wharf or central auction facility (TPI). Painan is a good example. Of the 9 subdistricts that make up the district of Pesisir Selatan (that includes 43 coastal villages) only two subdistricts have a wharf and/or TPI (Figures 5.2 and 5.3). In the other subdistricts, fishing vessel landings are directly onto the beach.

Figure 5.2. Fishing vessel unloading wharf at Painan (Carocok Tarusan).

Figure 5.3. Fish auction place (TPI) at Painan (Carocok Tarusan).

Table 5.0.1. Summary of characteristics of the artisanal landing places surveyed.
Landings data are based on most recent available production statistics.

Port	**Bungus/ Padang**	**Pariaman**	**Painan**	**Pelabuhanratu**	**Prigi**	**Jimbaran/ Kedonganan**	**Ende**	**Kupang**
Classification	*PPS/Type A*	*PPI/Type D*	*PPI/Type D*	*PPN/Type B*	*PPN/Type B*	*PPI/Type D*	*no classif.*	*PPP/Type C*
Province – District	Sumatera Barat – Padang	Sumatera Barat – Pariaman	Sumatera Barat – Pesisir Selatan	Jawa Barat – Sukabumi	Jawa Timur – Trenggalek	Bali – Badung	Nusa Tenggara Timur – Ende	Nusa Tenggara Timur – Kupang
Primary fishing gears	Troll-line, liftnet, bottom longline	Troll-line	Troll-line, long-line, lift net, boat seine	Boat seine, drop-line, drift gill-net & longline	Purse seine, boat seine, gillnet (shrimp)	Gill-net (shrimp), troll-line	Hand-line, troll-line, drift gill-net	Troll-line, hand-line, purse seine, drift & bottom gillnet, pole & line
Vessel size (GT)	Majority 5-10, some <5, or 10-20	Majority <5 (non-motor)	Majority <5, some 5-10	Majority <10, some <30	Majority <10, some <30	Majority <5 (non-motor), some 5-10 (motor)	Majority <5 (non-motor & motor)	Majority <10, some <30GT
Annual fish landings (tonnes)	**10285** (district 2001) [SS9]	**9187** (district 2002) [SS10]	**4200** (district 2002) [SS11]	**1300** [SS12] (fishing port 2001)	**10866** (fishing port 2001) [SS13]	**700** (district 2000) [SS14]	**7250** (district 2000) [SS15]	**12070** (fishing port 1999) [SS16]
Annual “tuna” landings (tonnes)	**2700**[++] (fishing port 2001) [SS17]	**2690**[+] (district 2002) [SS10]	**2500** (district 2002) [SS11]	**100** [SS12] (fishing port 2001)	**138** (fishing port 2001) [SS13]	**150** (district 2000) [SS14]	**770** (district 2000) [SS15]	**2500** (fishing port 1999) [SS16]
Primary species landed (pelagics only)	Skipjack Yellowfin* Tongkol	Skipjack Yellowfin* Tongkol	Skipjack Yellowfin* Tongkol	Skipjack Yellowfin* Tongkol	Small pelagics Skipjack Tongkol Yellowfin*	Skipjack Yellowfin* Tongkol	Skipjack Yellowfin* Tongkol Scads	Small pelagics Skipjack Tongkol Yellowfin*
Main fishing areas	Mentawai Strait & Islands	Mentawai Strait & Islands	Mentawai & Pagai Islands	Southcoast of western Java & westcoast of southern Sumatra	South coast of eastern Java	South of Bali & eastern Java	Savu Sea	Savu Sea & south of Timor & Savu Islands
Primary markets	Local markets & processing	Local markets & processing	Local markets & processing	Local markets & processing, some quality tuna & skipjack to Jakarta	Local markets & processing	Local markets & processing units	Local markets & processing	Local markets & processing

[++]Includes skipjack and tongkol. [+]Includes tongkol. **[SS9 – SS17]** See refs (Section 8) for sources. *Yellowfin juveniles.

Troll-line, boat seine, lift-net, and drift gill-net are the predominant fishing gear types in West Sumatra Province. The lift-net, boat seine and gill-net boats target the small pelagic species including tongkol, trevallies, and Spanish mackerel. The troll-line fleets operate in 3 of the 5 districts within province – Padang, Pariaman, and Pesisir Selatan (Table 5.1.1), and primarily target skipjack and yellowfin tuna. In 2000 there were around 972 troll-line vessels registered in West Sumatra province[SS18], and about half are based in Bungus.

Table 5.1.1. Vessel type in Province of West Sumatra during 2000. (Source: Dinas Perikanan dan Kelautan Propinsi Sumatera Barat[SS18]).

District	Troll line	Boat seine	Liftnet	Drift gillnet
Padang	472	101	273	156
Padang Pariam	384	334	102	938
Pesisir Selatan	116	388	312	183
Agam	-	41	101	-
Pasaman	-	58	143	241
Total	972	922	931	1518

The fishing fleets are dominated by small vessels up to 5 GT, and a large proportion of these are non-motorised or powered by outboard motor. Many are locally made 'dug-out' wooden boats, called "*jukung*", with double-outriggers and wooden 'plank-built' boats collectively called "*perahu papan*". Vessels with in-board engines range up to 25 GT in size, but the majority are smaller than 10 GT (Table 5.1.2).

Table 5.1.2. Number of boats of each type in fishing fleets by district in the Province of Sumatra Barat. (Source: Dinas Perikanan dan Kelautan Propinsi Sumatera Barat[SS18]).

