An evaluation of the content and quality of two Commercial Atlantic Shark Fishery logbook data sets for consideration for stock assessment use.

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BACKGROUND. We recently completed an exercise to estimate the reduction in fishing effort (number of boats) needed to extend the open fishing season for Atlantic Large Coastal Sharks.[3] Our purpose was not stock assessment; however, we did have many opportunities to work with the data sets and here we offer some observations on their quality and potential usefulness for stock assessment of Atlantic sharks.

THE DATA FILES. The data we used was courtesy of NMFS. These data are collected as part of the Federal Shark Limited Access Permit system. The file name and size, followed by a brief description of the content are:

A. Vessels Data.

Larkinsk.xls, 107 KB
The table contains permit application data for 2003 for Coastal Fisheries Logbook (CFL) and the Pelagic Longline Logbook (PLL). Larkinsk.xls is a subset of a master file that contains data for all vessels holding Federal Limited Access Permits (LAP's). Larkinsk.xls contains data only for the 594 vessels holding LAP's for Directed Shark (SKD – 245 boats) and Incidental Shark (SKI – 349 boats). Most of these 594 boats hold one or more LAP's for other species as well. Entries in this file are by vessel registration number and list owner and operator names and addresses, ZIP Codes, home port, all LAP permits held, vessel length, engine HP, and hold capacity and additional information on gear type, etc.

B. Landings, location and effort for the coastal fishery.

cfl0l_03.dbf, 99,582 KB
File containing landings data for 2001-3[4] of boats holding a Federal Limited Access Permit for shark and fishing under the Coastal Fishery Logbook system. Data include trip number, departure, landing and unloading dates, days away, dealer information, species landed and their weight, area fished, gear type and size or number of hooks (bottom longline), and some indication of overall effort.

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[3] Hester, F.J., 2005. Southeastern U.S. Commercial Shark Fishery Stock Assessment and Fishery Management Policy Analysis, Hanan & Associates, Inc., for Gulf & South Atlantic Fisheries Foundation, Inc., Cooperative Agreement No. NA 17FD Contract No. 84-04-2800/6000

[4] The Coastal Fishery Logbook has been in place since 1996, we looked only at the (then) three most recent years.

ctldatadescripton.wpd, 10 KB
File containing a description of the data elements that are in the coastal fisheries logbook data (cfl0l_03.dbf).

county.dbf, 2.7 KB
Table containing the county codes and the name and state codes used in cfl0l_03.dbf.

nmfsspec.xls, 102 KB
Table containing the common and scientific names for the species codes in cfl0l_03.dbf.

statisticalmap.pdf, 63 KB
Map of the Atlantic and Gulf of Mexico with the statistical grid identified by numeric code. These codes are entered in area fished column of cfl0l_03.dbf.

State_codes.xls, 16 KB
Table of names for the numeric state codes for cfl0l_03.dbf.

Port_codes.xls, 34 KB
Table of names for the numeric port codes for cfl0l_03.dbf.

C. Catch, discards, landings, location and effort for the pelagic fishery.

tripsumm_2001_03.xls, 1063 KB
Table of trip summary data for pelagic longline logbooks. These data include: schedule number, vessel registration number, departure date, first set date, last set date, landing date, port of departure, state code, days fished, number of crew, number of sets, port of landing, and state code. The number in the schedule number column is a unique identification number for the trip. This number is in the trip number column of the table that contains the set information (table name pll_2001_03.xls).

pll_2001_03.xls, 22,770 KB
File containing the location (latitude and longitude), catch and effort information (gear type and number of hooks, bait, etc.) for the individual longline sets for each pelagic trip. Data recorded include the schedule number, the targeting for the trip (tuna, shark, swordfish), the species and numbers of animals caught, discarded (dead and alive) and the weight of the fish kept. The number in the schedule (trip) number column links the set data to the data in the trip_summ.xls.

DATA QUALITY. We encountered a number of incomplete entries, or obviously wrong entries in these data bases. These errors did not present a major problem to us in as far as they could be flagged and not used (or corrected) in the analyses. Our interest was in standardizing fishing power. For this, we standardized the vessel based on length and total landings per trip, which is relatively insensitive to entry errors for number of hooks and number of sets. This may not be the case if these data are used to develop abundance indexes.

