6. DATA COLLECTION AND STATISTICS REPORTING SYSTEMS

6.1 National System of Fisheries Statistics – The 'original' design

In order to fully understand the workings of the current systems of fisheries data collection and reporting in Indonesia, we need to first describe the system from which they evolved. A defining time point in the history of Indonesia's marine and freshwater fisheries was the development and implementation of a national system of fisheries statistics in the mid to late 1970s – a system that emerged from a collaborative program between the Government of Indonesia, the United Nations Development Programme, and FAO. The program had, as its primary objectives: "to increase foreign exchange earnings from the fishing industry, improve domestic marketing and promote rational utilization of stocks; to provide advisory services in biology, resource management and other appropriate related fields; and to implement exploratory fishing operations and monitoring and evaluation of results" (Yamamoto 1980).

As part of the program, Dr Tadashi Yamamoto, a fisheries statistician, was employed by FAO to develop a new national system of fisheries data collection and reporting that would, for the first time, provide a standard set of surveys and reporting methods across all of Indonesia's provinces. Earlier systems were recognised as having several shortcomings: a discontinuity in fisheries time series data; a lack of standardisation in survey and estimation procedures across provinces; and it was generally accepted that catch figures were "very much underestimated" (Yamamoto 1980).

The development and implementation of the new system occurred over a five year period, 1974-1978. Dr Yamamoto led the project, with assistance from staff of the Statistics Division of Directorate General of Fisheries (now Directorate General of Capture Fisheries) and scientists of the national research institutes of Marine Fisheries and Inland Fisheries. The system components for marine based fisheries were implemented in April 1976. Four years later Dr Yamamoto prepared a comprehensive FAO report on development and implementation of the new system, together with detailed descriptions of the various survey methods and associated data collection and reporting forms (Yamamoto 1980, available at http://www.fao.org/docrep/field/003/N7334E/N7334E00.htm). Subsequent reports by others (Nishida 1988, Ishida et al. 1994, Gafa and Nishida 2000, Herrera 2002) have detailed and assessed the National fisheries statistics system to varying degrees.

With respect to marine fisheries, the system was designed to have two primary outcomes: 1) Nation-wide statistics on annual production for all species groups fished, both at the industrial and artisanal levels of fishing activity, and 2) Nation-wide annual inventories of the number of fishing units (households, companies, operators) and number, size, and gear-type of fishing vessels involved in the fishing activities at both levels in all provinces. These statistics have been and continue to be published by the Directorate General of Fisheries (now DGCF) as the annual report "Statistik Perikanan Tangkap Indonesia" (=

Statistics of Capture Fisheries of Indonesia) These reports also include similar statistics for inland "openwater" fisheries.

The statistics in the DGCF annual reports are presented both as time series data across many years, and as data specific to the year of the report. The latter are provided in ten tables that comprise "Part II: Statistical Data of Capture Fishery":

1. Number of marine fishing establishments by size of management, coastal area and Province
2. Number of marine fishermen, coastal area and Province
3. Number of marine fishing boats by size of boats, coastal area and Province
4. Number of marine fishing units by size of fishing gear, coastal area and Province
5. Marine fishery production by species, coastal area and Province (example shown in Appendix III i)
6. Marine fishery production by type of fishing gear, coastal area and Province (examples shown in Appendix III ii)
7. Disposition of marine fishery production by type of disposition, coastal area and Province
8. Product of preserved and processed marine fishery by product of processing, coastal area and Province
9. Marine fishery production by quarter, coastal area and Province
10. Production fry caught from the sea by species, coastal area and Province

In the original Yamamoto design, the data for all these tables came from a National Fishery Production Survey that was comprised of several surveys and censuses at two officially defined levels (see below) of catch landing place within each province that possess marine borders. The two levels of landing place are:

1. ***Major fish landing places*** – places where "large quantities of catch are unloaded from fishing vessels" (primarily longline, purse seine, gill-net, pole and line, troll, and hand-line vessels), and where "more than 50 percent of the total fish landings of a respective district are landed through such places, regardless of whether a fish market exists or not" (Yamamoto 1980).
2. ***Fishing villages*** – essentially all the fish landing places smaller than "major fish landing place" and characterised by artisanal fisheries where catch is landed on the beach (no wharves or central port area), and catch is either wholly for subsistence or sold through local markets.

These surveys and censuses were, and still are, coordinated at a national government level by DGCF (in collaboration with the Central Board of Statistics – see Sect. 6.3), but involve data collection and reporting by

provincial, district, and subdistrict government offices. The fundamental design and procedure of the national system are summarised below and in Figures 6.1.1 and 6.1.2, but for a more detailed description, see Yamamoto (1980).

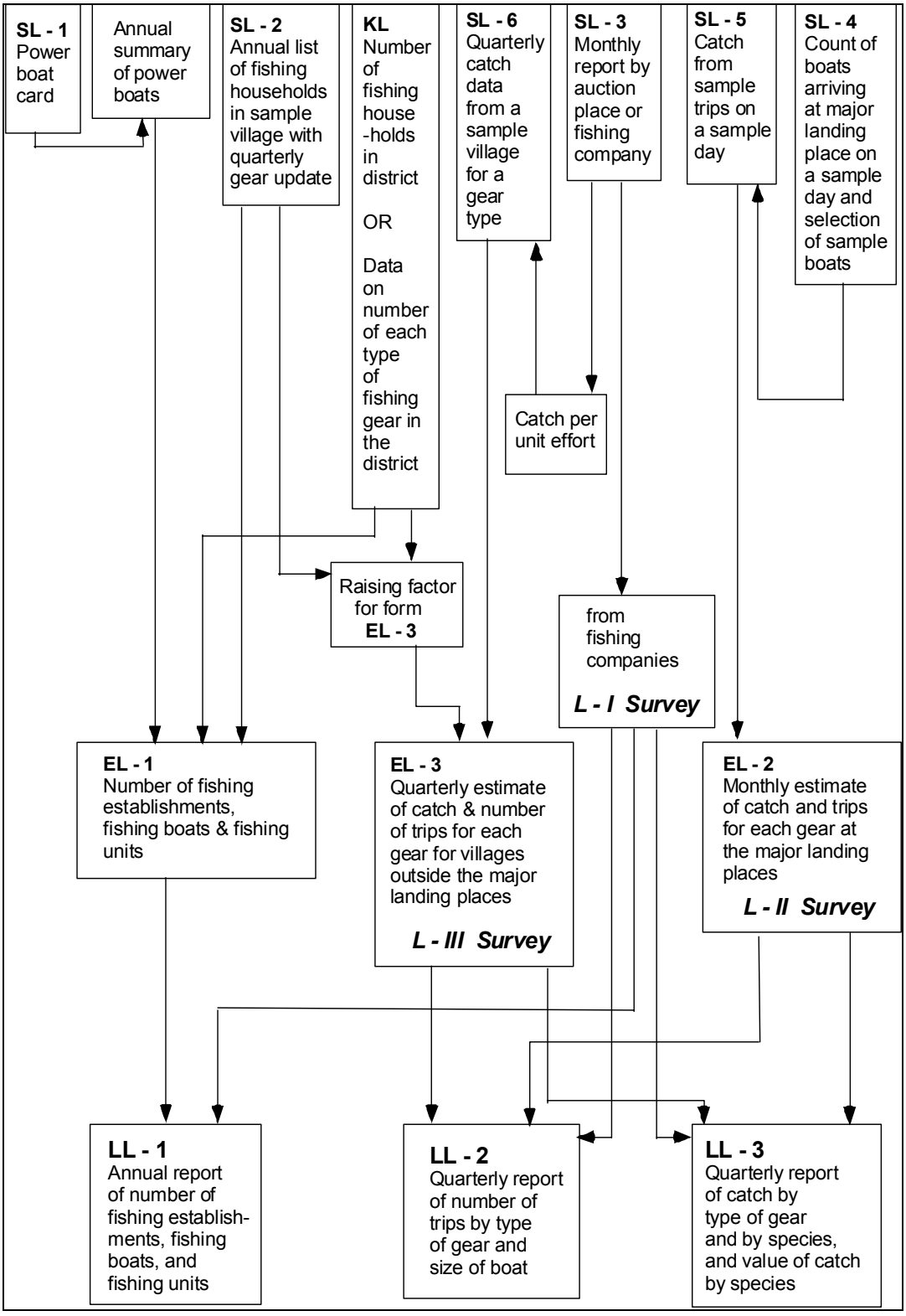

Figure 6.1.1. Key components of the Indonesia's national system of fisheries statistics, designed and implemented during 1974-1976. Letters and numbers in bold indicate titles of the various report forms. [Modified from Nishida 1988]

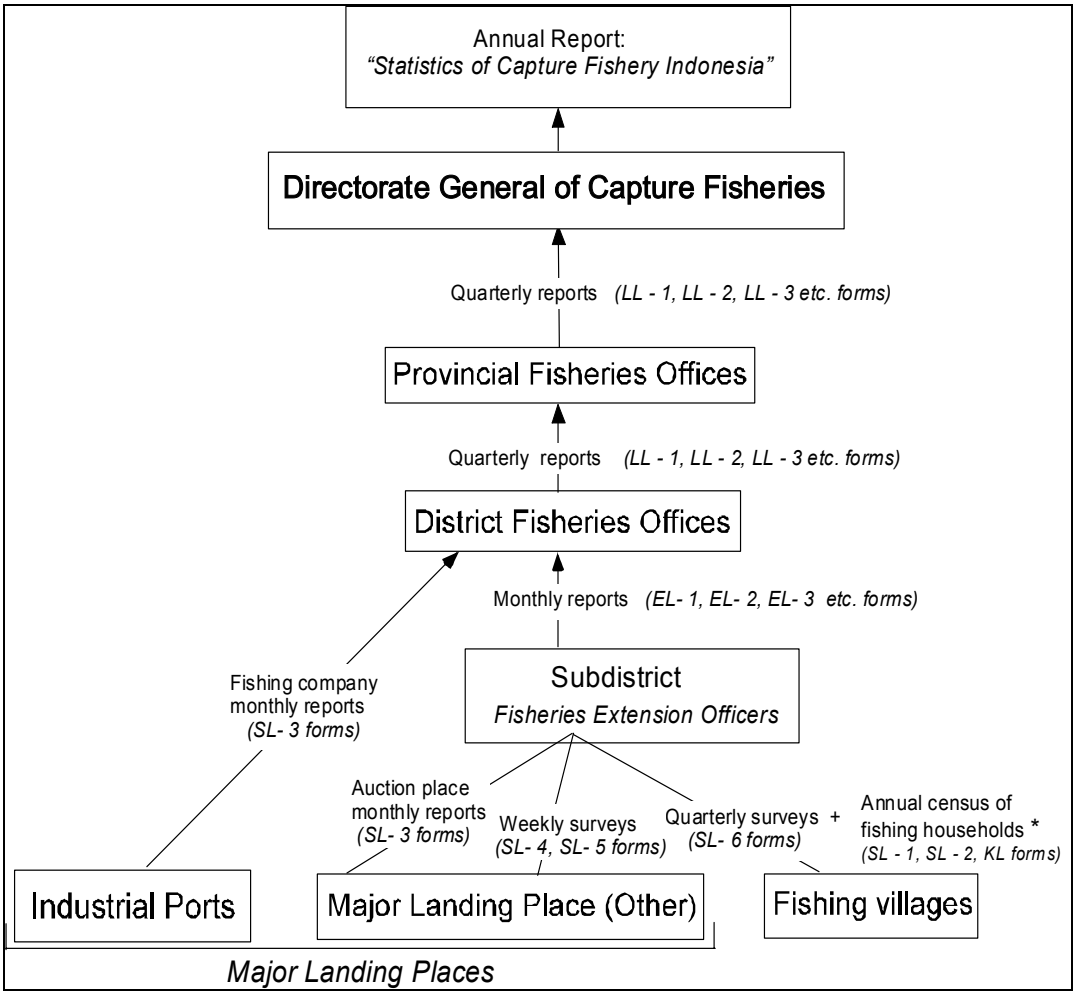

Figure 6.1.2. Generalised procedure of the national system of fisheries statistics.

