Florida Trip Tickets

S. Brown

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Florida Trip Ticket

Steve Brown

There were eight indices for Spanish mackerel developed from Florida trip tickets: Atlantic Coast (ATL) gill nets for 1986-June 30, 1995 (ATL_GN_early), ATL gill nets for July 1, 1995 to 2010 (ATL_GN_after), ATL cast nets for 1996-2010 (ATL_CN), ATL hook and line gears for 1985-2010 (ATL_HL), Gulf of Mexico (GULF) gill nets for 1986-June 30, 1995 (GULF_GN_early), GULF gill nets for July 1, 1995 to 2010 (GULF_GN_after), GULF cast nets for 1996-2010 (GULF_CN), GULF hook and line gears for 1985-2010 (GULF_HL). Each of the GN and CN indices were analyzed during time periods when trip limits allowed more than 1,500 pounds of Spanish mackerel to be landed, and each of the HL indices used data for time periods when trip limits allowed greater than 500 pounds of Spanish mackerel to be landed. The logic behind these choices for trip limits was that it was less likely for the landings from these trips using these gears to exceed the prevailing trip limit and therefore the landing may be more likely to reflect the availability of fish on that trip.

Introduction

Established by the Florida Legislature in Florida Statute (F.S.) 370.026 during 1983, the Florida Marine Fisheries Commission in conjunction with the Department of Natural Resources (DNR) [1] was charged with conserving and managing Florida's marine fisheries. In late-1984, the DNR implemented the mandatory reporting of detailed trip-level commercial fishery landings data by wholesale and retail seafood dealers using marine fisheries trip tickets. Prior to this time, commercial fisheries data was collected from seafood dealers on a monthly basis by the National Marine Fisheries Service (NMFS). Data were collected by both the NMFS and the DNR trip ticket system during 1985 to enable a comparison of the new data collection system. After determinations that the monthly dealer summaries and the detailed trip ticket information were comparable, the trip ticket system became the official commercial fisheries landings data collection system in Florida.

Wholesale and retail dealers operating in Florida are required to purchase dealer licenses, and wholesale dealers that purchase saltwater products (marine fish, invertebrates, live marine specimens, etc.) from commercial fishermen or wholesale and retail dealers that catch saltwater products themselves for sale in Florida are required to report these amounts on marine fisheries trip tickets to the Florida Fish and Wildlife Conservation Commission. Exceptions to the reporting requirements are: 1) restaurants who harvest their own catch for consumption on their premises; 2) transshipments of saltwater products after landing in Florida for destinations outside

1 The Department of Natural Resources was established by the Florida Legislature in 1968, and incorporated the Florida Board of Conservation into it's structure. Later, in 1993, Governor Lawton Chiles combined the Department of Natural Resources and the Department of Environmental Regulation into a single agency called the Department of Environmental Protection. During the 1998 general election, a majority Florida voters approved an amendment to the Florida Constitution which combined the Florida Game and Freshwater Fish Commission, the Florida Marine Fisheries Commission, and portions (chiefly, most of the Division of Marine Resources and most of the Florida Marine Patrol) of the Department of Environmental Protection into a single commission. The Florida Legislature, on July 1, 1999, formed the new Florida Fish and Wildlife Conservation Commission in fulfillment of that amendment.

of the state for which no purchase occurred (e.g., a corporate vessel landing saltwater products at a Florida port without receiving payment and shipping product to another state). Fishermen who harvest saltwater products commercially are required to purchase Saltwater Products Licenses and sell only to licensed wholesale seafood dealers or sell their catches directly to the public if they have a retail dealer license. Fishermen may also be required to have additional license endorsements and federal permits for the legal harvest and sale of some species (e.g., Spanish mackerel).

Trip tickets have been used by wholesale and retail seafood dealers for the reporting of fish and invertebrates purchased in Florida from fishermen since the system's inception in 1984. There have been revisions to the trip ticket fields and the mandatory nature of some fields over time (Table 1), as well as additions of new species codes, gear codes, and reporting units. Seafood dealers are required to report the preceding month's purchases from fishermen by the tenth day of the month following transaction. In the case of quota-managed species like Spanish mackerel, weekly reporting is required. Time lags for data entry of submitted paper forms is approximately four weeks after forms are received. Editing of computerized data typically takes two to three weeks. Computerized reporting of trip tickets, which eliminates the time lag for data entry, has occurred as early as 1987, and there has been considerable growth in level of computerized reporting by seafood dealers over the years.

Methods of Estimation

Geographic range

All commercial harvests landed and sold in Florida are required to be reported on Florida marine fisheries trip tickets (Fig. 1). Reports are required to have all mandatory information submitted with the landings data. The area fished information required on trip tickets is based on the NMFS' shrimp grid zones (Fig. 2). Additional areas fished for locations outside of Florida are available, and supplied to dealers upon request.

Assignment of fishing gears to trips:

At the time of applying for or renewing Saltwater Products License (SPL), fishermen were asked to indicate their use of fishing gears for the upcoming license year. Many license holders indicated more than one gear on their annual license application or renewal, and some did not indicate any gear at all. From the inception of the Florida trip ticket program until February of 1990, a "gear fished" field was not on the trip ticket (Table 1) so analysts inferred the gear used by a combination of the reported catch (species, amounts) and the gear fields on a fisherman's SPL license application. Beginning in 1990, the trip ticket was revised to include the gear fished field which consisted of rather generic "check boxes" for gears and a 4-digit gear code if the reporting of a more specific gear was desired. Old trip tickets were still in use for a couple of years, so not all records from 1990 to 1992 contained gear information. As the old stocks of trip tickets were used up by dealers, the reporting of gear used by trip increased.

Gear related to trip tickets was retrieved from the Saltwater Products (SPL) license record for the 1986 to 1992 license years during the editing of trip tickets, and this "gear" record was retained in the trip ticket data base. The SPL number was prohibited from being retained on the

trip ticket by the Florida legislature when then trip ticket program was initially approved, but later was allowed to be retained in the trip ticket data base in late 1986.

For trip tickets from 1986-1992, gear was assigned from the commercial fishing license application database (which was retained on the edited trip ticket record) based on a species/gear hierarchy from later years where gear was reported by trip. Target species and species groups were identified on trips where gear was reported from 1991-1994. The species-gear associations from these data were ranked from most common to least common and applied to the trip ticket data from 1986-1992. The target species (defined as the species with the highest poundage) and species groups were identified on trips where gears was not reported by trip from 1986-1992. Gear was assigned to each trip based on matching the species-license gear association with the species-ticket gear association from the 1991-1994 data. Gears by trip for these analyses were grouped into gill net, cast net, trawls, hook and line gears, and other. If gears were not determined for a trip (no license-gear information in the 1986-1992 period, or missing from the trip ticket from 1993-2011), the trip ticket was dropped from the analyses. The majority of Spanish mackerel landings were categorized as one of these gear types, and analyses for gill nets, cast nets, and hook and line gears are provided in this report.

At the Data Workshop, the Indices workgroup examined the preliminary results and suggested that the hook-and-line gear assignments for the 1986-1992 period may have included some landings exceeding reasonable limits for trips using this gear. Trips for this period were re-analyzed and landings in excess of the 99th percentile were excluded from the analyses. For the Florida Atlantic coast Spanish mackerel trips, those with landings greater than 840 pounds were excluded. For Florida Gulf coast Spanish mackerel trips, those with landings greater than 1,223 pounds were excluded. Trips from 1991-1994 where gear was reported on the trip ticket were also analyzed for maximum landings of Spanish mackerel on hook-and-line trips. The results from those years verified the 99th percentiles calculated from 1986-1992. The analyses in this report incorporate the recommendations of the Indices workgroup.

Species and species groups

As in SEDAR 17, trip tickets with Spanish mackerel ("positive" trips) were selected for analyses. A suitable method for selecting a universe of trips to evaluate (i.e., all trips which could have caught Spanish mackerel – zeros as well as positives) has not been developed yet, but possibly could be done using clustering techniques (e.g., Shertzer and Williams 2008) or other selection procedure (e.g., Stephens and MacCall 2004).

Species were assigned to fishery groups (Table 2) based upon fishery characteristics. The pounds landed by fishery group were summed for a trip ticket. Spanish mackerel was assigned to its own "group" since this was the species of interest for developing indices. For the purposes of developing the indices, a fishery group was classed as present or absent for the analyses.

Trip limits

Limits on harvest (pounds) of Spanish mackerel per trip during specific periods of the year would potentially affect the observed catch per trip, so the trip limits that were in effect during these periods were added to the trip ticket records. The dates for these trip limits for Atlantic Group Spanish mackerel (Table 3) were taken from SEDAR 17 (index code from Paul Conn, NMFS Beaufort Laboratory, personal communication) and from Sue Gerhart (NMFS SERO,

personal communication). Some of the trip limits were based on day of the week. Gill net and cast net trips with trip limits greater than 1,500 pounds and hook and line trips with trip limits greater than 500 pounds were selected for analyses as in SEDAR 17. There were no periods on the Florida Gulf of Mexico Coast when trips were limited as to the number of pounds harvested or landed.

Unit measure of abundance:

Pounds of Spanish mackerel landed on a trip was the response variable for most models (gamma models), and in a few cases the pounds of Spanish mackerel were log transformed (lognormal models).

Trips with Spanish mackerel (pounds whole weight landed) were selected by coast, gear, time period, and trip limit in effect (Table 3). The pounds of other species landed on the same trip ticket were grouped by fishery code (Table 2), and converted to '1' or '0' to indicate presence or absence from the landings for a trip. Year, month, Florida sub-region, and fishery codes were the twelve classification variables used to examine for trends in the amount (pounds) of Spanish mackerel landed.

A general linear model [GENMOD procedure (SAS Institute Inc. 2008)] using a forward stepwise selection technique was used to estimate trends in catch per trip by gear and coast. Two types of model probability distributions were explored: gamma (with a log link function) and lognormal. When the lognormal distribution was used, the pounds of Spanish mackerel landed were log-transformed and the model used a normal probability distribution with an identity link function. The forward selection process analyzes the null model (no class variables chosen), and then each class variable added singly in the model. If the GLM successfully converged, the reduction in deviance from the null model is assessed for each of these runs, and the class variable with the largest percentage reduction in deviance, a significant χ^2 (Chi-square) value, and a lower AICc than other class variables is selected for the model. The next series of model runs includes the variable selected in the previous series along with each of the remaining variables (one at a time), and each of the resulting two variable models are assessed for model convergence, the largest percentage reduction in deviance from the null model and significance criteria (χ^2, AICc) as before. This process continues until the percentage reduction in deviance becomes less than some desired level. For these model runs, a 0.25% reduction in deviance from the null model was the selected level of acceptance for a suite of class variables. If there were cases when the variable of interest (in this case, year was important) failed to be selected, it would have been included in the model statement so that a year effect could be estimated. However, all of the models included year using the criteria described. Annual values (and associated coefficients of variation) were estimated using the least squares mean method (SAS Institute Inc. 2008) for the year effect.

The model results from the forward stepwise selection of variables for the linear models are in Tables 4-11, and the diagnostic plots (standardized residuals by year, q-q plot, and standardized residuals versus the fitted distribution) and scaled index values (index values scaled to their means) over time are in Fig. 3-10. The adjusted average catch rates (pounds per trip), coefficient of variation (as a percentage of the mean), and the scaled index values are in Tables

12-13. Nominal average catch rates (simple averages) and adjusted averages by gear, and a comparison of the annual scaled index values by gear are shown in Figures 11-12.

Sampling Intensity

Temporal and spatial resolution:

Quotas for Spanish mackerel are managed by the NMFS for the South Atlantic Fishery Management Council (SAFMC) and the Gulf of Mexico Fishery Management Council (GMFMC). The boundary separating the SAFMC and GMFMC in Florida for Spanish mackerel is the line dividing Monroe County (Florida Keys) and Miami-Dade County. For SEDAR 28, discussions during a conference call expressed the desire, if possible, to divide the landings by US 1 in the Florida Keys which corresponds to the councils' jurisdictional boundaries rather than the boundaries used for managing Spanish mackerel quotas.

The separation of landings of Spanish mackerel to coincide with the council jurisdictions rather than how they are currently managed was approximate. Landings were first assigned to a migratory group based upon the area fished (if present on the trip ticket) or county landed corresponding to the quota management regime (separated at the Monroe County and Miami-Dade County boundary) so that any trip limits in effect could be assigned to the records. Once the migratory group was determined, landings were categorized based on the quota management boundaries as either Atlantic Coast or Gulf Coast, and separately by area fished (if present on the trip ticket) and county landed for SEDAR 28. Gulf group Spanish mackerel, if reported from areas 748 or 1 (Florida Keys) were classed as Atlantic Coast landings for SEDAR 28, while those in area 2 were considered Gulf Coast landings. If area fished was not reported on trip tickets from Monroe County (especially prior to 1992 when the reporting of this field was optional), the landings were considered to belong to the Gulf Coast. [There is a portion of area 2 that is in the SAFMC jurisdiction, but dividing catches into each council jurisdiction for area 2 is difficult to accomplish unless there are gear restrictions (e.g., SAFMC long line regulations)].

Additionally, the county of landing for Spanish mackerel was grouped into Florida subregions for these analyses. The subregion groupings were Nassau to Brevard (subregion 5), Indian River to Miami-Dade (subregion 4), Monroe County (subregion 3), Collier-Levy (subregion 2), and Dixie-Escambia (subregion 1). Landings may occur in a county in some years but not in others, and this situation can lead to missing cells in the general models that could result in model instability or inappropriate estimates for class variables. Two subregion groupings were devised. The first was based solely on county landed (corresponding to the usual subdivision of Florida landings in the NMFS commercial landings (Nassau County to Miami-Dade County landings are assigned to the Florida Atlantic Coast, and Monroe County to Escambia County are assigned to the Florida Gulf of Mexico Coast). A second subregion grouping modified the subregion based upon area fished (if reported on the trip ticket) as outlined in the preceding paragraph.

Series period:

Florida trip tickets reported for the time period of 1986 to 2010 were used for developing the indices. The hook and line indices were developed over the entire period by coast. Because of

the entangling net limitations implemented in Florida on July 1, 1995, trip tickets with the reported or assigned gear of gill nets were split into groups before and after this date by coast. Trip tickets where cast nets were the reported gear were only used after this date because of the rare use of this gear type prior to the net limitation date.

Size/Age Data

Not included as part of this index analysis**.**

Catch Rates – Number and Biomass

See Tables 12 and 13.

Uncertainty and Measures of Precision

Gill net and cast net trips were problematic. There are different methods to deploy gill nets (which may have different mesh sizes, lengths, and panels) and each method targets and catches fish differently which can affect the amounts of catch. The highest catches on trips were from run-around gill nets, where a school or portion of a school of fish is surrounded by an actively fished gill net and the fish are "startled" into the net by noise (e.g., by jumping on the bottom of the boat or some other method). If the target species was Spanish mackerel, landings could be in the thousands to tens of thousands of pounds. If the target species was not Spanish mackerel, there may only be a few pounds (i.e., Spanish mackerel may have been part of the retained bycatch). Gill nets may also be fished anchored to the bottom (stab nets, anchored gill nets) as a more passively fished gear, or may drift on the current (drift gill nets). There have also been restrictions on the amount of soak time in some years (e.g., to reduce the potential encounter with marine turtles), and on transfers of catch at sea. The specific type of gill net deployment is not often provided on trip tickets. Prior to July 1, 1995, gill nets could be used in state as well as in federal waters. After Florida's net limitations (Article X of the Florida Constitution) went into effect on July 1, 1995, usage of entangling nets was limited to federal waters only, and other nets (seines, trawls, cast nets) usable in state waters were limited to 500 square feet or smaller in mesh area. Changes in the way gears are designed (mesh sizes, panels, depth, etc.), used (deployment method, soak time, etc.), and non-specific gear identification (e.g., "gill nets") make interpretation of patterns observed in the data more complex especially when trying to develop indices of abundance.

In retrospect, there were issues with the choice of the time period analyzed for the gill net indices. Because the four GN indices (2 ATL and 2 GULF) included only a partial year for 1995, the model may not give an appropriate "annual" value for 1995 since it would be based on only 6 months of the year. It may be more appropriate, if these indices are accepted for use, to drop all of the 1995 data from the GN indices.

Catches of Spanish mackerel were infrequent from cast nets until after Florida's net limitations. Several years after the passage of Article X, some fishermen on the southeastern coast of Florida developed a thrown net effective at catching Spanish mackerel especially in an area of shallow offshore hard bottom [offshore of "Peck's Lake", about 3-5 miles southeast of St. Lucie Inlet, Martin County (Hartig, 2007)]. While called a cast net, it is not the typical cast

net used for bait fish or mullet. It is of larger mesh, more heavily weighted to sink more quickly, and when retrieved the net does not "purse" in the usual way. In southwest Florida, this type of modified cast net is not being used, and cast net-caught Spanish mackerel are a bycatch species from other nearshore fisheries.

The more important limitation to all of the indices produced is that they are based upon only "positive" trips (i.e., trips when Spanish mackerel were landed). Ideally, an index of abundance includes a component estimating the probability of encountering the target species on a trip ("zero" trips on which the target species might have been caught but was not, and "positive" trips on which the species was caught) as well as a component estimating the rate of capture on a trip (the number or weight of the target species caught on "positive" trips). Including "zero trips" (trips which could have but did not land Spanish mackerel) would be a refinement that would enhance an index's potential value as an indicator of abundance.

Comments on Adequacy for Assessment

The indices produced had reasonable fits to the distributions used and most had relatively modest coefficients of variation. The period of time covered by the indices were relatively long (ten years for gill nets over the 1986-1995 period, sixteen years for gill nets for the 1995-2010 period, fifteen years for cast nets over 1996-2010, and 25 years for hook and line gears over 1986-2010). The hook-and-line gears index may be more reliable indicator of abundance because of selectivity issues that complicate the interpretation of data from trips using gill nets (e.g., deployment methods, mesh sizes, configuration of panels, and changes in state/federal waters restrictions) and cast nets (e.g., configuration, depth, bottom types).

5.8 Tables

Table 5.1.1. Table of the data considered for the construction of a CPUE index.

Fishery Type	Data Source	Area	Years	Units	Standardization Method	Issues	Use?
Commercial	Gillnet pre-netban	Florida South Atlantic	1986-1995	Whole pounds per trip	GLM gamma	Configuration types not usually identified; limited to federal waters after net ban; restrictions on soak time, catch transfers at sea; only positive trips	Yes or No
Commercial	Gillnet post-netban	Florida South Atlantic	1995-2010	Whole pounds per trip	GLM lognormal	Configuration types not usually identified; limited to federal waters after net ban; restrictions on soak time, catch transfers at sea; only positive trips	
Commercial	Cast net	Florida South Atlantic	1996-2010	Whole pounds per trip	GLM lognormal	Shorter time series; active gear targeting Spanish; only positive trips	
Commercial	Hand lines	Florida South Atlantic	1986-2010	Whole pounds per trip	GLM gamma	Only positive trips	
Commercial	Gillnet pre-netban	Florida Gulf of Mexico	1986-1995	Whole pounds per trip	GLM gamma	Configuration types not usually identified; limited to federal waters after net ban; restrictions on soak time, catch transfers at sea; only positive trips	
Commercial	Gillnet post-netban	Florida Gulf of Mexixo	1995-2010	Whole pounds per trip	GLM lognormal	Configuration types not usually identified; limited to federal waters after net ban; restrictions	

						on soak time, catch transfers at sea; only positive trips	
Commercial	Cast net	Florida Gulf of Mexico	1996-2010	Whole pounds per trip	GLM gamma	Shorter time series; active gear with Spanish as bycatch; only positive trips	
Commercial	Hand lines	Florida Gulf of Mexico	1986-2010	Whole pounds per trip	GLM gamma	Only positive trips	

Table 5.1.2. Table of the pros and cons for each data set considered at the data workshop.

Gillnet

Pros:

long time series
intercepts S. Atlantic population
similar trends to commercial logbook

Cons:

hyperstability issues, particularly in the Gulf
Limited spatial extent in S. Atl (primarily Canaveral to Miami)

Hand lines/trolling

Pros:

long time series
similar trends to commercial logbook
sampling entire fishery (inshore and offshore)

Cons:

Florida only
fishery-dependent

Cast nets

Pros:

potentially useful as a year class indicator

Cons:

gear saturation effects
limited spatial extent
hyperstability issues since setting on schools
trip limit effects

Table 1. Listing of reporting fields available on Florida trip tickets. A dotted line indicates that the field was available but not mandatory. Solid bars indicate that field was mandatory. Blanks indicate that field was not present. Form type was not designated until June of 1997.