A. Larkinsk.xls.

We had no means to evaluate the likely accuracy of most of the information in this file: names and addresses of owner/operator and home port, etc. We wanted to standardize the vessels based on length, horsepower and capacity. Entries were incomplete for 59 vessels for length, 56 vessel for H.P. (not all the same vessel), and 183 vessels for hold capacity. Aside from not being entered for nearly one-third of the permitted vessels, hold capacity was clearly misreported in some of the entries. The most obvious error was a vessel with a 30,000 ton hold. We used length. If these omissions are continuous over the entire time series, and not just the three years we used, ten-percent of the vessels cannot be standardized to length.

B) CFL Series Data.

Landings.

Landings are reported in **weight** by species by trip. For shark, a number of the landing weights are unreasonable and may be in error. For example, there is one Directed Shark trip reporting landing 54,376 whole weight lb sandbar shark. This is likely a decimal error, as the 4000 lb dressed weight trip limit converts to 5600 lb whole weight. Less obvious are Directed Shark trips reporting landings well in excess of the trip limit (some in excess of 10,000 lb ww). These are possible, and perhaps the operator and dealer were unaware of the tip limit, but reported landings in excess of 6-7000 lb whole weight pounds should be questioned. The logbook trip sheet is reported to be accompanied with a weigh-out slip, so these trips can be validated somewhere in the system. The problem facing the assessment scientist is that the logbook landing reports need to be screened and some method of dealing with the questionable landings developed.

The Incidental Shark Permit trip limit is five Large Coastal Sharks per trip. One report is of 11,294 lb whole weight blacktip shark for a one day trip, and a number of the SKI Permit holders report repeated trip landings in excess of the SKD trip limit. These reported large landings are unlikely to affect any assessment work as we find the SKI information is of little use. However, these errors do raise additional questions as to the general quality of the CFL data in general.

Effort.

A number of gear types are used in producing the LAP shark landings. For Large Coastal Sharks, the group of major interest for future assessments, the breakdown in percent of landings is shown in Table 1. For assessment purposes, only the CFL bottom longline gear data is extensive enough to offer much hope for developing useable indexes of abundance. Gillnet landings of LCS are low and come mainly from the South Atlantic Region (Fig. 2).

For the Pelagic Logbook series, the pelagic data include sporadic trips using pelagic gear in coastal waters. Pelagic trips targeting shark were mainly unproductive, and most of the pelagic boats that did land LCS did so using the CFL logbooks rather than the pelagic logbooks.

Fishery	Permit	Species Group	Gear	LCS Commercial Quota 2001-2003
				Percent total
Pelagic	SKI	LCS	Longline	0.03
Pelagic	SKD	LCS	Longline	4.12
Coastal	SKI	LCS	All	1.91
Coastal	SKD	LCS	All	93.95
Coastal	SKD	LCS	Gillnet	5.33
Coastal	SKD	LCS	Other Gear	4.93
Coastal	SKD	LCS	Bottom Longline	83.46

Table 1. Distribution of landings among permits and gear types.

Effort data in the CFL data sets provides information on number of sets for the trip and the number of hooks set per set, but this number is invariant for each trip. We encountered some apparent entry errors for number of sets and number of hooks. For example, we noted trips reporting 2205 and 300 sets in 11 and 5 days and 81 and 31 sets in 3 days with 1000-hook gear. These we edited out of our data set. We kept trips that reported sets averaging up to ten/day, but believe most are entered in error. Because we used landings-per-trip to standardize vessel fishing power, including these trips did not effect our estimate assuming the reported landings were correct. For an abundance estimate, using these trips might need to be reconsidered.

We also found about 500 entries that seemed in unreasonable in terms of landings per hook (a very low number of hooks and numerous sets and high landings). We checked the ID number against other trip reports and in some cases found the same boat reported 200 or 500 hooks instead of 2 or 5. Because we did not use landings per hook in our analysis, we retained most of these data, but again, or an abundance index, using these trips might need to be reconsidered.
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Areas Fished.