The national system includes a multitude of forms – "survey forms" (the "SL" series) and "estimation forms" (the "EL" series) that together provide data for a series of "reporting forms" (the "LL" series) that are completed quarterly by District Fisheries Offices (DFO) and sent to Provincial Fisheries Offices (PFO). The PFO in turn collate data from all the LL-forms from DFOs within the province, then forward the data onto DGCF each quarter, and also use the LL-form data to produce PFO annual reports with production statistics and fishing effort (vessels, households, establishments, units) tables similar to that presented in the DGCF annual reports.
There are three primary surveys that yield the data for producing catch (production) and effort tables in both the provincial and national level annual reports:

1. L-I survey – Fishing Companies

Commercial ('industrial') fishing companies are required to keep records and make monthly reports of fishing activity and catch of their vessels using the SL-3 form. This form is not completed for each fishing trip, but is a monthly statement of catch by species for each gear type. Tuna and tuna like species are generally divided into three species categories: "Tuna" (all large tuna species

and including all billfish species), Cakalang (skipjack tuna), and Tongkol (small tunas). These monthly catch reports are sent by the companies to the DFO, and the information in them contributes to the LL-1 (number of fishing establishments, fishing vessels, fishing units), LL-2 (number of trips by type of gear and size of boat), and LL-3 (catch volume and value, by type of gear, and by species) reports that DFO sends to DGCF via PFO.

2. L-II survey – Major Landing Places

Vessels that land catch at major-landing places are surveyed using a two stage sampling design. A days sampling is the primary sampling unit and the number of trips is the secondary unit. Fisheries Extension Officers (FEO), employed at the Subdistrict level, visit selected major landing places once a week to collect data for catch landed on that day. Yamamoto (1980) provides a detailed description of how major landing places are selected for inclusion in the L-II survey but, essentially, the selection criteria are that the landing place meets the "more than 50% of total landings within the district" and that the landing place is easily accessible by the FEO or staff from the DFO. FEO collect data on vessel particulars (name, size, gear-type) and make estimations (in kilograms) of the amount of catch. The data for sampled vessels are raised by the ratio to total number of vessel trips for that landing place on that particular day to produce an estimation of total catch landed for the 'sample-day'. These sample-day landings are then raised by ratio to total number of operating days to produce an estimate of monthly catch landings at the major landing place. The FEO compile monthly summary reports (using form EL-2) which they send each month to their respective DFO. These in turn provide data for the DFO's LL-2 and LL-3 report forms.

At the majority of major landing places there is a central fish market or auctioning place (as described in Sect 5.5), and FEO collect most of the data for the L-II survey at these marketing centres. However, data is also collected, via direct interview at the level of vessels, on the amount of catch that does not pass through these market centres. This includes estimations, provided by vessel skippers/owners, of the amount of catch sold directly to fish dealers, that consumed during the trip, and that given upon landing to the vessel owner and crew for their and their family's personal consumption. For major landing places where there is no centralised marketing/auction centre, FEO source information direct from the vessel skippers/owners/company agents.

Auction places in major landing places are required to complete monthly reports for each fishing gear type (form SL-3), similar to those provided by fishing companies in the L-I survey. These reports include monthly totals of volume and value of catch by species and number of trips by vessel size. These reports are given to the FEO and/or are sent direct to the DFO. Either way the information provided by the auction places ultimately contributes to the statistics reported by DFO in the LL series of forms.

3. L-III survey – fishing village

Quarterly surveys are done by FEO at the smaller level landing places (primarily fishing villages) not covered by the L-II surveys. These surveys are essentially a census of fishing activity, via interviews with all or some of the fishing households/establishments in each selected village, that provide a total number of fishing units in each village, an average number of trips per quarter, and an average catch (by species group) per trip. The counting of fishing households/establishments, fishing vessels, and fishing units in each village is only done once per year, but the catch surveys are done each quarter.

The L-III survey is based on 'cluster sampling' with the fishing village as the sampling unit. Yamamoto (1980) provides a detailed description of how villages for the L-III surveys are selected. "In principle, the number of sample villages in a district will be the same as the number of marine subdistricts in that district, on the assumption that at least one FEO is stationed at each subdistrict". In practice, the number of FEOs in many provinces are less than one to each subdistrict (see Section 7 for comments on resource limitations).

If the fishing village has an auction place, the controlling body of the auction place is required to complete monthly reports as described above for major landing places. These reports are required regardless of whether the fishing village is sampled as part of an L-III survey.

6.1.1 Central Board of Statistics

Indonesia's Central Board of Statistics (*Badan Pusat Statistik*[8], BPS) is a non-departmental government institution directly responsible to The President. Its primary functions (which it has been doing since 1960) include providing census and survey data in a whole range of economy related fields (agricultural, foresty, fisheries, energy, trade, tourism etc.) to both government and public, and assisting statistics divisions of government departments and other institutions, in developing statistical collection and reporting systems (BPS 2003).

Within the original national system of fisheries statistics, in line with Indonesia's policy of centralization of information (National Law of Statistics No.7 1960), it was intended that BPS work collaboratively with DGCF ("DGF" at that time) and share some of the workload involved in both the collection of fisheries production data, but also in its collation and reporting. In addition to the head office of BPS in Jakarta there were, and still are, branch offices at provincial and district level, and also BPS "Statistical Officers" based in most subdistricts. With respect to fisheries statistics, BPS was primarily responsible for the annual census of fisheries establishments (households) at the Fishing Village level, whereas DGF was responsible for doing the more routine weekly and monthly sampling of catch at all levels of landing place.

[8] Prior to 1997 known as "Central Bureau of Statistics (Biro Pusat Statistik)"

6.2 Current Procedures of Collecting and Reporting Fisheries Statistics

The system of data collection and reporting of fisheries statistics that operates throughout Indonesia today is, in its fundamental form, the same system as described above. Subdistrict and District level fisheries offices are the primary data collection offices that do the L-I, L-II, L-III etc. surveys to fulfil the requirements of the LL-1, LL-2, LL-3 etc. reports that are sent to PFOs, and then in turn onto DGCF.

However, investigations for this report found that although the fundamental processes of the Yamamoto system still operate, with the same end product at national level (the DGCF annual reports), there is considerable variability among districts in the ways data are collected and reported, particularly at the first point of collection. This includes variability in: 1. the offices/agencies involved, 2. the actual procedures of data acquisition and estimation, and 3. the level of validation and cross-checking.

The level of variability is considered sufficiently high among the three industrial ports to warrant descriptions for each below (Sect. 6.2.1). The systems of data collection and reporting at the other major landing places ('artisanal' ports) surveyed have enough commonalities that some generalisations can be made (Sect. 6.2.2). All these descriptions are considered necessary background, prior to the discussion of limitations and deficiencies of the system with respect to providing fisheries data that are suitable for scientific based stock assessments.

[Note: The following descriptions do not include the IOTC/RCCF/RIMF/CSIRO monitoring/sampling programs that commenced in 2002 at the three industrial ports, as an extension of earlier monitoring/sampling by RIMF/CSIRO at Benoa]

6.2.1 Industrial ports

6.2.1.1 Benoa

Offices at District and Port Level

There are nine District Fisheries Offices in Bali, and the one responsible for collecting and reporting data for fish landed in the Port of Benoa is Dinas Pertanian dan Kelautan Kota Denpasar (Dinas PKKD) (= *Office of Agriculture and Marine Affairs for the Regency of Denpasar*). The offices of Dinas PKKD are located in Denpasar. They have a team of officers (4 per daily shift, 17 in total) who visit the port daily to collect catch landing data. The Dinas PKKD officers do not directly monitor the landings or processing operations. They obtain the data primarily from copies of processing tally sheets provided by the processing companies. Each company has it's own tally sheet format which usually is tailored for records of individual fish weights into size categories (e.g. $\leq$13 kg, 14-19 kg, 20-29 kg, >30 kg) and totals (in kgs) are provided for "fresh/export" and "reject" quality fish in each size class. Species differentiation is often limited to just "bigeye" and "yellowfin" tuna. Information obtained in interviews at Dinas PKKD and with staff at several companies suggested that some, more 'reliable', fishing companies provide monthly summary reports to

Dinas PKKD in a form similar to that of the SL-3 summaries described for the original Yamamoto system. The pathways of catch data collection and reporting at Benoa are summarized in Figure 6.2.1

Although there is generally some species differentiation of tuna species in the processing tally sheets, in the collation process by Dinas PKKD the tuna data are aggregated into one category and this includes billfish species.

In addition to providing the production statistics that are collated and reported quarterly and annually to DGCF through the provincial level, the catch landing data are used by Dinas PKKD to determine the amount of tax (*"retribusi"*) owed by each company. The landings attract two taxes: 1. a district government tax of 60 Rp/kg fish landed (export and reject combined), and 2. a provincial government tax of US$2.45/tonne for exported fish.

In common with WASKAN in Muara Baru, WASKI in Benoa manages a log-book (*Laporan Penangkapan Ikan – Form A*. See Appendix IV) reporting system for tuna longline vessels. However, as is in Muara Baru, it is rare for the log-book to be completed, as intended, by the vessel skipper or fishing master, and more often WASKI officers have to obtain the catch information from the vessel's agent or from information provided by the processing company that is handling the vessel's catch. Some companies also routinely provide copies of processing tally sheets to WASKI.

WASKI produces quarterly summary reports, copies of which are sent to Dinas PKKD, the provincial fisheries office, and to the Directorate General of Marine Resources and Fisheries Control in Jakarta. These reports are primarily vessel activity reports, containing a list of all vessels that have berthed during each month, vessel size, vessel gear type, and vessel arrival and departure dates. The only catch information provided in the quarterly reports is a single "production" figure of kilograms of unloaded catch for each vessel entry (with no species information).

The Port Authority Office (*Kantor Penguasa Pelabuhan Benoa*) in Benoa also collects and collates tuna landing/processing data and reports the amounts of fresh and frozen tuna exported from the port. This office bases its figures on catch/landing data that it receives from the processing companies. The Port Authority Office sends its summary figures, in the form of monthly and annual totals (tonnes) for 1) 'reject' fish (a single category, not tuna specific) that are shipped from Benoa to other Indonesian ports, 2) fresh tuna exported, and 3) frozen tuna exported, to the Central Board of Statistics (*Badan Pusat Statistik*, see Sect. 6.3) in Jakarta. The tuna data are not separated by species, and the "tuna" category also includes the tuna-like fish such as billfish.

