### American Samoa Longline Fishery Marine Mammal, Seabirds, Sea Turtles, and Fish Bycatch for Years 2014 and 2015<sup>1</sup>

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The attached Excel workbook (pir.asll.nbr17.xls) includes information requested by the Pacific Islands Fisheries Science Center and Pacific Islands Regional Office for preparation of bycatch estimates for the 2017 update of the National Bycatch Report. This information includes estimates of the total number of bycatch events by the American Samoa Longline (ASLL) fishery in years 2014 and 2015. These estimates are given for all species of seabirds, sea turtles, and fish that have been observed caught (animal is observed hooked or entangled in the longline gear) at least once by the ASLL observer program throughout its history. For marine mammals, estimates of the total number of bycatch events resulting in a Dead or Serious Injury (DSI) classification are given. The workbook includes a worksheet labeled 'key' that provides definitions of the column headings, the items being estimated, and notes of interest.

The bycatch estimates are based on data collected by observers from the ASLL observer program (Pacific Islands Regional Observer Program 2017). A representative from a vessel that is departing on a longline trip is required to notify the ASLL observer program 72 hours prior to their intended departure. Trips for observation are selected from these required notifications. An ASLL trip begins when the vessel departs port and ends when the vessel returns to port and offloads their catch. ASLL trips can last less than a week to several months. A trip's bycatch is assigned to the year that the trip ended. As the current ASLL fishery has around 18 active vessels and does less than 100 trips annually, only a few observers need to be detailed to ASLL fishery to obtain approximately 20% coverage, the current targeted coverage level. A probability sample design that accommodates the limited number of observers, highly variable trips lengths, and other practical constraints has not been realized. Instead, notifications (trips) are selected for observation when an observer is available for deployment. There is an effort to sample vessels roughly proportionally to their relative activity level (i.e., sample 20%) of a vessel's longline activity), but this target can be difficult to achieve, especially within a year's time frame. When there is more than one vessel available for selection, the vessel for observation will be randomly selected from the set pool of available vessels. There is one vessel excluded from being selected because of safety issues. If prior to departure it is known that a trip is going to be an atypical trip, then an observer, if available, will be deployed on this trip and the trip's bycatch and effort will not be used when estimating the bycatch of the remainder of the fleet; instead, its bycatch will be added to this estimate.

It is not uncommon for a vessel to return to port for several days and not offload fish before departing to continue fishing. To discourage an observed vessel from

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returning to port hoping that the observer will be removed, an observer, if available, will be deployed on the vessel when it leaves the port. Only once during 2014–2015 was an observer not available to deploy on the next leg of a selected trip.

Despite not having a probability sample, a sample-based estimator was used to estimate bycatch. Consequently, the properties of the sample-based estimators, such as unbiasedness, cannot be assumed to hold. The two primary reasons for using a sample-based estimator are (1) estimators need to be produced for approximating 100 species in a limited amount of time, and (2) there are only a few auxiliary (predictor) variables whose values are known for the unsampled portion of the fleet and these variables did not appear to have a consistent relationship to *bycatch*-values for any species.

To estimate bycatch, the notification records were split into time intervalswithin an interval, the probability a trip was selected for observation appears to be fairly consistent. Most time intervals were defined by an increase or decrease in the number of observers being deployed on an ASLL trip. Other intervals were defined by the period when the fishery is typically less active: from the very end of the calendar year through the first part of a new calendar year. The time intervals were treated as strata with simple random sampling (SRSWOR) within strata. The sample is expected to be more evenly spread out than expected with SRSWOR because there are only a finite number of observers and they can only be deployed on one trip at a time. A year's bycatch was estimated using all strata that contained trips landing in the year of interest. First, total bycatch over all these strata was computed using the common estimator for population totals for stratified sampling with SRSWOR within strata. This number was then divided by the number of trips over all strata to derive an estimated by catch rate per trip. This estimated rate was then multiplied by the number of trips landing during the year of interest. This estimator is known as the combined ratio estimator (pgs. 144-146, Lohr 2010). The standard error was estimated using the estimator for the combined ratio estimator provided in Lohr (2010). If there were no observed bycatch events in a stratum, the Bayesian model in Draper and Guttman (1971) was used to estimate the posterior distribution of total bycatch. The mean of this posterior distribution was divided by the total number of trips in the stratum and this estimated bycatch rate per trip was substituted for the average observed *bycatch*-value in the sample-based estimator. The Bayesian model assumes that the *bycatch*-values are independent identically distributed Poisson variates and is based on the conditional binomial distribution of the Binomial parameter N; that is, total bycatch.