We noted three errors on the fishing block maps (Figs. 1 and 2): Areas 2979, 3079 and 3179 are entered properly offshore, and entered in lieu of 2981, 3081, and 3181 in the near shore sector. What is not clear is if all fishermen entered their data properly despite the errors on the map, nor is it clear what effect these errors may have on subsequent analyses. Although miss-location of catches, especially for the gillnet boats, may have occurred, these mistakes probably will not matter in using these data for assessments. This is because area fished on this fine scale is unlikely to be used; instead, only the three major-region divisions: North Atlantic, South Atlantic and Gulf of Mexico will be assessed. But in that regard, it is important to note that the division line between the North and the South Atlantic Regions

cuts through the 3600 series blocks, and some decision needs to be made on how to apportion the landings between these Regions.
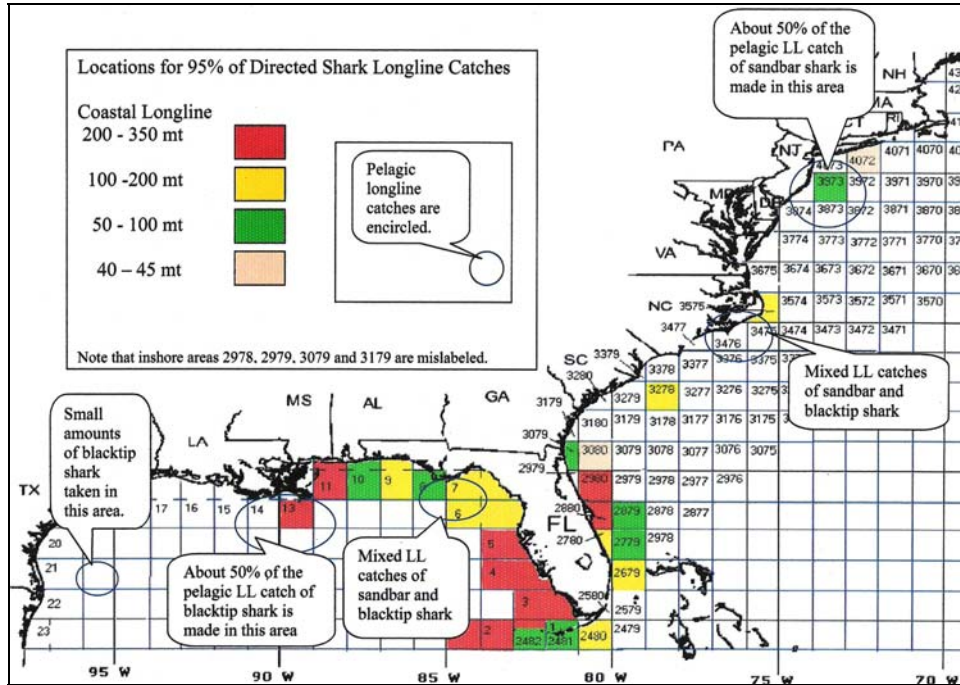