The office of PT. Pelabuhan Indonesia III, the state owned company that manages Port of Benoa, also monitors the amount of catch being unloaded, for the purposes of charging a port service fee (Rp. 30,000 to Rp. 90,000 /landing, dependent on vessel total weight) for use of port facilities. Pelabuhan Indonesia III only monitors the combined weight of vessel plus catch, and their records do

not include details of the catch composition. We mention this monitoring activity only to further illustrate that there are many offices independently collecting, collating, and reporting catch related information at Benoa but with little apparent coordination in effort and resources among them.

Provincial Offices

The provincial fisheries office in Bali is Dinas Perikanan dan Kelautan Propinsi Bali (Dinas PKPB) (= *Office of Fisheries and Marine Affairs for Bali Province*). Within the design of the Yamamoto system of fisheries statistics, Dinas PKPB would normally use production statistics provided to them by Dinas PKKD to compile their quarterly and annual reports to DGCF for the District of Denpasar (for tuna, this equates with Port of Benoa). However, in recent years, Dinas PKKD have been using different methods to calculate the statistics they report (via the LL-series of forms) to DGCF.

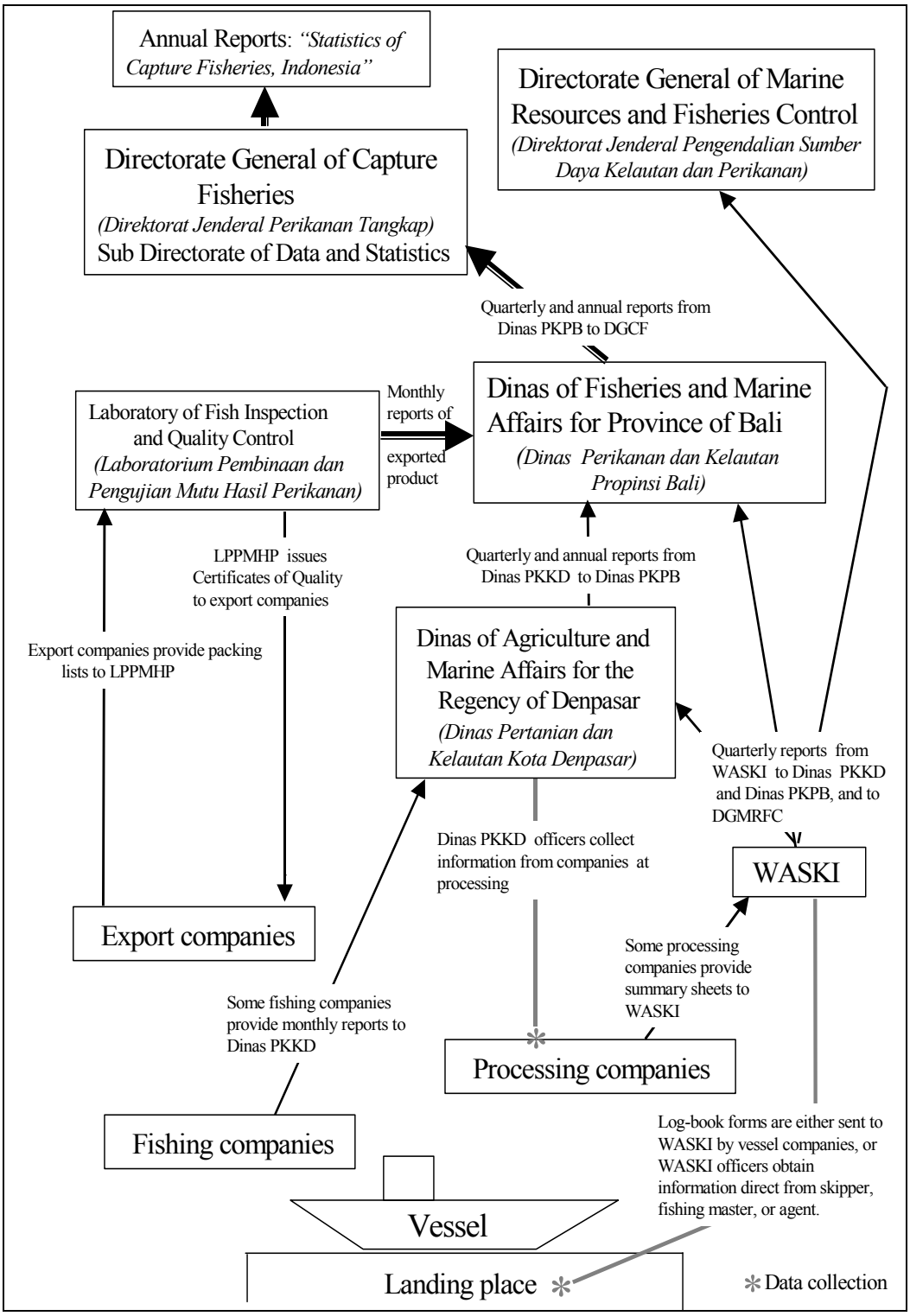

Figure 6.2.1. Pathways of catch data collection and reporting at Benoa. Thicker arrows indicate primary route of production statistics reported at national level.

In 2000 Indonesia's national government granted greater autonomy to district/regency governments, and, as a result, DGCF and provincial fisheries offices now have less control over how district level offices collect and report their fisheries statistics. In addition, the increased autonomy gave the district governments the opportunity to generate revenue through tax (retribusi) on

fishing companies for catch landed/processed. Because of this direct link to tax, there is now a greater incentive for companies to under-report catch. Dinas PKPB consider the majority (but not all) of company-provided-data to be underestimates of the real amount of fish landed and processed, and largely for this reason, they do not use the company-sourced data from Dinas PKKD in their estimations.

Dinas PKPB calculates their estimates of production statistics for tuna, for the District of Denpasar, based on exported and non-exported components. The estimate of volume (kgs) of exported tuna is calculated (Figure 6.2.2) using export figures for whole and processed fish obtained from monthly summary reports by the Laboratory of Inspection and Quality Control (*Laboratorium Pembinaan dan Pengujian Mutu Hasil Perikanan,* LPPMHP); reports complied from the packing lists provided by the exporting companies. In order to export fish product the export companies must first obtain a certificate of quality (*Sertifikat Mutu Hasil*), issued by LPPMHP after analyses of samples from the export consignment. The companies provide LPPMHP with packing lists that contain complete details of the type and amount of product in the consignment. For both fresh and frozen tuna these lists usually, but not always, have a breakdown of species, the number of pieces of each species in each carton, and the type of product (if not whole fish). The export companies are graded by LPPMHP according to their 'history of quality' – the grades range from 1 to 4. Companies with a history for of high quality product are classed Grade 1 and are only required to provide samples for one out of each 10 consignments, whereas Grade 4 companies with poor record of product quality are required to provide samples for analysis for every consignment.

Dinas PKPB uses multipliers to raise the export product data of LPPMHP to whole fish weight e.g. ×1.11 to raise "tuna segar" (fresh whole tuna) and "tuna beku" (frozen whole tuna), ×1.67 to raise "tuna meat" (frozen), ×1.67 to raise "tuna loin" (fresh and frozen), ×2.5 to raise "tuna steak" (frozen) to original whole-fish weight. The rationale used by Dinas PKPB is that the export data of LPPMHP, once raised to original whole-fish weights, provides a good estimate for volume of all the export quality tuna landed at Benoa. This includes all the "reject" quality tuna that are subsequently processed and exported as tuna product (meat, steak, loin etc.) [see Section 4.4.1 for description of processing and distribution of the various grades and type of tuna product]. To account for the "reject" tuna and tuna-like species that are not exported, and hence not captured in the LPPMHP reports, Dinas PKPB uses a standard estimation of 10% of the total export component.

The tuna production statistics reported by Dinas PKPB to DGCF have, up until recently, been a single aggregated category (for yellowfin, bigeye, and southern bluefin tunas) that also included billfish species. However, this is currently undergoing change, with the recent introduction by DGCF of new LL-3 report forms (see Section 6.4) that require reporting of statistics for each tuna species and each billfish species.

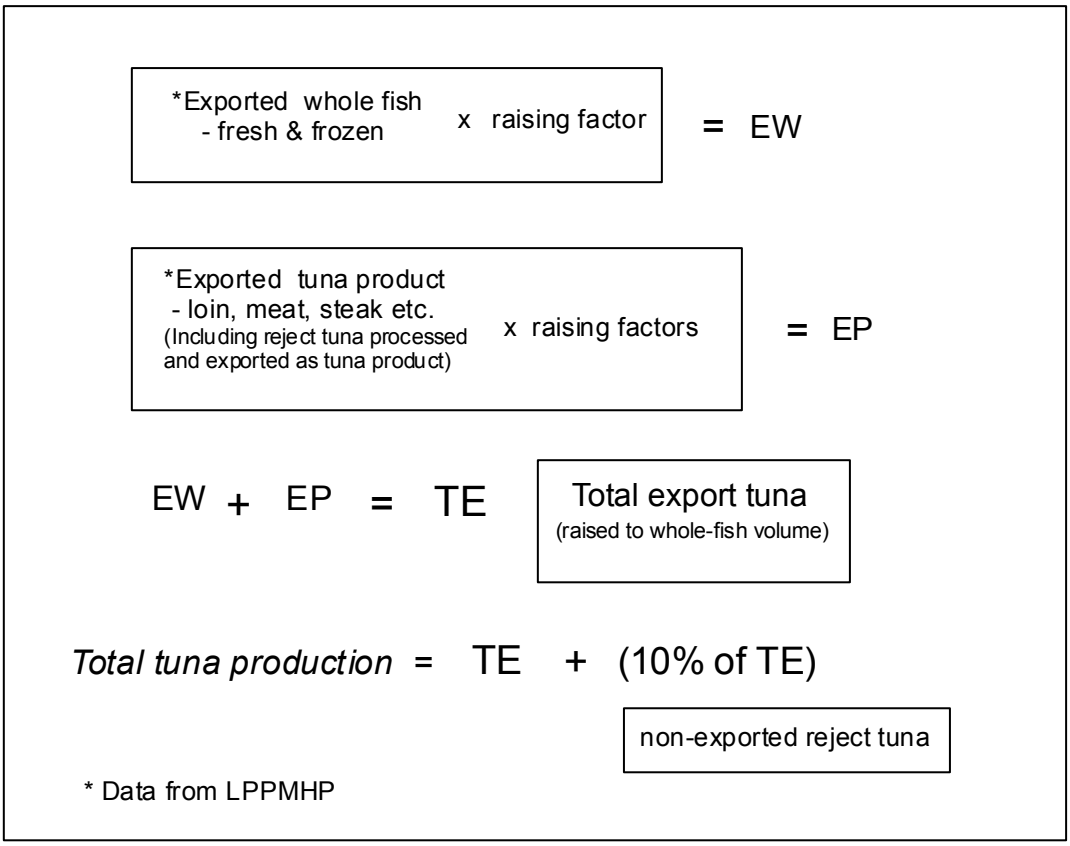

Figure 6.2.2. Method used by Dinas PKPB to estimate total tuna production.