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Field Name	Initiated on Form Type	Oct 1984-Jun 1986	Jly 1986 - Feb 1990	Mar 1990-Aug 1993	Sep 1993-May 1997	Jun 1997-Oct 2000 A2	Nov 2000 - present A3
Saltwater Products License	A1	●	●	●	●	●	●
Vessel Identification Number	A2					●	●
Dealer's License Number	A1	●	●	●	●	●	●
Number of Crew (includes captain)	A3						●
Trip Start Date	A3						●
Unloading Date	A1	●	●	●	●	●	●
Actual Time Fished (hours assumed unless days indicated)	A1	●	●	●	●	●	●
Actual Time Fished Units (Hours or Days)	A2					●	●
Area Fished	A1	●	●	●	●	●	●
State of Landing	A3						●
County Landed (special coding for state landed other than Florida)	A1	●	●	●	●	●	●
Depth (Avg. depth fished, feet assumed unless fathoms indicated)	A1	●	●	●	●	●	●
Depth Units (Feet or Fathoms)	A2					●	●
Gears Fished: Purse Seine	A1*			●	●	●	●
Gears Fished: Beach or Haul Seine	A1*			●	●	●	●
Gears Fished: Long Line	A1*			●	●	●	●
Gears Fished: Hook & Line gears	A1*			●	●	●	●
Gears Fished: Traps	A1*			●	●	●	●
Gears Fished: Trawl	A1*			●	●	●	●
Gears Fished: Gill net	A1*			●	●	●	●
Gears Fished: Trammel net	A1*			●	●	●	●
Gears Fished: Cast net	A2					●	●
Gears Fished: Bandit rig	A2					●	●
Gears Fished: 4-digit gear code	A1*			●	●	●	●
Number of gear sets	A1	●	●	●	●	●	●
Quantity of traps pulled/gear set	A1	●	●	●	●	●	●
Soak Time (days assumed)	A1	●	●	●	●	●	●
Soak Time Units (Hours or Days)	A2					●	●
For-Hire Fishery: Head boat	A2					●	●
For-Hire Fishery: Charter boat	A2					●	●
For-Hire Fishery: Guide boat	A2					●	●
Aquaculture	A2					●	●
Aquaculture Lease Number	A2					●	●
Trip Ticket Invoice Prefix	A1	●	●	●	●	●	●
Trip Ticket Invoice Number	A1	●	●	●	●	●	●
Trip Ticket Invoice Continuation Field (split trips, etc.)	A1*			●	●	●	●
Species Code	A1	●	●	●	●	●	●
Market Size Code	A1*			●	●	●	●
Market Grade Code	A3						●
Amount of Catch (units depend on species code used)	A1	●	●	●	●	●	●
Unit Price ($US)	A1	●	●	●	●	●	●
Catch Disposition	A3						●
Form Number	A2					●	●

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Table 2. Examples of species reported on trip tickets arranged into 'fishery groups' for these analyses.

Bait fish **BT**	Crustacea **CR**	Inshore Benthic **IB**	Inshore Pelagics* **IP**	Offshore Benthic **OB**	Offshore Pelagics **OP**	Reef Fish **RF**
anchovies	spiny lobster	catfish, hardhead	bluefish	flounders (gulf, southern, summer)	little tunny	greater amberjack
bait fish	Spanish lobster	catfish, gafftopsail	blue runner	tilefish (golden)	dolphin	squirrelfish
ballyhoo	blue crab	Atlantic croaker	cobia	tilefish, blueline	mackerel, chub	grouper, black
scad, round	stone crab	black drum	crevalle jack	tilefish, anchor	mackerel, king	gag
scad, bigeye	shrimp, pink	grunts	mixed jack	tilefish, blackline	marlin, blue	grouper, Nassau
herring, thread	shrimp, white	mullet, striped	other jack	tilefish, goldface	marlin, white	grouper, red
herring, round	shrimp, brown	mullet, white	ladyfish	shark, angel	sharks (mixed)	scamp
menhaden	shrimp, rock	tilapia	permit	shark, sand tiger	spearfish	grouper, snowy
sardines, Spanish	shrimp, royal red	rays and skates	Florida pompano	shark, sandbar	swordfish	warsaw
sardines, scaled	shrimp, other	red drum*	Atlantic bumper	brotula	tuna, bigeye	grouper, yellowedge
misc. industrial fish	shrimp, bait	sand perch	spadefish	cusk-eel	tuna, bluefin	grouper, yellowfin
pinfish		weakfish	cero	hake (southern, gulf, spotted)	tuna, albacore	grouper, goliath
flyingfish		seatrout, sand	Atlantic moonfish	longtail bass	tuna, skipjack	hogfish
needlefish		seatrout, silver	bar jack	wreckfish	tuna, yellowfin	sea bass
		seatrout, spotted	horse-eye jack		tuna, mixed	snapper, lane
		sheepshead	lookdown		wahoo	snapper, grey
		spot	yellow jack		oilfish	snapper, mutton
		kingfish ("whiting")	African pompano		escolar	snapper, red
		porgy, grass	shark, blacknose		opah	snapper, silk
		mojarra	Shark, bonnethead		cutlassfish	Snapper, vermilion
		goatfishes	shark, finetooth		banded rudderfish	snapper, yellowtail
		searobins			tripletail	triggerfish
					butterfish	surgeonfish
					harvestfish	bigeye
					barrelfish	porgy, jolthead
					shark, blacktip	porgy, littlehead
					shark, Atlantic sharpnose	porgy, knobbed

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					shark, Bignose	porgy, longspine
					shark, bull	porgy, red
					shark, dusky	scorpionfish
					shark, hammerhead	blackbelly rosefish
					shark, lemon	margates
						lesser amberjack
						many others

*Spanish mackerel is typically placed in “inshore pelagics”, but in these analyses it is the target species.

Table 3. Trip limits in effect for the Atlantic migratory group (Spanish mackerel)

Fishing Year	Time period	Trip limits (TL) in effect					
86-87	19860401 - 19870113	TL unlimited					
	19870114 - 19870331	TL=0	closed				
87-88	19870401 - 19871230	TL unlimited					
	19871231 - 19880401	TL=0	closed				
88-89	19880401 - 19890103	TL unlimited					
	19890104 - 19890331	TL=0	closed				
89-90	19890401 - 19900331	TL unlimited					
90-91	19900401 - 19910128	TL unlimited					
	19910129 - 19910401	TL=0	closed				
91-92	19910401 - 19920331	TL unlimited					
92-93	19920401 - 19921208	TL=1500					
	19921209 - 19921231	TL=500	Sa,Su	TL=1500	T,Th	TL unlimited	M,W,F
	19930101 - 19930111	TL=500	Sa,Su	TL=1500	T,Th	TL unlimited	M,W,F
	19930112 - 19930223	TL=1000					
	19930224 - 19930331	TL=500					
93-94	19930401 - 19931130	TL=1500					
	19931201 - 19931222	TL unlimited					
	19931223 - 19940223	TL=1000					
	19940224 - 19940331	TL=500					
94-95	19940401 - 19950124	TL unlimited					
	19940125 - 19950331	TL=1000					
95-96	19950401 - 19960331	TL unlimited					
96-97	19960401 - 19961031	TL unlimited					
	19971101 - 19980331	TL=1500	Sa,Su			TL unlimited	M-F
97-98	19970401 - 19971031	TL unlimited					
	19971101 - 19981217	TL=1500	Sa,Su			TL unlimited	M-F
	19971218 - 19980331	TL=1500					
98-99	19980401 - 19981031	TL unlimited					
	19981101 - 19990215	TL=1500	Sa,Su			TL unlimited	M-F
	19990216 - 19990331	TL=1500					
99-00	19990401 - 19991031	TL=1500					
	19991101 - 20000331	TL=1500	Sa,Su			TL unlimited	M-F
00-01	20000401 - 20001130	TL=3500					
	20001201 - 20010331	TL=1500	Sa,Su			TL unlimited	M-F
01-02	20010401 - 20011130	TL=3500					
	20011201 - 20020331	TL=1500	Sa,Su			TL unlimited	M-F
02-03	20020401 - 20021130	TL=3500					
	20021201 - 20030331	TL=1500	Sa,Su			TL unlimited	M-F
03-04	20030401 - 20031130	TL=3500					
	20031201 - 20040302	TL=1500	Sa,Su			TL unlimited	M-F

	20040303 - 20040331	TL=1500					
04-05	20040401 - 20041130	TL=3500					
	20041201 - 20050202	TL=1500	Sa,Su			TL unlimited	M-F
	20050203 - 20050228	TL=1500					
05-06	20050301 - 20050331	TL unlimited					
	20050401 - 20051130	TL=3500					
	20051201 - 20060228	TL=1500	Sa,Su			TL unlimited	M-F
06-07	20060301 - 20060331	TL unlimited					
	20060401 - 20061130	TL=3500					
	20061201 - 20070205	TL=1500	Sa,Su			TL unlimited	M-F
	20070206 - 20070228	TL=1500					
07-08	20070301 - 20070331	TL unlimited					
	20070401 - 20071130	TL=3500					
	20071201 - 20080229	TL=1500	Sa,Su			TL unlimited	M-F
08-09	20080301 - 20080331	TL unlimited					
	20080401 - 20081130	TL=3500					
	20081201 - 20090228	TL=1500	Sa,Su			TL unlimited	M-F
09-10	20090301 - 20090331	TL unlimited					
	20090401 - 20091130	TL=3500					
	20091201 - 20100221	TL=1500	Sa,Su			TL unlimited	M-F
	20100222 - 20100228	TL=1500					
10-11	20090301 - 20090331	TL unlimited					
	20090401 - 20091130	TL=3500					
	20091201 - 20100228	TL=1500	Sa,Su			TL unlimited	M-F

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Table 4. Florida Atlantic Coast gill net gear trips during 1986-1995: Stepwise selection of variables (shaded lines) to include in estimating the catch per trip of Spanish mackerel from using a GLM (gamma distribution and log link) based on highest percentage reduction in model deviance and lowest AICc values. The fields include the variables, the degrees of freedom for that variable (df), the deviance of the model with those variables, the mean deviance (deviance/df), the change in mean deviance (Δ mean dev), percent reduction in mean deviance (% change in mean dev), log likelihood, the change in log likelihood from previous run, minus two times the change in log-likelihood, chi-square value, the Chi-square degrees of freedom, the probability of the null hypothesis (Prob Ho), and the corrected Akaike Information Criterion (AICc).

ATL GN 1986-1995 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICC	Δ AICC	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
Null model	32809	-194697.9					389399.8		214417.5	6.54			
month	32798	-185414.3	9283.6	18567.28	11	< 0.001	370854.6	18545.27	143480.0	4.37	2.16067	-33.06%	-33.06%
IB	32808	-186178.7	8519.2	17038.4	1	< 0.001	372363.5	17036.4	148434.1	4.52	2.01100	-30.77%	
IP	32808	-188547.1	6150.8	12301.6	1	< 0.001	377100.2	12299.6	164727.7	5.02	1.51436	-23.17%	
OS	32808	-192339.9	2358.0	4716.0	1	< 0.001	384685.8	4714.0	194026.1	5.91	0.62134	-9.51%	
FL_reg_area_co	32807	-192979.5	1718.5	3436.9	2	< 0.001	385966.9	3432.9	199384.2	6.08	0.45783	-7.01%	
BT	32808	-193373.0	1324.9	2649.8	1	< 0.001	386752.0	2647.8	202744.1	6.18	0.35561	-5.44%	
year	32800	-193420.4	1277.5	2555.0	9	< 0.001	386862.8	2537.0	203152.1	6.19	0.34166	-5.23%	
OB	32808	-193777.0	921.0	1841.9	1	< 0.001	387559.9	1839.9	206243.7	6.29	0.24894	-3.81%	
RF	32808	-193974.8	723.2	1446.3	1	< 0.001	387955.5	1444.3	207976.2	6.34	0.19613	-3.00%	
OP	32808	-194534.7	163.2	326.4	1	< 0.001	389075.5	324.4	212949.2	6.49	0.04456	-0.68%	
CR	32808	-194690.0	7.9	15.7	1	< 0.001	389386.1	13.7	214346.5	6.53	0.00196	-0.03%	
With month													
IB	32797	-182182.0	3232.3	6464.629	1	< 0.001	364391.9	6462.627	124070.7	3.78	0.591668	-9.05%	-42.11%
IP	32797	-183364.1	2050.2	4100.4	1	< 0.001	366756.2	4098.4	130889.2	3.99	0.383770	-5.87%	
BT	32797	-184562.4	851.9	1703.8	1	< 0.001	369152.7	1701.8	138127.2	4.21	0.163077	-2.50%	
OS	32797	-184884.3	529.9	1059.9	1	< 0.001	369796.7	1057.9	140129.8	4.27	0.102016	-1.56%	
OB	32797	-185025.6	388.7	777.4	1	< 0.001	370079.2	775.4	141016.2	4.30	0.074992	-1.15%	
RF	32797	-185104.7	309.6	619.1	1	< 0.001	370237.4	617.1	141514.7	4.31	0.059791	-0.91%	

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ATL GN 1986-1995 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICC	Δ AICC	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
year	32789	-185128.7	285.6	571.1	9	< 0.001	370301.5	553.1	141666.2	4.32	0.054116	-0.83%	
FL_reg_area_co	32796	-185349.4	64.8	129.7	2	< 0.001	370728.9	125.7	143066.4	4.36	0.012344	-0.19%	
CR	32797	-185376.4	37.9	75.8	1	< 0.001	370780.8	73.8	143238.2	4.37	0.007240	-0.11%	
OP	32797	-185405.5	8.7	17.5	1	< 0.001	370839.1	15.5	143424.2	4.37	0.001569	-0.02%	
With month IB													
IP	32796	-181604.5	577.5	1155.0	1	< 0.001	363239.0	1153.0	120852.4	3.68	0.098017	-1.50%	-43.61%
BT	32796	-181604.5	577.5	746.5	1	< 0.001	363647.4	744.5	121982.2	3.72	0.063567	-0.97%	
year	32796	-181808.7	373.3	407.8	9	< 0.001	364002.2	389.8	122926.1	3.75	0.034785	-0.53%	
FL_reg_area_co	32788	-181978.1	203.9	249.4	2	< 0.001	364146.5	245.4	123369.5	3.76	0.020349	-0.31%	
OP	32795	-182057.2	124.7	98.3	1	< 0.001	364295.6	96.3	123793.9	3.77	0.008210	-0.13%	
OB	32796	-182132.8	49.2	93.9	1	< 0.001	364300.0	91.9	123806.3	3.78	0.007946	-0.12%	
OS	32796	-182135.0	47.0	36.1	1	< 0.001	364357.8	34.1	123969.0	3.78	0.002987	-0.05%	
RF	32796	-182163.9	18.1	8.2	1	0.004	364385.7	6.2	124047.5	3.78	0.000593	-0.01%	
CR	32796	-182177.8	4.1	0.0	1	0.994	364393.9	-2.0	124070.7	3.78	-0.000115	0.00%	
With month IB IP													
BT	32795	-181235.7	368.8	737.6	1	< 0.001	362503.3	735.6	118834.8	3.62	0.061409	-0.94%	-44.55%
year	32787	-181429.3	175.1	350.3	9	< 0.001	362906.7	332.2	119890.7	3.66	0.028320	-0.43%	
FL_reg_area_co	32794	-181437.2	167.3	334.6	2	< 0.001	362908.4	330.6	119933.6	3.66	0.027791	-0.43%	
OP	32795	-181529.9	74.6	149.2	1	< 0.001	363091.8	147.2	120442.0	3.67	0.012402	-0.19%	
OB	32795	-181571.4	33.1	66.1	1	< 0.001	363174.9	64.1	120670.4	3.68	0.005437	-0.08%	
OS	32795	-181601.4	3.0	6.1	1	0.014	363234.9	4.1	120835.6	3.68	0.000399	-0.01%	
CR	32795	-181603.1	1.4	2.8	1	0.096	363238.2	0.8	120844.8	3.68	0.000120	0.00%	
RF	32795	-181604.4	0.0	0.1	1	0.823	363240.9	-2.0	120852.2	3.69	-0.000108	0.00%	
With month IB IP BT													
FL_reg_area_co	32793	-181051.2	184.4	368.9	2	< 0.001	362138.4	364.9	117836.7	3.59	0.030215	-0.46%	-45.02%

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ATL GN 1986-1995 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICC	Δ AICC	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
year	32786	-181083.4	152.3	304.6	9	< 0.001	362216.8	286.6	118010.1	3.60	0.024159	-037%	
OP	32794	-181139.8	95.8	191.6	1	< 0.001	362313.7	189.6	118315.3	3.61	0.015729	-0.24%	
OB	32794	-181189.8	45.8	91.6	1	< 0.001	362413.7	89.6	118586.2	3.62	0.007470	-0.11%	
OS	32794	-181230.1	5.6	11.1	1	< 0.001	362494.2	9.1	118804.6	3.62	0.000810	-0.01%	
CR	32794	-181231.0	4.7	9.4	1	0.002	362496.0	7.4	118809.3	3.62	0.000665	-0.01%	
RF	32794	-181235.3	0.4	0.7	1	0.388	362504.6	-1.3	118832.8	3.62	-0.000049	0.00%	

With month IB IP BT FL_reg_area_co

year	32784	-180902.9	148.3	296.6	9	< 0.001	361859.8	278.6	117039.3	3.57	0.023335	-0.36%	-45.37%
OP	32792	-180959.7	91.5	183.1	1	< 0.001	361957.4	181.1	117344.1	3.58	0.014913	-0.23%	
OB	32792	-180988.2	63.0	126.1	1	< 0.001	362014.4	124.1	117497.3	3.58	0.010241	-0.16%	
OS	32792	-181034.7	16.5	33.0	1	< 0.001	362107.5	31.0	117747.8	3.59	0.002600	-0.04%	
RF	32792	-181042.4	8.8	17.7	1	< 0.001	362122.7	15.7	117789.0	3.59	0.001345	-0.02%	
CR	32792	-181045.7	5.5	11.0	1	< 0.001	362129.4	9.0	117807.0	3.59	0.000794	-0.01%	

With month IB IP BT FL_reg_area_co year

OP	32783	-180792.7	110.2	220.5	1	< 0.001	361641.4	218.5	116449.7	3.55	0.017878	-0.27%	-45.65%
OB	32783	-180847.1	55.8	111.6	1	< 0.001	361750.3	109.6	116740.6	3.56	0.009003	-0.14%	
OS	32783	-180887.4	15.5	31.1	1	< 0.001	361830.8	29.1	116956.1	3.57	0.002431	-0.04%	
RF	32783	-180895.6	7.3	14.6	1	< 0.001	361847.3	12.6	117000.3	3.57	0.001082	-0.02%	
CR	32783	-180897.8	5.1	10.2	1	0.001	361851.7	8.2	117012.0	3.57	0.000724	-0.01%	

With month IB IP BT FL_reg_area_co year OP

OB	32782	-180735.5	57.1	114.3	1	< 0.001	361529.1	112.3	116145.0	3.54	0.009185	-0.14%	
OS	32782	-180768.1	24.6	49.1	1	< 0.001	361594.3	47.1	116318.7	3.55	0.003887	-0.06%	

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ATL GN 1986-1995 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICC	Δ AICC	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
RF	32782	-180785.4	7.2	14.4	1	< 0.001	361628.9	12.4	116411.1	3.55	0.001068	-0.02%	
CR	32782	-180788.2	4.4	8.9	1	0.003	361634.5	6.9	116426.0	3.55	0.000615	-0.01%	

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Table 5. Florida Atlantic Coast gill net gear trips during 1995-2010: Stepwise selection of variables (shaded lines) to include in estimating the catch per trip of Spanish mackerel from using a GLM (lognormal distribution and identity link) based on highest percentage reduction in model deviance and lowest AICc values. The fields include the variables, the degrees of freedom for that variable (df), the deviance of the model with those variables, the mean deviance (deviance/df), the change in mean deviance (Δ mean dev), percent reduction in mean deviance (% change in mean dev), log likelihood, the change in log likelihood from previous run, minus two times the change in log-likelihood, chi-square value, the Chi-square degrees of freedom, the probability of the null hypothesis (Prob Ho), and the corrected Akaike Information Criterion (AICc).