Figure 1. Areas of origin for most of the shark catches reported by the SKD Permit vessels using bottom longline gear reported in the Coastal Fishery logbooks and pelagic or bottom longline gear reported in the Pelagic Longline Fishery logbooks. Catches shown account for 95% of the landings.
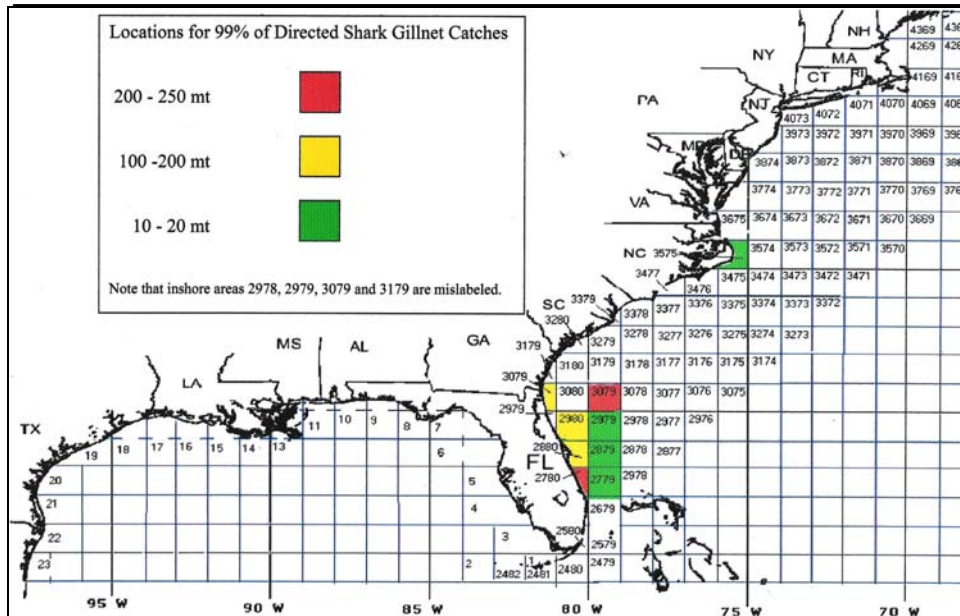

Figure 2. Areas of origin for most of the shark catches reported by the SKD Permit vessels using gillnet gear reported in the Coastal fishery logbooks. Catches shown account for 99% of the landings.

USING THESE DATA IN ASSESSMENTS.

The CFL series comprises about ten years of data, and is probably the largest and longest single data series for the commercial LCS fishery. Unfortunately, the information content is limited owing to the fact that the data are aggregated by trip, and landings and not catches are reported. This means that the best one can expect to extract from the series is some average measure of landings per unit of effort.

The available data are:

- size of vessel (we standardized to four Classes)
- number of trips,
- number of days away (but not necessarily fished) for each trip,
- type of gear for each trip,
- number of sets per trip,
- size of gear for each trip[5]
- area(s) fished
- landings by species for each trip.

No record is kept of actual catch and discards so the only measures that can be extracted that might relate to abundance are averages by species of:

- landings per hook,
- landings per set,
- landings per trip,
- sets per trip,
- trip length.

However, before starting analyzing the data two steps are necessary.

First, because there is no set by set information on catch, the trips must be screened to exclude multispecies trips. These are trips that may be snapper/grouper or other bottom fish trips that finished off with a few sets for sharks, or that kept some shark taken on the bottom fish sets.

We defined a shark trip as a trip lasting less than five days (Figure 3) and that landed more than 100 pounds whole weight LCS, and this seems a workable solution. One hundred sixteen boats made at least one shark trip in the three year period. The trip length cutoff keeps about 90-percent of the LCS landings and excludes most other species.

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[5] for bottom longline this is number of hooks set each set and this does not change during that trip
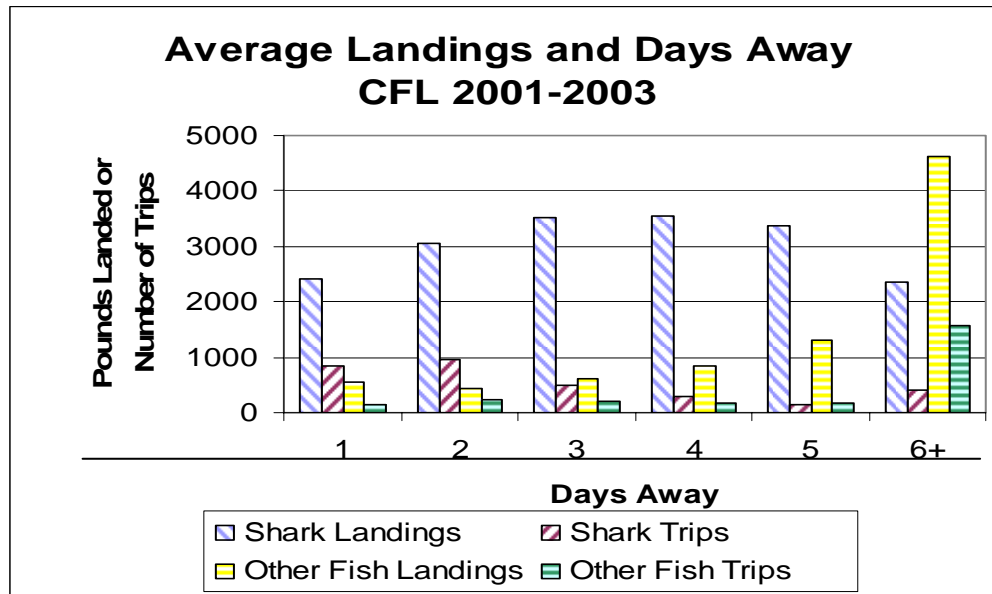
Figure 3. Average landings per trip and number of targeted trip LCS and Other Fish by days away