6.2.1.2 Muara Baru

The systems of data collection and reporting at Muara Baru (Figure 6.2.3) are similar to those described above for Benoa, but there are also several key differences. At Muara Baru the system of data flow from district level to provincial level, and then from provincial level to DGCF is similar to that in Bali, but the ways in which the quarterly production totals for export and reject components of landings are compiled by the PFO in Jakarta are quite different to those used in Bali.

Adjacent to the TPI at Muara Baru, there is a subdistrict level fisheries office, Dinas Tempat Pelelangan Ikan (=*Office of Fish Auctioning Place*) that employs a team of enumerators (15 in total, 8 working on any one day) to monitor and record the details of tunas and other species that are auctioned daily. There are five Dinas TPI offices in Jakarta, but only one of these monitors tuna. Dinas TPI produces monthly reports[SS23] that include summary statistics on daily number of landings, total daily production (kg), total daily catch value (Rp.), and the amount of tax (*retribusi*) payable on those catches (5% of sales value). Monthly totals are provided for individual species, including some separation of tuna and tuna-like species: yellowfin, bigeye, tuna kecil = 'small' tuna, tuna rs = 'damaged' tuna, albacore, skipjack, marlin, and sailfish. Their primary focus is only reject quality tuna and other non-export local species that are auctioned at the TPI. As described in Sect. 4.4.2 it is only the lowest grade of reject tuna that go to auction at the TPI, so therefore all the export component (whole and processed) of tuna landings are not included in the Dinas TPI monthly data.

The monthly Dinas TPI reports are sent to the district level fisheries office, Dinas Pengelolaan Kawasan Pendaratan Ikan (Dinas PKPI) (=*Office of Regional Management of Fish Landings*) which is located in Muara Angke, the adjoining city district to Muara Baru. Dinas PKPI in turn produces quarterly production reports, based on the data in the monthly Dinas TPI reports.

The Dinas PKPI quarterly reports are sent to the provincial level fisheries office, Dinas Peternakan, Perikanan dan Kelautan Propinsi DKI Jakarta (Dinas PPKP) (= *Department of Animal Husbandry, Fisheries and Marine Affairs, Jakarta*), which .is located in Central Jakarta. These reports only provide production data for tuna and billfish as a single aggregated category "tuna".

To compile their total production statistics for reporting to DGCF (via the LL – series of forms) Dinas PPKP use information provided in monthly reports of Laboratory of Inspection and Quality Control (*Laboratorium Pembinaan dan Pengujian Mutu Hasil Perikanan,* LPPMHP). These reports have monthly summary totals for fresh and frozen whole tuna and tuna product (loin, steak etc.) as determined from packing lists provided by the export companies. However, in contrast to the provincial fisheries office in Bali, Dinas PPKP does not use raising factors to bring the whole tuna and tuna product data from LPPMHP up to original fish weight – they use only the aggregated total of whole and processed product. Consequently the export component in the Dinas PPKP reporting is very much an underestimate of the real export volume of "tuna" from Muara Baru. In common with the reject tuna component, the export component in "tuna" reporting by Dinas PPKP includes the billfish species.

The port authority (Pelabuhan Perikanan Samudera Jakarta, PPSJ) at Muara Baru, with assistance from the closely linked office of WASKAN, also collect, collate and report information on tuna production (and for other species). PPSJ make weekly requests to Dinas PPKP for copies of their data on both the export and reject component, but they also collect information independently, direct from vessels (longline) using a log-book system, similar to that described above for WASKI at Benoa. However, as in Benoa, the log-book form is rarely filled in by the vessel skipper or fishing master, but instead the information on volume of catch is usually obtained indirectly from the vessel agent, vessel owner, or processing company handling the catch after the vessel has landed. In addition to the log-book form, a second form (*Surat Tanda Bukti Lapor Kedatangan Kapal, STBLKK*) is filled out by PPSJ staff for each vessel landing. In addition to registration details of the vessel and other vessel specific information, the form has entries for the types and amount (in kg) of fish species caught, and for area of fishing operation (but only general area). The log-book and STBLKK forms are also used for recording fish unloaded from carrier vessels.

PPSJ monthly reports include tables of total production by fish type and by vessel gear type (longline, gill-net, muro ami), with fish types including albacore, skipjack, marlin, swordfish, sailfish, tuna, yellowfin, tongkol, and tenggiri. However, in the annual reports the billfish species groups are aggregated with tuna species into the one category "tuna". These reports present annual production statistics for the volume of fresh tuna (*tuna segar*), frozen

tuna (*tuna beku*), and reject tuna. Included in the frozen statistics is separate reporting of the volume of frozen tuna transhipped at Muara Baru.

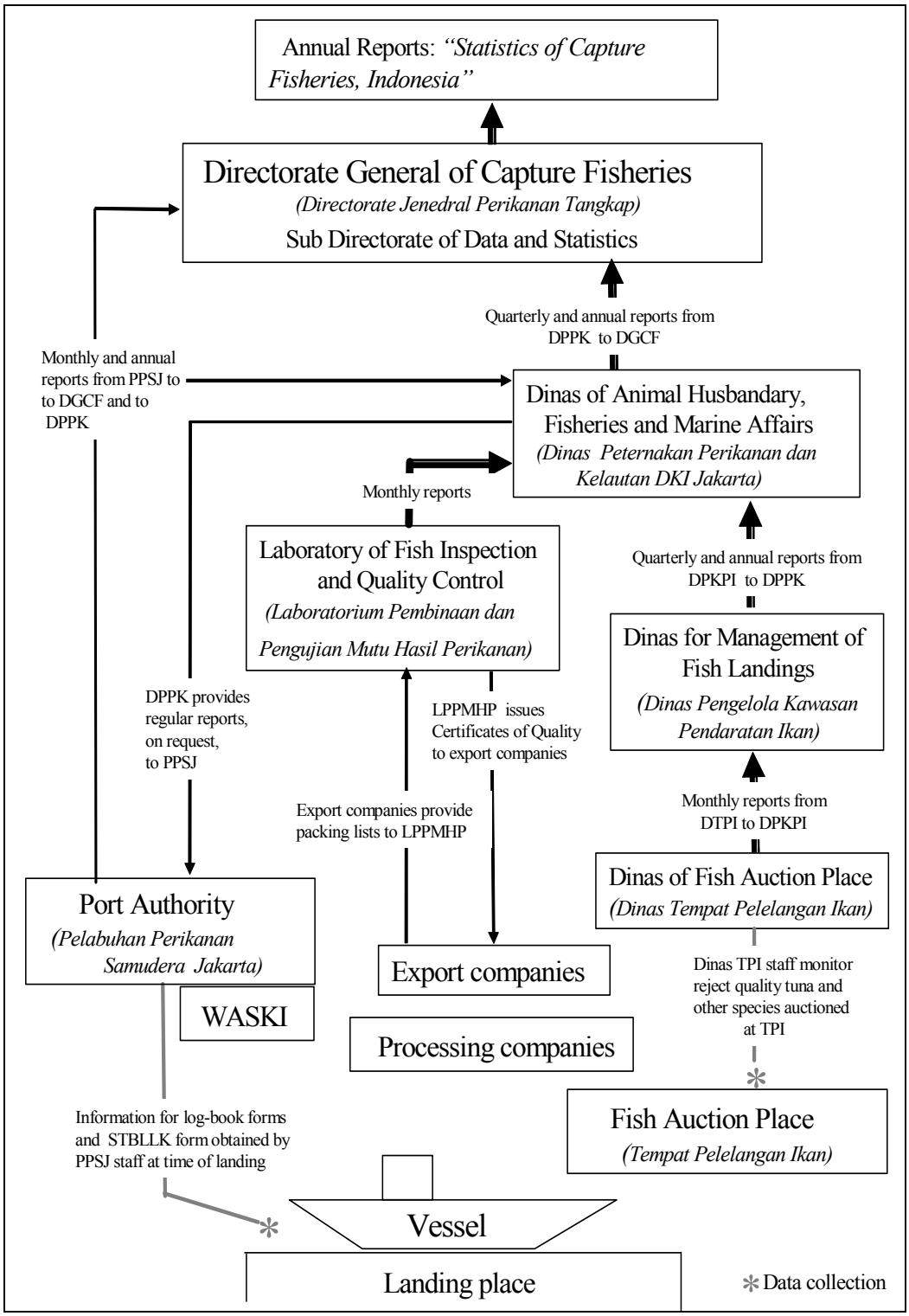

Figure 6.2.3. Pathways of data collection and reporting at Muara Baru. Thicker line and arrows indicate primary route of production statistics reported at national level.

As shown in Section 4.5.2, the total production volume of "tuna" reported by PPSJ is significantly higher than that reported by Dinas PPKP. During the course of interviews for this report, staff at Dinas PPKP readily acknowledged

that their total production volumes were underestimates, largely because of the unraised export component. Although a clear picture of the methods used by PPSJ to determine their production statistics was not achieved during the course of this review, it is thought PPSJ use a combination of data in the reports sourced from Dinas PPKP and from LBMHP, information provided by the log-book system, and information they obtain direct from fishing companies. The PPSJ monthly and annual reports are sent to Dinas PPKP and also to DGCF, but their production statistics are not used in the compilation of the national fisheries statistics.

6.2.1.3 Cilacap

The system of data collection (Figure 6.2.4) and reporting for fish landed at Port of Cilacap is similar to that described below for some of the 'artisanal' ports surveyed, in that the data collated and reported by the DFO (Dinas Perikanan dan Kelautan Kabupaten/Kotamadya Cilacap = *the Cilacap District Office of Fisheries and Marine Affairs*) up to DGCF is based on information provided by the main fish auction centre in the port. The officers of PUSKUD "Mina Baruna" record estimates of the volume of catch that is unloaded from each vessel, as it passes through the Tempat Pelelangan Ikan (Fish Auction Place). The data they record provide no species discrimination for yellowfin, bigeye, nor southern bluefin tuna which are recorded together as "*tuna besar*" (big tuna), "*tuna sedang*" (medium-size tuna) and "*tuna kecil*" (small tuna). Their records are only volume (kg) estimates, because, as described above in Section 4.4.3, all large tuna in good condition are not weighed prior to loading onto trucks. PUSKUD "Mina Baruna" produces monthly summary reports (using Form SL-3), copies of which are sent to the DFO. The DFO in turn produces quarterly reports (LL-series of forms) which are sent to the PFO (Dinas Perikanan Propinsi Jawa Tengah = *Office of Fisheries for Province of Central Java*) for Central Java Province, located in Semarang.

The data provided by Puskud "Mina Baruna" are used by the DFO to determine the amount of tax (*retribusi*) payable by fishing vessel owners. There is a 3% tax on reject quality tuna that are sold locally, and for the export quality fish that are trucked to Jakarta, there is a standard tax of 5% of 9000 Rp/kg.

Prior to the commencement of the IOTC/RCCF/RIMF monitoring program at Port of Cilacap in August 2002, the Port of Cilacap Port Authority (PPSC) also monitored the catches unloaded from fishing vessels. The forms used by PPSC in their daily monitoring included an entry column for fish type, but there was usually no differentiation among the larger tuna species (i.e. yellowfin, bigeye, and southern bluefin are grouped together as "tuna"). Albacore and skipjack tunas were differentiated as separate categories, as were sailfish (*layaran*), marlin (*setuhuk*), and swordfish (*meka*). PPSC staff would collect catch information both direct from the vessel skipper after the vessel docks in port and also from observations made during the catch unloading and as catch passes through TPI. Between August 2001 and the commencement of the IOTC/RCCF/RIMF monitoring program in August 2002, PPSC staff were sampling fish length measurements and doing species identification for the larger tunas; data that was collected in a collaborative arrangement with the

RIMF. However, due to limited staff resources, these measurements were not done for all landings, particularly when several vessels are unloading at the same time.