District	Non-motor	Outboard motor	Inboard motor			
			<5 GT	5-10 GT	10-20 GT	20-30 GT
Pesisir Selatan	796	589	279	38	-	-
Padang Pariaman	1542	458	-	157	-	-
Padang	393	546	81	423	-	-
Agam	556	49	38	86	-	-
Pasaman	1,112	54	142	82	99	6
Total	4399	1696	540	786	99	6

The region of the Indian Ocean off west coast of Sumatra is considered an important fishing ground for large tunas, and tuna longline vessels from both Muara Baru and Benoa have been known to fish this area (Marcille *et al.* 1984, Uktolseja *et al.* 1997). However, for small scale fishermen of the provinces of West Sumatra, the primary fishing areas are the closer in-shore areas within the Mentawai Strait and the waters around the Mentawai Islands and the other island groups (Rawita 1997).

The length of fishing trips is very much determined by the size of vessel. Generally, the small non-motorised or out-board powered vessels fish for only a day or two before returning to shore. The larger in-board engine vessels can

range further, particularly those with a capacity to carry ice, and many will stay out for one to three weeks. The number of fishing vessel landings at Bungus Fishing Port during 1989 – 2001 (Table 5.1.3) show a relatively even rate of landing through the year, i.e. there are no obvious seasonal peaks in activity. The mean number of landings per month was around 300 in 2001, compared with 217 per month in 2000, and 288 per month in 1999.

Table 5.1.3. Number of catch landings by fishing vessels in Bungus Fishing Port, by month during 1989-2001. (Source: Dinas Perikanan dan Kelautan Propinsi Sumatera Barat[SS18]).

	Year												
Month	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
January	396	369	336	353	321	304	202	334	314	326	208	142	291
February	361	387	365	330	258	271	259	237	181	176	297	135	304
March	390	471	377	420	203	207	226	281	347	258	317	124	343
April	385	414	200	243	202	173	314	299	347	284	304	134	358
May	267	361	332	360	240	350	291	292	311	236	331	135	345
June	396	443	332	341	290	282	296	324	277	256	369	135	327
July	435	412	334	363	300	239	321	302	274	231	363	188	335
August	380	312	341	342	256	272	334	300	307	263	357	192	294
September	359	406	335	351	387	226	293	308	259	224	358	341	256
October	382	325	341	348	273	278	312	282	269	243	295	391	306
November	407	342	328	362	386	247	294	297	282	245	164	343	243
December	403	376	351	395	407	278	317	301	297	317	74	348	188
Total	4561	4618	3972	4208	3523	3127	3459	3557	3465	3059	3457	2608	3590

According to the 2000 fisheries statistics (Table 5.1.4) for Province of West Sumatra[SS18] almost 70% of the three primary tuna groups, “tuna”, “skipjack” and “tongkol” were caught by troll-line vessels.

Table 5.1.4. The ten most important fishing gear for catching tuna, skipjack and tongkol in Sumatra Barat. (Source: Dinas Perikanan dan Kelautan Propinsi Sumatera Barat 2000[SS18]). Data are in tonnes.

Gear Type	Tuna	Skipjack	Tongkol	Total	Percent
Troll line	4702	8565	3898	17165	68
Boat seine	258	279	3498	4036	16
Handline	303	841	347	1491	6
Boat/raft lifnet	67	56	985	1108	4
Purse seine	87	185	414	685	3
Beach seine	78	65	124	267	1
Bottom longline	118	54	0	172	1
Drift gillnet	33	34	99	167	1
Trammel net	30	70	38	138	1
Bottom gillnet	40	10	88	137	1
Total	5716	10158	9491	25364	100

No information is available on the species makeup of the "tuna" category as species data are aggregated during the collection and reporting process (see Section 6). However, observations made and information obtained during surveys for this report suggest that the majority of "tuna" are juvenile yellowfin (often reported as "baby tuna"). However, it is possible, given the difficulties of discerning between juveniles of yellowfin and bigeye tunas, that significant numbers of the latter species are also caught.

In 2000 for the West Sumatra Province[SS18] "tuna" contributed 22% of the total catch of the three species groups (Table 5.1.5). Both skipjack and tongkol each made up around 50% of the remainder. The districts of Pariaman and Padang contributed 45% and 38% respectively of the total production of the three pelagic groups combined.

Table 5.1.5. Production of tuna, skipjack, and tongkol (tonnes), West Sumatra Province for year 2000. (Source: Dinas Perikanan dan Kelautan Propinsi Sumatera Barat 2000[SS18]).

District	Tuna	Skipjack	Tongkol	Total	Percent
Pariaman	1969	3858	5729	11556	45
Padang	2842	5116	1723	9681	38
Pasaman	341	399	1529	2269	9
Pesisir Selatan	508	729	371	1607	6
Agam	56	56	212	323	1
Total	5716	10157	9564	25437	100
Percent	22	40	38	100	

According to the provincial production statistics, the total catch of "tuna" increased steadily from around 3,700 tons in 1989 to around 8,660 tons in 1997. In 1998, the tuna production figure increased dramatically to around 17,840 tons but then declined, equally dramatically, to 6703 and 5716 tons in years 1999 and 2000 respectively (Table 5.1.6). The production figures of skipjack and tongkol do not show any dramatic changes during the same period, just steady

increases in both from around 7,000 tons to around 10,000 tons. No information was available to explain the dramatic rise in "tuna" production for that one year.