Since 2008 there have only been 19 observed marine mammal bycatch events and only one of these has not been classified as DSI. As this one case involved a different species than the species observed bycaught in 2014-2015, it was assumed that all bycatch events in 2104-2015 resulted in a DSI classification and the same combined ratio estimator describe above was used to estimate the total DSI in the ASLL fishery.

# **References**

Draper, N. and Guttman, I. (1971). Bayesian Estimation of the Binomial Parameter. Technometrics, 13(3), 67-673.

Lohr, Sharon L. (2010), Sampling Design and Analysis. Boston: Brooks/Cole.

Pacific Islands Regional Observer Program (2017), Longline Observer Data System, Pacific Islands Regional Office, <u>https://inport.nmfs.noaa.gov/inport/item/9027</u>.

#### Definitions

Bycatch	The event that an animal is observed hooked or entangled in the gear (as bycatch).
DSI	A bycatch (take) event with a marine mammal that results in a Dead or Serious Injury (DSI) classification

#### Column Key for deep-set and shallow-set sectors

Column names	Definition
Species code	Species code in Longline Observer Data System (LODS) except for marine mammals where the species code is that used by Stock Review Group (SRG)
Landing year	Calendar year when the vessel returned to port after the fishing trip
Observed Bycatch	Observed bycatch for the landing year on the observed trips .
Point Estimate	Estimated total bycatch for the landing year, expect for marine mammals where the point estimates are for the total DSI
Standard Error	Standard error of the estimated total bycatch (DSI).

## Notes

1	The total bycatch is the numbers of bycatch events. It is possible for an animal to be
	bycaught by the fishery more than once during a year. To assume the total bycatch
	represents the number of unique animals taken by the fishery during a year assumes an
2	The total DSI is the number of marine mammal takes that result in a DSI classification (DSI
	take event). An animal can survive a DSI take event and be bycaught again during the
	year; therefore, the assumption that the total DSI represents the number of unique animals
	taken requires making the assumption that an animal can only have one DSI take event

Chelonidae-Hard sh	elled sea turtles			
Turtle, Green				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
502	2014	2	17	7.308
502	2015	0	0	1.709
		-	-	
Turtle, Olive Ridley				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
505	2014	2	5	4.115
505	2015	1	6	4.014
Dermochelyidae-Lea	atherback sea turt	les		
Turtle, Leatherback				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
506	2014	0	4	4.507
506	2015	3	22	13.422
Diomedeidae-Albatr	OSSES			
Albatross, Black-foo	oted			
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
681	2014	0	0	1.644
681	2015	13	13	1.709
Fregatidae-Frigate b	birds			
Frigotokind Unidout	if a d			
Frigatebird, Unident Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
610	2014	0	0	1.644
610	2014	0	0	1.709
Procellariidae-Gadfl	v 8 Diving potrols			
Frocenanidae-Gaun	y & Diving petiels			
Shearwater, unident				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
670	2014	0	0	1.644
670	2015	0	0	1.709
Alepisauridae-Lance	etfish			
Longnose Lancetfis	h			
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
121	2014	659	3924	498.662
121	2015	1200	5044	745.719