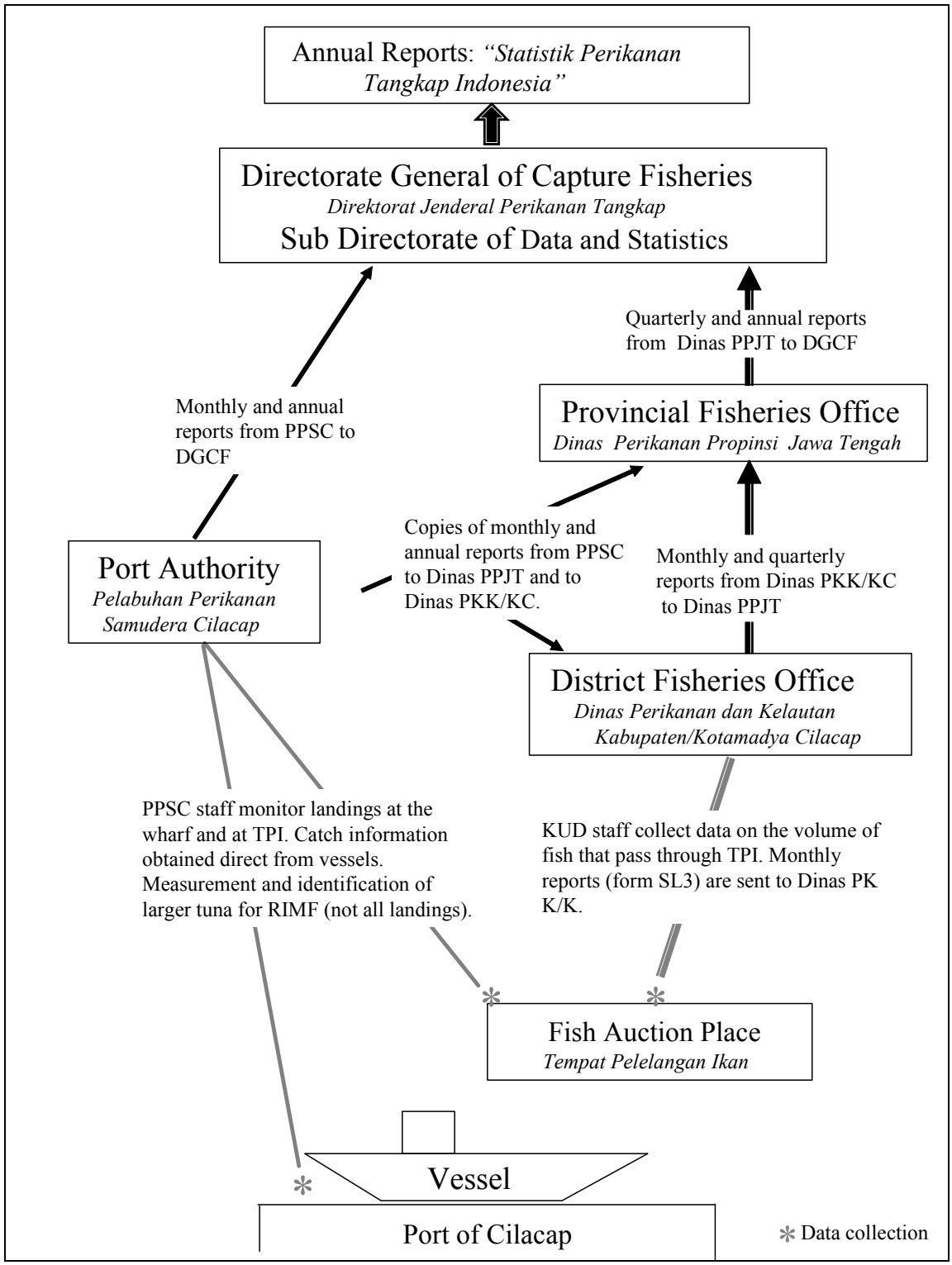

Figure 6.2.4. Pathways of data collection and reporting at Port of Cilacap. Thicker line and arrows indicate primary route of production statistics reported at national level.

The section of Marketing and Information within PPSC enters data from the daily records into computer spreadsheet (Excel). Monthly summary reports are sent to DGCF, and copied to the PFO in Semarang and to the DFO in Cilacap. Similarly, annual reports containing catch/production statistics are produced by PPSC and sent to those same three offices.

The office of WASKI at Cilacap does not manage a log-book system for the tuna longline vessels as described for WASKI in Muara Baru and Benoa. WASKI's primary responsibility in Cilacap is not to monitor fish catches/landings but to monitor vessel activity. This 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' (*Surat Penangkapan Ikan*) for each fishing trip. WASKI produces quarterly reports of vessel activity that are sent to the Directorate General of Marine Resources and Fisheries Control, to DGCF, and copied to PPSC.

6.2.2 Artisanal ports

In general, the systems of data collection and reporting at the artisanal ports surveyed follow closely the original national system (Figure 6.1.2) – data is received by the DFOs, provided by various sources, and DFOs collate and report production statistics quarterly to provincial level (via the LL-series of forms), and in turn are reported quarterly by PFOs to DGCF.

At most ports the primary source of catch landing/data is the main auction place (*Tempat Pelelangan Ikan*, TPI). The operation of the TPI is usually under the control of fishers' cooperatives (*Koperasi Unit Desa*, KUD) or, as described for Cilacap, a company appointed by the provincial government. The actual administration of the auction centres is often the responsibility of subdistrict or district level fisheries offices, but may also be managed by the local port authority (particularly if the TPI facility is owned the port authority).

Typically, an auction place officer (*juru lelang*) makes handwritten records during the auctions – these records include name of the fishing boat/agent, type of fish sold, the amount of fish (kg), and the name of the buyer. The auction officer then either provides these records to the office that manages the TPI, to the office of the KUD, or to an officer from the subdistrict or district fisheries office. In some ports this is done daily after each auction session, whereas in others the auction officer compiles a monthly report from the daily records and provides this to one or more of the other offices. Investigations for this report revealed that the daily handwritten records of the auction offices range from notes scribbled on blank pieces of paper to more formal log-books.

The procedures used by the TPI auction officers to estimate the amount of fish sold for each species group also varies among landing places. Some of the smaller landing places do not have weighing facilities and estimations are generally based on the number of baskets (for smaller fish) and estimations judged 'by eye' for larger fish.

In Bungus/Padang, the total daily production for each fish group (skipjack, tongkol, tuna etc.) used to be determined by dividing the total sales for each group by the buying price of the main purchasing company (PT Tirta Raya Mina) for that particular day. However, now the TPI auction officers use an 'average price' (for that day) and the known total sales (Rp.) in the auction place (for that day) to estimate the total volume (kg) of fish sales. Then, to obtain an estimate of weight for each fish group, they use 'standard' proportions e.g. 40 % of total sales by volume for tuna, and 60 % of total sales by volume for the combination of skipjack and tongkol.

At some TPI (e.g. those at Kupang, Jimbaran, Kedonganan), the daily records are adjusted upwards to account for unrecorded catch (= unauctioned catch) – fish given to the crew, that taken by the fishing boat owner, that given as payment to workers who help unload, and also where the amount of fish is too small for auction (generally, if the amount of a particular fish type is <10 kg, it will not be auctioned). The amount of addition for unrecorded catch can be dependent on gear type e.g. in Kupang there is a 10% addition for longline and gill-net vessels, 5% for pole and line and purse seine vessels. However, in reality, the amount of unrecorded catch will not be proportional to the amount auctioned i.e. the owner and crew may take home 1-3 fish each at the end of each trip, regardless of the amount landed. Generally these unrecorded fish are not the higher value pelagic species like yellowfin or bigeye, but most often skipjack and tongkol.

At the smaller landing places in the neighbouring subdistricts of the artisanal ports surveyed, FEOs conduct weekly sampling and prepare monthly reports (using form EL-2) to their respective DFO, i.e. as per the original national system described above. However, the investigations for this report found that the effective execution of the FEO weekly surveys are regularly hampered by limited resources (see Section 6.3).

6.2.3 Current Role of Central Board of Statistics

The Central Board of Statistics (CBS) continues to share some of responsibility with DGCF in the collection and reporting of fisheries statistics (Fig. 6.2.5). As described in Sect. 6.1.1 there are CBS offices at district, provincial, and national level. Generally, there is also a CBS officer based in each subdistrict. CBS continues to have the responsibility to carry out the annual census of fisheries households. However, according to information obtained through interviews for this review, BPS struggles to perform the task adequately because of limited resources – this is not surprising given that the subdistrict officers have to collect, collate, and report data for all agricultural sectors in their respective subdistricts, not just fisheries. Where CBS is unable to obtain fisheries related data itself, it sources information from the offices under DGCF. District and provincial fisheries offices provide data regularly (on request) to BPS. The national office of BPS assists the Subdirectorate of Data and Statistics within DGCF to produce the annual reports "Statistics Capture Fishery Indonesia".

BPS also collaborates with the Directorate General of Aquaculture (*Direktorat Jenderal Perikanan Budidaya*) to produce the annual report[SS24] "Export

Statistics of Fishery Product". This report provides totals for volume and value of fresh and frozen export tuna product, for all provinces, and statistics on the volume and value of product to destination countries. These data include all tuna product that is exported from the provinces, not just that landed by vessels at port, i.e. totals include imports from regions outside the province that are subsequently processed and exported. With no way of determining the original landing place of the fish, the statistics are of limited use in any assessment of catch volume. The purpose of these annual reports is primarily to provide statistics of international trade in fisheries for "evaluation and planning of fisheries development" (DGA 2003).

