

Review of the current estimation procedure of Indonesian SBT catch

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Abstract : The procedure used by the CSIRO to estimate SBT catch of Indonesia is reviewed based on knowledge and data obtained through our last visit to Indonesia. Several major problems were noted. This includes the use of two step extrapolation of species composition and exporting rate by species without an appropriate stratification, whose impacts can be reduced by using species identified export/import data for extrapolation. The other major problem is the statistics used for extrapolation does not match with what monitored at processing sites and we propose to use the alternative statistics to resolve this problem. The conversion factor should be adjusted to reflect the current form of dressing. It is important for the CCSBT to develop the procedure agreed and accepted by all nations with interests.

要約 : インドネシアのミナミマグロ漁獲量の推定に CSIRO が用いている方法について、前回のインドネシア訪問時に得たデータ・知見に基づき検討を行った。いくつかの重大な問題点が認められた。まず適切な層別化を行わずに魚種組成と魚種毎の輸出率という 2 段階の外挿を行っている問題があるが、外挿に魚種判別のされた輸出/輸入データを用いれば問題は少なくなる。もう 1 つの主要な問題点は外挿に用いている統計が加工場でモニターしているものと一致しない点であり、この問題の解決には別の統計を用いることを提案している。全重量への変換率は現在の処理形態に応じた形に調整をする必要がある。CCSBT が関心国すべてが合意し納得した方法を開発することが重要である。

Introduction :

The stock assessment generally requires the total removal from the stock. Currently, the estimation of southern bluefin tuna (SBT) global catch is relied on data provided by each fishing nation for the CCSBT Members' catch, and the Japanese Import Statistics for those taken by non-Members except for Indonesia which has been estimated by the CSIRO based on data collected through CSIRO/RIMF collaborative program.

The CSIRO of Australia and RIMF of Indonesia (Research Institute of Marine Fisheries of Indonesia) established a collaborative research program in August 1992 to monitor species composition and proportion by species to be exported at tuna processing sites at the Port of Benoa, Indonesia. The estimation of southern bluefin tuna catch taken by Indonesia has been provided by the CSIRO since 1993 based on the results of this monitoring program extrapolated with the amount of tuna export from Bali Airport.

A large discrepancy has been noted from the start of this monitoring program on a large discrepancy between the expected amount of SBT export based on this estimation and

the fresh SBT import by Japan from Indonesia recorded in the Japanese Import Statistics. The former is about twice or three times of the latter and this discrepancy has increased in recent years (Fig. 1). We are very confident with a reliability of our Import Statistics and believe that the accuracy especially for tunas import has been improved through an increased demand of more accurate monitoring according to the Trade Information Schemes developed by various regional fisheries organization including the ICCAT and CCSBT. Then, we have kept some reservation on a reliability of the estimation of Indonesian SBT catch by the CSIRO.

There have been several opportunities for Japanese scientists to observe the CSIRO/RIMF monitoring activities at processing sites and one of those reports was presented to the CCSBT (Davis 1998, and Nishida 1998), although they could not resolve a discrepancy between estimated SBT export from Indonesia and Japanese import. Recently, we had an opportunity to visit Indonesia to examine an overall situation of processing and fishing activities at the Port of Benoa and reliability of Indonesian statistics. This document reviews the current estimation procedure used by the CSIRO based on the information obtained during the last visit to Indonesia.

This document cannot be developed without a great assistances and collaborations of many people responding to our interviews as well as of * Harini who set up interviews and act as interpreters during the visit. We would like to express our appreciation to all of them. We also would like to appreciate to Tim Davis who kindly shares the basic information used for estimation of the Indonesian catch.

Catch Estimating Procedure by the CSIRO :

First, the current procedure used to estimate the Indonesian SBT catch is described. This is a summarization of a series of documents by Davis et al. (all of their documents listed in the reference) presented to the SBT scientific forum and represents our understandings on the current procedure:

a) Selection of processing to monitor :

All processing at all units of PT. Perikanan Samodra Besar (PSB) since 1992 and at one processing unit of PT. Sari Segara Utama (SSU) since December 1993 have been monitored. It was reported that the monitoring sites have been expanded since 1996 and distribution of monitored landings by processors names as well as by fishing companies for 1992 to 1997 is available in Davis (1998). The corresponding information is not available for 1998 and afterward.

Total number of processing monitored had steadily increased up to 1999 then

drastically dropped in 2000 and 2001 (Fig.2). However, the amount of both catch and export monitored has stayed about the same level until 1999, then declined substantially. The level of monitored catch is the lowest during the last two years since the initiation of this monitoring program (Fig. 3).

Fig. 4 shows monthly change of monitoring efforts in number of processing monitored standardized with monthly average value of a given year. Monitoring have been conducted constantly around a year and no specific seasonal pattern is found.

b) Monitoring at each processing (except catch taken by PSB) :

At a processing site, individual tuna landed is cleaned and graded, then weighted by the buyer/exporter. A copy of those records of weight of individual fish, identified by species and graded into export/reject categories, are obtained by the RIMF/CSIRO samplers, after the processing completed. Weight referred here is a dressed weight as gilled and gutted and de-finned with tail stock intact.