Table 5.1.6. Fish production of West Sumatra Province (tonnes) for period 1989-2000 (Source: Production statistics DGCF 2000[SS4,SS19]).

Year	Tuna	Skipjack	Tongkol	Other fish	Total
1989	3701	7101	7356	6278	24436
1990	3908	7499	7767	6630	25804
1991	3341	8941	9533	32612	54428
1992	5488	5898	6396	40890	58672
1993	3135	4699	4874	51708	64415
1994	5095	6719	6053	51381	69248
1995	6816	7421	6587	49928	70752
1996	6323	8157	7210	55993	77683
1997	8664	9118	7996	60039	85818
1998	17844	9392	8903	62590	98730
1999	6703	11017	11301	60132	89154
2000	5716	10158	9564	66827	92265

In year 2000[SS19] the province of Sumatra Barat accounted for around 57% of the production of "tuna", skipjack, and tongkol (combined) within the 5 provinces that make-up the West Sumatra coastal area (as defined by DGCF) (Table 5.1.7). This again reflects the importance of Padang (i.e. Bungus) and Pariaman as the major landing places for these pelagic species groups on the western Sumatra coast.

Table 5.1.7. Production statistics (tonnes) for major pelagic groups in the five provinces that comprise the West Sumatra coastal area. (Source: Production statistics DGCF 2000[SS19]).

Province	Tuna	Skipjack	Tongkol	Total
D.I. Aceh	1898	2975	4977	9850
Sumatera Utara	1802	2400	3072	7274
Sumatera Barat	5718	10157	9494	25369
Bengkulu	339	228	252	819
Lampung	445	420	491	1356
Total	10202	16180	18286	44668

The average catch per trip for troll-line vessels, based on data (Table 5.1.8) available from one of the auction centres (TPI Muara Pariaman) in District Pariaman during 2001 and 2002 was around 200 kg. This is total catch data, and weight proportion for each species is unknown (however, as reported above, the likely proportion of "tuna" is around 20%).

Table 5.1.8. Number of fishing vessel (troll-liners) landings and fish production at TPI Muara Pariaman during 2001 and 2002. (Source: Dinas Perikanan dan Kelautan Kabupaten Padang Pariaman[SS20]).

Year	Month	Number of landings	Production (kg)	Production /boat(kg)
2001	Jan	17	4245	250
	Feb	42	9210	219
	Mar	51	11635	228
	Apr	39	7172	184
	May	42	8357	199
	Jun	53	12611	238
	Jul	40	8269	207
	Aug	48	11635	242
	Sep	36	8252	229
	Oct	38	6800	179
	Nov	25	5362	214
	Dec	10	2734	273
	Total	441	96282	218
2002	Jan	53	12281	232
	Feb	27	6204	230
	Mar	35	11235	321
	Apr	10	1935	194
	May	9	2169	241
	Jun	na	na	na
	Jul	16	3116	195
	Aug	15	2668	178
	Sep	29	5111	176
	Oct	15	3256	217
	Total (9 mths)	209	47975	230

5.2 Pelabuhanratu (West Java)

Pelabuhanratu is a subdistrict within the district of Sukabumi, one of the six coastal districts on the south of Jawa Barat (West Java) and Banten provinces. The subdistrict is about 180 km from Bandung, the capital of Jawa Barat Province. The fishing port of Pelabuhanratu is located on the coast of Pelabuhanratu Bay. The port underwent development during 1991-1993 and is now a Class B fishing port (Archipelago Fishing Port). It has facilities to accommodate fishing vessels up to 60 GT. It is under the management of DGCF.

In common with the West Sumatra ports, “tuna”, skipjack, and tongkol are the three most important to fishers operating out of Pelabuhanratu. These pelagics

are mainly caught by boat seine (payang), drop lines, and drift gill-nets. The majority of vessels[SS12] are less than 10 GT, but there are some as large as 30-50 GT (Table 5.2.1). The number of in-board powered vessels in the 5-10 GT size class showed most growth during the period 1993-2000. Pelabuhanratu is also home to many unpowered or out-board powered *jukung* and *perahu*. The unpowered vessels are not included in reports from the Port Authority. All the fishing vessels in Pelabuhanratu are constructed of wood and are locally made.

Table 5.2.1. The number of marine fishing vessels based at Pelabuhanratu, 1993 to 2000 (Source: PPN Pelabuhanratu 2001[SS12]).

Year	Type of boat					Total
	Fishing boat with outboard	Fishing boat with inboard engine				
		<10 GT	11-20 GT	21-30 GT	>30 GT	
1993	342	42	9	14	13	420
1994	344	40	23	22	16	445
1995	352	37	40	17	15	461
1996	365	51	30	30	12	488
1997	290	60	30	14	12	406
1998	275	112	13	12	9	421
1999	278	112	13	12	9	421
2000	235	147	11	12	11	416

The gill-net vessels generally use nets of 4.5-5.5 inch mesh. The number of fishers on each vessel is usually 3-5 persons. While drifting, some gill-net fishers also deploy longlines for catching shark or billfish.

The seine net or payang vessels are generally around 5 GT in size, powered by outboard motors of around 40 HP. The catch are mostly pelagic species, such as skipjack, tongkol, banjar (*Rastrelliger* sp), tembang (*Clupea* sp), tenggiri (*Scomberomorus* sp), and scads (*Decapterus* sp). “Tuna” (primarily juvenile yellowfin) are caught occasionally.