ATL GN 1995-2010 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICc	Δ AICc	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
Null model	11278	-23851.3					47706.6		45349.3	4.02			
month	11267	-21895.3	1956.0	3911.959	11	< 0.001	43816.68	3889.927	32058.41	2.85	1.175706	-29.24%	-29.24%
IB	11277	-23528.2	323.1	646.3	1	< 0.001	47062.3	644.3	42823.8	3.80	0.22360	-5.56%	
year	11263	-23580.3	271.0	542.0	15	< 0.001	47194.7	512.0	43221.6	3.84	0.18356	-4.56%	
IP	11277	-23600.1	251.3	502.5	1	< 0.001	47206.1	500.5	43373.3	3.85	0.17487	-4.35%	
FL_reg_area_co	11276	-23715.0	136.3	272.5	2	< 0.001	47438.1	268.5	44266.7	3.93	0.09530	-2.37%	
OP	11277	-23746.0	105.3	210.7	1	< 0.001	47497.9	208.7	44510.0	3.95	0.07407	-1.84%	
RF	11277	-23748.5	102.8	205.7	1	< 0.001	47502.9	203.7	44529.9	3.95	0.07231	-1.80%	
BT	11277	-23842.2	9.1	18.2	1	< 0.001	47690.4	16.2	45276.2	4.01	0.00613	-0.15%	
OS	11277	-23843.5	7.8	15.7	1	< 0.001	47692.9	13.7	45286.3	4.02	0.00523	-0.13%	
OB	11277	-23845.4	5.9	11.8	1	< 0.001	47696.8	9.8	45302.0	4.02	0.00384	-0.10%	
CR	11277	-23849.9	1.4	2.8	1	9.57E-02	47705.8	0.8	45338.2	4.02	0.00063	-0.02%	
With month													
IP	11266	-21767.1	128.2	256.4593	1	< 0.001	43562.23	254.4543	31337.7	2.78	0.06372	-1.58%	-30.82%
year	11252	-21796.9	98.4	196.9	15	< 0.001	43649.9	166.7	31503.7	2.80	0.045503	-1.13%	
IB	11266	-21837.1	58.2	116.5	1	< 0.001	43702.2	114.5	31729.1	2.82	0.028981	-0.72%	
RF	11266	-21859.2	36.1	72.3	1	< 0.001	43746.4	70.3	31853.7	2.83	0.017921	-0.45%	
BT	11266	-21862.9	32.4	64.8	1	< 0.001	43753.9	62.8	31874.7	2.83	0.016054	-0.40%	
OS	11266	-21877.9	17.5	34.9	1	< 0.001	43783.8	32.9	31959.3	2.84	0.008543	-0.21%	

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ATL GN 1995-2010 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICc	Δ AICc	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
FL_reg_area_co	11265	-21881.2	14.1	28.2	2	< 0.001	43792.5	24.2	31978.4	2.84	0.006597	-0.16%	
OP	11266	-21882.6	12.8	25.5	1	< 0.001	43793.2	23.5	31986.0	2.84	0.006176	-0.15%	
CR	11266	-21890.2	5.1	10.2	1	1.37E-03	43808.4	8.2	32029.3	2.84	0.00233	-0.06%	
OB	11266	-21892.8	2.5	5.0	1	0.0253	43813.7	3.0	32044.2	2.84	0.001009	-0.03%	
With month IP													
year	11251	-21691.4	75.7	151.4	15	< 0.001	43441.0	121.3	30919.9	2.75	0.033425	-0.83%	-31.65%
RF	11251	-21691.4	75.7	58.6	1	< 0.001	43505.7	56.6	31175.4	2.77	0.010715	-0.27%	
BT	11265	-21737.8	29.3	54.4	1	< 0.001	43509.8	52.4	31186.9	2.77	0.013138	-0.33%	
IB	11265	-21739.9	27.2	45.9	1	< 0.001	43518.3	43.9	31210.4	2.77	0.011055	-0.27%	
OS	11265	-21744.1	23.0	22.4	1	< 0.001	43541.8	20.4	31275.5	2.78	0.005272	-0.13%	
FL_reg_area_co	11265	-21755.9	11.2	21.0	2	< 0.001	43545.2	17.0	31279.3	2.78	0.004936	-0.12%	
OP	11264	-21756.6	10.5	9.0	1	0.002678	43555.2	7.0	31312.7	2.78	0.001729	-0.04%	
CR	11265	-21762.6	4.5	8.6	1	0.003312	43555.6	6.6	31313.7	2.78	0.001880	-0.05%	
OB	11265	-21762.8	4.3	3.4	1	0.064	43560.8	1.4	31328.2	2.78	0.000598	-0.01%	
With month IP year													
RF	11250	-21665.5	25.9	51.8	1	< 0.001	43391.2	49.8	30778.2	2.74	0.012348	-0.31%	-31.96%
BT	11250	-21666.3	25.1	50.2	1	< 0.001	43392.8	48.2	30782.7	2.74	0.011956	-0.30%	
IB	11250	-21667.3	24.1	48.3	1	< 0.001	43394.7	46.2	30787.9	2.74	0.011489	-0.29%	
OS	11250	-21680.6	10.8	21.7	1	< 0.001	43421.3	19.6	30860.6	2.74	0.005027	-0.13%	
OP	11250	-21684.3	7.1	14.2	1	< 0.001	43428.7	12.2	30880.9	2.74	0.003222	-0.08%	
FL_reg_area_co	11249	-21683.8	7.6	15.1	2	< 0.001	43429.9	11.1	30878.5	2.74	0.003197	-0.08%	
CR	11250	-21686.3	5.1	10.3	1	0.001358	43432.7	8.3	30891.8	2.75	0.002255	-0.06%	
OB	11250	-21689.1	2.3	4.6	1	0.031	43438.3	2.6	30907.2	2.75	0.000888	-0.02%	
With month IP year RF													
IB	11249	-21637.6	27.9	55.9	1	< 0.001	43337.3	53.9	30626.1	2.72	0.013283	-0.33%	-32.29%

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ATL GN 1995-2010 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICc	Δ AICc	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
BT	11249	-21640.4	25.1	50.3	1	< 0.001	43342.9	48.2	30641.4	2.72	0.011922	-0.30%	
FL_reg_area_co	11248	-21655.7	9.8	19.6	2	< 0.001	43375.6	15.6	30724.7	2.73	0.004275	-0.11%	
OS	11249	-21656.8	8.8	17.5	1	< 0.001	43375.7	15.5	30730.5	2.73	0.004001	-0.10%	
OP	11249	-21660.0	5.5	11.1	1	< 0.001	43382.1	9.1	30748.0	2.73	0.002444	-0.06%	
CR	11249	-21660.9	4.7	9.3	1	0.002281	43383.9	7.3	30752.9	2.73	0.002014	-0.05%	
OB	11249	-21663.4	2.1	4.2	1	0.039324	43388.9	2.2	30766.7	2.74	0.000787	-0.02%	
With month IP year RF IB													
BT	11248	-21614.9	22.7	45.4	1	< 0.001	43293.9	43.3	30503.2	2.71	0.010686	-0.27%	-32.56%
OS	11248	-21629.5	8.0	16.0	1	< 0.001	43323.3	14.0	30582.6	2.72	0.003624	-0.09%	
FL_reg_area_co	11247	-21630.3	7.2	14.5	2	< 0.001	43326.9	10.4	30586.9	2.72	0.003003	-0.07%	
CR	11248	-21632.6	5.0	10.0	1	0.001563	43329.3	8.0	30598.9	2.72	0.002171	-0.05%	
OP	11248	-21634.7	2.8	5.7	1	0.0173	43333.6	3.7	30610.7	2.72	0.001125	-0.03%	
OB	11248	-21636.4	1.2	2.4	1	0.122871	43336.9	0.4	30619.6	2.72	0.000333	-0.01%	
With month IP year RF IB BT													
OS	11247	-21606.7	8.1	16.3	1	< 0.001	43279.7	14.3	30459.2	2.71	0.003673	-0.09%	
FL_reg_area_co	11246	-21608.3	6.6	13.2	2	0.001372	43284.8	9.2	30467.5	2.71	0.002686	-0.07%	
CR	11247	-21609.7	5.2	10.4	1	0.001256	43285.6	8.4	30475.0	2.71	0.002260	-0.06%	
OP	11247	-21612.4	2.4	4.9	1	0.027449	43291.1	2.9	30490.0	2.71	0.000928	-0.02%	
OB	11247	-21613.6	1.3	2.5	1	0.113435	43293.5	0.5	30496.4	2.71	0.000361	-0.01%	

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Table 6. Florida Atlantic Coast cast net gear trips during 1996-2010: Stepwise selection of variables (shaded lines) to include in estimating the catch per trip of Spanish mackerel from using a GLM (lognormal distribution and identity link) based on highest percentage reduction in model deviance and lowest AICc values. The fields include the variables, the degrees of freedom for that variable (df), the deviance of the model with those variables, the mean deviance (deviance/df), the change in mean deviance (Δ mean dev), percent reduction in mean deviance (% change in mean dev), log likelihood, the change in log likelihood from previous run, minus two times the change in log-likelihood, chi-square value, the Chi-square degrees of freedom, the probability of the null hypothesis (Prob Ho), and the corrected Akaike Information Criterion (AICc).

ATL CN 1996-2010 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICc	Δ AICc	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
Null model	15881	-36249.9					72503.7		89318.4	5.62			
month	15870	-32521.2	3728.6	7457.27	11	< 0.001	65068.5	7435.2	55849.7	3.52	2.105026	-37.43%	-37.43%
IB	15880	-32980.0	3269.9	6539.7	1	< 0.001	65966.0	6537.7	59171.4	3.73	1.89807	-33.75%	
IP	15880	-35175.0	1074.8	2149.7	1	< 0.001	70356.0	2147.7	78011.3	4.91	0.71168	-12.65%	
BT	15880	-35553.2	696.6	1393.3	1	< 0.001	71112.4	1391.3	81816.7	5.15	0.47204	-8.39%	
year	15867	-35677.4	572.5	1145.0	14	< 0.001	71386.8	1116.9	83105.8	5.24	0.38658	-6.87%	
OS	15880	-35800.9	448.9	897.9	1	< 0.001	71607.9	895.9	84409.0	5.32	0.30880	-5.49%	
FL_reg_area_co	15879	-36048.2	201.7	403.4	2	< 0.001	72104.3	399.4	87078.4	5.48	0.14036	-2.50%	
OB	15880	-36101.4	148.5	297.0	1	< 0.001	72208.7	295.0	87663.6	5.52	0.10385	-1.85%	
RF	15880	-36142.0	107.9	215.7	1	< 0.001	72290.0	213.7	88113.4	5.55	0.07553	-1.34%	
OP	15880	-36209.2	40.6	81.2	1	< 0.001	72424.5	79.2	88862.7	5.60	0.02834	-0.50%	
CR	15880	-36239.3	10.6	21.1	1	< 0.001	72484.6	19.1	89199.7	5.62	0.00712	-0.13%	
With month													
IB	15869	-30566.5	1954.7	3909.473	1	< 0.001	61161.0	3907.5	43663.27	2.75	0.767720	-13.65%	-51.08%
year	15856	-31927.3	593.9	1187.8	14	< 0.001	63908.7	1159.7	51825.2	3.27	0.250712	-4.46%	
IP	15869	-32093.7	427.5	855.0	1	< 0.001	64215.4	853.0	52922.4	3.33	0.184244	-3.28%	
OS	15869	-32191.2	330.0	660.0	1	< 0.001	64410.4	658.0	53576.3	3.38	0.143043	-2.54%	
BT	15869	-32295.0	226.3	452.5	1	< 0.001	64618.0	450.5	54280.9	3.42	0.098639	-1.75%	

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ATL CN 1996-2010 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICc	Δ AICc	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
FL_reg_area_co	15868	-32450.2	71.0	141.9	2	< 0.001	64930.5	137.9	55352.8	3.49	0.030873	-0.55%	
OB	15869	-32462.7	58.5	117.1	1	< 0.001	64953.4	115.1	55439.5	3.49	0.02563	-0.46%	
RF	15869	-32472.3	48.9	97.9	1	< 0.001	64972.6	95.9	55506.6	3.50	0.021400	-0.38%	
CR	15869	-32517.6	3.6	7.2	1	0.007	65063.3	5.2	55824.6	3.52	0.001364	-0.02%	
OP	15869	-32518.0	3.2	6.5	1	0.011	65064.0	4.5	55827.0	3.52	0.001210	-0.02%	
With month IB													
year	15855	-30155.9	410.6	821.1	14	< 0.001	60367.9	793.1	41463.2	2.62	0.136335	-2.42%	-53.50%
OS	15855	-30155.9	410.6	302.1	1	< 0.001	60860.9	300.0	42840.7	2.70	0.049451	-0.88%	
BT	15868	-30415.5	151.0	241.4	1	< 0.001	60921.6	239.4	43004.6	2.71	0.041335	-0.73%	
IP	15868	-30445.8	120.7	188.2	1	< 0.001	60974.8	186.1	43149.1	2.72	0.032233	-0.57%	
FL_reg_area_co	15868	-30472.4	94.1	128.9	2	< 0.001	61036.0	124.9	43310.2	2.73	0.022077	-0.39%	
OB	15867	-30502.0	64.5	54.0	1	< 0.001	61109.0	52.0	43515.2	2.74	0.008986	-0.16%	
RF	15868	-30539.5	27.0	34.4	1	< 0.001	61128.6	32.4	43568.9	2.75	0.005775	-0.10%	
OP	15868	-30549.3	17.2	16.5	1	< 0.001	61146.5	14.5	43618.0	2.75	0.002682	-0.05%	
CR	15868	-30558.2	8.2	7.6	1	0.006	61155.4	5.6	43642.4	2.75	0.001143	-0.02%	
With month IB year													
OS	15854	-30036.8	119.2	238.3	1	< 0.001	60131.6	236.3	40845.6	2.58	0.038785	-0.69%	-54.19%
BT	15854	-30068.6	87.4	174.7	1	< 0.001	60195.2	172.7	41009.6	2.59	0.028446	-0.51%	
IP	15854	-30069.0	86.9	173.9	1	< 0.001	60196.1	171.9	41011.7	2.59	0.028309	-0.50%	
FL_reg_area_co	15853	-30110.4	45.5	90.9	2	< 0.001	60281.0	86.9	41226.4	2.60	0.014605	-0.26%	
OB	15854	-30130.3	25.6	51.1	1	< 0.001	60318.8	49.1	41329.9	2.61	0.008243	-0.15%	
OP	15854	-30143.7	12.2	24.5	1	< 0.001	60345.4	22.5	41399.3	2.61	0.003865	-0.07%	
RF	15854	-30145.6	10.3	20.6	1	< 0.001	60349.4	18.6	41409.5	2.61	0.003219	-0.06%	
CR	15854	-30152.9	3.0	6.1	1	0.014	60363.8	4.1	41447.3	2.61	0.000838	-0.01%	

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ATL CN 1996-2010 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICc	Δ AICc	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
With month IB year OS													
BT	15853	-29934.8	101.9	203.9	1	< 0.001	59929.7	201.9	40324.6	2.54	0.032703	-0.58%	-54.77%
IP	15853	-29960.4	76.3	152.7	1	< 0.001	59980.9	150.7	40454.8	2.55	0.024491	-0.44%	
FL_reg_area_co	15852	-29988.1	48.7	97.3	2	< 0.001	60038.3	93.3	40596.1	2.56	0.015416	-0.27%	
OB	15853	-30010.9	25.9	51.8	1	< 0.001	60081.9	49.8	40712.7	2.57	0.008221	-0.15%	
OP	15853	-30023.8	13.0	26.0	1	< 0.001	60107.6	24.0	40778.8	2.57	0.004052	-0.07%	
RF	15853	-30028.4	8.4	16.8	1	< 0.001	60116.9	14.7	40802.6	2.57	0.002554	-0.05%	
CR	15853	-30033.7	3.0	6.1	1	0.014	60127.6	4.1	40830.0	2.58	0.000822	-0.01%	
With month IB year OS BT													
IP	15852	-29862.3	72.5	145.1	1	< 0.001	59786.7	143.1	39957.9	2.52	0.022972	-0.41%	-55.18%
FL_reg_area_co	15851	-29899.8	35.0	70.1	2	< 0.001	59863.7	66.1	40147.1	2.53	0.010879	-0.19%	
OB	15852	-29908.2	26.6	53.3	1	< 0.001	59878.5	51.3	40189.6	2.54	0.008360	-0.15%	
OP	15852	-29919.6	15.2	30.5	1	< 0.001	59901.3	28.5	40247.3	2.54	0.004719	-0.08%	
RF	15852	-29927.8	7.0	13.9	1	< 0.001	59917.8	11.9	40289.2	2.54	0.002071	-0.04%	
CR	15852	-29931.3	3.5	7.0	1	0.008	59924.8	5.0	40306.9	2.54	0.000960	-0.02%	
With month IB year OS BT IP													
FL_reg_area_co	15850	-29822.7	39.6	79.2	2	< 0.001	59711.5	75.2	39759.1	2.51	0.012223	-0.22%	
OB	15851	-29837.0	25.3	50.6	1	< 0.001	59738.1	48.6	39830.8	2.51	0.007863	-0.14%	
OP	15851	-29845.4	16.9	33.8	1	< 0.001	59754.9	31.8	39872.9	2.52	0.005202	-0.09%	
RF	15851	-29857.2	5.1	10.2	1	0.001	59778.4	8.2	39932.2	2.52	0.001465	-0.03%	
CR	15851	-29859.1	3.2	6.3	1	0.012	59782.3	4.3	39942.0	2.52	0.000847	-0.02%	

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Table 7. Florida Atlantic Coast hook and line gear trips during 1986-2010: Stepwise selection of variables (shaded lines) to include in estimating the catch per trip of Spanish mackerel from using a GLM (gamma distribution and log link) based on highest percentage reduction in model deviance and lowest AICc values. The fields include the variables, the degrees of freedom for that variable (df), the deviance of the model with those variables, the mean deviance (deviance/df), the change in mean deviance (Δ mean dev), percent reduction in mean deviance (% change in mean dev), log likelihood, the change in log likelihood from previous run, minus two times the change in log-likelihood, chi-square value, the Chi-square degrees of freedom, the probability of the null hypothesis (Prob Ho), and the corrected Akaike Information Criterion (AICc).