Shortnose Lancetfis	h			
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
122	2014	1	3	2.952
122	2015	0	0	1.709
Balistidae-Triggerfis	hes			
Danstrade- mygerns				
Rough Triggerfish (I	Pelegic)			
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
151	2014	0	0	1.644
151	2015	0	0	1.709
Bramidae-Pomfrets				
Pacific Pomfret				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
183	2014	0	0	1.644
183	2015	0	0	1.709
Sickle Pomfret				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
185	2014	68	399	108.111
185	2014	85	381	103.346
105	2015	65	501	105.540
Lustrous Pomfret				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
186	2014	0	14	9.662
186	2015	12	76	35.568
Dagger Pomfret				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
187	2014	3	8	3.432
187	2015	28	126	62.511
Rough Pomfret				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
188	2014	1	3	2.952
188	2015	5	37	35.032
Brama Pomfret				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
189	2014	62	236	65.205
189	2015	25	116	42.562
Fanfishes				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
195	2014	0	2	2.495212
195	2015	1	3	3.317348

Belonidae-Needlefis	h			
Flat Needlefish				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
198	2014	1	2	2.495
198	2015	0	3	3.317
Carangidae-Jacks				
Rainbow Runner				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
177	2014	0	0	1.644
177	2015	0	0	1.709
Cottonmouth Jack				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
168	2014	0	0	1.644
168	2015	0	0	1.709
Jack Mackerel				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
226	2014	0	0	1.644
226	2015	0	0	1.709
Coryphaenidae-Dolp	ohinfishes			
Dolphinfish				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
218	2014	34	373	167.896
218	2015	23	94	31.898
Pompano Dolphinfis	sh			
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
219	2014	0	2	2.495
219	2015	1	3	3.317
Echeneidae-Remora	IS			
Remora or Suckerfis	sh			
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
. 199	2014	, 1	4	3.662
199	2015	0	0	1.709
Gempylidae-Snake I	Mackerels			

Longfin Escolar				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
196	2014	871	5046	869.377
196	2015	1164	5228	847.915
Roudi Escolar				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
. 197	2014	72	423	87.261
197	2015	127	488	89.476
Escolar				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
191	2014	1564	7869	1168.733
191	2015	1895	9655	1465.621
Oilfish				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
192	2014	348	1185	473.529
192	2015	133	693	112.946
Snake Mackerel				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
193	2014	583	2410	1105.403
193	2015	386	1367	154.264
Black Gemfish				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
194	2014	38	125	39.091
194	2015	17	97	21.160
Unidentified Snake I	Mackerel			
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
190	2014	0	0	1.644
190				
100	2015	1	1	1.709
Istiophoridae-Billfisl		1	1	1.709
Istiophoridae-Billfisl		1	1	1.709
Istiophoridae-Billfisl Shortbill Spearfish	nes			
stiophoridae-Billfisi Shortbill Spearfish Species Code	n <b>es</b> Landing Year	Observed Bycatch	Point Estimate	Standard Error
Istiophoridae-Billfisl Shortbill Spearfish Species Code 303	nes Landing Year 2014	Observed Bycatch 77	Point Estimate 502	Standard Error 173.593
Istiophoridae-Billfish Shortbill Spearfish Species Code	n <b>es</b> Landing Year	Observed Bycatch	Point Estimate	Standard Error 173.593
Istiophoridae-Billfisl Shortbill Spearfish Species Code 303 303 Blue Marlin	nes Landing Year 2014 2015	Observed Bycatch 77 87	Point Estimate 502 551	Standard Error 173.593 166.605
Istiophoridae-Billfisl Shortbill Spearfish Species Code 303 303 Blue Marlin Species Code	Landing Year 2014 2015 Landing Year	Observed Bycatch 77 87 Observed Bycatch	Point Estimate 502 551 Point Estimate	Standard Error 173.593 166.605 Standard Error
Istiophoridae-Billfisl Shortbill Spearfish Species Code 303 303 Blue Marlin	nes Landing Year 2014 2015	Observed Bycatch 77 87	Point Estimate 502 551	Standard Error 173.593 166.605