Length measurement and otolith samples are taken from rejected fish.

c) Monitoring of processing at the PSB :

The PSB is a semi-private, semi-governmental company and owns both fishing vessels and processing areas. Since the CSIRO considers that the catch pattern of PSB fishing vessels is different from that of other fishing vessels, unloading at the Port of Benoa based on proportion between yellowfin and bigeye tuna in their catch, the catch taken by the PSB has been treated separately. The record of all catches with individual weight, species, and export/reject categories have been provided by the PSB. Length measurement of fish at PSB was stopped in 1995 because of inaccurate measurement by staff. We assume that no RIMF/CSIRO samplers are involved in data collection of catch taken by the PSB.

Species composition of catch by the PSB and non-PSB fishing companies are shown in Fig. 5. The catch taken by the PSB and other fishing companies shows a marked contrast especially in proportion between yellowfin and bigeye tunas as noted. Also, the proportion of SBT shows a significant difference of 0.6-1.0 % in the PSB catch and 4-7 % in catches by the other fishing companies. However, proportion of bigeye in non-PSB companies increased between 1993 to 1996 and stayed at the same level after that. Although we have no information to determine the causes of this, one possibility is an increase of vessels operating in the similar way as the PSB.

Davis et al. (1998a) consider the proportion between yellowfin and bigeye tunas as an indicator of fishing depth. However, the Figure 2 of the document indicates no relationships between a proportion of bigeye and number of hooks per basket, an

index usually used for maximum operating depth and bigeye targeting, in the case of Indonesian fisheries. There are two modes in a distribution of number of hooks per basket, at 5 and 14-18, and the PSB uses 8-10 hooks per basket. A whole range of bigeye proportion, i.e. from no bigeye to 100% bigeye, is observed more or less homogeneously over the whole range of number of hooks per basket, though all the PSB operations (and also those by the SSU) show high proportion of bigeye catch. Our survey results suggest the species composition may be more dependent on operating area than depth (Itoh, 2001).

Since the PSB also owns processing areas, many fishing companies have used the PSB for processing. We assume that the same monitoring procedure described in b) has been applied for monitoring all processing at the PSB but for catches taken by other fishing companies.

d) Extrapolation of monitored information :

The species composition and proportion to be exported by species collected at processing sites is extrapolated with the total amount of tuna export from the Bali Airport. All exporters are required to obtain an export permit for each shipment from the Provincial Fisheries Service, Laboratory Quality Control and Fish Inspection Division (DINAS) and they submit invoices showing species, commodity, weight, and number of packages. The DINAS assembles those invoices to provide monthly statistics of exported amount by commodities. This statistics are aggregated with all tuna species.

As mentioned in c), the portion taken by the PSB is treated separately. So, the exported amount from the PSB is extracted from the total export from Bali first. Then, the SBT catch is estimated as follows :

$$(\text{non-PSB export}) = (\text{Bali export}) - (\text{PSB export})$$

$$(\text{extrapolation rate}) = (\text{non-PSB export}) / (\text{monitored export})$$

$$(\text{SBT non-PSB catch}) = (\text{extrapolation rate}) * (\text{monitored SBT catch})$$

$$(\text{SBT total catch}) = (\text{SBT non-PSB catch}) + (\text{SBT PSB catch})$$

If the extrapolation rate to be multiplied with the amount of monitored SBT categorized for export, the expected amount of SBT export from Bali will be obtained.

Although this seems one-step extrapolation, two different types of information are extrapolated at the same time, i.e. proportion of SBT within a monitored processing and proportion of SBT to be graded for 'export' out of whole SBT monitored.

e) Conversion from processed weight to whole weight :

All weight monitored here is a dressed weight as gilled and gutted and de-finned with tail stock intact. In order to get a total catch, the estimated value will be multiplied with a conversion factor, 1.15.

Quick survey in the Indonesia :

This section describes the activities during our visit to Indonesia and summarize the points we found.

Interviews with processing companies :

We visited several processing companies at the Port of Benoa, interviewed to workers as well as owner of companies, and observed processing and packing for export when possible. The companies visited are PT. Bandar Tuna, PT. Bali Tuna Segar, PT. Trima Sura, PT. Pelikanan Samodra Besar (PSB), P.T. Balinusa Windumas, and SSU. At the SSU, we are only able to observe the processing and talk with people from the fishing company who unloaded and processed at that day.

Questions asked at the processing companies are generally as follows :

- processing capacity and average level of monthly processing, average export rate
- what is the main product for export, fresh or frozen/ whole or further processed such as loin, steak, meat, etc.
- if processing loin/steak/meat, how to get materials
- destination of export, especially any destination other than Japan for fresh whole tuna
- whether RIMF samplers being involved
- if owning fishing vessels, general description of fishing operation, fishing area, and average length of one cruise.