ATL HL 1986-2010 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICC	Δ AICC	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
Null model	51019	-273675.2					547354.4		151858.0	2.98			
month	51008	-268563.3	5111.9	10223.87	11	< 0.001	537152.6	10201.86	129919.1	2.55	0.429465	-14.43%	-14.43%
OP	51018	-269314.2	4361.0	8722.0	1	< 0.001	538634.4	8720.0	132959.0	2.61	0.37038	-12.44%	
RF	51018	-270964.4	2710.8	5421.6	1	< 0.001	541934.8	5419.6	139856.2	2.74	0.23519	-7.90%	
year	50995	-270990.1	2685.1	5370.2	24	< 0.001	542032.3	5322.1	139966.2	2.74	0.23180	-7.79%	
FL_reg_area_co	51017	-272159.3	1515.9	3031.8	2	< 0.001	544326.6	3027.8	145041.4	2.84	0.13350	-4.49%	
IP	51018	-273386.0	289.2	578.3	1	< 0.001	546778.1	576.3	150536.8	2.95	0.02584	-0.87%	
IB	51018	-273389.1	286.2	572.3	1	< 0.001	546784.1	570.3	150550.5	2.95	0.02557	-0.86%	
OS	51018	-273516.1	159.1	318.2	1	< 0.001	547038.3	316.2	151129.9	2.96	0.01421	-0.48%	
OB	51018	-273610.9	64.3	128.6	1	< 0.001	547227.8	126.6	151563.3	2.97	0.00572	-0.19%	
BT	51018	-273617.9	57.3	114.6	1	< 0.001	547241.8	112.6	151595.3	2.97	0.00509	-0.17%	
CR	51018	-273638.4	36.8	73.6	1	< 0.001	547282.9	71.6	151689.4	2.97	0.00325	-0.11%	
With month													
OP	51007	-266335.6	2227.7	4455.423	1	< 0.001	532699.2	4453.422	121252.2	2.38	0.169865	-5.71%	-20.14%
RF	51007	-266620.7	1942.6	3885.2	1	< 0.001	533269.3	3883.2	122332.6	2.40	0.148684	-5.00%	
year	50984	-266698.1	1865.2	3730.4	24	< 0.001	533470.2	3682.4	122627.5	2.41	0.141819	-4.76%	
FL_reg_area_co	51006	-267168.5	1394.7	2789.5	2	< 0.001	534367.1	2785.5	124432.4	2.44	0.107471	-3.61%	

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ATL HL 1986-2010 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICC	Δ AICC	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
IP	51007	-268063.8	499.5	999.0	1	< 0.001	536155.6	997.0	127930.6	2.51	0.038935	-1.31%	
IB	51007	-268433.3	130.0	260.0	1	< 0.001	536894.6	257.9	129399.1	2.54	0.010145	-0.34%	
OS	51007	-268513.7	49.6	99.1	1	< 0.001	537055.4	97.1	129720.5	2.54	0.003843	-0.13%	
BT	51007	-268535.1	28.1	56.3	1	< 0.001	537098.3	54.3	129806.4	2.54	0.002160	-0.07%	
CR	51007	-268549.8	13.4	26.9	1	< 0.001	537127.7	24.9	129865.2	2.55	0.001006	-0.03%	
OB	51007	-268561.5	1.8	3.6	1	0.0593	537151.0	1.6	129912.0	2.55	0.000090	0.00%	
With month OP													
year	50983	-264752.3	1583.3	3166.5	24	< 0.001	529580.7	3118.5	115401.6	2.26	0.113637	-3.82%	-23.95%
RF	50983	-264752.3	1583.3	2934.5	1	< 0.001	529766.6	2932.5	115821.8	2.27	0.105396	-3.54%	
FL_reg_area_co	51006	-264868.3	1467.3	2276.4	2	< 0.001	530426.7	2272.4	117020.9	2.29	0.082911	-2.79%	
IP	51005	-265197.4	1138.2	801.7	1	< 0.001	531899.5	799.7	119747.2	2.35	0.029414	-0.99%	
IB	51006	-265934.7	400.8	337.0	1	< 0.001	532364.1	335.0	120617.5	2.36	0.012397	-0.42%	
OS	51006	-266167.1	168.5	70.6	1	< 0.001	532630.6	68.6	121119.1	2.37	0.002564	-0.09%	
BT	51006	-266300.3	35.3	65.3	1	< 0.001	532635.9	63.3	121129.1	2.37	0.002368	-0.08%	
CR	51006	-266302.9	32.6	51.5	1	< 0.001	532649.6	49.5	121155.1	2.38	0.001859	-0.06%	
OB	51006	-266309.8	25.8	4.5	1	0.034	532696.7	2.5	121243.8	2.38	0.000119	0.00%	
With month OP year													
RF	50982	-263616.5	1135.8	2271.7	1	< 0.001	527311.0	2269.7	111356.9	2.18	0.079292	-2.66%	-26.62%
FL_reg_area_co	50981	-263959.3	793.0	1586.0	2	< 0.001	527998.7	1582.0	112564.6	2.21	0.055560	-1.87%	
IP	50982	-264574.7	177.6	355.2	1	< 0.001	529227.4	353.2	114760.8	2.25	0.012525	-0.42%	
IB	50982	-264650.3	102.1	204.1	1	< 0.001	529378.6	202.1	115033.1	2.26	0.007185	-0.24%	
CR	50982	-264670.8	81.5	162.9	1	< 0.001	529419.8	160.9	115107.4	2.26	0.005728	-0.19%	

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ATL HL 1986-2010 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICC	Δ AICC	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
OB	50982	-264711.2	41.1	82.2	1	< 0.001	529500.5	80.2	115253.1	2.26	0.002869	-0.10%	
BT	50982	-264737.7	14.7	29.3	1	< 0.001	529553.4	27.3	115348.6	2.26	0.000995	-0.03%	
OS	50982	-264752.3	0.0	0.1	1	0.823	529582.6	-2.0	115401.6	2.26	-0.000043	0.00%	
With month OP year RF													
FL_reg_area_co	50980	-263080.3	536.2	1072.4	2	< 0.001	526242.6	1068.4	109490.8	2.15	0.036519	-1.23%	-27.84%
IP	50981	-263413.9	202.5	405.1	1	< 0.001	526908.0	403.1	110648.8	2.17	0.013847	-0.47%	
IB	50981	-263551.1	65.4	130.8	1	< 0.001	527182.2	128.8	111127.9	2.18	0.004450	-0.15%	
CR	50981	-263561.9	54.6	109.2	1	< 0.001	527203.8	107.2	111165.6	2.18	0.003710	-0.12%	
OB	50981	-263588.3	28.1	56.3	1	< 0.001	527256.7	54.3	111258.3	2.18	0.001892	-0.06%	
BT	50981	-263598.9	17.6	35.2	1	< 0.001	527277.8	33.2	111295.2	2.18	0.001168	-0.04%	
OS	50981	-263608.5	7.9	15.9	1	< 0.001	527297.2	13.9	111329.1	2.18	0.000503	-0.02%	
With month OP year RF FL_reg_area_co													
IP	50979	-262949.9	130.4	260.9	1	< 0.001	525983.8	258.9	109041.0	2.14	0.008782	-0.30%	-28.14%
CR	50979	-262992.4	87.9	175.7	1	< 0.001	526068.9	173.7	109187.6	2.14	0.005906	-0.20%	
IB	50979	-263038.7	41.6	83.1	1	< 0.001	526161.5	81.1	109347.3	2.14	0.002773	-0.09%	
OB	50979	-263042.7	37.6	75.2	1	< 0.001	526169.5	73.2	109361.0	2.15	0.002504	-0.08%	
BT	50979	-263062.6	17.7	35.4	1	< 0.001	526209.2	33.4	109429.6	2.15	0.001159	-0.04%	
OS	50979	-263067.5	12.8	25.6	1	< 0.001	526219.0	23.6	109446.5	2.15	0.000826	-0.03%	
With month OP year RF FL_reg_area_co IP													

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ATL HL 1986-2010 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICC	Δ AICC	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
CR	50978	-262862.5	87.4	174.7	1	< 0.001	525811.1	172.7	108740.6	2.13	0.005850	-0.20%	
IB	50978	-262881.9	68.0	135.9	1	< 0.001	525849.8	133.9	108807.2	2.13	0.004544	-0.15%	
OB	50978	-262920.4	29.5	59.0	1	< 0.001	525926.8	57.0	108939.5	2.14	0.001949	-0.07%	
BT	50978	-262926.0	23.8	47.7	1	< 0.001	525938.1	45.7	108958.9	2.14	0.001567	-0.05%	
OS	50978	-262942.8	7.0	14.0	1	< 0.001	525971.7	12.0	109016.8	2.14	0.000432	-0.01%	

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Table 8. Florida Gulf Coast gill net gear trips during 1986-1995: Stepwise selection of variables (shaded lines) to include in estimating the catch per trip of Spanish mackerel from using a GLM (gamma distribution and log link) based on highest percentage reduction in model deviance and lowest AICc values. The fields include the variables, the degrees of freedom for that variable (df), the deviance of the model with those variables, the mean deviance (deviance/df), the change in mean deviance (Δ mean dev), percent reduction in mean deviance (% change in mean dev), log likelihood, the change in log likelihood from previous run, minus two times the change in log-likelihood, chi-square value, the Chi-square degrees of freedom, the probability of the null hypothesis (Prob Ho), and the corrected Akaike Information Criterion (AICc).

GULF GN 1986-1995 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICc	Δ AICc	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
Null model	55199	-312021.8					624047.5		305134.8	5.53			
month	55188	-303974.9	8046.9	16093.75	11	< 0.001	607975.8	16071.75	247573.5	4.49	1.041903	-18.85%	-18.85%
IB	55198	-304636.4	7385.3	14770.6	1	< 0.001	609278.9	14768.6	251923.8	4.56	0.96390	-17.44%	
IP	55198	-305544.7	6477.1	12954.1	1	< 0.001	611095.4	12952.1	258003.3	4.67	0.85376	-15.44%	
FL_reg_area_co	55197	-306999.1	5022.6	10045.3	2	< 0.001	614006.2	10041.3	268001.3	4.86	0.67255	-12.17%	
OB	55198	-310203.9	1817.9	3635.7	1	< 0.001	620413.8	3633.7	291214.3	5.28	0.25209	-4.56%	
OS	55198	-310327.6	1694.1	3388.2	1	< 0.001	620661.3	3386.2	292144.2	5.29	0.23525	-4.26%	
BT	55198	-311377.0	644.7	1289.4	1	< 0.001	622760.1	1287.4	300133.8	5.44	0.09050	-1.64%	
OP	55198	-311628.7	393.1	786.1	1	< 0.001	623263.4	784.1	302077.2	5.47	0.05529	-1.00%	
year	55190	-311795.1	226.7	453.4	9	< 0.001	623612.2	435.4	303368.3	5.50	0.03111	-0.56%	
RF	55198	-311900.5	121.2	242.5	1	< 0.001	623807.0	240.5	304189.0	5.51	0.01704	-0.31%	
CR	55198	-312012.0	9.7	19.5	1	< 0.001	624030.1	17.5	305058.8	5.53	0.00128	-0.02%	
With month													
IB	55187	-299340.3	4634.6	9269.135	1	< 0.001	598708.6	9267.134	218867.9	3.97	0.52007	-9.41%	-28.26%
FL_reg_area_co	55186	-301163.3	2811.6	5623.2	2	< 0.001	602356.6	5619.2	229797.3	4.16	0.321951	-5.82%	
IP	55187	-301186.7	2788.2	5576.4	1	< 0.001	602401.4	5574.4	229940.7	4.17	0.319428	-5.78%	
OS	55187	-302356.4	1618.5	3237.0	1	< 0.001	604740.8	3235.0	237201.9	4.30	0.187854	-3.40%	
OB	55187	-302545.5	1429.4	2858.8	1	< 0.001	605118.9	2856.8	238393.9	4.32	0.166255	-3.01%	
BT	55187	-303692.8	282.1	564.2	1	< 0.001	607413.6	562.2	245738.2	4.45	0.033174	-0.60%	

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GULF GN 1986-1995 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICc	Δ AICc	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
RF	55187	-303725.8	249.1	498.2	1	< 0.001	607479.6	496.2	245952.4	4.46	0.029293	-0.53%	
year	55179	-303783.3	191.6	383.2	9	< 0.001	607610.6	365.1	246325.8	4.46	0.021880	-0.40%	
CR	55187	-303868.8	106.1	212.2	1	< 0.001	607765.5	210.2	246881.7	4.47	0.012454	-0.23%	
OP	55187	-303945.7	29.2	58.3	1	< 0.001	607919.4	56.3	247383.2	4.48	0.003366	-0.06%	
With month IB													
FL_reg_area_co	55185	-296911.4	2428.9	4857.8	2	< 0.001	593854.8	4853.8	205001.9	3.71	0.251120	-4.54%	-32.80%
IP	55185	-296911.4	2428.9	1551.5	1	< 0.001	597159.2	1549.5	214354.4	3.88	0.081645	-1.48%	
OS	55186	-298564.6	775.7	1292.3	1	< 0.001	597418.4	1290.3	215102.8	3.90	0.068152	-1.23%	
OB	55186	-298694.2	646.1	1030.9	1	< 0.001	597679.7	1028.9	215859.8	3.91	0.054435	-0.98%	
year	55186	-298824.9	515.4	648.3	9	< 0.001	598078.3	630.3	216972.0	3.93	0.034283	-0.62%	
OP	55178	-299016.2	324.2	196.5	1	< 0.001	598514.1	194.5	218291.6	3.96	0.009797	-0.18%	
BT	55186	-299242.0	98.3	55.2	1	< 0.001	598655.4	53.2	218705.8	3.96	0.002865	-0.05%	
CR	55186	-299312.7	27.6	28.7	1	< 0.001	598682.0	26.7	218783.8	3.96	0.001452	-0.03%	
RF	55186	-299326.0	14.3	1.2	1	0.270	598709.4	-0.8	218864.3	3.97	-0.000007	0.00%	
With month IB FL_reg_area_co													
IP	55184	-296243.4	668.0	1335.9	1	< 0.001	592520.8	1333.9	201323.8	3.65	0.066583	-1.20%	-34.00%
year	55176	-296249.6	661.8	1323.5	9	< 0.001	592549.3	1305.5	201357.7	3.65	0.065440	-1.18%	
OB	55184	-296381.2	530.2	1060.4	1	< 0.001	592796.4	1058.4	202077.8	3.66	0.052922	-0.96%	
OS	55184	-296446.7	464.6	929.3	1	< 0.001	592927.5	927.3	202437.3	3.67	0.046405	-0.84%	
OP	55184	-296693.9	217.5	435.0	1	< 0.001	593421.8	433.0	203798.0	3.69	0.021749	-0.39%	
CR	55184	-296820.9	90.5	181.1	1	< 0.001	593675.7	179.1	204500.1	3.71	0.009027	-0.16%	
BT	55184	-296883.0	28.4	56.8	1	< 0.001	593800.0	54.8	204844.3	3.71	0.002789	-0.05%	
RF	55184	-296911.2	0.2	0.3	1	0.558	593856.4	-1.7	205000.9	3.71	-0.000050	0.00%	
With month IB FL_reg_area_co IP													

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GULF GN 1986-1995 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICc	Δ AICc	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
year	55175	-295665.9	577.5	1155.0	9	< 0.001	591383.9	1137.0	198189.8	3.59	0.056206	-1.02%	-35.02%
OB	55183	-295815.7	427.7	855.4	1	< 0.001	591667.4	853.4	198998.7	3.61	0.042069	-0.76%	
OP	55183	-295933.9	309.5	619.0	1	< 0.001	591903.8	617.0	199638.9	3.62	0.030468	-0.55%	
OS	55183	-295939.0	304.4	608.9	1	< 0.001	591914.0	606.9	199666.4	3.62	0.029970	-0.54%	
CR	55183	-296168.8	74.6	149.2	1	< 0.001	592373.6	147.2	200916.5	3.64	0.007315	-0.13%	
BT	55183	-296229.8	13.6	27.2	1	< 0.001	592495.6	25.2	201249.5	3.65	0.001281	-0.02%	
RF	55183	-296232.4	11.0	22.0	1	< 0.001	592500.9	20.0	201263.9	3.65	0.001021	-0.02%	
With month IB FL_reg_area_co IP year													
OB	55174	-295194.9	471.0	942.1	1	< 0.001	590443.8	940.0	195664.8	3.55	0.045700	-0.83%	-35.85%
OP	55174	-295335.1	330.8	661.6	1	< 0.001	590724.3	659.6	196413.7	3.56	0.032126	-0.58%	
OS	55174	-295381.0	284.9	569.8	1	< 0.001	590816.0	567.8	196659.2	3.56	0.027677	-0.50%	
CR	55174	-295599.6	66.3	132.6	1	< 0.001	591253.3	130.6	197832.9	3.59	0.006405	-0.12%	
RF	55174	-295656.7	9.2	18.4	1	< 0.001	591367.5	16.4	198140.3	3.59	0.000832	-0.02%	
BT	55174	-295660.9	5.0	10.1	1	0.0015	591375.8	8.1	198162.6	3.59	0.000428	-0.01%	
With month IB FL_reg_area_co IP year OB													
OP	55173	-294802.0	392.9	785.7	1	< 0.001	589660.1	783.7	193580.0	3.51	0.037723	-0.68%	-36.53%
OS	55173	-294983.2	211.7	423.4	1	< 0.001	590022.4	421.4	194538.9	3.53	0.020343	-0.37%	
CR	55173	-295144.8	50.1	100.2	1	< 0.001	590345.6	98.2	195397.9	3.54	0.004774	-0.09%	
RF	55173	-295180.2	14.7	29.4	1	< 0.001	590416.4	27.4	195586.4	3.54	0.001356	-0.02%	
BT	55173	-295191.1	3.8	7.7	1	0.0057	590438.2	5.7	195644.4	3.55	0.000305	-0.01%	
With month IB FL_reg_area_co IP year OB OP													
OS	55172	-294582.3	219.7	439.4	1	< 0.001	589222.7	437.4	192422.5	3.49	0.020915	-0.38%	-36.91%
CR	55172	-294740.5	61.5	123.0	1	< 0.001	589539.1	121.0	193255.3	3.50	0.005821	-0.11%	

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GULF GN 1986-1995 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICc	Δ AICc	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
BT	55172	-294794.0	8.0	16.0	1	< 0.001	589646.0	14.0	193537.6	3.51	0.000704	-0.01%	
RF	55172	-294794.4	7.6	15.2	1	< 0.001	589646.9	13.2	193539.8	3.51	0.000665	-0.01%	
With month IB FL_reg_area_co IP year OB OP OS													
CR	55171	-294533.0	49.3	98.7	1	< 0.001	589126.1	96.6	192163.5	3.48	0.004632	-0.08%	
RF	55171	-294567.2	15.1	30.2	1	< 0.001	589194.5	28.2	192343.2	3.49	0.001376	-0.02%	
BT	55171	-294577.0	5.3	10.7	1	0.0011	589214.0	8.7	192394.5	3.49	0.000446	-0.01%	

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Table 9. Florida Gulf Coast gill net gear trips during 1995-2010: Stepwise selection of variables (shaded lines) to include in estimating the catch per trip of Spanish mackerel from using a GLM (lognormal distribution and identity link) based on highest percentage reduction in model deviance and lowest AICc values. The fields include the variables, the degrees of freedom for that variable (df), the deviance of the model with those variables, the mean deviance (deviance/df), the change in mean deviance (Δ mean dev), percent reduction in mean deviance (% change in mean dev), log likelihood, the change in log likelihood from previous run, minus two times the change in log-likelihood, chi-square value, the Chi-square degrees of freedom, the probability of the null hypothesis (Prob Ho), and the corrected Akaike Information Criterion (AICc).