Striped Marlin				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
302	2014	43	193	85.119
302	2015	18	111	34.336
Sailfish				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
304	2014	21	149	33.495
304	2015	48	221	59.127
Black Marlin				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
311	2014	0	0	1.644
311	2015	0	0	1.709
Unidentified Billfish	1			
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
300	2014	7	42	18.002
300	2015	16	50	13.695
Lampridae-Opah				
Opah				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
144	2014	9	66	24.826
144	2015	20	70	35.516
Lophotidae-Crestfis	hes			
Lophotidae-Crestfis	hes			
	hes Landing Year	Observed Bycatch	Point Estimate	Standard Error
Lophotidae-Crestfis Crestfishes		Observed Bycatch 54	Point Estimate 247	
Lophotidae-Crestfis Crestfishes Species Code	Landing Year	•		55.622
Lophotidae-Crestfis Crestfishes Species Code 145	Landing Year 2014 2015	54	247	55.622
Lophotidae-Crestfis Crestfishes Species Code 145 145 Molidae-Molas or Oc	Landing Year 2014 2015	54	247	Standard Error 55.622 42.560
Lophotidae-Crestfis Crestfishes Species Code 145 145 Molidae-Molas or Oc Common Mola	Landing Year 2014 2015 <b>cean sunfishes</b>	54 26	247 139	55.622 42.560
Lophotidae-Crestfis Crestfishes Species Code 145 145 Molidae-Molas or Oc Common Mola Species Code	Landing Year 2014 2015 <b>cean sunfishes</b> Landing Year	54 26 Observed Bycatch	247 139 Point Estimate	55.622 42.560 Standard Error
Lophotidae-Crestfis Crestfishes Species Code 145 145 Molidae-Molas or Oc Common Mola Species Code 315	Landing Year 2014 2015 <b>cean sunfishes</b> Landing Year 2014	54 26 Observed Bycatch 5	247 139 Point Estimate 18	55.622 42.560 Standard Error 8.665
Lophotidae-Crestfis Crestfishes Species Code 145 145 Molidae-Molas or Oc Common Mola Species Code	Landing Year 2014 2015 <b>cean sunfishes</b> Landing Year	54 26 Observed Bycatch	247 139 Point Estimate	55.622 42.560 Standard Error 8.665
Lophotidae-Crestfis Crestfishes Species Code 145 145 Molidae-Molas or Oc Common Mola Species Code 315 315 Sharptail Mola	Landing Year 2014 2015 <b>cean sunfishes</b> Landing Year 2014 2015	54 26 Observed Bycatch 5 3	247 139 Point Estimate 18 9	55.622 42.560 Standard Error 8.665 4.449
Lophotidae-Crestfis Crestfishes Species Code 145 145 145 Molidae-Molas or Oc Common Mola Species Code 315 315 Sharptail Mola Species Code	Landing Year 2014 2015 <b>cean sunfishes</b> Landing Year 2014 2015 Landing Year	54 26 Observed Bycatch 5	247 139 Point Estimate 18	55.622 42.560 Standard Error 8.665 4.449 Standard Error
Lophotidae-Crestfis Crestfishes Species Code 145 145 Molidae-Molas or Oc Common Mola Species Code 315 315 Sharptail Mola	Landing Year 2014 2015 <b>cean sunfishes</b> Landing Year 2014 2015	54 26 Observed Bycatch 5 3	247 139 Point Estimate 18 9	55.622 42.560 Standard Error 8.665 4.449

Slender Mola	1 II X7	<u></u>		<u></u>
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
317	2014	457	2223	915.371
317	2015	424	2465	882.779
Nomeidae-Cigarfish	es			
Cigarfishes				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
233	2014	5	24	8.402
233	2015	1	9	4.449
Omosudidae-Hamm	erjaw			
Hammerjaw				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
238	2014	11	42	16.305
238	2015	4	20	11.326
Scrombridae-Macke	rels, Tunas & See	rfishes		
Bigeye Tuna				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
211	2014	213	1268	297.909
211	2015	190	972	235.648
Skipjack Tuna				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
212	2014	232	1856	931.892
212	2015	181	771	125.648
Albacore Tuna				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
215	2014	159	855	151.754
215	2015	281	1519	220.491
Bluefin Tuna, (N. Pa				<u> </u>
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
214 214	2014 2015	0 0	0 0	1.644 1.709
Yellowfin Tuna	-	-	-	
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
216	2014	217	1665	562.714
210	2014	368	1716	360.405
210	2015	506	1/10	300.403