Our interview revealed that currently three types of processing companies exist at the Port of Benoa. First type is specialized in processing of tunas unloaded by other fishing companies and owns no or very few fishing boats. The SSU, continuously monitored by the CSIRO/RIMF program, is a typical example of this type. The fishing companies using this type of processing sites are generally small in scale and owns a few to 10 boats. When each boat operating separately, fish has been kept during a whole cruise period, usually 10 days to two weeks. Grading is conducted by exporter/buyer. Then, different exporter/buyer may have different criteria of grading depending on an

expected price they would like to fetch at the Japanese market.

The second type is the one developed to mainly process the catch taken by their own company including their group company. The number of boats belong to one group ranges 20 to 60 or more. A certain number of boats come back to the port in turn every several days after collecting catch at sea from the group companies' boats. Then, the period fish kept in a boat storage may be shorter than the case that each boat operating independently. PT. Bandar Tuna and PT. Bali Tuna Segar are this type. The PSB mentioned that 80% of processing is now their own catch, though they do not apply a fish collection system at sea.

The third is the one who is specialized in processing of fillet/loin/steak/meat product. PT. Trima Sura and P.T. Balinusa Windumas are the example. Both companies own their boats but the majority of materials is obtained from the top grade of fresh whole tuna rejected for export at the other processing sites. Fillet/loin/steak/meat are exported both in fresh and frozen. The main destination is the US. When price at Japanese sashimi market is high, they occasionally send as a fresh whole tuna to Japan. The PSB is also making some loin for export.

Although all of those processing sites are involved in export of tuna products, the proportion of fish to be exported as a whole fresh tuna is expected to differ especially among different types of processing companies. We assume that the monitoring has been only conducted at the first type of processing company. This factor may introduce either positive or negative biases depending on the situation. At this moment, we do not have an adequate information to judge whether this can be significant.

We consider that the fish categorized for 'export' and cleansed with a special care and kept in tanks with water and ice are all aiming for export to Japanese sashimi market as a whole fresh tuna. Every time we asked, we had a response to confirm our belief. None of those companies has an capacity to process deep frozen whole tuna for Sashimi market. We also asked about any previous experiences to send those 'export' category fish to the destinations other than Japanese market and we always had a negative answer.

Strangely all companies we talked said that they did not have samplers measuring fish except having occasional ones several years ago.

Examination of export statistics used for an extrapolation :

We also visited to the DINAS and tried to obtain a copy of historical statistics relevant to those used by the CSIRO for extrapolation by showing a hard copy of document as an example. Then, we found that those are intermediate products during an assembling the final statistics and are only kept until the final statistics to be printed. We could see

the printed statistics of DINAS for 1996 to 2000, except for 1999 which was borrowed by somebody and not available when we visited. This statistics carries tables of monthly export of fresh and frozen tunas separately, but there is no category corresponding to tuna steak, loin etc.

Fig 6 is a comparison of the records from the printed statistics and the data used by the CSIRO. The 2001 figure was calculated from the monthly intermediate statistics mentioned below. Those two data shows good consistency for 1996 to 1998 but the figures for 2000 and 2001 are substantially different. We do not know what causes this difference.

The DINAS explained that it did not process those intermediate statistics any more and has now changed to produces monthly total of exported amount and values by commodities, destinations, and exporters. Here, the categories relating with tunas are only 'fresh tuna (Tuna Segar)' and 'frozen tuna (Tuna Beku)' and second products such as loin and fillet are also included in these two categories. It was also explained that billfishes were included in 'tuna' categories. This statistics indicates a substantial amount of export from those company specialized in fillet/loin/steak processing especially in the 'frozen tuna' category. While more than 95 % of fresh tuna is exported to Japan, export of frozen tuna is destined mostly to the US and some EU nations and only 5- 20% is sent to Japan, which is also consistent with the inclusion of fillet/loin/steak data to the statistics. The proportion between fresh and frozen export is included in Fig. 6. The proportion of fresh tuna export has declined in recent years.

These statistics are produced by accumulating records in invoices which carry data of species, weights, values, and number of packages. Although the DINAS started using a computer data input and assembling system, the system is only used as a data entry format and all electric raw data has been destroyed once the printed statistics is produced. Therefore, only data for the recent two years, at most, can be extracted from the computer system. The DINAS said that original invoices are stored in a separate warehouse.

The data accumulated at the DINAS is assembled and sent to the national statistical department in Jakarta to produce the national statistics. We are only able to obtain the 1999 national statistics. Unfortunately, this is the year we could not get a DINAS printed statistics. So, the figures in national statistics are compared with export data used by the CSIRO and with the Japanese Statistics. The 1999 export (species categories as yellowfin, albacore and other tunas) from the Bali State is 603t in frozen and 11, 032t in fresh (total : 11,635t), while the value used by the CSIRO for 1999 was 19,281t in total. The statistics by destinations is only available for species group aggregating all tunas, (probably including billfish,) skipjack and small tunas such as

Auxis. Proportion to be exported to Japan from whole Indonesia is 60% in frozen and 67% in fresh as a yearly average of 1995 to 1999. The records of Indonesian exported amount corresponds to around 60% to 80% of records in the Japanese Import Statistics for this tuna and skipjack group and this ratio shows gradual increase during 1995 to 1999. Herrera pointed out an underestimation of Indonesian national statistics in general, and our comparison supports his view. He also pointed an inconsistency among different statistics as well as inconsistency in figures depending on years of printing, which are not able to examine.