According to production statistics from the Pelabuhanratu Port Authority [SS12] (Table 5.2.2), the amount of “tuna”, skipjack, and tongkol landed in the port during year 2000 was 105, 725, and 479 tons respectively. “Tuna” were landed throughout the whole year, without any obvious seasonality (Table 5.2.3).

Table 5.2.2. Production (tonnes) of tuna, skipjack, and tongkol in Pelabuhanratu 1996-2000 (Source: PPN Pelabuhanratu 2001[SS12]).

	Year				
Fish	**1996**	**1997**	**1998**	**1999**	**2000**
Tuna	125	393	194	178	105
Skipjack	1549	1290	700	577	725
Tongkol	521	1090	468	545	479
Total	2195	2773	1361	1300	1308

Table 5.2.3. Monthly production (tonnes) of tuna landed in Pelabuhanratu 1996-2000 (Source: PPN Pelabuhanratu 2001[SS12]).

Month			Year		
	1996	**1997**	**1998**	**1999**	**2000**
January	10.6	13.6	18.5	12.8	1.0
February	11.0	6.2	13.7	11.0	6.6
March	14.1	14.4	18.7	6.7	7.3
April	12.1	11.0	13.8	8.6	4.6
May	17.0	8.2	17.6	8.7	5.2
June	8.0	10.5	9.8	7.7	10.9
July	12.9	31.5	6.6	24.5	8.4
August	7.7	57.6	6.6	15.1	10.1
September	6.7	47.8	46.0	28.0	11.4
October	4.2	51.9	15.0	43.3	21.0
November	9.1	56.1	8.3	6.8	11.4
December	11.4	84.6	19.2	4.7	6.6
Total	124.9	393.2	193.7	178.0	104.6

5.3 Prigi (East Java)

Prigi is located in the subdistrict of Watulimo, within the district of Trenggalek, which is one of eight coastal districts within the Province of Jawa Timur (East Java). The Prigi Fishing Port began operations in 1982, as a Class C fishing port, but it has since grown to be one of the eleven Class B (Archipelago Fishing Port) fishing ports in Indonesia under management of DGCF.

Fishing fleets in Prigi are characterized by small scale-artisanal fishing units (Table 5.3.1), most geared to catching demersal fish and prawns. However, there are a significant number (104 in year 2001) of purse seine boats that contribute to local fish production (Table 5.3.2). Duration of the purse seine vessel fishing trips is normally only one day, and the primary fishing grounds are the waters along south coast of east Java. The main catch of the purse seine fleets are small pelagic species, dominated by skipjack, tongkol, and scads (*Decapterus sp.*), but "tuna" (mainly juvenile yellowfin) are occasionally caught.

Table 5.3.1. Fleet structure of fishing vessels in Trenggalek District (Source: Dinas Perikanan dan Kelautan Propinsi Jawa Timur 2001[SS21]).

Type of boat	Year				
	1996	1997	1998	1999	2000
Non-motor	597	701	666	782	549
Outboard motor	506	511	384	499	623
Inboard motor	94	94	80	87	101

Table 5.3.2. Type and number of vessels in Trenggalek District, 1991 – 2001 (Source: Dinas Perikanan dan Kelautan Propinsi Jawa Timur 2001[SS21]).

Type of	Year										
fishing gear	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Boat seine	3	25	8	8	8	8	8	8	8	33	23
Purse seine	71	71	70	72	77	81	82	80	87	101	104
Beach seine	62	63	61	62	63	60	53	33	35	62	63
Gillnet	62	62	60	35	35	28	35	25	25	8	8
Trammel net	62	62	82	101	101	96	121	25	25	165	725
Shrimp gillnet	223	223	248	256	256	250	224	327	327	339	1620
Lift-net	20	20	20	20	20	20	20	20	20	2	2
Bottom longline	16	16	16	16	16	16	16	16	16	16	16
Handline	647	647	631	611	611	600	581	555	555	495	1247
Total	1163	1164	1188	1173	1179	1151	1132	1081	1090	1188	3785

The purse seines are operated day or night by 20-25 fishermen using two boats, one for shooting and the other for pursing the lower edge of the net. The purse seine boats can hold 10-15 tons of fish. The fishers are generally not too concerned about maintaining the quality of their fish, as most of the catch goes directly to fish processing for boiled, salted and fermented product (*pindang*).

According to production statistics of East Java Province, the amount of "tuna" landed annually in Trenggalek District is highly variable (Table 5.3.3), e.g. 135 tons in 2000 but only 40 tons in 2001. The variability across years in production of all species groups is highly questionable and most likely the result of data collection procedures (see Section 6) rather than true catch variability.

Table 5.3.3. Annual production (tonnes) of tuna, skipjack, tongkol, and scads in Trenggalek District, 1991-2001
(Source: Dinas Perikanan dan Kelautan Propinsi Jawa Timur 2001[SS21]).

Year	Tuna	Skipjack	Tongkol	Scads
1991	38	685	627	577
1992	28	67	338	237
1993	9	72	504	531
1994	6	18	-	3618
1995	16	12	511	861
1996	13	750	2743	236
1997	40	64	1162	730
1998	1	-	630	67
1999	45	48	5320	7527
2000	135	17	1728	3580
2001	40	40	966	1714

DGCF year 2000 production statistics for the whole of East Java Province show 229 tonnes of "tuna", 388 tonnes of skipjack, 9387 tonnes of tongkol, and 7913 tonnes of scad.