Second, because of the anomalous listings of a large number of sets on a short trip, or large landings using only a few hooks per set, another cutoff to the data is necessary if indexes of landings per hook or landings per set are desired. We suggest that 8 sets per trip and a minimum of 100 hooks per set will result in fairly well behaved results.

Third, we found that a relationship exists between landings per hook, per set and per trip and vessel length. We chose to standardize based on length to our Class III vessel (42-54 ft. LOA), although other options are open.

Finally, the 4000-pound dressed weight trip limit distorts the landings. It probably encourages high-grading, which may change the species and size composition, although that cannot be determined from the data. It also may cause last-set discards that will give a negative bias to the estimates. Again, this cannot be determined from the data. The onboard observer data may be able to provide some idea of the magnitude of the biases. Figure 4 illustrates the distribution of the average landings per set for the four Classes of vessels we developed. (Class I = <32 ft, Class II = 32-41 ft, Class III = 42-54 ft, Class IV = 55 ft and over) using the full 116 boat data set. None of the distributions is normal.
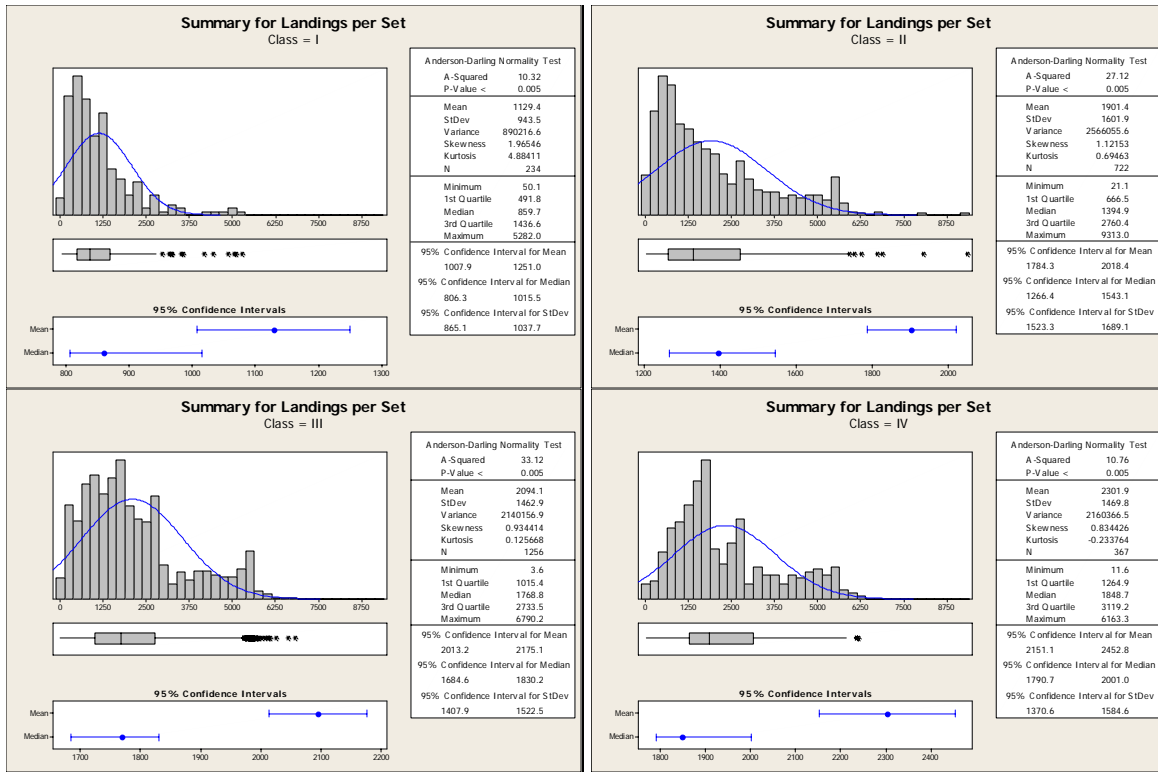
Figure 4. Distribution of Landings per set by Vessel Class (116 boats total)