Problems of the current estimation procedure and some alternative suggestions :

- Two types of extrapolation at one time :

The current estimation procedure by the CSIRO utilizes two information collected at processing sites, i.e. proportion of SBT within a monitored processing and proportion of SBT to be graded for 'export' out of whole SBT monitored. Those two factors are expected to fluctuate in a quite different ways. For example, a proportion of SBT or species composition is expected to vary drastically according to gear configurations and operating areas. A proportion of SBT to be exported depends on a period kept in vessel storage and how much an exporter would like to fetch from which market.

The difference in SBT ratio between catches by the PSB and by the other companies suggests this factor may fluctuate about ten times. Note that the operational pattern and fishing areas of the PSB are not considered as a completely unique among Indonesian fisheries. Rather, those of other companies are considered as a combination of wide range of operating patterns and fishing areas including those similar to the PSB as one extreme. In that case, it is important to stratify samples before an extrapolation.

One other solution is to utilize a species identified export data for extrapolation, since a level of fluctuation of exporting rate of SBT seems much smaller than that of SBT ratio in catch. One possible source is invoices which carries exported weight with species name and we are now seeking the way and fund to salvaging those original invoice data. The other solution is to use the Japanese Import Statistics which will be described later.

- Inconsistency between monitored part and extrapolated part :

We consider that the fish categorized for 'export' at processing sites are all aiming for export to Japanese sashimi market as a whole fresh tuna, and this belief is confirmed through the last visit to Indonesia. On the other hand, the statistics used to extrapolate monitored information include exports to all destinations both in fresh and frozen including fillet/loin/steak/meat etc. Fig. 6 shows the change in proportion between

fresh and frozen export from Bali (data sources : 1988-1995 from Davis et al. (1996); 1996-2001 from DINAS printed statistics). The proportion of fresh tuna export continuously declined since 1993, the start of monitoring program.

If what is monitored at processing sites is a proportion of SBT to be exported to Japan as fresh tuna, why the exactly corresponding statistics will not be used, i.e. the Japanese Import Statistics. There are two advantage in using the Japanese Statistics. First, species and type of product is clearly separated and free from problems in estimating species composition and in separation among fresh or frozen, whole or fillet/loin/etc. Secondly, the Japanese Statistics corresponds to whole export from Indonesia. When the same 'export' rate can be assumed for processing sites in other areas, an extrapolation using this value indicate whole catch from Indonesia. We also believe that the Japanese Statistics is much more reliable than the Indonesian statistics. There has been a claim from Australia of possible re-labeling of species name in Japan. However, species name and weight of fish are scribbled outside the individual box. Discrepancy of species name in importing documents and those scribbled outside box will definitely trigger further investigation at the trading office. Also, fresh import is also directly sent to the market for auction and there is no chance to change the fish name. If fish are displayed for auction under a wrong species name, the importer will lose their face completely, which is quite unlikely to happen.

Alternative estimation of SBT catch in dressed weight when using a fresh tuna export from Bali and the Japanese Import Statistics for extrapolation in place of all tuna export from Bali are shown in Table 1.

- Bias in selection of processing to be monitored :

Currently, the PSB and one unit of SSU processing plants have been continuously monitored but we do not know how many other processing sites are monitored and how they are selected for monitoring. We expect difference in both species composition and exporting rate of SBT among different types of processing companies. The SSU is a typical plants of the first type described in the previous section. If monitoring efforts concentrated only to this type of processing companies, there is a possibility to introduce some bias.

Also, Herrera (2002) pointed that both Indonesian and foreign boats land their catch to the processing sites at the Port of Benoa. If this is true and those catches by foreign boats are estimated from the other sources, this causes a double count of catches. However, even a fishing company belongs to a foreign flag, the processed product is expected to be handled as an export from Indonesia by an Indonesian licensed exporter. Since most of non members catch is estimated from the Japanese Import Statistics, this may not be a significant problem in terms of estimation of global catch.

- Conversion from dressed weight to whole weight :

Fish are dressed as gilled, gulled and de-finned with tail stock intact. The conversion factor currently used, 1.15, correspond to fish gilled, gutted and de-finned and tail removed. The conversion factor used by the IOTC for products from the South Asian countries, 1.09, will be more appropriate.

These are the major problems we noted and it is hard for us to accept the estimated catch amount of Indonesia without resolving these problems. It is important for the CCSBT to develop promptly the agreed estimation procedure of Indonesian catch including monitoring and sampling design through a collaboration among all Members and relevant non-Member nations. It is also important for the agreed procedures to be based on a set of solid traceable statistics.