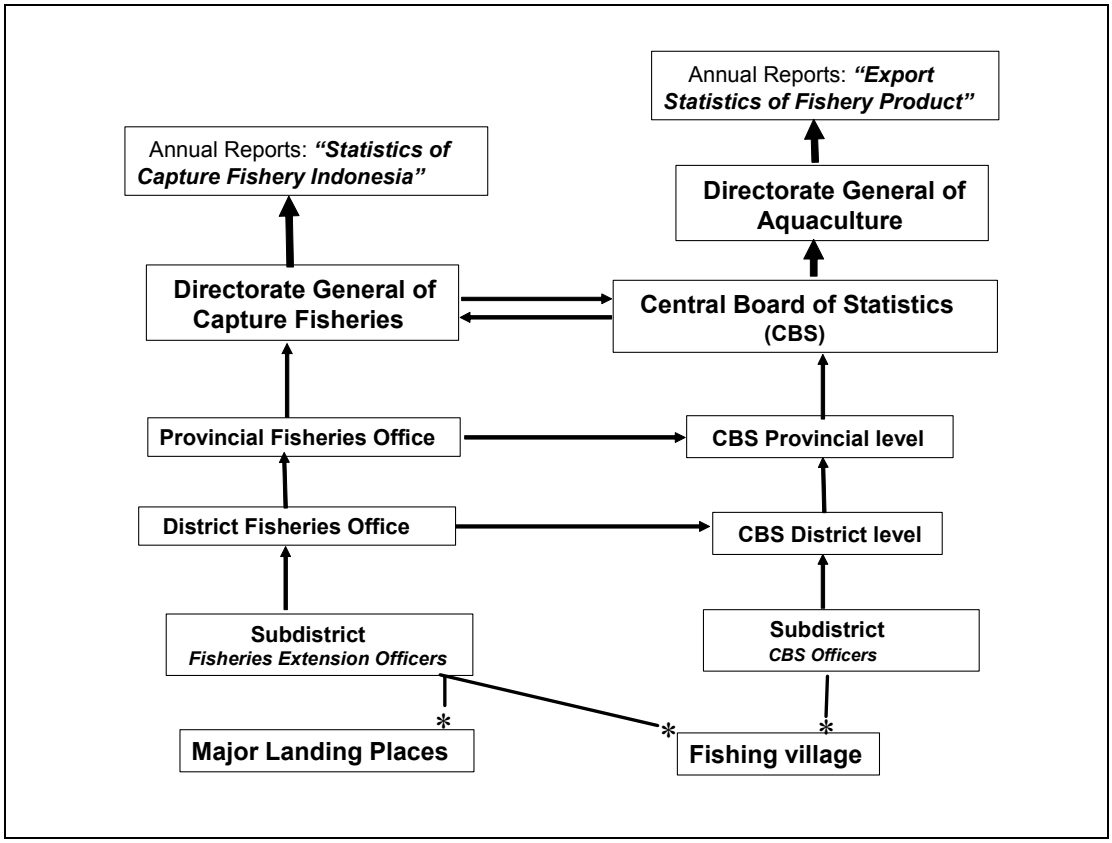

Figure 6.2.5. Shared data collection and reporting responsibilities, between DGCF and CBS. (* Points of data collection).

6.2.4 Current on-board observer programs

There are currently two on-board observer programs operating on Indonesian longline vessels fishing tunas in the Indian Ocean:

1. RIMF has had an observer program for longline vessels since 2001. However, the program in still in its infancy and till now only 2 to 3 trips have been done per year (2 observers on board for each trip). The trips to date have been on vessels from all three industrial ports.
2. As part of graduate degrees for students at fisheries schools, the students are required to do one trip to sea as an observer on a longline vessel. The trips can vary in length from 2 to 5 weeks. The program has been

operating since 2000[9] and is managed by WASKI at Benoa. There are currently 16 fisheries schools involved, each producing 50 students per year for the program. The program only operates from Benoa, on vessels from at least 3 companies, and covers 10 months of the year (January and February excluded because of school break). WASKI retains all the hard-copy log-book sheets that have been completed by the student observers over the past four years, but none of that information has been entered into a computer database as yet.

6.3 Limitations and Deficiencies of Current Systems

The following is a summary of the limitations and deficiencies in the current systems of data collection and reporting, with respect to meeting the data requirements for science-based stock assessments. Some of these limitations and deficiencies are applicable to the national system of fisheries statistics in general, whereas others are specific to either the industrial or artisanal ports. They are grouped accordingly:

6.3.1 General

1. The current national system of fisheries statistics is designed for providing production figures and census statistics for assessment of importance of fisheries to the nation's economy rather than for science-based stock assessments for fisheries management.

2. The majority of production data for tunas (yellowfin, bigeye, southern bluefin, albacore) and tuna-like (marlin, swordfish, sailfish) species, in reports at provincial and national level are aggregated and reported as a single category "tuna". The same is generally true at the lower levels data collection and reporting (i.e. district and subdistrict levels) although reporting for individual species groups was encountered, to various degrees, in reports and data sets of some of these offices.

   The rationale that underlies the grouping of fish species (see Appendix I) in Indonesia's fisheries statistics reports is unclear. On the one hand all the *Thunnus* species are grouped together under "tuna" together with billfish species, and yet there is usually separate reporting for individual species such as narrow barred king mackerel, *tenggiri* (*Scomberomorus commersoni*), and Indo-Pacific king mackerel, *tenggiri papan* (*Scomberomorus guttatus*).

3. The national production statistics, and production data in contributory reports, often show very significant fluctuations across years, but explanations are not provided in the reports to explain these inconsistencies. Generally little information is provided in the reports to explain the methods used to compile these statistics.

4. 'Validation meetings' are held annually between DGCF and Provincial Fisheries Offices, and between Provincial and District levels. However, such meetings have yet to become routine procedure between offices at

[9] The fisheries student observer program was initiated by WASKI (Benoa) from an idea of staff member Mr K. Mordinatha

the lower levels (but see below *Current and Proposed DGCF Initiatives*). Efforts are made to remove errors at the higher levels of reporting, but there appears to be a shortage of validation/cross-checking procedures for minimization of errors at lower levels (i.e. particularly at the point of collection of the raw data). At the completion of investigations for this review it was still unclear what (if any) procedures are followed, in offices at all levels of data collation and reporting, to investigate and reconcile unusual inconsistencies in production statistics.

5. Catch related information that are routinely collected by various means and used to compile production statistics, are also, in most cases, used by district and provincial governments to determine the amount of tax ("*retribusi"*) that must be paid by fishing companies/vessel owners. The dual purpose in data collection increases the likelihood of under-reporting of catch. And furthermore, this in turn influences the ways some offices estimate production, with some forced to use less direct methods of estimation to remove reliance on company provided data (e.g. methods described in Sect 6.2.1.1 for the PFO in Bali). It should be emphasised that we are not suggesting that all fishing companies under-report catch, but from comments received and observations made in the course of interviews for this review, it appears it is a widespread phenomenon and is, for the large part, expected and tolerated by the data collection offices. Contributing to this issue of under-reported catch data, there appears to be no system for punitive measures to encourage companies not to under-report.

6. A shortage of resources (staff, computers, transport) was a common message received from many offices at all levels. In addition, staff whose tasks include collection, collation, and reporting of catch/production data are often required to do many other duties that detract from their ability to monitor landings, produce reports on time, do validation/cross-checking etc.

7. As a related resource issue to that described above, within each port there are many different offices (Dinas Fisheries Offices, Port Authorities, WASKI, CBS) involved in collecting, collating and reporting catch/production related statistics to various degrees. Each office reported limited resources (primarily insufficient staff) as a serious issue. In many cases there appears to be duplication of effort, particularly with respect to collation and reporting. This is particularly evident at the industrial ports, but also, to varying degrees, at the artisanal ports surveyed.

8. The limited computer resources in many offices do not allow for computers to be dedicated to the fisheries data collation and reporting tasks. As has already been experienced during the first year of the IOTC/RCCF/RIMF monitoring program, when computers are used heavily for multiple purposes, there is increased likelihood of software and hardware problems, and then protracted periods when data cannot be entered.

9. Reporting from office to office (Subdistrict – District – Provincial – National) is primarily by hard-copy report, or in some cases, at lower

levels, by handwritten copy. Currently, there is minimal electronic transfer of data and likelihood of errors through transcription is high.

6.3.2 Specific to Industrial Ports

1. The log-book system for longline vessels (administered by WASKI/WASKAN at Benoa and Muara Baru), has always had the potential to provide good catch data for stock assessment purposes. However, as the information that is entered into the log-book forms appears rarely to be obtained directly from the vessel skipper or fishing master, and the catch composition and volume information that is provided is often 'coarse', the usefulness of the log-book is greatly diminished.
2. During the IOTC/RCCF/RIMF/CSIRO monitoring in 2002/2003 many problems have been experienced matching landings of vessels with vessel records in the National (DGCF) licensing registry. Factors that contribute to these problems include:
    - Some vessels from which landings have been monitored were sometimes found to be missing from the DGCF, WASKI, and Port Authority registries
    - Inconsistencies have been encountered between vessel listings in the DGCF registry and those used by WASKI and Port Authority Offices
    - Vessels can have more than one port nominated as their home port.
    - Since regulations were introduced during 1997-1998, all foreign owned vessels, registered in Indonesia, now operate under the Indonesian flag. However, it is recognised that some foreign vessels may be using the Indonesian flag to gain entry into Indonesian ports for unloading while actually being registered in foreign ports.

6.3.3 Specific to Artisanal Ports

1. Procedures used by staff in fish auctioning places, to collect data for reports to District Fisheries Offices, are not standard across ports/landing places. Methods of estimation can be highly variable, particularly where there are no weighing facilities. The ways data are recorded are also highly variable (from standard forms through to roughly written notes on slips of paper).
2. In Districts with many landing places, the ability of Fisheries Extension Officers to complete the weekly surveys, that are an integral part of the National Statistics System, are hampered by the practical limitations of having to travel large distances and also, sometimes by shortage of available transport.

6.4 Current and proposed efforts to improve collection and reporting systems

During the past year DGCF has commenced initiatives to address some of the above issues. These initiatives include:

1. The introduction of new reporting forms, for reporting of production statistics by Provincial Fisheries Offices to DGCF, that contain higher

differentiation of species – including, for the first time, separate entries for albacore (*albakora*), yellowfin (*madidihang*), bigeye (*mata besar*), sailfish (*ikan layaran*), black marlin (*setuhuk hitam*), blue marlin (*setuhuk biru*), striped marlin (*setuhuk loreng*), and swordfish (*ikan pedang*).

2. Training is currently being provided to staff at 30 Provincial Fisheries Offices, for use of the new reporting forms. Training is also planned for staff at District Offices and for the 34 Port Authority Offices.

3. Plans for provision of increased computer resources to offices at all levels to enable electronic storage, and (most importantly) electronic transfer of fisheries data and reports between offices. As part of this initiative DGCF is developing a software program for distribution to all offices, to enable a more standard data entry, better data storage procedures, and easier report transfer between offices. [Note: The plan to increase computer facilities and introduction of software will commence with a pilot project in the 16 regencies of Central Java Province, commencing by the end of 2003].

4. Transport (motorbikes) are to be provided to District Fisheries Offices, for use by Fisheries Extension Officers, to assist in achieving adequate sampling at small landing ports and villages. Similarly, financial assistance is to be provided to the District level to enable honorariums to be paid to the Fisheries Extension Officers to increase job satisfaction and reduce the likelihood of high staff turnover.

5. Validation meetings between DGCF and Provincial Fisheries Offices have been routine (annually) for many years. Similar validation meetings commenced in 2002 between Provincial and District Fisheries Offices, and DGCF has been encouraging District Offices to formalise procedures of validation/cross-checking with Port Authority Offices.

7. RECOMMENDATIONS

7.1 Monitoring

7.1.1 Industrial fisheries

The catch monitoring program currently run as a collaboration between RCCF/RIMF, DGCF, CSIRO, IOTC and OFCF is likely to receive funding from international partners for only two more years – i.e. until July 2005. After this time the expectation is that Indonesia will take responsibility for the monitoring of catches at Benoa, Muara Baru and Cilacap as part of its international commitments to IOTC and CCSBT.

The Indonesian Government, through DGCF, has developed and commenced a program for increasing the resources for catch monitoring (primarily infrastructure – computers, transport) at the lower levels (primarily District and Subdistrict) and is introducing new measures (modified reporting forms, new computers and data/report management software).