GULF GN 1995-2010 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICc	Δ AICc	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
Null model	2812	-6948.9					13901.8		23033.1	8.19			
IP	2811	-6004.2	944.7	1889.435	1	< 0.001	12014.36	1887.431	11766.45	4.19	4.005141	-48.90%	-48.90%
year	2797	-6686.2	262.7	525.3	15	< 0.001	13406.7	495.1	19109.5	6.83	1.35886	-16.59%	
month	2801	-6716.8	232.1	464.2	11	< 0.001	13459.7	442.1	19529.0	6.97	1.21884	-14.88%	
FL_reg_area_co	2810	-6838.5	110.4	220.8	2	< 0.001	13685.0	216.8	21294.5	7.58	0.61287	-7.48%	
OB	2811	-6891.2	57.7	115.4	1	< 0.001	13788.4	113.4	22107.1	7.86	0.32652	-3.99%	
IB	2811	-6909.3	39.6	79.2	1	< 0.001	13824.6	77.2	22393.7	7.97	0.22453	-2.74%	
OP	2811	-6943.3	5.6	11.2	1	< 0.001	13892.6	9.2	22941.3	8.16	0.02973	-0.36%	
RF	2811	-6947.8	1.1	2.1	1	0.1427	13901.6	0.1	23015.5	8.19	0.00334	-0.04%	
OS	2811	-6948.0	0.9	1.7	1	0.1897	13902.1	-0.3	23019.0	8.19	0.00210	-0.03%	
BT	2811	-6948.4	0.5	1.0	1	0.3259	13902.8	-1.0	23025.2	8.19	-0.00010	0.00%	
CR	2811	-6948.4	0.4	0.9	1	0.3458	13902.9	-1.1	23025.8	8.19	-0.00033	0.00%	
With IP													
year	2796	-5869.6	134.6	269.1638	15	< 0.001	11775.43	238.9275	10692.75	3.82	0.361554	-4.41%	-53.31%
month	2800	-5895.2	109.0	217.9	11	< 0.001	11818.6	195.8	10889.4	3.89	0.296792	-3.62%	
OB	2810	-5975.7	28.5	56.9	1	< 0.001	11959.4	54.9	11530.7	4.10	0.082398	-1.01%	

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GULF GN 1995-2010 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICc	Δ AICc	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
FL_reg_area_co	2809	-5985.6	18.6	37.1	2	< 0.001	11981.2	33.1	11612.1	4.13	0.051957	-0.63%	
RF	2810	-5998.5	5.7	11.3	1	< 0.001	12005.0	9.3	11719.1	4.17	0.015367	-0.19%	
IB	2810	-6000.3	3.9	7.7	1	0.0055	12008.6	5.7	11734.2	4.18	0.009984	-0.12%	
CR	2810	-6002.5	1.6	3.3	1	0.0699	12013.1	1.3	11752.7	4.18	0.003398	-0.04%	
OP	2810	-6003.1	1.1	2.1	1	0.1456	12014.2	0.1	11757.6	4.18	0.001662	-0.02%	
OS	2810	-6003.8	0.3	0.7	1	0.4104	12015.7	-1.3	11763.6	4.19	-0.000480	0.01%	
BT	2810	-6004.1	0.1	0.2	1	0.6355	12016.1	-1.8	11765.5	4.19	-0.001155	0.01%	
With IP year													
month	2785	-5765.7	103.9	207.8	11	< 0.001	11590.0	185.5	9931.2	3.57	0.258357	-3.15%	-56.47%
OB	2785	-5765.7	103.9	36.5	1	< 0.001	11740.9	34.5	10554.8	3.79	0.034418	-0.42%	
FL_reg_area_co	2795	-5851.3	18.3	35.9	2	< 0.001	11743.6	31.8	10557.1	3.78	0.047151	-0.58%	
RF	2794	-5851.6	18.0	11.2	1	< 0.001	11766.2	9.2	10650.1	3.81	0.012537	-0.15%	
IB	2795	-5864.0	5.6	6.4	1	0.0115	11771.1	4.4	10668.5	3.82	0.007311	-0.09%	
OP	2795	-5866.4	3.2	5.4	1	0.0199	11772.0	3.4	10672.2	3.82	0.005998	-0.07%	
OS	2795	-5866.9	2.7	2.3	1	0.1264	11775.1	0.3	10683.9	3.82	0.001807	-0.02%	
CR	2795	-5868.4	1.2	2.2	1	0.1351	11775.2	0.2	10684.3	3.82	0.001667	-0.02%	
BT	2795	-5868.5	1.1	0.0	1	0.9360	11777.5	-2.0	10692.7	3.83	-0.001360	0.02%	
With IP year month													
OB	2784	-5745.4	20.3	40.6	1	< 0.001	11551.4	38.6	9788.8	3.52	0.049846	-0.61%	-57.07%
FL_reg_area_co	2783	-5747.0	18.7	37.4	2	< 0.001	11556.7	33.3	9800.0	3.52	0.044550	-0.54%	
RF	2784	-5758.3	7.4	14.7	1	< 0.001	11577.3	12.7	9879.2	3.55	0.017366	-0.21%	
IB	2784	-5761.3	4.4	8.8	1	0.0031	11583.3	6.7	9900.3	3.56	0.009802	-0.12%	

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GULF GN 1995-2010 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICc	Δ AICc	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
OP	2784	-5762.3	3.3	6.7	1	0.0098	11585.3	4.6	9907.6	3.56	0.007176	-0.09%	
CR	2784	-5765.3	0.4	0.7	1	0.3877	11591.3	-1.3	9928.5	3.57	-0.000335	0.00%	
OS	2784	-5765.5	0.2	0.3	1	0.5555	11591.7	-1.7	9929.9	3.57	-0.000840	0.01%	
BT	2784	-5765.5	0.1	0.3	1	0.5955	11591.7	-1.8	9930.2	3.57	-0.000923	0.01%	
With IP year month OB													
FL_reg_area_co	2782	-5725.4	20.0	40.0	2	< 0.001	11515.5	35.9	9650.6	3.47	0.047153	-0.58%	-57.65%
RF	2783	-5737.8	7.6	15.2	1	< 0.001	11538.2	13.2	9736.1	3.50	0.017690	-0.22%	
OP	2783	-5742.2	3.2	6.4	1	0.0113	11547.0	4.4	9766.5	3.51	0.006749	-0.08%	
IB	2783	-5742.9	2.5	5.0	1	0.0260	11548.5	2.9	9771.6	3.51	0.004927	-0.06%	
CR	2783	-5745.0	0.3	0.7	1	0.4128	11552.8	-1.4	9786.5	3.52	-0.000425	0.01%	
BT	2783	-5745.1	0.3	0.6	1	0.4290	11552.8	-1.4	9786.6	3.52	-0.000481	0.01%	
OS	2783	-5745.3	0.0	0.1	1	0.7662	11553.4	-2.0	9788.5	3.52	-0.001153	0.01%	
With IP year month OB FL_reg_area_co													
RF	2781	-5718.8	6.6	13.2	1	< 0.001	11504.4	11.1	9605.6	3.45	0.014952	-0.18%	
IB	2781	-5721.5	3.8	7.7	1	0.0056	11509.9	5.6	9624.3	3.46	0.008221	-0.10%	
OP	2781	-5723.7	1.7	3.4	1	0.0650	11514.1	1.4	9638.9	3.47	0.002951	-0.04%	
BT	2781	-5725.0	0.4	0.7	1	0.3989	11516.8	-1.3	9648.2	3.47	-0.000370	0.00%	
CR	2781	-5725.0	0.3	0.7	1	0.4154	11516.9	-1.4	9648.3	3.47	-0.000429	0.01%	
OS	2781	-5725.2	0.2	0.4	1	0.5170	11517.1	-1.6	9649.2	3.47	-0.000729	0.01%	

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Table 10. Florida Gulf Coast cast net gear trips during 1996-2010: Stepwise selection of variables (shaded lines) to include in estimating the catch per trip of Spanish mackerel from using a GLM (gamma distribution and log link) based on highest percentage reduction in model deviance and lowest AICc values. The fields include the variables, the degrees of freedom for that variable (df), the deviance of the model with those variables, the mean deviance (deviance/df), the change in mean deviance (Δ mean dev), percent reduction in mean deviance (% change in mean dev), log likelihood, the change in log likelihood from previous run, minus two times the change in log-likelihood, chi-square value, the Chi-square degrees of freedom, the probability of the null hypothesis (Prob Ho), and the corrected Akaike Information Criterion (AICc).

GULF CN 1996-2010 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICc	Δ AICc	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
Null model	3971	-18381.9					36767.7		16847.6	4.24			
month	3960	-18076.0	305.9	611.8	11	< 0.001	36178.0	589.7	15034.6	3.80	0.44603	-10.51%	-10.51%
IP	3970	-18196.9	185.0	370.0	1	< 0.001	36399.7	368.0	15730.1	3.96	0.28043	-6.61%	
year	3957	-18237.3	144.6	289.2	14	< 0.001	36506.7	261.0	15968.5	4.04	0.20715	-4.88%	
IB	3970	-18296.8	85.1	170.1	1	< 0.001	36599.6	168.1	16325.5	4.11	0.13043	-3.07%	
FL_reg_area_co	3969	-18336.0	45.8	91.6	2	< 0.001	36680.1	87.6	16564.7	4.17	0.06915	-1.63%	
OB	3970	-18372.6	9.2	18.5	1	< 0.001	36751.3	16.5	16790.3	4.23	0.01338	-0.32%	
CR	3970	-18374.6	7.3	14.5	1	< 0.001	36755.2	12.5	16802.4	4.23	0.01031	-0.24%	
OS	3970	-18380.6	1.3	2.5	1	0.111	36767.2	0.5	16839.7	4.24	0.00092	-0.02%	
OP	3970	-18381.5	0.3	0.6	1	0.428	36769.1	-1.4	16845.6	4.24	-0.00058	0.01%	
BT	3970	-18381.7	0.1	0.3	1	0.601	36769.4	-1.7	16846.7	4.24	-0.00085	0.02%	
RF	3970	-18381.8	0.0	0.1	1	0.802	36769.7	-1.9	16847.4	4.24	-0.00102	0.02%	
With month													
IP	3959	-17929.7	146.3	292.6	1	< 0.001	35887.4	290.6	14228.57	3.59	0.20265	-4.78%	-15.29%
FL_reg_area_co	3958	-17946.6	129.4	258.8	2	< 0.001	35923.3	254.7	14319.9	3.62	0.17867	-4.21%	
year	3946	-17942.6	133.4	266.7	14	< 0.001	35939.6	238.4	14298.4	3.62	0.17311	-4.08%	

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GULF CN 1996-2010 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICc	Δ AICc	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
IB	3959	-17956.3	119.7	239.3	1	< 0.001	35940.7	237.3	14372.5	3.63	0.16628	-3.92%	
OB	3959	-18062.8	13.2	26.3	1	< 0.001	36153.7	24.3	14960.6	3.78	0.01775	-0.42%	
BT	3959	-18065.8	10.1	20.3	1	< 0.001	36159.8	18.3	14977.6	3.78	0.01346	-0.32%	
CR	3959	-18067.6	8.4	16.8	1	< 0.001	36163.2	14.8	14987.2	3.79	0.01102	-0.26%	
OS	3959	-18072.5	3.5	7.0	1	0.008	36173.1	5.0	15015.0	3.79	0.00401	-0.09%	
OP	3959	-18073.8	2.2	4.4	1	0.035	36175.6	2.4	15022.1	3.79	0.00220	-0.05%	
RF	3959	-18074.7	1.2	2.5	1	0.115	36177.6	0.5	15027.6	3.80	0.00081	-0.02%	
With month IP													
FL_reg_area_co	3957	-17786.4	143.3	286.6	2	< 0.001	35604.9	282.5	13475.5	3.41	0.18850	-4.44%	-19.73%
year	3957	-17786.4	143.3	248.8	14	< 0.001	35667.0	220.5	13572.8	3.43	0.16391	-3.86%	
IB	3945	-17805.3	124.4	189.5	1	< 0.001	35700.0	187.5	13726.7	3.48	0.11446	-2.70%	
CR	3958	-17834.9	94.7	28.7	1	< 0.001	35860.7	26.7	14151.5	3.58	0.01857	-0.44%	
OB	3958	-17915.3	14.4	15.8	1	< 0.001	35873.6	13.8	14186.1	3.58	0.00982	-0.23%	
OP	3958	-17921.8	7.9	9.5	1	0.002	35880.0	7.5	14203.0	3.59	0.00554	-0.13%	
BT	3958	-17924.9	4.7	4.9	1	0.027	35884.6	2.9	14215.5	3.59	0.00240	-0.06%	
RF	3958	-17927.2	2.4	3.6	1	0.056	35885.8	1.6	14218.8	3.59	0.00157	-0.04%	
OS	3958	-17927.8	1.8	3.6	1	0.057	35885.8	1.6	14218.8	3.59	0.00155	-0.04%	
With month IP FL_reg_area_co													
year	3943	-17673.4	113.0	225.9	14	< 0.001	35407.3	197.6	12906.2	3.27	0.13228	-3.12%	-22.85%
IB	3956	-17719.8	66.5	133.1	1	< 0.001	35473.8	131.1	13137.6	3.32	0.08455	-1.99%	
OB	3956	-17770.3	16.0	32.1	1	< 0.001	35574.8	30.1	13393.4	3.39	0.01990	-0.47%	
CR	3956	-17773.5	12.9	25.8	1	< 0.001	35581.2	23.7	13409.5	3.39	0.01582	-0.37%	

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GULF CN 1996-2010 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICc	Δ AICc	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
OP	3956	-17778.8	7.6	15.2	1	< 0.001	35591.8	13.1	13436.6	3.40	0.00896	-0.21%	
OS	3956	-17785.7	0.7	1.4	1	0.232	35605.5	-0.6	13471.8	3.41	0.00006	0.00%	
BT	3956	-17786.0	0.4	0.8	1	0.362	35606.1	-1.2	13473.3	3.41	-0.00032	0.01%	
RF	3956	-17786.0	0.3	0.7	1	0.405	35606.2	-1.3	13473.7	3.41	-0.00041	0.01%	
With month IP FL_reg_area_co year													
IB	3942	-17596.8	76.6	153.2	1	< 0.001	35256.1	151.2	12532.0	3.18	0.09409	-2.22%	-25.07%
OB	3942	-17656.2	17.2	34.5	1	< 0.001	35374.9	32.5	12821.2	3.25	0.02074	-0.49%	
CR	3942	-17662.4	11.0	22.0	1	< 0.001	35387.3	20.0	12851.8	3.26	0.01298	-0.31%	
OP	3942	-17666.1	7.3	14.6	1	< 0.001	35394.8	12.6	12870.2	3.26	0.00832	-0.20%	
RF	3942	-17673.1	0.4	0.7	1	0.402	35408.6	-1.3	12904.5	3.27	-0.00039	0.01%	
OS	3942	-17673.2	0.3	0.5	1	0.461	35408.8	-1.5	12904.9	3.27	-0.00049	0.01%	
BT	3942	-17673.3	0.2	0.3	1	0.570	35409.0	-1.7	12905.4	3.27	-0.00063	0.01%	
With month IP FL_reg_area_co year IB													
OP	3941	-17584.9	12.0	23.9	1	< 0.001	35234.2	21.9	12474.5	3.17	0.01380	-0.33%	-25.39%
CR	3941	-17588.3	8.5	17.0	1	< 0.001	35241.1	15.0	12491.0	3.17	0.00960	-0.23%	
OB	3941	-17589.1	7.7	15.3	1	< 0.001	35242.8	13.3	12495.1	3.17	0.00856	-0.20%	
BT	3941	-17596.5	0.3	0.6	1	0.432	35257.5	-1.4	12530.5	3.18	-0.00043	0.01%	
RF	3941	-17596.7	0.1	0.2	1	0.678	35258.0	-1.9	12531.6	3.18	-0.00070	0.02%	
OS	3941	-17596.8	0.0	0.0	1	0.928	35258.2	-2.0	12532.0	3.18	-0.00080	0.02%	
With month IP FL_reg_area_co year IB OP													

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GULF CN 1996-2010 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICc	Δ AICc	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
CR	3940	-17576.4	8.4	16.9	1	< 0.001	35219.4	14.8	12434.0	3.16	0.00946	-0.22%	
OB	3940	-17577.5	7.4	14.8	1	< 0.001	35221.5	12.8	12439.0	3.16	0.00821	-0.19%	
BT	3940	-17584.4	0.4	0.9	1	0.349	35235.4	-1.2	12472.3	3.17	-0.00027	0.01%	
RF	3940	-17584.8	0.1	0.1	1	0.718	35236.1	-1.9	12474.1	3.17	-0.00072	0.02%	
OS	3940	-17584.9	0.0	0.0	1	0.932	35236.3	-2.0	12474.4	3.17	-0.00080	0.02%	

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Table 11. Florida Gulf Coast hook and line gear trips during 1986-2010: Stepwise selection of variables (shaded lines) to include in estimating the catch per trip of Spanish mackerel from using a GLM (gamma distribution and log link) based on highest percentage reduction in model deviance and lowest AICc values. The fields include the variables, the degrees of freedom for that variable (df), the deviance of the model with those variables, the mean deviance (deviance/df), the change in mean deviance (Δ mean dev), percent reduction in mean deviance (% change in mean dev), log likelihood, the change in log likelihood from previous run, minus two times the change in log-likelihood, chi-square value, the Chi-square degrees of freedom, the probability of the null hypothesis (Prob Ho), and the corrected Akaike Information Criterion (AICc).

GULF HL 1986-2010 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICC	Δ AICC	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
Null model	19594	-85198.5					170400.9		55058.6	2.81			
RF	19593	-84496.9	701.5	1403.1	1	< 0.001	168999.8	1401.1	52069.7	2.66	0.15240	-5.42%	-5.42%
year	19570	-84503.9	694.6	1389.2	24	< 0.001	169059.8	1341.1	52098.6	2.66	0.14780	-5.26%	
month	19583	-84900.0	298.5	596.9	11	< 0.001	169826.0	574.9	53769.3	2.75	0.06425	-2.29%	
FL_reg_area_co	19592	-85045.0	153.5	307.0	2	< 0.001	170097.9	303.0	54392.2	2.78	0.03372	-1.20%	
BT	19593	-85110.2	88.2	176.4	1	< 0.001	170226.5	174.4	54674.7	2.79	0.01945	-0.69%	
IP	19593	-85130.5	67.9	135.9	1	< 0.001	170267.1	133.9	54762.8	2.80	0.01495	-0.53%	
IB	19593	-85144.7	53.7	107.5	1	< 0.001	170295.5	105.5	54824.5	2.80	0.01180	-0.42%	
OB	19593	-85191.5	7.0	13.9	1	< 0.001	170389.0	11.9	55028.2	2.81	0.00141	-0.05%	
CR	19593	-85194.9	3.5	7.0	1	0.008	170395.9	5.0	55043.2	2.81	0.00064	-0.02%	
OS	19593	-85197.3	1.2	2.4	1	0.123	170400.5	0.4	55053.4	2.81	0.00012	0.00%	
OP	19593	-85197.8	0.7	1.3	1	0.246	170401.6	-0.7	55055.6	2.81	0.00001	0.00%	
With RF													
year	19569	-84022.6	474.4	948.7	24	< 0.001	168099.2	900.6	50129.2	2.56	0.09590	-3.41%	-8.84%
month	19582	-84088.9	408.0	816.0	11	< 0.001	168205.9	793.9	50396.9	2.57	0.08393	-2.99%	
IP	19592	-84340.4	156.5	313.1	1	< 0.001	168688.7	311.1	51422.2	2.62	0.03291	-1.17%	
BT	19592	-84367.5	129.4	258.8	1	< 0.001	168743.1	256.8	51534.1	2.63	0.02720	-0.97%	
OS	19592	-84396.7	100.2	200.5	1	< 0.001	168801.3	198.5	51654.3	2.64	0.02107	-0.75%	
FL_reg_area_co	19591	-84454.6	42.3	84.7	2	< 0.001	168919.1	80.7	51893.9	2.65	0.00870	-0.31%	
CR	19592	-84466.7	30.2	60.4	1	< 0.001	168941.5	58.4	51944.3	2.65	0.00627	-0.22%	

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GULF HL 1986-2010 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICC	Δ AICC	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
OP	19592	-84471.5	25.4	50.8	1	< 0.001	168951.0	48.8	51964.1	2.65	0.00525	-0.19%	
OB	19592	-84496.8	0.1	0.2	1	0.646	169001.6	-1.8	52069.3	2.66	-0.00011	0.00%	
IB	19592	-84496.8	0.1	0.2	1	0.669	169001.7	-1.8	52069.3	2.66	-0.00012	0.00%	
With RF year													
month	19558	-83522.2	500.4	1000.8	11	< 0.001	167120.5	978.7	48150.4	2.46	0.09974	-3.55%	-12.39%
IP	19558	-83522.2	500.4	329.8	1	< 0.001	167771.4	327.8	49469.5	2.53	0.03229	-1.15%	
BT	19568	-83857.7	164.9	238.6	1	< 0.001	167862.6	236.6	49651.1	2.54	0.02430	-0.86%	
OS	19568	-83903.2	119.3	218.7	1	< 0.001	167882.5	216.7	49690.9	2.54	0.02227	-0.79%	
FL_reg_area_co	19568	-83913.2	109.3	126.5	2	< 0.001	167976.7	122.5	49875.2	2.55	0.01285	-0.46%	
CR	19567	-83959.3	63.3	66.7	1	< 0.001	168034.5	64.7	49995.2	2.56	0.00659	-0.23%	
OP	19568	-83989.2	33.3	36.6	1	< 0.001	168064.6	34.6	50055.6	2.56	0.00363	-0.13%	
OB	19568	-84004.2	18.3	0.8	1	0.363	168100.4	-1.2	50127.5	2.56	-0.00005	0.00%	
IB	19568	-84022.1	0.4	0.6	1	0.442	168100.6	-1.4	50128.0	2.56	-0.00007	0.00%	
With RF year month													
IP	19557	-83416.5	105.7	211.4	1	< 0.001	166911.1	209.4	47741.1	2.44	0.02080	-0.74%	-13.13%
BT	19557	-83427.9	94.3	188.6	1	< 0.001	166933.9	186.6	47785.1	2.44	0.01855	-0.66%	
FL_reg_area_co	19556	-83472.3	49.9	99.8	2	< 0.001	167024.7	95.8	47956.8	2.45	0.00965	-0.34%	
OS	19557	-83485.7	36.5	72.9	1	< 0.001	167049.6	70.9	48008.9	2.45	0.00711	-0.25%	
CR	19557	-83509.0	13.2	26.4	1	< 0.001	167096.1	24.4	48099.2	2.46	0.00249	-0.09%	
OP	19557	-83513.0	9.2	18.4	1	< 0.001	167104.1	16.4	48114.7	2.46	0.00170	-0.06%	
IB	19557	-83517.5	4.7	9.4	1	0.002	167113.1	7.4	48132.1	2.46	0.00081	-0.03%	
OB	19557	-83518.7	3.4	6.9	1	0.009	167115.6	4.9	48137.1	2.46	0.00056	-0.02%	
With RF year month IP													
BT	19556	-83350.6	65.8	131.7	1	< 0.001	166781.4	129.6	47487.8	2.43	0.01283	-0.46%	-13.58%
FL_reg_area_co	19555	-83372.0	44.5	88.9	2	< 0.001	166826.2	84.9	47569.9	2.43	0.00851	-0.30%	