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Table 1. Alternative estimations of Indonesian SBT catches in dressed weight by using fresh tuna export from Bali and Japanese Import Statistics for extrapolation in place of total tuna export from Bali.

	Total Bali Export (Australia Estimation)	Bali Fresh Export	Jp Import Statistics
1993	1190.2	921.04	361.75
1994	787.65	683.72	459.75
1995	751.05	539.03	349.79
1996	1398.56	1018.94	681.98
1997	1922.07	1374.1	790.16
1998	1155.96	753.21	580.24
1999	2178.74	n.a.	650.02
2000	978.84	605.33	370.27
2001	1349.34	784.67	213.04

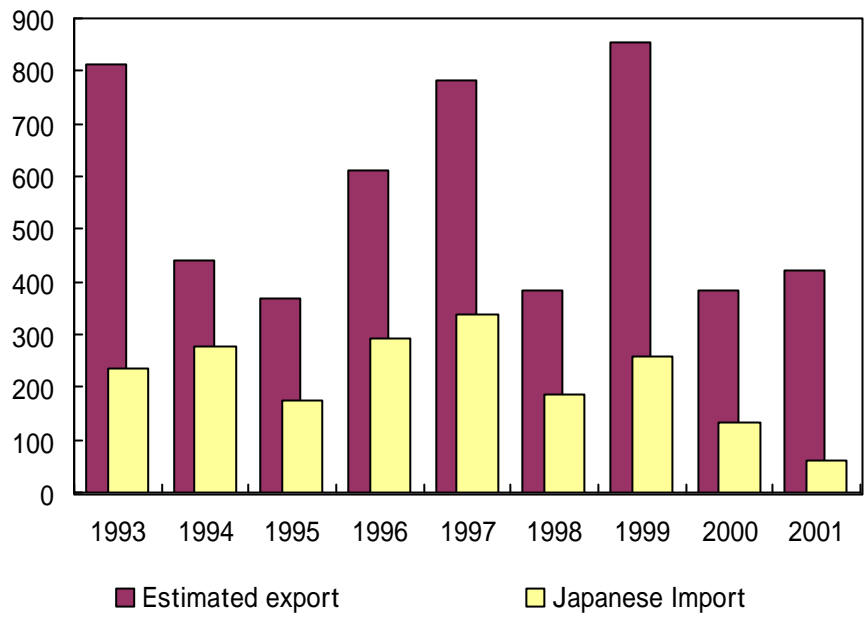


Fig. 1 Comparison between SBT fresh import from Indonesia to Japan and to estimated SBT export from the Bali Airport.

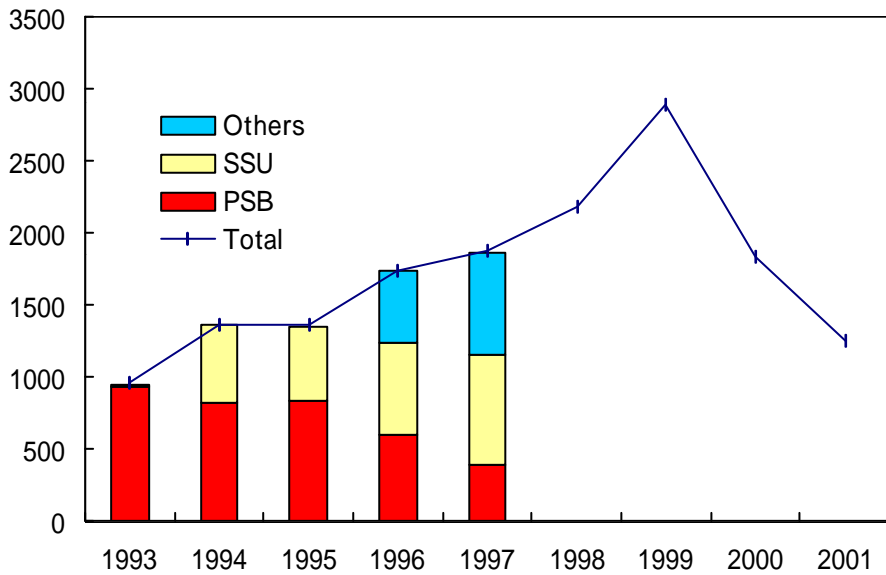


Fig. 2 Changes in number of processings monitored and composition of monitored processing sites.