5.4 Kedonganan and Jimbaran (Bali)

The landing centres of Kedonganan and Jimbaran are close to each other on the western side of south Bali, within the province of Badung. Both are Class D (Fish Landing Centre) landing places, and do not have wharf facilities. All landings are made directly onto the beach (Figure 5.4). Throughout Indonesia there are 477 Class D landing places listed under management of DGCF (DGCF web-site 2003).

Figure 5.4. Catch being unloaded from a jukung (dug-out fishing boat) on beach landing site at Jimbaran.

Badung is one of 9 districts in Bali that have marine-based fisheries. The vessel and gear types that operated in these provinces during 2001 are shown in Tables 5.4.1 and 5.4.2. Vessels fishing out of Kedonganan and Jimbaran include drift gill-net, troll-line, hand-line, and shrimp gill-net vessels[SS22]. The large majority of these vessels are non-motorised or out-board powered jukung. There is a third Class D landing place in Badung District, that being Tanjung Benoa, situated close to the general port of Benoa. This landing place does have a wharf and is home to some larger, in-board powered vessels up to 10 GT.

Fishing grounds for vessels operating out of Kedonganan and Jimbaran are the Bali Strait and adjacent waters to the south of Bali and eastern Java.

The only information available on the volume of catch of tunas at Kedonganan and Jimbaran are the production statistics reported for the District of Badung[SS22] (Table 5.4.3). During 1997 – 2001, "tuna" (primarily juvenile yellowfin, but possibly also bigeye) has made up 20 to 30 % of the combined recorded volume of the three most commonly caught species groups – tuna, skipjack, and tongkol. In 2001, the volumes recorded were "tuna" 141 tonnes, skipjack 150 tonnes, and tongkol 422 tonnes. Only two of other 8 districts (excluding District Denpasar – Port of Benoa), Buleleng and Karang Asem, have "tuna" listed in their production statistics. Tongkol makes up the largest component of landings in most districts. As is often encountered in Indonesia's fisheries production statistics, there are some dramatic fluctuations across the time series that are difficult to accept as real e.g. 2095 tonnes of tongkol landed in Jembrana district in 1998 and then almost 12000 tonnes the following year (returning to around 3000 tonnes in the following two years).

Kedonganan, Jimbaran, and Tanjung Benoa all have TPI (similar to Figure 5.3), managed and operated by fishers' cooperatives (Koperasi Unit Desa). The process of auction and distribution of fish is similar to that described for West Sumatra ports.

Table 5.4.1. Number and type of fishing vessel operating in Bali districts (excluding Denpasar Province – Port of Benoa) in 2001. (Source: Dinas Perikanan Propinsi Bali 2001[SS22]).

District	Total	Non-motor (jukung)	Outboard motor	In-board motor	
				<5 GT	5-10 GT
Badung	**1735**	**1047**	**631**	**-**	**57**
Tabanan	311	215	96	-	-
Jembrana	1684	546	1138	-	-
Buleleng	2220	975	1237	8	-
Karangasem	3472	580	2892	-	-
Klungkung	1800	1137	663	-	-
Gianyar	317	232	85	-	-
Bangli	146	146	-	-	-

Table 5.4.2. Number of vessels by gear type operating in Bali Province (excluding Denpasar Province – Port of Benoa) in 2001. (Source: Dinas Perikanan Propinsi Bali 2001[SS22]).

District	Purse seine	Drift gillnet	Shrimp gillnet	Surface fixed gillnet	Drift long line	Troll line	Other lines
Badung	**2**	**256**	**801**	**-**	**-**	**503**	**811**
Tabanan	-	750	-	1336	-	-	2392
Jembrana	74	808	204	360	21	71	1090
Buleleng	67	385	-	134	-	1657	3427
Karangasem	-	2878	-	-	-	5450	2835
Klungkung	-	480	-	-	-	1380	693
Gianyar	-	313	293	-	129	85	630
Bangli	-	-	-	215	-	-	1003

Table 5.4.3. Production statistics for "tuna", skipjack, and tongkol in Bali districts (excluding Denpasar Province – Port of Benoa) in 1997 – 2001 (Source: Dinas Perikanan Propinsi Bali[SS22]).

Year	1997	1998	1999	2000	2001	1997	1998	1999	2000	2001
District	**Tuna**					**Skipjack**				
Badung	**125**	**116**	**89**	**99**	**141**	**73**	**53**	**102**	**109**	**150**
Buleleng	272	191	220	422	384	676	807	741	937	956
Karang Asem	36	75	52	23	0	357	519	300	452	474
Total	433	382	361	544	525	1106	1379	1143	1498	1580

Year	1997	1998	1999	2000	2001
District	**Tongkol**				
Badung	**202**	**505**	**422**	**379**	**422**
Jembrana	1139	2095	11999	3068	3101
Buleleng	1210	1224	1277	561	860
Karang Asem	4104	3993	5386	6545	5505
Klungkung	3001	1876	1541	837	1618
Gianyar	20	10	27	35	26
Total	9737	9848	20728	11473	11638

5.5 Kupang (West Timor) and Ende (Flores)

Kupang on the southwest coast of West Timor and Ende on the mid south coast of the island of Flores are two of the twelve districts with marine-based fisheries within the province of Nusa Tenggara Timur. The province consists of over 550 islands, but is dominated by the three main islands of Flores, Sumba, and Timor.