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GULF HL 1986-2010 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICC	Δ AICC	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
IB	19556	-83377.1	39.3	78.7	1	< 0.001	166834.4	76.7	47589.5	2.43	0.00763	-0.27%	
OB	19556	-83403.4	13.1	26.2	1	< 0.001	166886.9	24.1	47690.7	2.44	0.00245	-0.09%	
OS	19556	-83407.6	8.9	17.8	1	< 0.001	166895.3	15.7	47706.9	2.44	0.00163	-0.06%	
CR	19556	-83409.9	6.5	13.1	1	< 0.001	166900.0	11.0	47715.9	2.44	0.00116	-0.04%	
OP	19556	-83410.5	6.0	11.9	1	< 0.001	166901.1	9.9	47718.1	2.44	0.00105	-0.04%	
With RF year month IP BT													
IB	19555	-83303.8	46.8	93.6	1	< 0.001	166689.8	91.6	47308.3	2.42	0.00905	-0.32%	-13.91%
FL_reg_area_co	19554	-83304.5	46.1	92.2	2	< 0.001	166693.2	88.2	47311.0	2.42	0.00879	-0.31%	
OB	19555	-83338.1	12.6	25.1	1	< 0.001	166758.3	23.1	47439.6	2.43	0.00234	-0.08%	
CR	19555	-83344.0	6.6	13.3	1	< 0.001	166770.2	11.3	47462.3	2.43	0.00118	-0.04%	
OP	19555	-83345.7	4.9	9.8	1	0.002	166773.6	7.8	47469.0	2.43	0.00084	-0.03%	
OS	19555	-83346.0	4.6	9.2	1	0.002	166774.2	7.2	47470.1	2.43	0.00078	-0.03%	
With RF year month IP BT IB													
FL_reg_area_co	19553	-83251.2	52.6	105.1	2	< 0.001	166588.7	101.1	47107.5	2.41	0.01002	-0.36%	-14.26%
CR	19554	-83294.0	9.8	19.7	1	< 0.001	166672.1	17.6	47270.7	2.42	0.00180	-0.06%	
OS	19554	-83295.0	8.8	17.5	1	< 0.001	166674.3	15.5	47274.7	2.42	0.00159	-0.06%	
OB	19554	-83296.2	7.6	15.2	1	< 0.001	166676.6	13.1	47279.3	2.42	0.00136	-0.05%	
OP	19554	-83299.5	4.3	8.6	1	0.003	166683.2	6.6	47291.7	2.42	0.00072	-0.03%	
With RF year month IP BT IB FL_reg_area_co													
OS	19552	-83234.1	17.1	34.2	1	< 0.001	166556.4	32.2	47042.2	2.41	0.00321	-0.11%	
CR	19552	-83237.9	13.3	26.7	1	< 0.001	166564.0	24.7	47056.6	2.41	0.00248	-0.09%	
OP	19552	-83240.1	11.1	22.2	1	< 0.001	166568.5	20.2	47065.2	2.41	0.00204	-0.07%	

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GULF HL 1986-2010 Source	df	log like	Δ log like	Chi-sq	Chi-sq df	Prob Ho	AICC	Δ AICC	Deviance	Mean Deviance	Δ Mean Deviance	% change (null model)	cum % change
OB	19552	-83242.6	8.7	17.3	1	< 0.001	166573.3	15.3	47074.4	2.41	0.00157	-0.06%	

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Table 12. Atlantic Coast Spanish mackerel adjusted average pounds per trip for various gears, the coefficient of variation (cv), and index values scaled to mean. Commercial fishery data reported on Florida trip tickets.

Atlantic Coast, Florida Trip Ticket indices

	Gill nets, 1986-1995			Gill nets, 1995-2010			Cast Nets, 1996-2010			Hook-and-Line Gears		
Year	index (adjusted mean pounds/trip)	cv (%)	index scaled to mean	index (adjusted mean pounds/trip)	cv (%)	index scaled to mean	index (adjusted mean pounds/trip)	cv (%)	index scaled to mean	index (adjusted mean pounds/trip)	cv (%)	index scaled to mean
1986	293.08	3.66	1.164							20.6	3.89	0.554
1987	261.54	3.77	1.039							24.8	4.19	0.667
1988	260.30	3.78	1.034							30.5	4.85	0.819
1989	318.60	3.81	1.265							27.4	4.81	0.735
1990	222.98	3.36	0.885							29.8	3.97	0.800
1991	220.92	3.38	0.877							22.2	3.14	0.596
1992	196.23	3.23	0.779							27.3	4.01	0.733
1993	317.52	8.14	1.261							31.7	4.27	0.851
1994	268.34	7.30	1.066							22.6	4.58	0.606
1995	413.17	6.97	1.641	140.04	17.47	1.089				32.2	4.03	0.865
1996				176.33	10.30	1.371	3.84	12.55	0.266	28.1	3.31	0.753
1997				87.60	10.55	0.681	9.31	10.70	0.643	27.5	2.93	0.737
1998				124.92	14.34	0.971	0.80	30.09	0.055	26.7	3.02	0.716
1999				115.57	9.83	0.898	1.77	17.21	0.123	32.6	3.10	0.874
2000				121.39	8.93	0.944	9.45	8.05	0.653	33.9	2.83	0.911
2001				116.63	8.24	0.907	11.12	6.99	0.768	33.8	2.81	0.908
2002				103.10	9.20	0.802	10.25	6.78	0.709	32.3	2.69	0.867
2003				132.28	10.62	1.028	16.84	6.18	1.163	34.9	3.03	0.937
2004				77.32	10.17	0.601	19.11	6.24	1.321	45.3	3.01	1.216
2005				149.37	9.09	1.161	15.53	6.94	1.073	44.0	2.73	1.181

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2006		155.75	8.71	1.211	15.89	6.50	1.098	47.1	2.80	1.264
2007		144.42	8.98	1.123	10.01	6.49	0.692	40.8	2.58	1.096
2008		143.07	9.13	1.112	12.01	6.39	0.830	42.1	2.42	1.129
2009		128.61	9.09	1.000	12.59	6.19	0.870	55.7	2.24	1.496
2010		103.42	9.50	0.804	20.29	6.24	1.402	47.9	2.25	1.286

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Table 13. Gulf Coast Spanish mackerel adjusted average pounds per trip for various gears, the coefficient of variation (cv), and index values scaled to mean. Commercial fishery data reported on Florida trip tickets.

Gulf Coast, Florida Trip Ticket indices

	Gill nets, 1986-1995			Gill nets, 1995-2010			Cast Nets, 1996-2010			Hook-and-Line Gears		
Year	index (adjusted mean pounds/trip)	cv (%)	index scaled to mean	index (adjusted mean pounds/trip)	cv (%)	index scaled to mean	index (adjusted mean pounds/trip)	cv (%)	index scaled to mean	index (adjusted mean pounds/trip)	cv (%)	index scaled to mean
1986	153.66	2.96	0.602							29.1	4.41	0.694
1987	167.59	2.63	0.656							22.8	4.12	0.545
1988	208.84	3.07	0.818							30.8	4.54	0.735
1989	202.50	2.90	0.793							64.4	5.37	1.539
1990	202.82	2.45	0.794							41.7	4.97	0.996
1991	276.62	2.33	1.083							45.8	4.85	1.095
1992	312.84	2.29	1.225							45.9	5.71	1.097
1993	316.03	2.64	1.238							25.3	6.41	0.604
1994	340.55	2.50	1.334							43.6	5.93	1.042
1995	253.04	3.47	0.991	91.92	32.56	0.449				39.7	7.41	0.949
1996				176.80	15.64	0.864	70.22	32.49	0.937	30.4	6.10	0.727
1997				84.12	18.36	0.411	28.41	33.48	0.379	33.2	7.31	0.794
1998				84.41	15.62	0.412	63.69	33.40	0.850	48.3	7.34	1.155
1999				141.49	17.34	0.691	72.52	34.57	0.967	40.1	7.05	0.958
2000				104.05	15.60	0.508	69.03	32.37	0.921	31.8	6.73	0.760
2001				265.83	17.14	1.299	137.15	32.24	1.830	59.7	6.48	1.427
2002				355.52	23.53	1.737	93.54	32.50	1.248	46.0	6.46	1.100
2003				324.07	22.02	1.583	55.96	32.86	0.747	54.0	6.56	1.289
2004				630.82	27.22	3.082	43.78	36.05	0.584	66.7	7.46	1.594
2005				459.92	22.91	2.247	49.32	33.68	0.658	46.9	7.56	1.119
2006				221.10	22.75	1.080	103.91	33.52	1.386	62.4	6.98	1.490

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2007		233.38	21.61	1.140	37.92	36.85	0.506	49.1	6.75	1.173
2008		173.62	18.50	0.848	51.93	34.80	0.693	45.4	7.83	1.086
2009		527.11	20.22	2.575	59.25	34.57	0.790	59.9	5.85	1.431
2010		307.85	22.80	1.504	148.04	35.58	1.975	66.7	5.89	1.594

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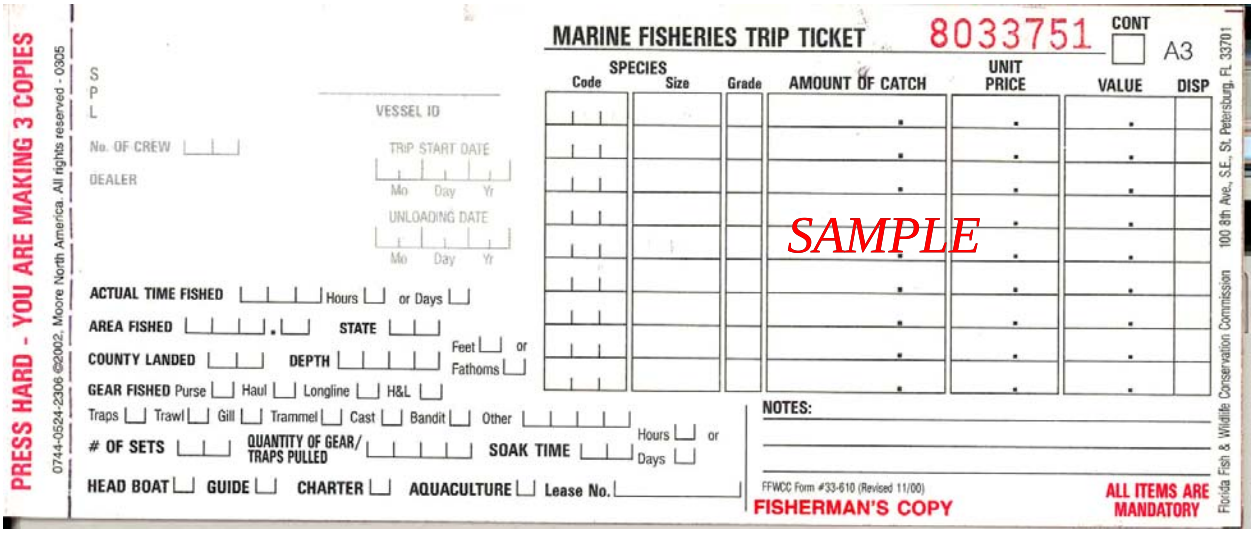
Figures.

a.)



b.)

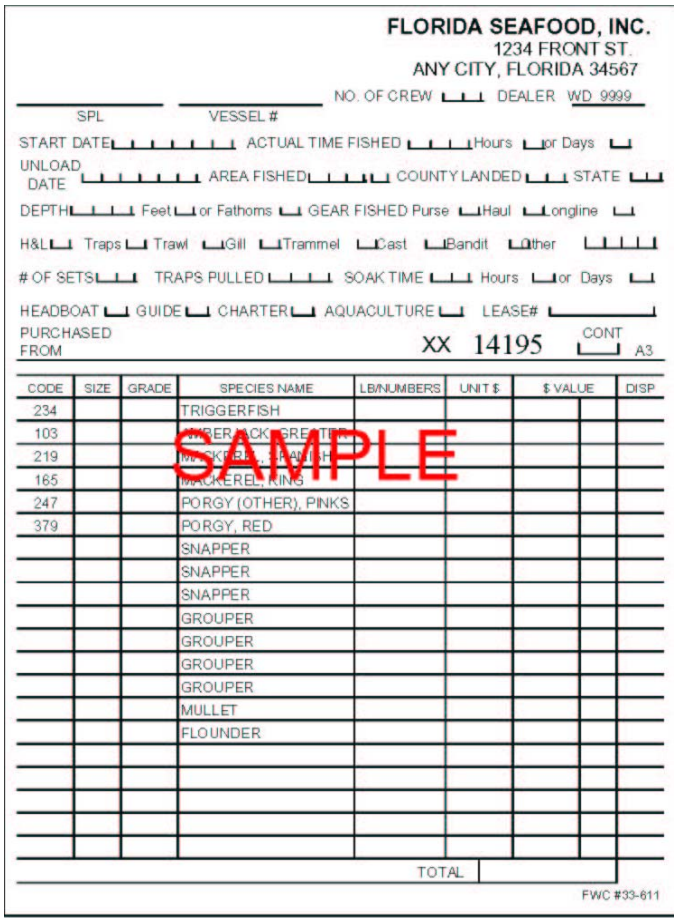


Figure 1 a) Florida trip ticket, form 'A3'; b) a "dealer-customized" Florida trip ticket form.

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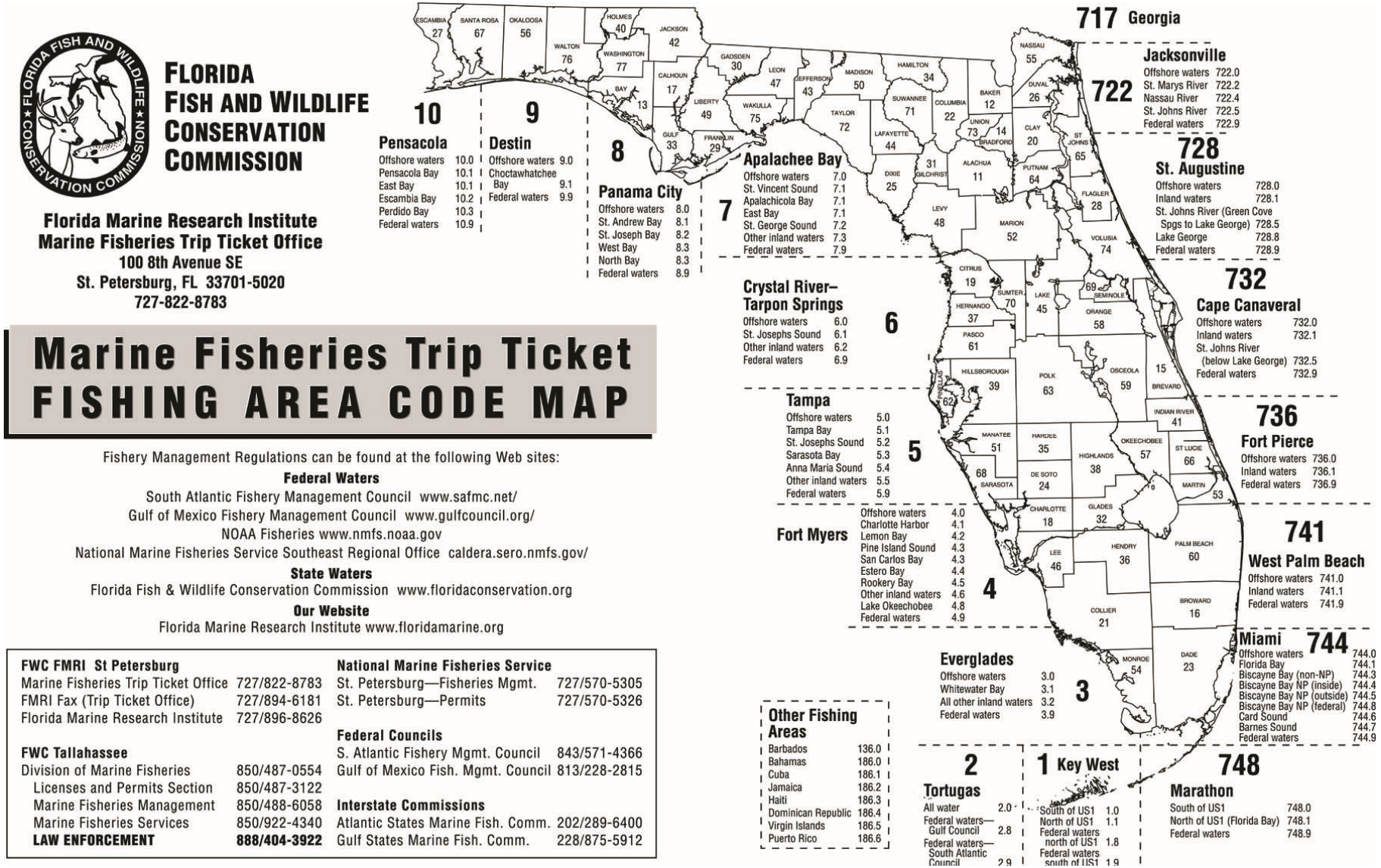

Figure 2. Area fished map for trip ticket reporting.

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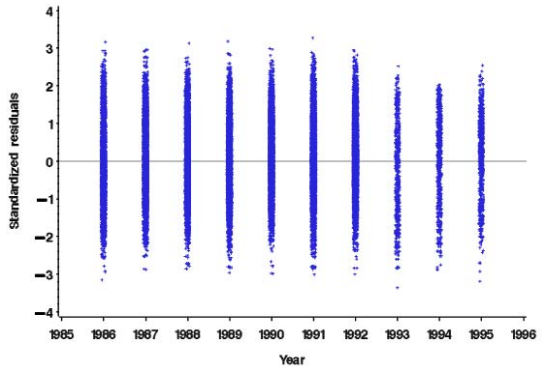
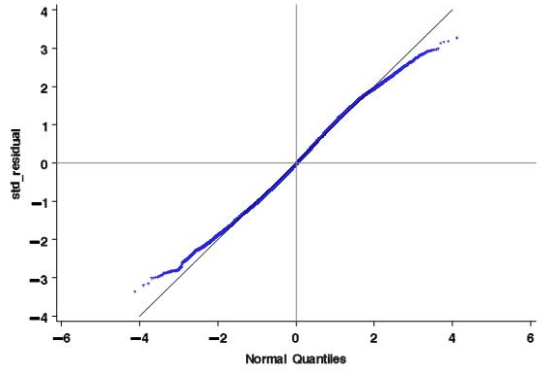
Figure 3. Diagnostics and scaled index for Florida Atlantic Coast Spanish mackerel, gill net trip landings 1986- July 1, 1995.