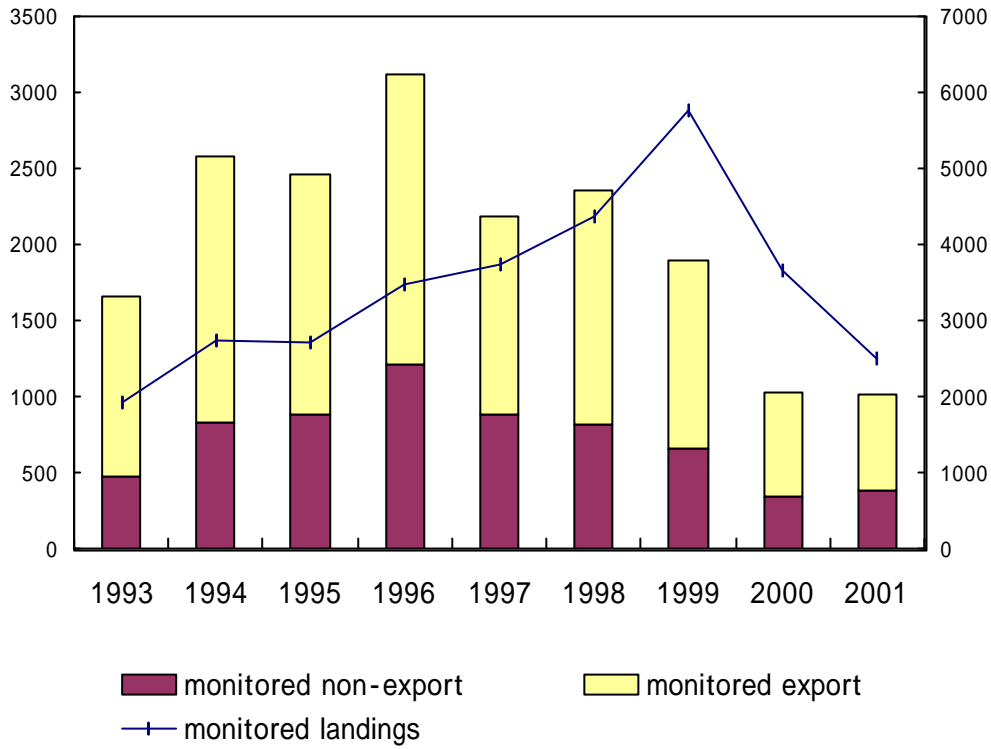


Fig. 3 Changes in number of processing monitored and amount of monitored landings.

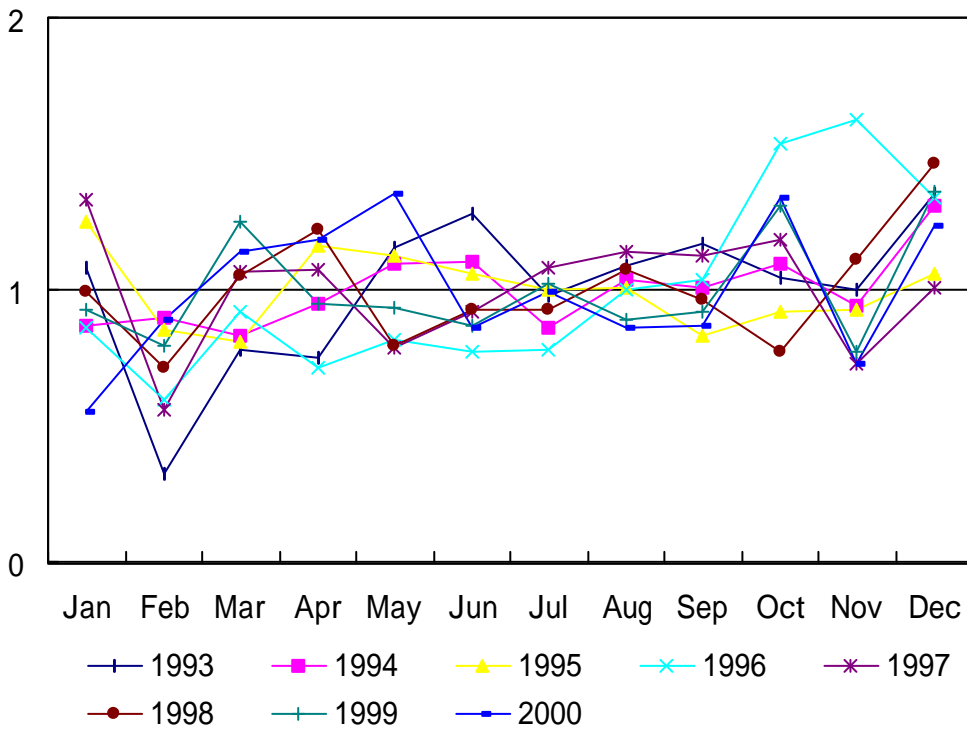
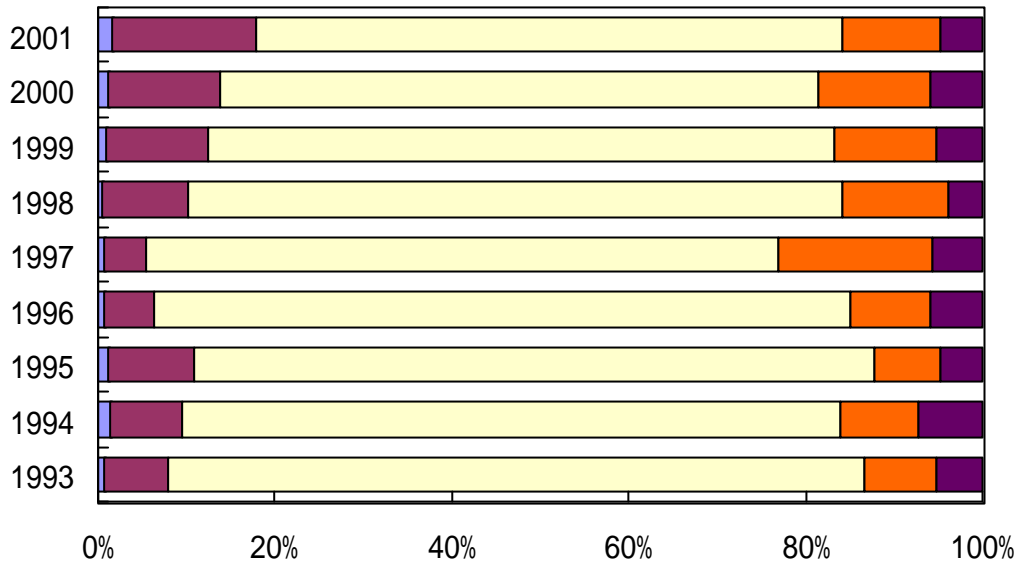