The fishing port of Kupang has operated since its construction in 1977. It is a Class C fishing port (Coastal Fishing Port) – one of 17 Class C fishing ports in Indonesia under the management of DGCF. It occupies an area of around 10 acres (40,250 m^2).
The port can accommodate vessels up to 30 GT. The gear type of vessels (Table 5.5.1 and 5.5.2) at Kupang include large numbers of non-motorised and out-board motor powered jukung and perahu, and around 700 in-board motor powered vessels up to 30 GT[SS15]. The port is base for handline, drift gill-net, set gill-net, and troll-line vessels. Pole and line fishing had been productive for fishing fleets based at Kupang, operating in the Savu Sea, since 1991. However, in recent years, the pole and line activity has decreased, as the availability of live bait has become a limiting factor (the bait commonly used for pole and line fishing are sardine, *Sardinella* sp., and anchovy, *Stolephorus* sp.).

Ende is a relatively small landing place compared to Kupang fishing port, with no wharf, and has a significantly smaller number of motorised vessels (Table 5.5.2). The majority of the in-board motor powered vessels at Ende are less than 5 GT. Hand-line and troll-line vessels are the dominant fishing vessel type[SS15].

The fleets that operate from the Kupang and Ende fish the adjacent Savu Sea, the waters around the islands within the Nusa Tenggara Timur Province, the western Timor Sea and Indian Ocean waters to the southeast.

"Tuna", skipjack, and tongkol are the three most important pelagic species groups for both Kupang and Ende fishers. The production statistics reported by Nusa Tenggara Province for Kupang[SS15](Table 5.5.3) show a dramatic rise in production of "tuna" from 473 tonnes in 1997, to 2323 tonnes in 1998, 1778 tonnes in 1999, and 1987 tonnes in 2000. The production of "tuna" at Ende was significantly less during the same period, but showed similar scales of variability – 378 tonnes in 1997, 623 tonnes in 1998, 1291 tonnes in 1999, and 769 tonnes in 2000. The reasons behind this high level of variability are unknown.

Table 5.5.1. The number of fishing vessels by gear type in Nusa Tenggara Timur Province in year 2000. (Source: Dinas Perikanan dan Kelautan Propinsi Nusa Tenggara Timur[SS15]).

District	Boat seine	Purse seine	Drift gillnet	Set bottom gillnet	Pole & line	Hand line	Troll line
Sumba barat	-	2	202	588	-	697	489
Sumba timur	68	5	510	782	-	2628	892
Manggarai	-	25	242	430	-	823	382
Ngada	-	10	1695	-	-	1680	429
Ende	**88**	**49**	**2809**	**-**	**-**	**2959**	**-**
Sikka	-	111	780	1145	58	2262	748
Flotim	52	86	704	1445	68	3206	138
Alor	15	4	1205	-	-	1693	938
Kupang	**410**	**98**	**2567**	**1335**	**52**	**3076**	**1120**
Timor Tengah Selatan	-	-	145	-	-	161	-
Timor Tengah Utara	-	1	340	-	-	227	-
Belu	-	2	226	74	-	322	-
Total	633	393	11425	5799	178	19734	5256

Table 5.5.2. Numbers of fishing vessels by type in Nusa Tenggara Timur Province in 2000 (Source: Dinas Perikanan dan Kelautan Propinsi Nusa Tenggara Timur[SS15]).

District	Non-motor		Outboard motor	In-board motor			
	Jukung	Perahu papan		0-5 GT	5-10 GT	10-20 GT	>20 GT
Sumba Barat	376	-	4	6	-	-	-
Sumba Timur	1015	65	36	13	-	-	-
Manggarai	457	463	45	75	-	-	-
Ngada	229	491	20	30	-	-	-
Ende	**220**	**1700**	**27**	**302**	**29**	**-**	**-**
Sikka	2054	731	215	408	82	31	2
Flores Timur	2940	485	140	158	55	10	-
Alor	1211	77	15	56	4	-	-
Kupang	**1462**	**366**	**310**	**262**	**274**	**137**	**25**
Timor Tengah Selatan	250	-	10	-	-	-	-
Timor Tengah Utara	258	262	3	14	-	-	-
Belu	476	482	18	20	-	-	-
Total	10948	5122	843	1344	444	178	27

Table 5.5.3. Production (tonnes) of capture fisheries in 1997-2000 (Nusa Tenggara Timur Province) (Dinas Perikanan dan Kelautan Propinsi Nusa Tenggara Timur[SS15]).

District	1997			1998			1999			2000		
	Tuna	Cakalang	Tongkol	Tuna	Cakalang	Tongkol	Tuna	Cakalang	Tongkol	Tuna	Cakalang	Tongkol
Sumba Barat	17	23	65	-	73	61	-	90	89	-	103	133
Sumba Timur	86	124	325	38	104	203	38	96	115	19	110	147
Manggarai	88	287	373	-	42	58	1	124	137	2	183	623
Ngada	50	203	604	122	128	244	116	113	230	118	202	479
Ende	**378**	**986**	**1241**	**623**	**475**	**2403**	**1291**	**521**	**640**	**769**	**852**	**1021**
Sikka	140	861	614	352	1294	472	529	2645	235	531	2892	296
Flores Timur	211	1524	692	298	1360	1482	328	2176	1282	344	2126	1166
Alor	130	689	570	83	89	296	97	88	289	105	233	214
Kupang	**473**	**4161**	**1451**	**2323**	**2418**	**2244**	**1778**	**1927**	**1900**	**1987**	**3015**	**2875**
Timor Tengah selatan	-	1	1	-	-	-	1	1	0	1	1	0
Timor Tengah Utara	1	5	15	-	1	21	-	-	15	-	12	26
Belu	94	43	143	-	79	84	-	72	81	-	83	133
Total	1581	8907	6093	3837	6058	7566	4179	7853	5012	3876	9811	7114