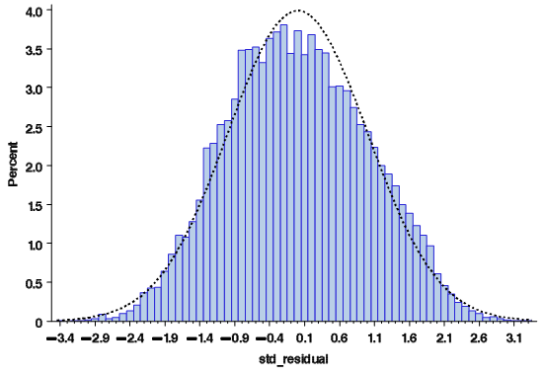
a.) Standardized residuals by year.



b.) Q-Q plot



c.) Histogram of standardized residuals and fitted distribution.



d.) Scaled index

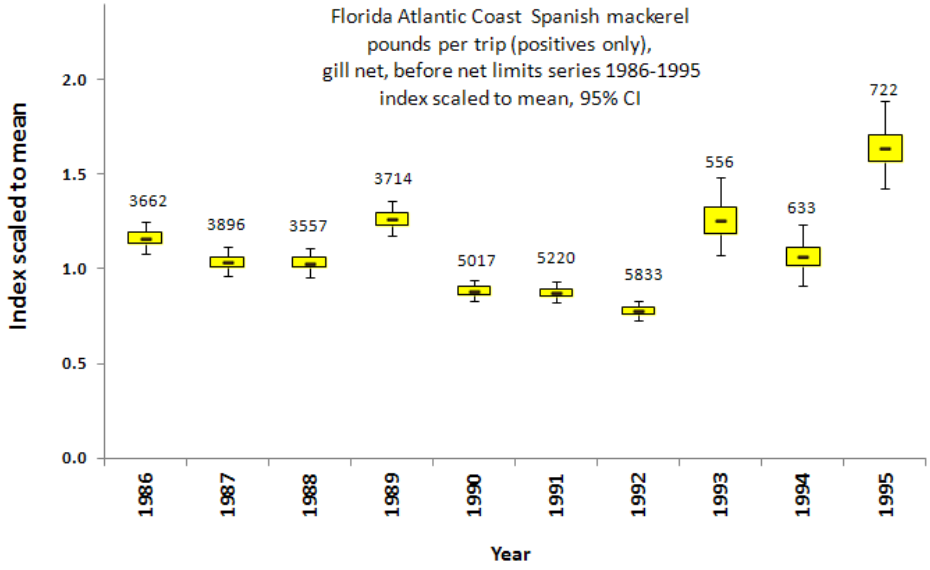


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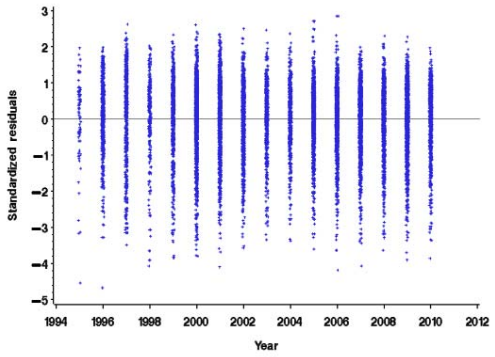
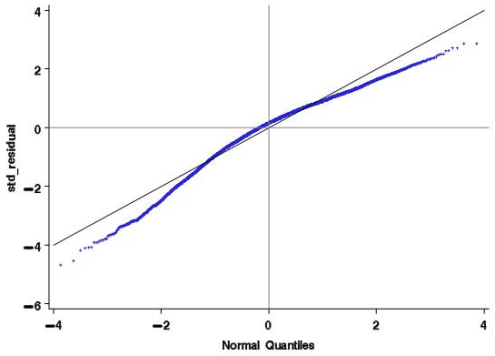
Figure 4. Diagnostics and scaled index for Florida Atlantic Coast Spanish mackerel, gill net trip landings July 1, 1995-2010.

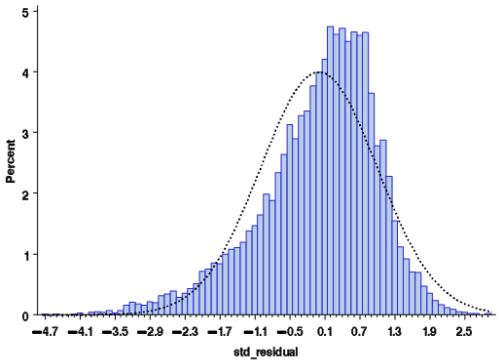
a.) Standardized residuals by year.



b.) Q-Q plot



c.) Histogram of standardized residuals and fitted distribution.



d.) Scaled index

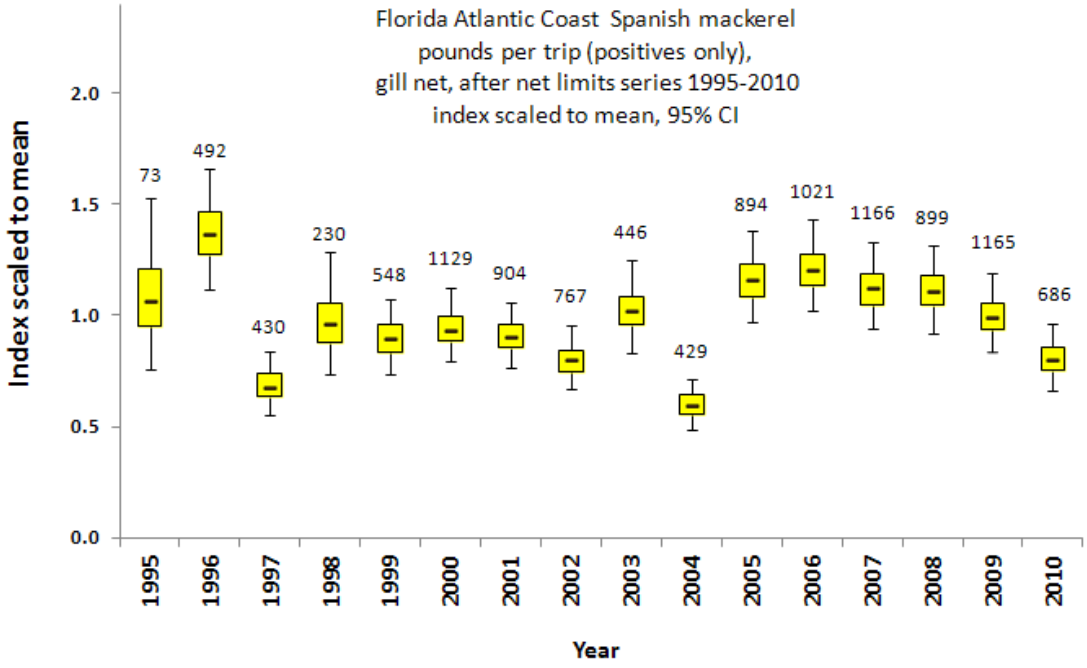


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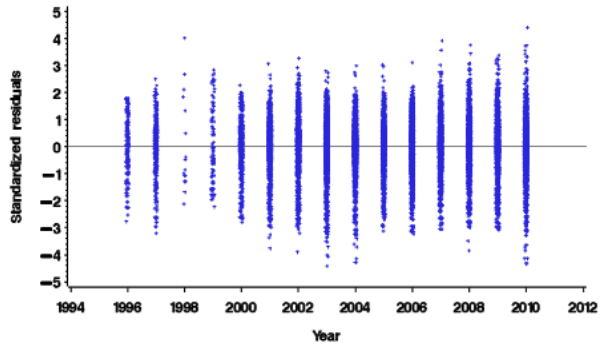
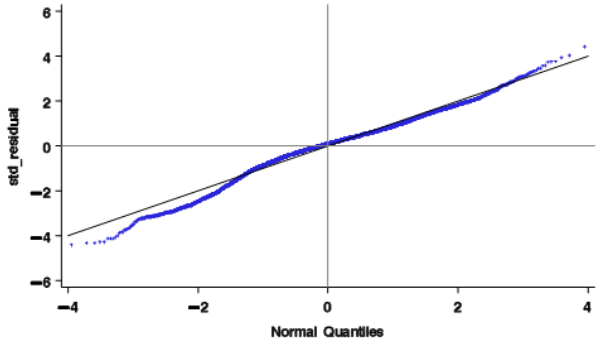
Figure 5. Diagnostics and scaled index for Florida Atlantic Coast Spanish mackerel, cast net trip landings 1996-2010.

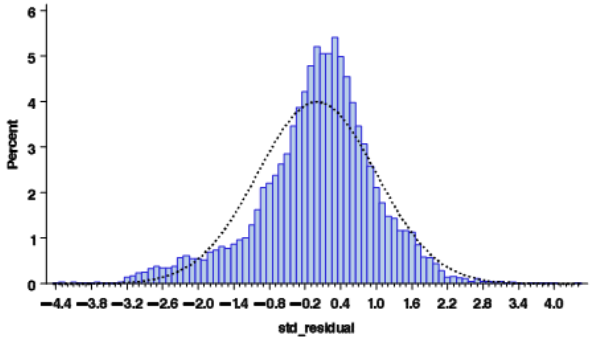
a.) Standardized residuals by year.



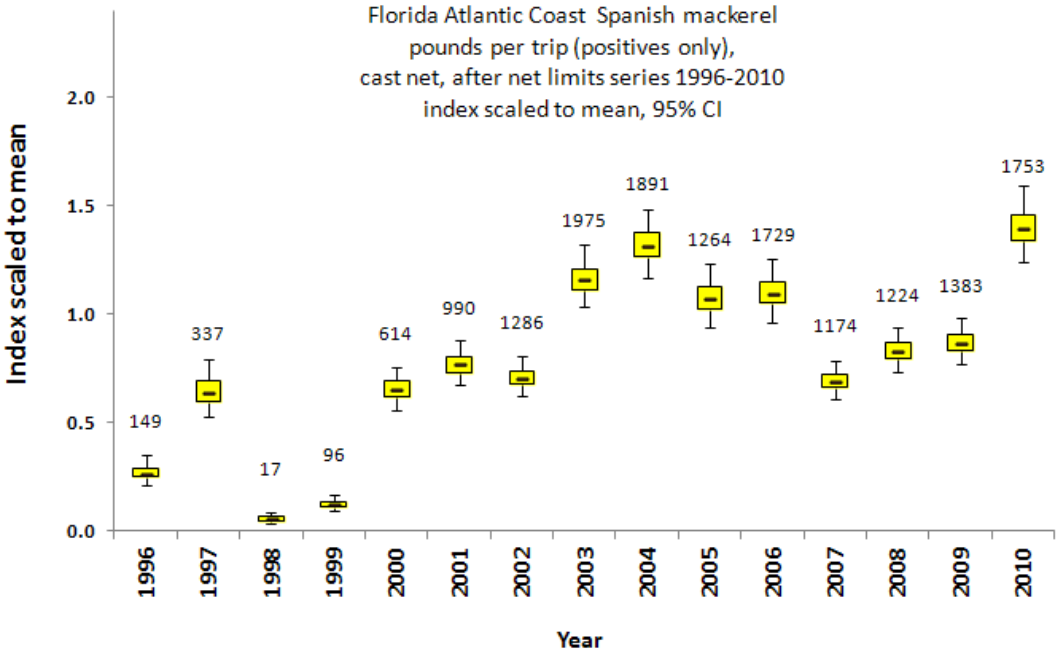
b.) Q-Q plot



c.) Histogram of standardized residuals and fitted distribution.



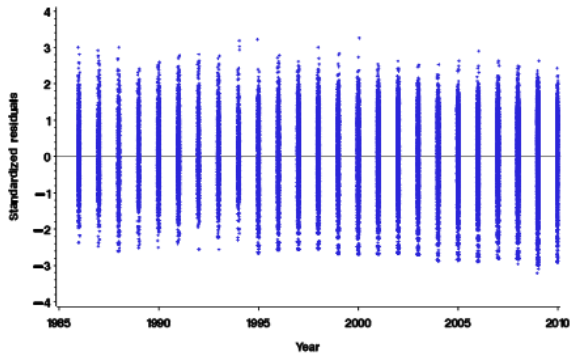
d.) Scaled index



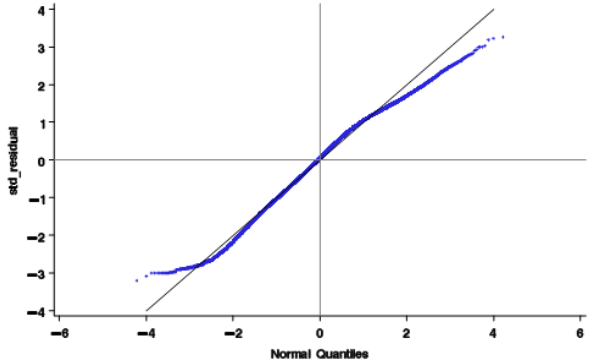
SEDAR28-AW01

Figure 6. Diagnostics and scaled index for Florida Atlantic Coast Spanish mackerel, hook and line gear trip landings 1986-2010.

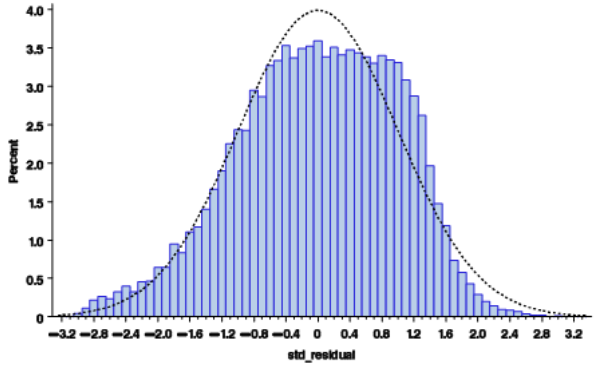
a.) Standardized residuals by year.



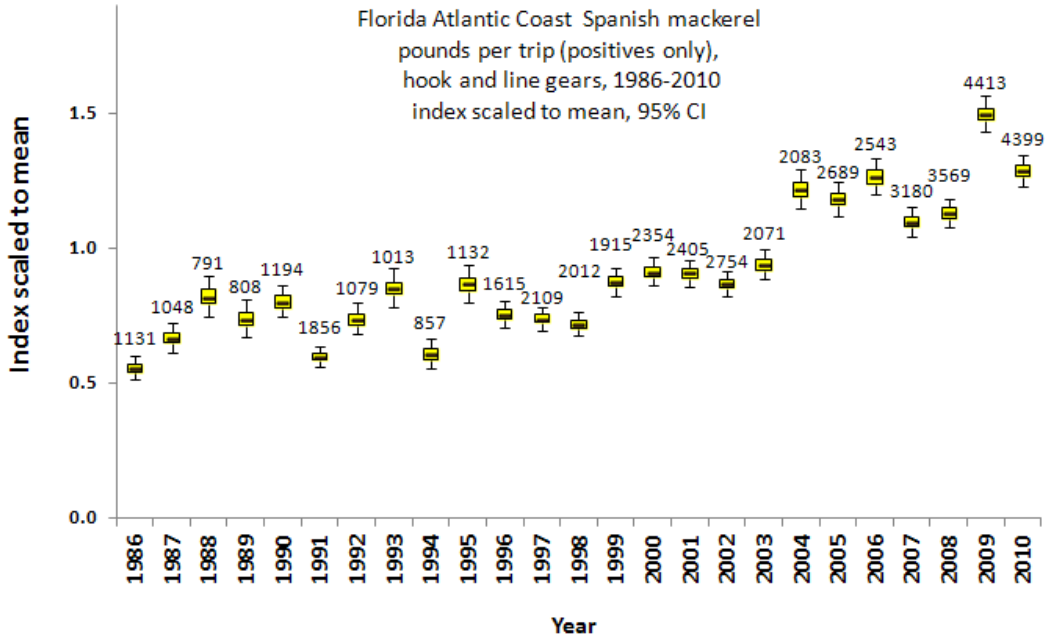
b.) Q-Q plot



c.) Histogram of standardized residuals and fitted distribution.



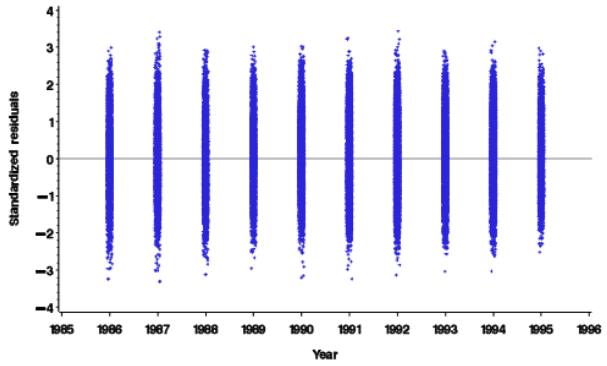
d.) Scaled index



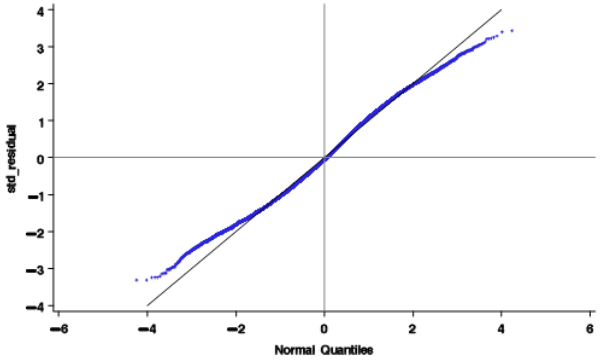
SEDAR28-AW01

Figure 7. Diagnostics and scaled index for Florida Gulf Coast Spanish mackerel, gill net trip landings 1986- July 1, 1995.

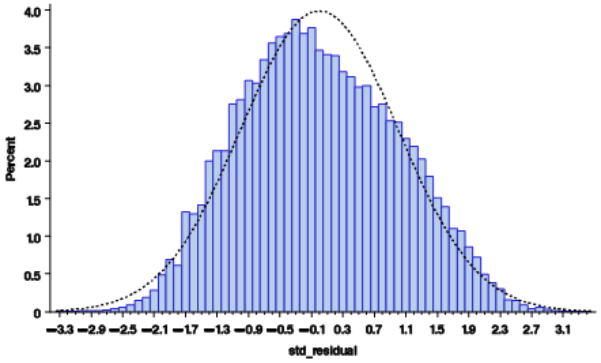
a.) Standardized residuals by year.



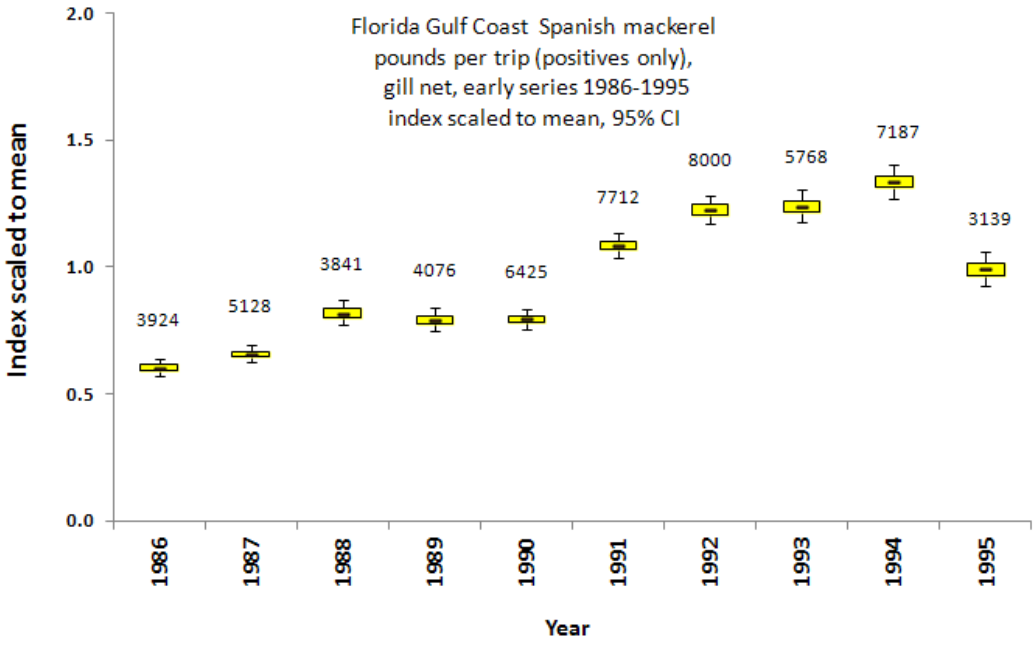
b.) Q-Q plot



c.) Histogram of standardized residuals and fitted distribution.