We recommend that Indonesia develop resource plans to ensure the continuation of the monitoring program at Benoa, Muara Baru and Cilacap past 2005. As the current collaborative program involves a mixture of scientific monitoring (e.g. size composition) and basic catch/fleet monitoring, we recommend that RCCF/RIMF and DCGF continue to collaborate in this program.

The bycatch of these fisheries and impact on ecologically related species needs to be determined to meet the increasing requirements of IOTC, CCSBT etc. All available data on bycatch needs to be collated and analysed, and an observer program established to monitor bycatch in the future.

7.1.2 Artisanal fisheries

The field observations on artisanal ports over a relatively short period of time did not enable determination of total annual catch of yellowfin and bigeye tuna etc. Therefore, a targeted monitoring program over 12-18 months is required to get the detailed information needed on these fisheries.

7.2 Resource requirements and the reduction of duplication within the data collection and reporting systems

This review found a substantial number of areas in which duplication of effort, lack of data validation and inadequate resources have resulted in inaccurate or inadequate data on catches and fleets. Thus, we recommend**:**

1. A comprehensive review be done, coordinated by DCGF, but preferably with input from independent agencies/consultants, to:

   Determine the resources required at Provincial, District, and Sub-district level to enable adequate coverage by surveys of catch and fleet, both in geographical and temporal terms. Key issues for this review would be:

   – number of staff required within each district (this will vary depending on size of district and number of landing places)

- the transport requirements
- computer and software facilities
- training required for existing and new staff

2. Investigate how the various port offices (WASKI, Port Authority), Government fisheries offices (District and Provincial) can be better coordinated to reduce duplication of effort and make most efficient use of available resources.
3. Investigate ways to reduce any duplication of effort between the branches of CBS, and those of DGCF.

7.3 Data Collection and Reporting

The review found serious problems in the way in which catch and fleet data are currently collected and reported for industrial and artisanal catches of tunas and billfish in the Indian Ocean. Based on interviews at all levels of the collection and reporting system, it seems likely that these problems are generic to data for all Indonesian tuna fisheries.

However, the review also found that the basis of a successful system exists in the methods developed by Yamamoto (1980), particularly if this could be modified to record catch by species (rather than aggregated under categories such as "tuna").

To improve the incentives for provision of accurate data by industry, we recommend:

4. The Indonesian Government investigates ways to separate the collection of catch data that is used by District government (or other offices) to levy tax *(retribusi*), from that used to compile fisheries statistics. Where this cannot be done the data provided by fishing companies needs to be validated at the source of collection by direct monitoring.
5. That the basis for a data collection system should be built on a partnership between Government and industry, and include incentives for compliance with regulations at the same time as penalties for non-compliance. For a partnership to be effective, DGCF and partners will need to provide regular feedback to all levels of the industry on the objectives of and results from current and future monitoring programs is essential – the former to ensure a full understanding of the long term goals of sustainable fisheries and the associated benefits for industry, for the Nation's many inhabitants that have fish as a primary food source, and for the marine environment.
6. Introduce regulations to enforce accurate and prompt reporting of catch by fishing companies. For example:
    - Regulations that give WASKI/Port Authorities more powers to withhold permits for vessels to sail from port if vessel skippers do not provide accurate and prompt reports of catch OR

- Regulations that give the Directorate General Fisheries Enterprise Services (*Direktorat Jenderal Pelayanan Usaha Perikanan*), which is responsible for issuing licences to fishing companies/vessel owners, the power to place sanctions on companies/owners that do not provide accurate and prompt catch reports.

To improve the efficiency and accuracy of data collection systems, and ensure that the data collected is useful for stock assessments, we recommend that:

1. As a high priority, the government develop and implement a logbook system and targeted observer program to collect catch and effort data for all industrial fisheries. To enable stock assessments by Indonesia, and regional fisheries authorities (IOTC, CCSBT, WCPFC) of key tuna and billfish species, it is essential that Indonesia collect accurate data on the catch–per-unit-of-effort in its longline, purse seine and pole and line fisheries. Government and industry should work collaboratively to establish effective logbook and on-board observer programs.
2. Data collection should be co-ordinated through a National Program. For this to be successful there needs to be resolution of the problems generated by the granting of greater authority to Regencies (in 2000) – the main problem being Regencies not fulfilling their data collection responsibilities to the appropriate level, and/or using data collection/catch estimation methods that are different to the National system.
3. Catch sampling/catch surveys must include separation of tuna species. The recent introduction by DGCF of the modified sampling and reporting forms, with differentiation among tunas and tuna-like species, is a very positive development. However, it must be ensured, that together with these modified forms, there is provision of adequate training in species identification to all staff involved in the monitoring/sampling.
4. Increased rigor in the validation of catch data is essential. Currently there are a series of processes in which data is verified (i.e. checks are made that the data entered on forms at the collection points are accurately represented in the data summaries and reports). However, there is little validation that raw catch data accurately represent the true catch of vessels. The implementation of a log book system would allow systematic checks of catches reported on logbooks with the data collected by port and regency offices, and allow an estimate of the accuracy of the data used by DGCF to report on national catches. Similarly, the catch monitoring system currently operating in Benoa, Muara Baru and Cilacap provide the basis for independent validation of the DGCF data.

The review revealed a number of inconsistencies in the recording of vessel activity and registration. These complicate and limit the accuracy of estimates of catch derived from catch monitoring as these require raising of the fraction of the vessels/catch monitored to the total fleet/catch.

According to Indonesia's submission to the April 2003 CCSBT Indonesian Catch Monitoring Workshop (DGCF 2003), a re-registration of all fisheries businesses and fishing licenses was done during September 2001 – January

2002. However, this re-registration procedure has not alleviated the problems associated with inconsistencies in the vessel registries.

To correct the inconsistencies, we recommend a review of the vessel registry licensing systems, both at the National (currently for vessels > 30 GT), and Provincial (vessels < 30 GT) levels. The review would need to address the following issues:

1. What are the reasons for inconsistencies between DGCF vessel registry and those in WASKI and Port Authority Offices, and the inconsistencies encountered between vessels monitored and vessel registries?
2. What measure can be introduced to ensure that all registries are coordinated and up-to-date with regards vessel name changes, ownership changes, fishing gears changes, and vessel activity changes (some vessels may become inactive but remain in the registries)?
3. Are all Indonesian flagged vessels that land catches registered in Indonesian ports?
4. Is it possible to have all vessels registered with only one home port?

Addressing these vessel registry issues will not only improve efficiencies in the monitoring of catch through landings, but will also allow Indonesia to better combat illegal, unreported, and unregulated fishing activities within its National maritime boundaries.

7.4 Capacity Building

There are two major drivers for the need to increase Indonesia's capacity in stock assessment of tuna fisheries. First, Indonesia continues to move towards membership and/or co-operating non-member status of three Regional Fisheries Management Organizations - IOTC, CCSBT and the soon-to-be-ratified WCPFC. For Indonesia's interests to be well represented at these meetings, accurate data and an assessment of the status of the large national fisheries is essential. Second, there are already signs that the industrial longline fisheries of the Indian Ocean are being depleted. Recently, more than 200 vessels have left this fishery due to decreased catch rates making operations unprofitable. For the Indonesian Government to develop management strategies to ensure long term sustainability of this resource, good stock assessment advice is essential.

To improve its capacity for stock assessment we recommend the following actions:

1. Recruiting staff with the appropriate mathematical and data analysis skills into its primary fisheries research and management organisations (RCCF, RIMF, DGCF).
2. Assisting the newly recruited staff or existing staff with opportunities for training in overseas fisheries research institutions.
3. Introducing more population analysis/stock assessment elements into university and fisheries school courses.

4. As the capacity for stock assessment within the research organisations increases, opportunities should be provided for these skilled staff to pass on their knowledge to students in the universities and fisheries schools – as visiting lecturers. Avenues should also be pursued to encourage visiting lecturers from overseas institutions.
5. One of the long term primary objectives should be to have Indonesian fisheries scientists reporting on their own stock assessments at international stock assessment workshops/meetings rather than assessments being done by overseas institutions.

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Appendix I

Tunas, tuna-like species, and some of the other pelagic species caught by Indonesia's industrial and artisanal fishing fleets in the Indian Ocean. Group names indicate commonly used categories in fisheries production reports - those marked with * are standard group names in reporting at national (DGCF) and provincial level, prior to the introduction of new LL-3 forms in 2003.

Group Name	Indonesian name(s)	English name	Scientific name
Tuna*	Madidihang	Yellowfin tuna	Thunnus albacares
	Jabrik	Juvenile yellowfin tuna	*Thunnus albacares*
	Mata besar	Bigeye tuna	*Thunnus obesus*
	Albakor, Bakor	Albacore	*Thunnus alalunga*
	Blufin, Sirip biru	Southern bluefin tuna	*Thunnus maccoyii*
	Setuhuk hitam, Geber	Black marlin	*Makaira indica*
	Setuhuk putih, Gepeng	White marlin	*Tetrapturus albidus*
	Setuhuk loreng	Striped marlin	*Tetrapturus audax*
	Ikan pedang, Meka	Swordfish	*Xiphias spp.*
Layaran	Ikan layar	Sailfish	*Istiophorus spp.*
	Cakalang*	Skipjack tuna	*Katsuwomus pelamis*
Tenggiri	Tenggiri*	Narrow barred king (Spanish) mackerel	*Scomberomorus commersoni*
	Tenggiri papan*	Indo-Pacific king mackerel	*Scomberomorus guttatus*
Tongkol*	Tongkol	Eastern little tuna, frigate tuna, bullet tuna	*Euthynus affinis* *Auxis thazard, A. rochei*
	Abu-abu	Longtail tuna	*Thunnus tonggol*
	Kembung*	Short mackerel, Indian mackerel	*Rastrelliger spp.*
	Alu-alu*	Barracudas	*Sphyraena spp.*
	Slengseng	Slimy (blue) mackerel	*Scomber astralasicus*
	Ikan layang, Layang*	Scads	*Decapterus spp.*
	Talang-talang, Daun bambu*	Queenfish	*Scomberoides spp.*
	Lemadang	Dolphinfish	*Coryphaena hippurus*
	Kuwe*	Jack trevallies	*Caranx spp.*
	Cucut*	Sharks	Charcharhinidae Spyrinidae Oreotolobidae

Appendix II

Fishing gear types. The majority of these gear categories are standard classifications used in reporting of marine fisheries production by gear type (modified from Appendix 1. Statistics of Capture Fisheries Indonesia, DGCF1999).