5.6 Fish auction and distribution at artisanal ports

The following is a generalised description of the ways tuna and tuna-like species are distributed after being landed at artisanal ports in Indonesia, based on the many common features of distribution systems encountered during the artisanal port surveys. Several port-specific comments are included at the end of this section to explain major deviations from this generalised description.

The majority of the ports surveyed have a central auction place (*Tempat Pelelangan Ikan*, TPI) and the majority of catch is sold through auction at the TPI, prior to being distributed along other routes (Figure 5.5). Fish not auctioned includes that given to crew, that given to friends and relatives, that given as payment to port labourers that help unload, and that kept by the vessel owner. This non-auctioned component of catch would not usually include "tuna", but more often skipjack and other small pelagics such as tongkol and tenggiri) Also, if the amount of a particular species is less than 10 kg it will normally not be auctioned.

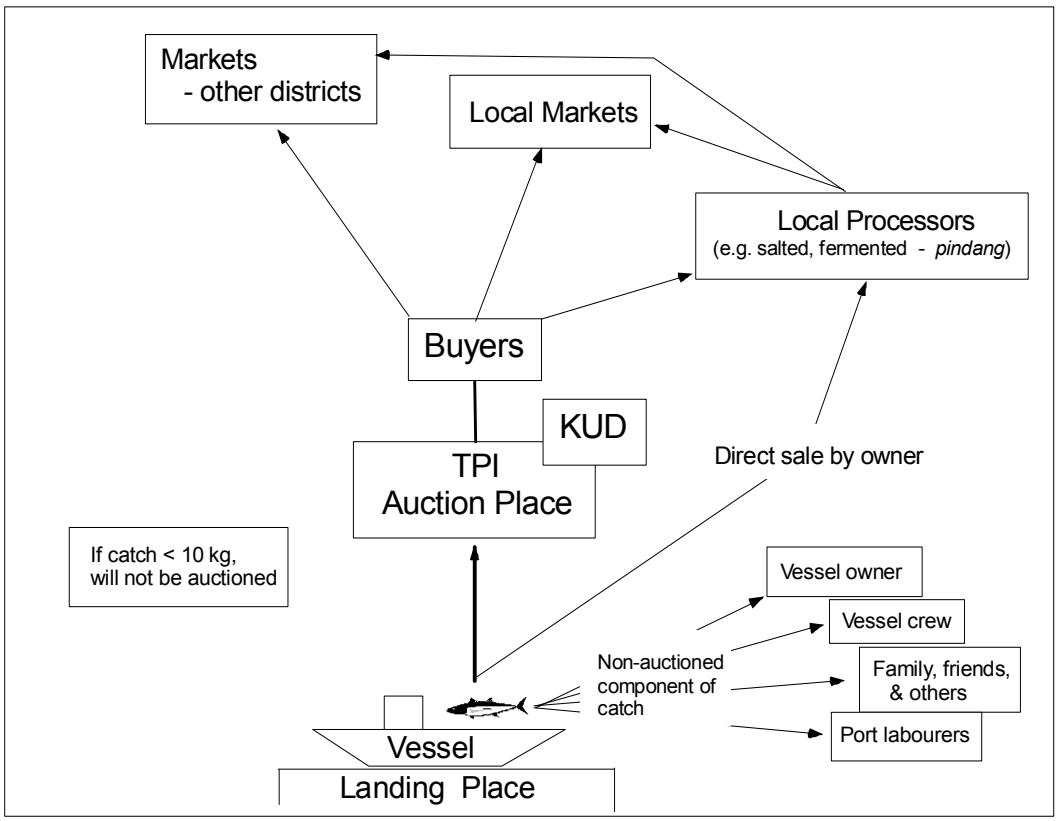

Figure 5.5. Generalised illustration of distribution routes of fish at artisanal landing places.

The TPI are often managed and operated by fishers cooperatives (*Koperasi Unit Desa*, KUD), but under the supervision of the District or Provincial Fisheries Office. The KUD provide auction staff and the facilities and equipment needed to run the auction and the recording of sales. The records are used for monthly report that is submitted regularly to the Subdistrict or District Fisheries Office (see Section 6).

Fish are normally unloaded from the boat under the direction of the vessel's agent or owner and transported to the TPI in tricycles (*becak*), by hand-trolleys, on motorcycles, or in trucks. The smaller fish are usually contained within bamboo baskets or plastic barrels. The auction staff arrange the fish by grouping them according to species group (e.g., tuna, skipjack, and tongkol), size group (e.g., small, medium, and large) and quality (e.g., good, bad). The auction is usually done for the catch of one vessel at a time.

The fish auction at TPI usually start around 10 am and are chaired by a principal auction official (*juru lelang*) who is often assisted by one person to record number of fish and the price of each fish group. As the auction proceeds from one group of fish to the next, the vessel agent or owner settles on a price with prospective buyers, overseen by the auction staff. The winning buyer receives a voucher containing details of: number of fish, the price per piece, the name code of the buyer and the name code of the agent/owner.