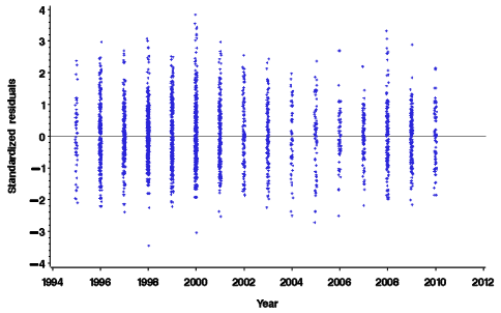
d.) Scaled index



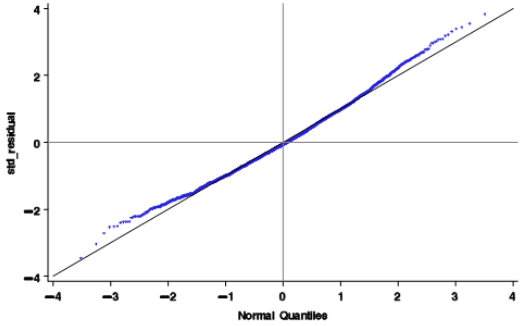
SEDAR28-AW01

Figure 8. Diagnostics and scaled index for Florida Gulf Coast Spanish mackerel, gill net trip landings July 1, 1995-2010.

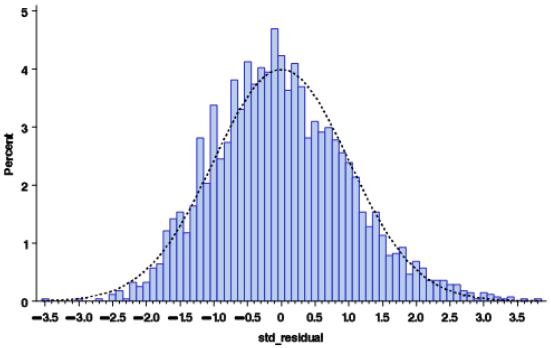
a.) Standardized residuals by year.



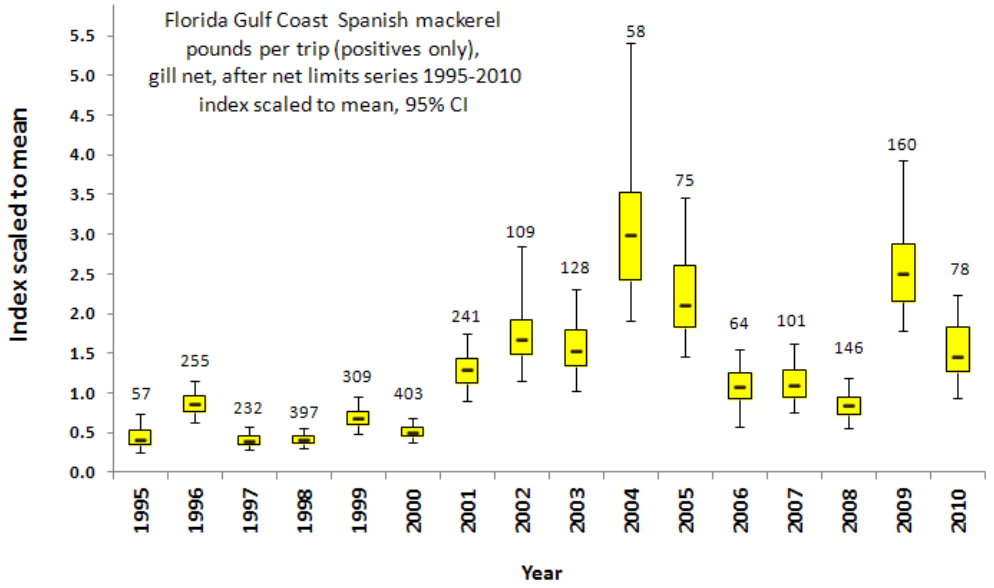
b.) Q-Q plot



c.) Histogram of standardized residuals and fitted distribution.

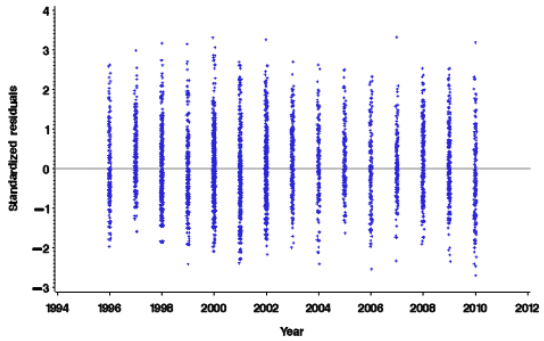
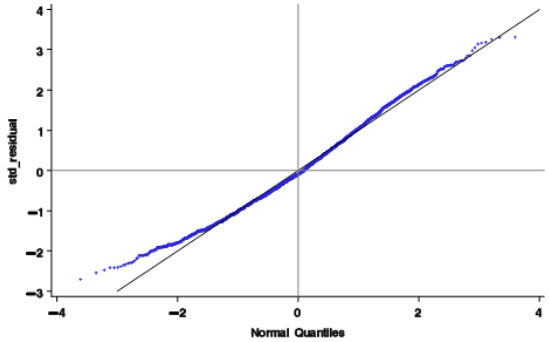
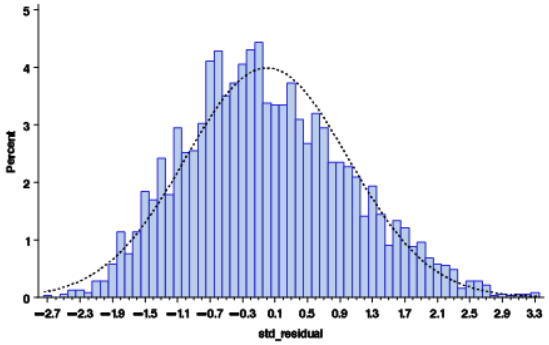


d.) Scaled index



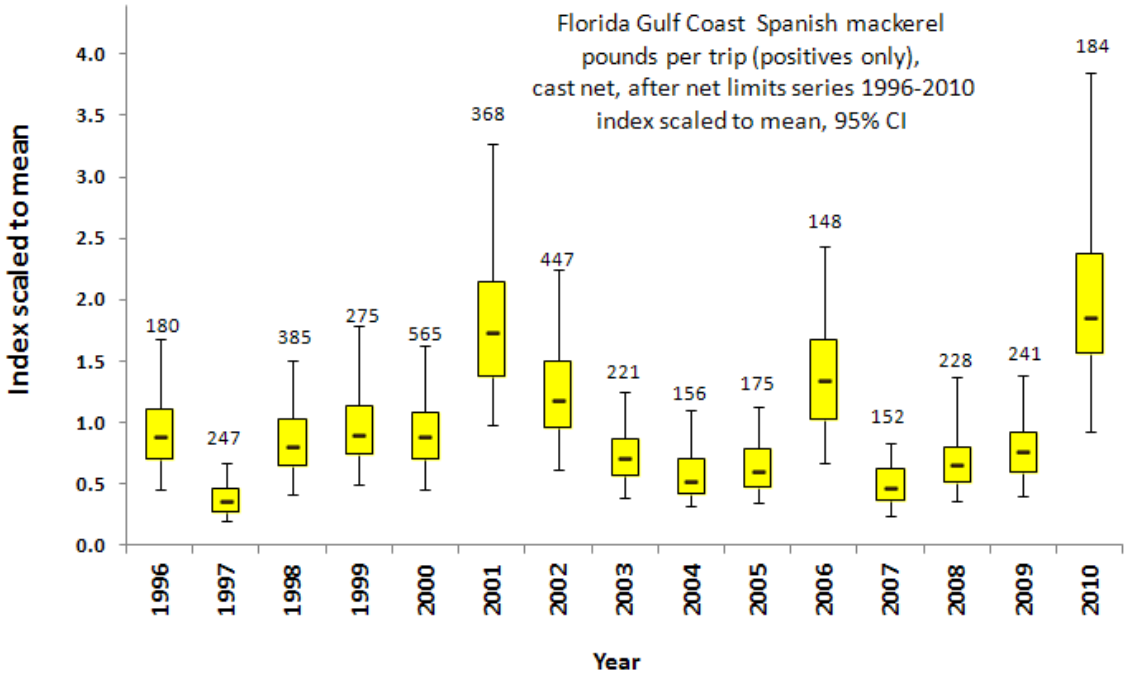
SEDAR28-AW01

Figure 9. Diagnostics and scaled index for Florida Gulf Coast Spanish mackerel, cast net trip landings 1996-2010.

a.) Standardized residuals by year.	b.) Q-Q plot	c.) Histogram of standardized residuals and fitted distribution.
		

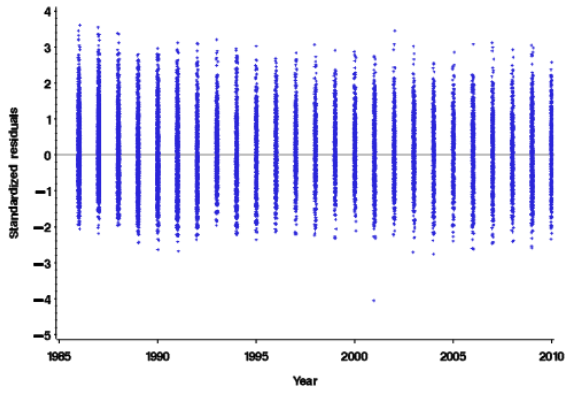
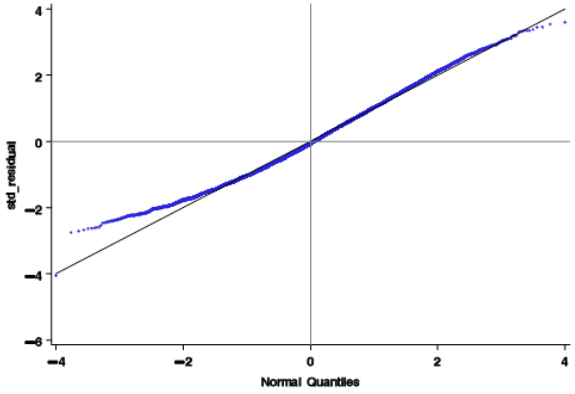
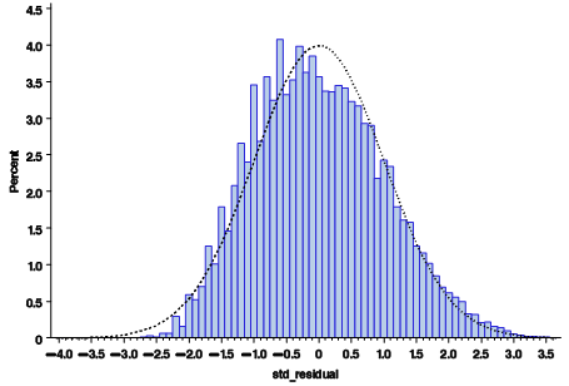
SEDAR28-AW01

d.) Scaled index



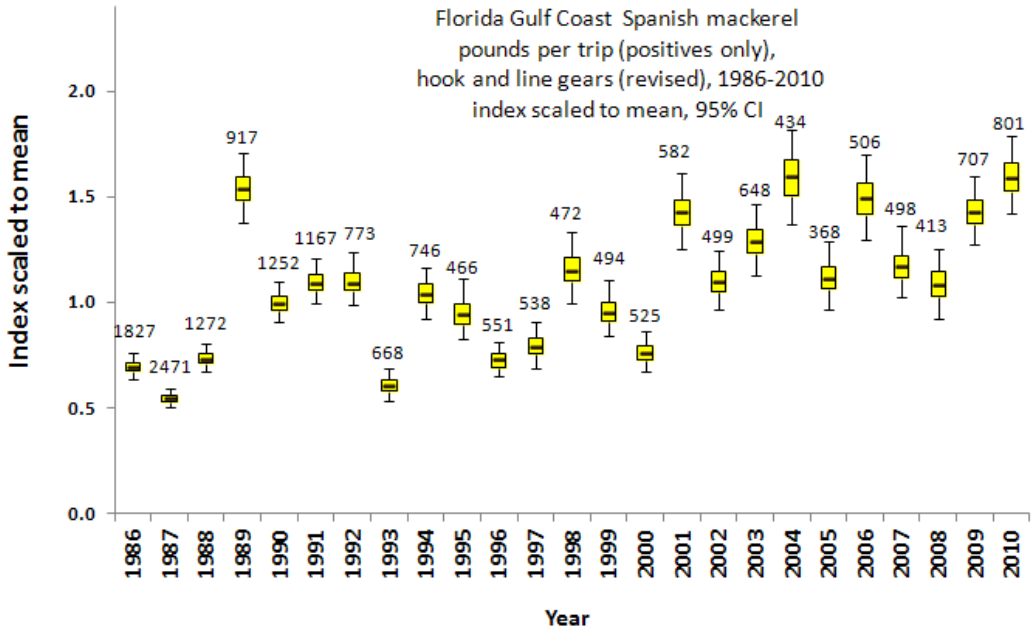
SEDAR28-AW01

Figure 10. Diagnostics and scaled index for Florida Gulf Coast Spanish mackerel, hook and line gear trip landings 1986-2010.

a.) Standardized residuals by year.	b.) Q-Q plot	c.) Histogram of standardized residuals and fitted distribution.
		

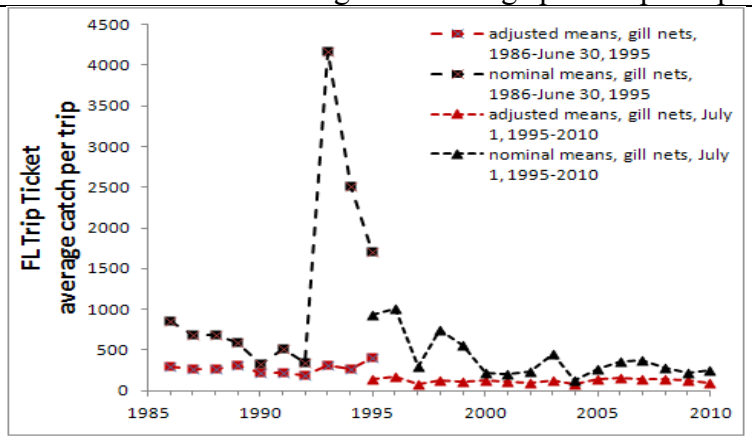
SEDAR28-AW01

d.) Scaled index

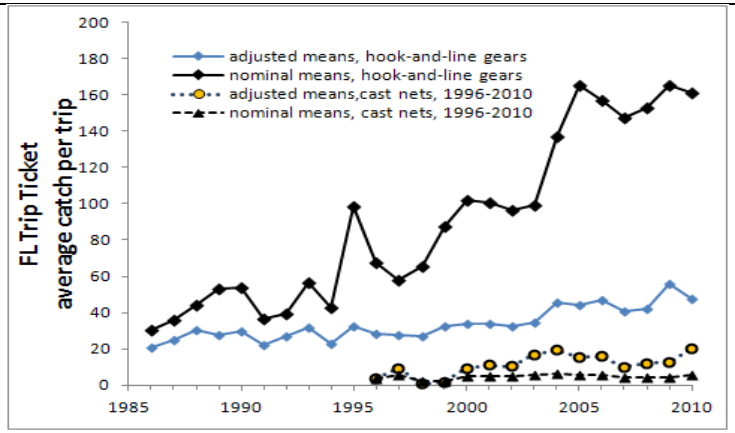


SEDAR28-AW01

a.) Adjusted and nominal means of gill net average pounds per trip.

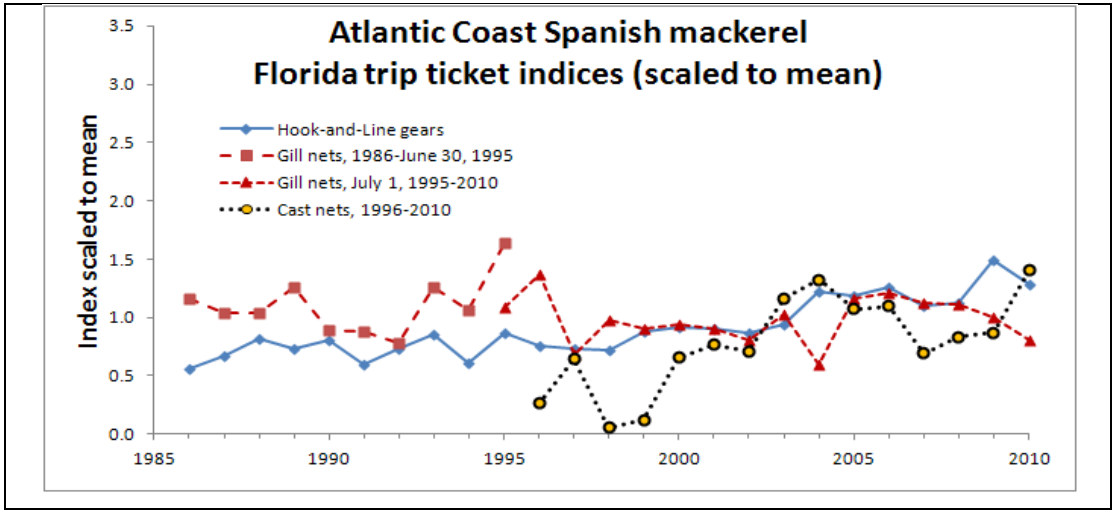


b.) Adjusted and nominal means of cast net and hook and line average pounds per trip.



c.) Indices (scaled to means) of average pounds per trip.

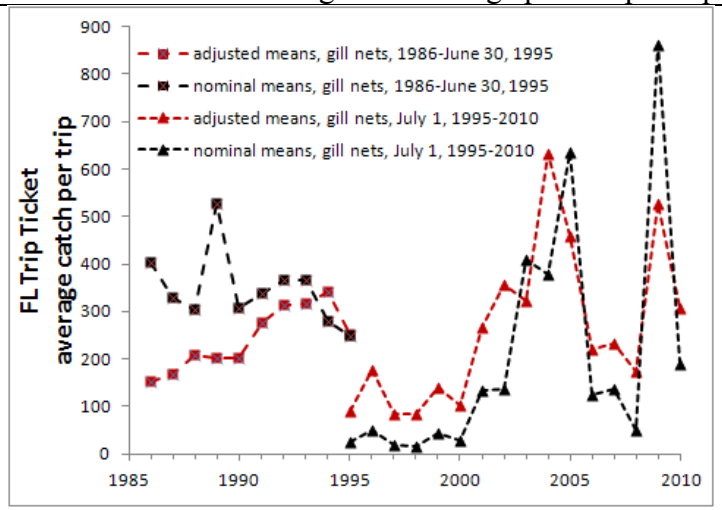
Figure 11. Atlantic mackerel reported on fishery trip tickets. means for: a) gill hook and line gears, indices (scaled to



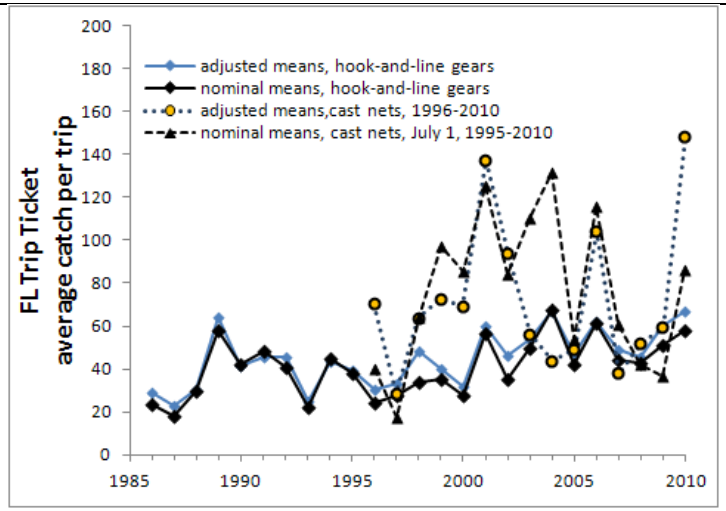
Coast Spanish Florida commercial Adjusted and nominal nets, b) cast nets and and c) comparison of means).

Figure 12. Gulf Coast Spanish mackerel reported on Florida commercial fishery trip tickets. Adjusted and nominal means for: a) gill nets, b) cast nets and hook and line gears, and c) comparison of indices

a.) Adjusted and nominal means of gill net average pounds per trip.



b.) Adjusted and nominal means of cast net and hook and line average pounds per trip.



SEDAR28-AW01

(scaled to means).

c.) Indices (scaled to means) of average pounds per trip.