The tendency is for the larger boats to have higher average landings per set. The means are 1130, 1901, 2094 and 2302 pounds per set respectively for Classes I, II, III and IV. The reasons are likely that the larger boats make longer trips (fish farther afield), and the larger boats set more hooks per set.

Figure 5 looks at these two factors graphically. The boxes encompass the 2nd and 3rd quartile of the data, the whiskers indicate the range (about 95% of the data), and outliers are marked with an asterisk.
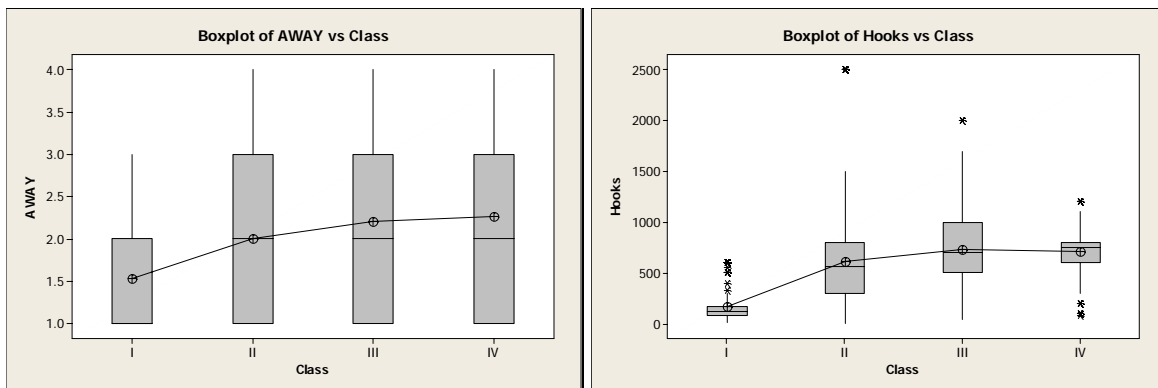

Figure 5. Two measures of fishing effort by Vessel Class: Days away, Hooks per set