Some of the TPI have weighing facilities to assist in the recording of volume of catch, but other TPI do not, and the presence/absence of these facilities is not necessarily determined by size of the TPI. For instance, the TPI in the relatively large port of Bungus does not have weighing facilities, whereas the much smaller TPI at Kedonganan does. Where there are no weighing facilities the auction staff estimate the volume of sales 'by eye', relying on their experience of weight per basket or size of fish etc.

The fish are then given a label indicating 'sold' and the successful buyer then pays the price in cash at a counter. Fish can then be removed from the auction hall. Once the auction for one vessel's catch is complete, the auction for the next vessel begins. The buyers in the auctions include 'groceries' representatives and retailers from local markets, restaurants, and owners of local processing households. Some of the buyers will be agents purchasing on behalf of other parties.

The vessel owner or fish owner must pay an auction fee (*retribusi*). The level of this fee varies among districts, but it can be as much as 5% of the total sale price of the vessel's catch. In Bungus, vessel owners have to pay several retribusi fees: 1% to the KUD, 0.5% for a social fund, 5% to the agent who manages the vessel, 1% for port labourers, and 1% as an auction equipment fee – therefore a total fee of 8.5 % of their total sales. At auction in Pariaman, the total fee for vessel owners is 5% of their total sales. Usually the buyer pays an additional service fee, or contributes to the retribusi fee e.g. in Pelabuhanratu the retribusi fee is 5% of the total sales, the seller and buyer each contributing 2.5%.

After purchase at auction, the distribution of fish is primarily to local markets, to local processing operations (home industries) that produce boiled, salted and fermented fish (*pindang*), to local restaurants, and in some cases to markets in other neighbouring districts or destinations further a field. At some landing places (e.g. Pelabuhanratu), some fish may bypass auction and be sold by vessel owners direct to processing factories. Also at Pelabuhanratu, good quality tuna and skipjack are not auctioned at the TPI**,** but instead are transported by truck to

the fish market North Jakarta, in a similar manner to that described above for Cilacap.

The distribution of fish product such as pindang is primarily to local markets but may also include wider distribution (e.g. from Pelabuhanratu to Sukabumi, Cianjur, Jakarta, and Surabaya). At Prigi fish distribution is to local markets, to the local fish processing households, and to markets in other cities (e.g. Surabaya, Sidoarjo, and Tuban) within East Java Province.

The fishing port of Kupang does have a TPI facility, but at the time of investigation for this report, the TPI was not being used, due to insufficient operating resources. Instead tuna and tuna-like species are transported from unloading to cold-storage facilities by fishing companies at Kupang, and then fish carrier vessels transport the frozen product to markets in Surabaya and Ujung Pandang.

5.7 Production statistics for Indian Ocean – Industrial and artisanal combined

Indonesia's national fisheries statistics, reported annually by DGCF[SS4] (see Section 6), include production statistics for all provinces that have marine fisheries. The provinces are grouped within 11 "coastal areas", 5 of which include provinces with fisheries that operate in the Indian Ocean. The production statistics for Indian Ocean caught "tuna" (DGCF aggregated category that includes yellowfin, bigeye, southern bluefin, albacore, marlins, sailfish, and swordfish) for the relevant coastal areas are shown in Table 5.7.1. These annual totals include both industrial and artisanal production, compiled by DGCF from the statistics reported quarterly by each province.

The main purpose for presenting this table is to further illustrate the high level of variability across years in statistics that are the end product of Indonesia's national system of fisheries statistics. Herrera (2002) provides a more detailed assessment of these production figures (and for tuna-like species), as part of his comprehensive re-estimation of industrial and artisanal catches, 1973 – 2000.

Table 5.7.1. National production statistics (tonnes) for "tuna", 1992 – 2000. Data are for "coastal areas" (DGCF classification) that include provinces with fleets that land catches from the Indian Ocean. (Source: DGCF annual reports[SS4,SS19] "Statistics of Capture Fishery Indonesia").

Area (Provinces)	**Year**	**Production – "Tuna"**
Bali-Nusa Tenggara (Bali, Nusa Tenggara Barat, Nusa Tenggara Timur)	1992	12660
	1993	10352
	1994	9655
	1995	14595
	1996	13055
	1997	8142
	1998	44902
	1999	16712
	2000	32065
Barat Sumatera (D.I. Aceh, Sumatera Utara, Sumatera Barat, Bengkulu, Lampung)	1992	8595
	1993	6334
	1994	7680
	1995	10603
	1996	10228
	1997	12487
	1998	24692
	1999	11598
	2000	10202
Selat Malaka – Aceh (D.I. Aceh)	1992	1129
	1993	1922
	1994	931
	1995	1415
	1996	2444
	1997	1575
	1998	1479
	1999	1764
	2000	1503
Selatan Jawa (Jawa Barat, Jawa Tengah, D.I. Yogyakarta, Jawa Timur)	1992	661
	1993	1610
	1994	561
	1995	389
	1996	792
	1997	1564
	1998	10889
	1999	1771
	2000	6037
Utara Jawa – DKI Jakarta (DKI Jakarta)	1992	na
	1993	7756
	1994	10609
	1995	12399
	1996	13786
	1997	17840
	1998	9741
	1999	11995
	2000	7506