Fig. 4 Monthly changes of monitoring efforts in number of processing standardized with average monthly effort of that year.

PSB catch



Catch by non-PSB fishing companies

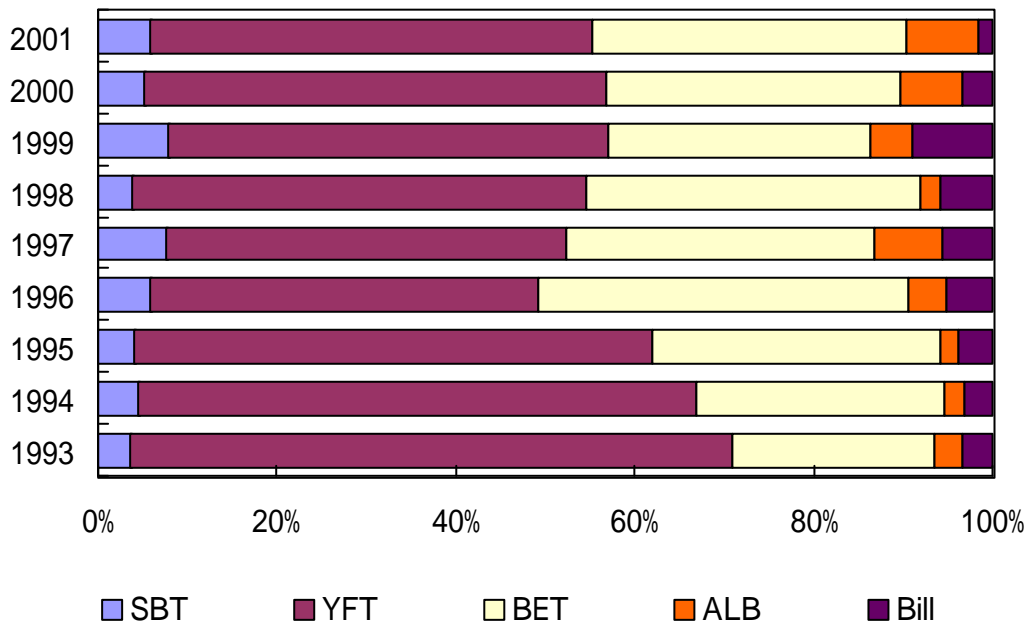


Fig. 5 Species composition of catch taken by the PSB and the other fishing companies.