We have only three-years of data. This is obviously too short a time span to get any meaningful results but Figure 6 illustrates the type of information that is in the data.
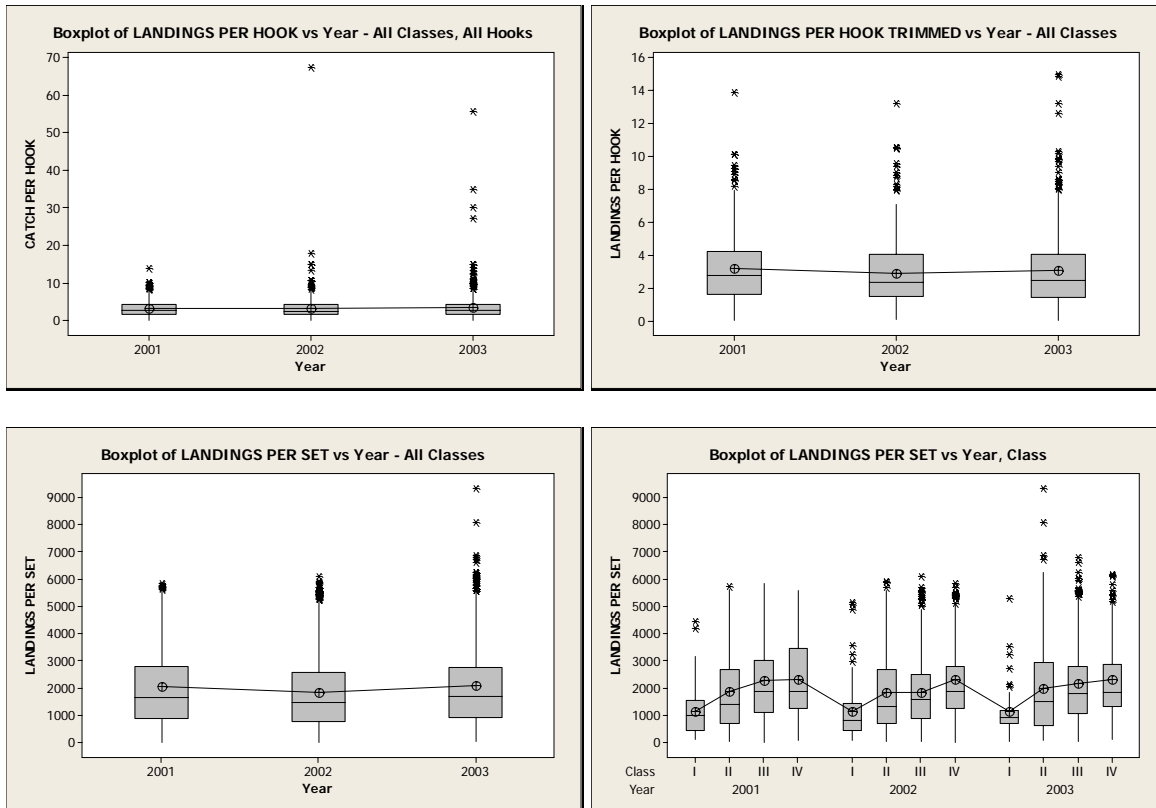

Figure 6. Sample indexes from the CFL Data – 116 Vessels, All Classes. The upper left panel uses all the reported hook numbers, the upper left panel is trimmed to 15 hooks. A trim to 8 hooks appears worth considering. The lower right panel graphs landings for the individual Classes of vessels.

DISCUSSION.

Of the two logbook data sets, the Pelagic Set contains the most information. However, it is of limited use in assessing Coastal Sharks, which are seldom targeted. If these data are used, the areas fished need to be selected so as to exclude effort where LCS are less likely to be available.

The Coastal Fishery Logbook data are much better in terms of the landings and area coverage. The time series now covers a decade of fishing, and has the potential to supply relative abundance indexes for coastal sharks post 1996. Unfortunately, catch (landings in pounds) is aggregated by trip. This will limit the use of these data sets to developing series based on trip averages along the lines we have given above: Average Landings per Hook and Average Landings per Set. Possible errors and omissions in the data set should be identifies if these data sets are to be used for stock assessments, boats and trips standardized. The data will require editing before attempting any analyses. **It would be very useful to make some spot checks to compare the weigh-out slips with the logbook reports to see how well the two agree.**

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Furthermore, the errors we noted indicate a need for future improvement in managing data entry in both the permit application process and in collecting Logbook data. The latter are especially important for stock assessment and their accuracy can best be guaranteed by making sure that the permit forms and logbooks are filled in correctly. This might well include dockside validating some of the logbooks when the boats are unloaded.

We have not considered using either the PLL or the CFL data to assess the two other species groups included in the Shark LAP's: Small Coastal Sharks (SCS) and Pelagic Sharks. The fishery for SCS is essentially separate from the LCS fishery in both the boats involved and the gear used, but the necessary commercial logbook data are contained in the CFL data base to attempt this. The comments we have made concerning the quality of these data also will apply to these other assessments.

We have ignored in this discussion the problem with species identification, as there is no practical way to verify the reports. As species misidentification is a concern common to almost all shark data sets, it deserves separate consideration elsewhere.