Unidentified Tuna				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
210	2014	369	1717	556.467
210	2015	465	2367	997.901
Wahoo				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
221	2014	77	815	384.308
221	2015	124	696	290.026
Mackerel				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
224	2014	0	2	2.495
224	2015	1	3	3.317
Serranidae-Basses	& Groupers			
Goldenstripe Soapfi	sh			
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
262	2014	4	10	6.431
262	2015	1	14	9.057
Sphyraenidae-Barra	cudas			
Great Barracuda				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
263	2014	67	501	152.190
			215	400.440
263	2015	86	315	108.419
		86	315	108.419
Tetrodontidae-Puffe	rfishes	86		108.419
Tetrodontidae-Puffe	rfishes	86 Observed Bycatch	Point Estimate	Standard Error
Tetrodontidae-Puffe Pelagic Puffer (Ocea	rfishes anic)			Standard Error
Tetrodontidae-Puffe Pelagic Puffer (Ocea Species Code	<b>rfishes</b> anic) Landing Year	Observed Bycatch	Point Estimate	Standard Error 2.986
Tetrodontidae-Puffe Pelagic Puffer (Ocea Species Code 261 261	<b>anic)</b> Landing Year 2014	Observed Bycatch 1	Point Estimate 4	Standard Error 2.986
Tetrodontidae-Puffe Pelagic Puffer (Ocea Species Code 261 261	<b>anic)</b> Landing Year 2014	Observed Bycatch 1	Point Estimate 4	Standard Error 2.986
Tetrodontidae-Puffe Pelagic Puffer (Ocea Species Code 261 261 Unidentified Puffer	anic) Landing Year 2014 2015	Observed Bycatch 1 1	Point Estimate 4 7	Standard Error 2.986 4.144 Standard Error
Tetrodontidae-Puffe Pelagic Puffer (Ocea Species Code 261 261 Unidentified Puffer Species Code	anic) Landing Year 2014 2015 Landing Year	Observed Bycatch 1 1 Observed Bycatch	Point Estimate 4 7 Point Estimate	Standard Error 2.986 4.144 Standard Error 1.644
Tetrodontidae-Puffe Pelagic Puffer (Ocea Species Code 261 261 Unidentified Puffer Species Code 260	Anic) Landing Year 2014 2015 Landing Year 2014 2015	Observed Bycatch 1 1 0bserved Bycatch 0	Point Estimate 4 7 Point Estimate 0	Standard Error 2.986 4.144 Standard Error 1.644
Tetrodontidae-Puffe Pelagic Puffer (Ocea Species Code 261 261 Unidentified Puffer Species Code 260 260 Trachipteridae-Ribb	anic) Landing Year 2014 2015 Landing Year 2014 2015 onfishes	Observed Bycatch 1 1 0bserved Bycatch 0	Point Estimate 4 7 Point Estimate 0	Standard Error 2.986 4.144 Standard Error 1.644
Tetrodontidae-Puffe Pelagic Puffer (Ocea Species Code 261 261 Unidentified Puffer Species Code 260 260 260 Trachipteridae-Ribb	erfishes anic) Landing Year 2014 2015 Landing Year 2014 2015 onfishes	Observed Bycatch 1 1 Observed Bycatch 0 1	Point Estimate 4 7 Point Estimate 0 3	Standard Error 2.986 4.144 Standard Error 1.644 2.834
Tetrodontidae-Puffe Pelagic Puffer (Ocea Species Code 261 261 Unidentified Puffer Species Code 260 260 Trachipteridae-Ribb Scalloped Ribbonfis Species Code	anic) Landing Year 2014 2015 Landing Year 2014 2015 onfishes sh Landing Year	Observed Bycatch 1 1 Observed Bycatch 0 1 0	Point Estimate 4 7 Point Estimate 0 3 Point Estimate	Standard Error 2.986 4.144 Standard Error 1.644 2.834 Standard Error
Tetrodontidae-Puffe Pelagic Puffer (Ocea Species Code 261 261 Unidentified Puffer Species Code 260 260 Trachipteridae-Ribb Scalloped Ribbonfis	erfishes anic) Landing Year 2014 2015 Landing Year 2014 2015 onfishes	Observed Bycatch 1 1 Observed Bycatch 0 1	Point Estimate 4 7 Point Estimate 0 3	Standard Error 2.986 4.144 Standard Error 1.644 2.834