No.	*Kategori Alat Penangkap (Indonesian)*	Fishing Gear Category (English)	*Jenis Alat Penangkap (Indonesian)*	Type of Fishing Gear (English)
1	*Trawl*	Trawl	*Pukat udang*	Shrimp trawl
			Pukat ikan	Fish net ~ fish trawl
2	*Pukat kantong*	Seine net	*Payang (termasuk lampara)*	Boat seine for pelagic fish (including lampara)
			Dogol	Boat seine for demersal fish (Danish seine)
			Pukat pantai	Beach seine
3	*Pukat cincin*	Purse seine	*Pukat cincin*	Purse seine
4	*Jaring insang*	Gill net	*Jaring insang hanyut*	Drift gill-net
			Jaring insang lingkar	Encircling gill-net
			Jaring klitik	Shrimp gill-net
			Jaring insang tetap	Set (fixed) gill-net
			Trammel net	Trammel net
5	*Jaring angkat*	Lift net	*Bagan perahu/rakit*	Boat/raft lift-net
			Bagan tancap (termasuk Kelong)	Fixed lift-net (including kelong)
			Serok	Scoop net
			Jaring angkat lainnya	Other lift-net
6	*Pancing*	Hook and line	*Rawai tuna*	Tuna longline
			Rawai hanyut lain	Other drift longline
			Rawai tetap, Rawai dasar	Set longline, Bottom longline
			Huhate	Pole and line
			Pancing Ulur	Hand-line
			Pancing tonda	Troll-line
7	*Perangkap*	Traps	*Sero*	Guiding barrier
			Jermal	Stow net
			Bubu	Fish traps
			Perangkap lainnya	Other fish traps
9	*Muro ami*	Drive-in net	*Muro ami*	Drive-in net
10	*Alat lain*	Other gears	*Jala, tombak, dll*	Cast net, harpoons, etc.

Appendix III

(following 2 pages)

(i) Example of "Marine Fishery Production by Species, Coastal Area and Province" table, presented in DGCF annual fisheries statistics reports "Statistics Capture Fisheries Indonesia" (Statistik Perikanan Tangkap Indonesia). Data shown are for 2002 but are only one section from a larger table that includes data for a total of 66 species groups. Seven other coastal areas (Selat Malaka, Timur Sumatra, Selatan – Barat Kalimantan, Timur Kalimantan, Selatan Sulawesi, Utara Sulawesi and Malaku-Irian Jaya) are not included due to limited page space.

(ii) Example of "Marine Fishery Production by Type of Fishing Gear, Coastal Area and Province" table, presented in DGCF annual fisheries statistics reports "Statistics Capture Fisheries Indonesia" (Statistik Perikanan Tangkap Indonesia). Data shown are for 2002 but are only one section from a larger table that includes data for a total of 28 gear classifications. Seven other coastal areas (Selat Malaka, Timur Sumatra, Selatan – Barat Kalimantan, Timur Kalimantan, Selatan Sulawesi, Utara Sulawesi and Malaku-Irian Jaya) are not included due to limited page space.

PERIKANAN LAUT/*MARINE FISHERY*

Tabel 1.5 **Produksi perikanan laut menurut jenis ikan, daerah perairan pantai dan Propinsi, 2000**

Table ***Marine fishery production by species, coastal area and Province, 2000***

Satuan : TON

Unit : MT

Perairan pantai *Coastal area*	**PROPINSI - *PROVINCE***	Ikan - *Fishes*								
		Terubuk *Tholishad/ Chinese herrings*	Kembung *Indian mackerels*	Tenggiri papan *Indo-pacific king mackerels*	Tenggiri *Narrow barred king mackerels*	Layur *Hair tail/ Cutlass fishes*	Tuna *Tunas*	Cakalang *Skipjack tuna*	Tongkol *Eastern little tuna*	Ikan lainnya *Others*
JUMLAH - *TOTAL*		**2 645**	**207 037**	**24 449**	**85 430**	**38 077**	**163 241**	**236 275**	**250 522**	**508 966**
	Sub jumlah - *Sub total*	**119**	**27 826**	**4 628**	**4 670**	**4 391**	**10 202**	**16 180**	**18 286**	**27 248**
	D.I. Aceh	84	1 743	1 462	1 101	161	1 898	2 975	4 977	5 708
Barat Sumatera (West Sumatera)	Sumatera Utara	-	20 489	1 567	1 712	2 248	1 802	2 400	3 072	6 065
	Sumatera Barat	-	4 179	511	1 030	1 047	5 718	10 157	9 494	11 027
	Bengkulu	-	836	622	381	674	339	228	252	1 713
	Lampung	35	579	466	446	261	445	420	491	2 735
	Sub jumlah - *Sub total*	**-**	**4 669**	**8**	**3 431**	**5 692**	**6 037**	**3 088**	**14 173**	**9 035**
	Jawa Barat	-	3 143	-	2 988	1 945	723	1 310	4 602	2 781
Selatan Jawa (South Java)	Jawa Tengah	-	6	-	141	619	5 084	1 387	106	3 397
	D.I. Yogyakarta	-	93	-	40	151	1	3	78	121
	Jawa Timur	-	1 427	8	262	2 977	229	388	9 387	2 736
	Sub jumlah - *Sub total*	**32**	**44 121**	**1 107**	**21 427**	**10 691**	**7 565**	**5 149**	**52 192**	**109 564**
	DKI Jakarta	-	8 113	-	3 860	129	7 506	2 468	15 928	45 725
Utara Jawa (North Java)	Jawa Barat	-	8 309	593	4 795	2 578	-	-	6 303	7 433
	Jawa Tengah	-	15 377	-	4 503	3 359	-	-	12 634	31 190
	Jawa Timur	32	12 322	514	8 269	4 625	59	2 681	17 327	25 216
	Sub jumlah - *Sub total*	**379**	**8 994**	**302**	**3 790**	**2 154**	**32 065**	**15 230**	**25 561**	**10 769**
	B a l i	-	166	-	340	276	26 768	1 502	11 479	1 952
Bali-Nusatenggara	Nusa Tenggara Barat	79	5 240	-	1 636	1 235	1 421	3 917	6 968	6 479
	Nusa Tenggara Timur	300	3 588	302	1 814	643	3 876	9 811	7 114	2 338
	Timor Timur	-	-	-	-	-	-	-	-	-

PERIKANAN LAUT/*MARINE FISHERY*

Tabel 1.7 — Produksi perikanan laut menurut jenis alat penangkap, daerah perairan pantai dan Provinsi, 2000

Table — *Marine fishery production by type of fishing gear, coastal area and Province, 2000*

Satuan : TON

Unit : MT

Perairan Pantai *Coastal area*	PROVINSI - *PROVINCE*	Jumlah *Total*	Pancing - *Hook and lines*						Others
			Rawai tuna *Tuna long line*	Rawai hanyut lain selain rawai tuna *Drift long lines other than tuna long line*	Rawai tetap *Set long line*	Huhate *Skipjack pole and line*	Pancing yang lain *Other pole and line*	Pancing tonda *Troll line*	
JUMLAH - *TOTAL*		**3 807 191**	**74 763**	**43 774**	**78 807**	**150 722**	**277 045**	**127 704**	**3 054 376**
Barat Sumatera (West Sumatera)	**Sub jumlah - *Sub total***	**277 214**	**1 332**	**3 235**	**11 945**	**49**	**36 135**	**25 544**	**198 974**
	D.I. Aceh	43 931	226	399	2 815	-	12 833	3 311	24 347
	Sumatera Utara	98 083	-	216	6 947	-	14 080	-	76 840
	Sumatera Barat	95 508	114	-	399	49	4 829	21 456	68 661
	Bengkulu	24 169	272	698	815	-	3 275	462	18 647
	Lampung	15 523	720	1 922	969	-	1 118	315	10 479
Selatan Jawa (South Java)	**Sub jumlah - *Sub total***	**130 353**	**4 534**	**1 341**	**1 019**	**-**	**7 727**	**-**	**115 732**
	Jawa Barat	41 634	-	574	693	-	5 191	-	35 176
	Jawa Tengah	16 650	4 534	-	271	-	551	-	11 294
	D.I. Yogyakarta	1 428	-	-	54	-	10	-	1 364
	Jawa Timur	70 641	-	767	1	-	1 975	-	67 898
Utara Jawa (North Java)	**Sub jumlah - *Sub total***	**690 421**	**8 445**	**2 868**	**10 349**	**-**	**21 189**	**10 873**	**636 697**
	DKI Jakarta	105 179	8 335	-	-	-	123	-	96 721
	Jawa Barat	127 951	-	1 802	1 399	-	9 740	82	114 928
	Jawa Tengah	229 864	-	154	7 796	-	2 438	6	219 470
	Jawa Timur	227 427	110	912	1 154	-	8 888	10 785	205 578
Bali-Nusatenggara	**Sub jumlah - *Sub total***	**223 057**	**26 894**	**5 631**	**1 450**	**16 227**	**18 708**	**10 026**	**144 121**
	B a l i	55 910	26 224	-	143	-	1 633	6 537	21 373
	Nusa Tenggara Barat	85 709	-	5 631	1 307	-	7 904	2 378	68 489
	Nusa Tenggara Timur	81 438	670	-	-	16 227	9 171	1 111	54 259
	Kalimantan Tengah	53 018	-	-	4 141	-	-	-	48 877

Appendix IV

(following page)

Fishing log-book form (*Laporan Penangkapan Ikan*), used by WASKI in Port of Benoa, for reporting by all longline vessels unloading catch in the port. A similar form is used by WASKAN at Muara Baru.

Explanation of Indonesian terms:

Diisi oleh ahli perikanan/abk = To be filled in by Fishing Master/Crew
Nama kapal = Name of vessel
Nomor IUP = Vessel Registration No.
Nomor Ijin (Spi/Sipi) = No. of "License to Fish"
Tanggal berangkat = Date of departure
Tanggal tiba = Date of arrival
Jumlah basket/blong = Total no. of baskets
Bahan bakar = Fuel
Es = Ice
Umpan = Bait
Air Tawar = Fresh water
Daerah penangkapan = Fishing area
Jumlah tarikan = Total no. of sets
Diperiksa oleh Pengawas Kapal Ikan = Inspected by WASKI
Tanggal Lapor = Date of reporting
Nama Pengisi/Nakhoda = Name of person who completed the form/Vessel skipper
Tanda tangan = Signature

DEPARTEMEN KELAUTAN DAN PERIKANAN RI
DIREKTORAT JENDERAL PENGAWASAN DAN PERLINDUNGAN LAUT
DINAS PERIKANAN DAN KELAUTAN PROPINSI BALI
UNIT PENGAWAS PENANGKAPAN IKAN
PELABUHAN BENOA

FORMA A.

KODE PELABUHAN : 044
BASE PORT CODE

TELP. (0361) 721047

LAPORAN PENANGKAPAN IKAN
FISHING LOG

FORMULIR - AMCS (DIISI OLEH AHLI PERIKANAN / ABK)

1. Nama Kapal : .....
2. Nomor IUP : .....
3. Nomor Ijin (Spi / Sipi) : .....
4. Tanggal berangkat : .....
5. Tanggal tiba : .....
6. Jumlah basket / blong : .....
7. Bahan bakar : ..... Ton
8. Es : ..... Ton
9. Umpan : ..... Kg/ekor
10. Air Tawar : ..... Ton
11. Daerah penangkapan : .....
12. Jumlah tarikan : ..... Kali

Jumlah Hasil Tangkapan	Export		Reject		Jumlah	
Jenis / Species	Ekor	Kg.	Ekor	Kg.	Ekor	Kg.
Blue Tuna (sirip biru)						
Yellofin Tuna (sirip kuning)						
Bigeye Tuna (mata besar)						
Albacore						
Billfish (setuhuk)						
Shark (Hiu / Cucut)						
Other Fish (Ikan Lain)						
J u m l a h						

Diperiksa oleh,
Pengawas Kapal Ikan.

.....

NIP. .....

Tanggal Lapor : .....

Nama Pengisi / Nakhoda : .....

Tanda tangan : .....