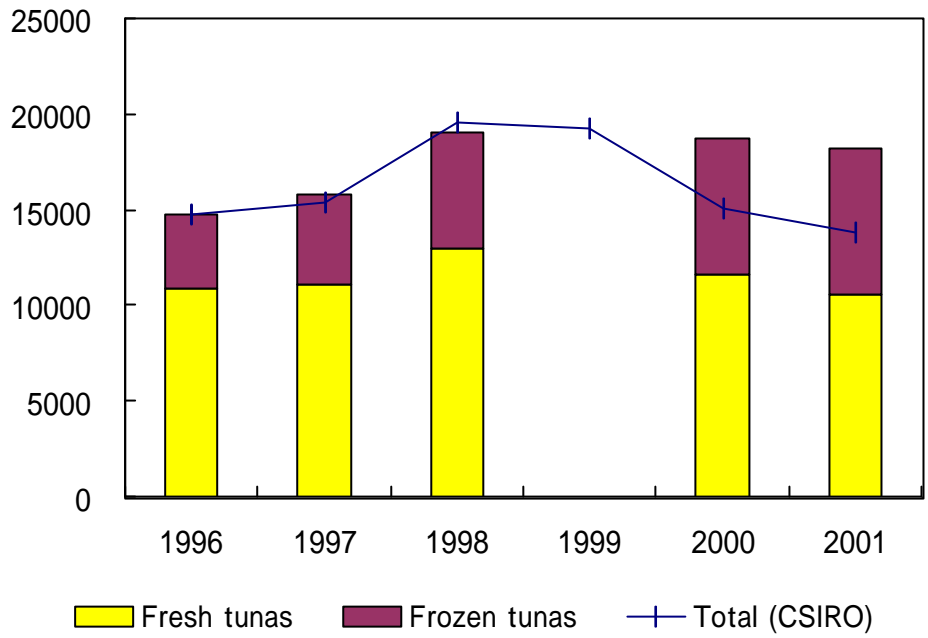
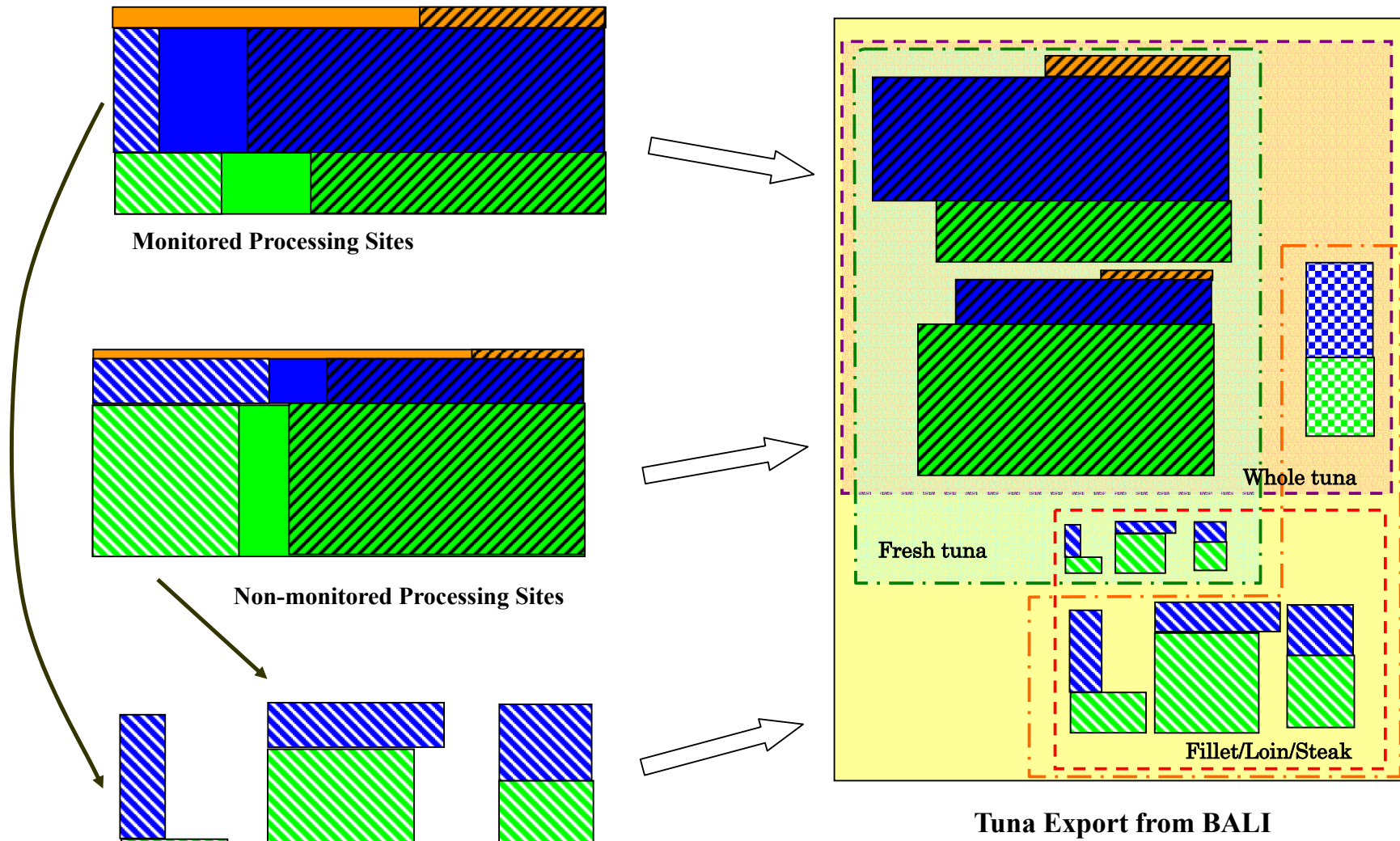


Fig. 6 Comparison of export statistics from Bali Airport in the printed version of NINAS statistics and those used by the CSIRO.



The current transfer scheme of tunas landed in Indonesia (Bali). Different colors correspond to different species. Black shadow indicating fresh whole fish export and white shadow corresponding to portion processed into fillet/loin/steak etc.