Tapertail Ribbonfish	ı			
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
148	2014	12	60	11.709
148	2015	9	50	13.780
Trichiuridae-Cutlass	sfishes & Scabbar	dfishes		
Razorback Scabbar	dfish			
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
232	2014	0	0	1.644
232	2015	3	15	8.489
Xiphiidae-Swordfish	1			
Swordfish (see Note	2 in kev)			
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
301	2014	61	241	83.079
301	2015	53	237	42.724
Unidentified or Iden	tified Uncoded Fis	sh		
Unidentified Fish				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
100	2014	1	4	2.986
100	2015	49	156	80.207
Identified Uncoded	Fish			
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
101	2014	6	46	15.056
101	2015	2	13	7.620
Alopiidae-Thresher	Sharks			
Bigeye Thresher Sh	ark			
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
424	2014	43	197	55.933
424	2015	48	219	34.245
Common Thresher \$	Shark			
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
. 425	2014	0	0	1.644
425	2015	0	0	1.709
Pelagic Thresher Sh	nark			
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
426	2014	1	3	2.952
426	2015	0	0	1.709

Unidentified Threshe	er Shark			
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
420	2014	5	27	14.224
420	2015	7	25	10.517
Deletiidee Kitefin Ch	<u>aulto</u>			
Dalatiidae-Kitefin Sh	arks			
Cookie Cutter Shark				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
437	2014	0	0	1.644
437	2015	0	0	1.709
Carcharinidae-Requi	em Sharks			
Blue Shark				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
418	2014	838	3548	556.595
418	2015	695	3574	461.563
Galapagos Shark				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
407	2014	0	0	1.644
407	2015	0	0	1.709
Gray Reef Shark				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
408	2014	0	0	1.644
408	2015	0	0	1.709
Oceanic Whitetip Sh	ark			
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
419	2014	104	464	124.644
419	2015	168	827	151.184
Sandbar Shark	Londing Voor	Observed Bycatch	Doint Cotimoto	Standard Error
Species Code 405	Landing Year	•	Point Estimate	Standard Error
	2014	0	0	1.644
405	2015	0	0	1.709
Silky Shark				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
413	2014	426	1741	340.518
413	2015	331	1728	324.295
Lamnidae-Mackerel	Sharks			

Shortfin Mako Shark	<b>k</b>			
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
432	2014	59	376	100.509
432	2015	112	456	140.470
Longfin Mako Shark	í.			
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
433	2014	11	48	19.457
433	2015	3	10	4.614
Unidentified Mako S	hark			
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
430	2014	0	0	1.644
430	2015	1	7	7.019
Pseudocarcharinida	e-Crocodile Shark	(		
Crocodile Shark				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
438	2014	10	32	20.864
438	2014	3	14	7.903
430	2015	3	14	7.903
Sphyrnidae-Hamme	rhead Sharks			
Scalloped Hammerh	ead Shark			
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
. 422	2014	1	6	4.115
422	2015	1	3	3.317
Smooth Hammernea	d Shark			
Smooth Hammerhea Species Code		Observed Bycatch	Point Estimate	Standard Error
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error 2 952
		Observed Bycatch 1 0	Point Estimate 3 0	Standard Error 2.952 1.709
Species Code 423 423	Landing Year 2014 2015	1	3	2.952
Species Code 423 423 Unidentified Hamme	Landing Year 2014 2015 erhead Shark	1 0	3 0	2.952 1.709
Species Code 423 423 Unidentified Hamme Species Code	Landing Year 2014 2015 Prhead Shark Landing Year	1 0 Observed Bycatch	3 0 Point Estimate	2.952 1.709 Standard Error
Species Code 423 423 Unidentified Hamme	Landing Year 2014 2015 erhead Shark	1 0	3 0	2.952 1.709
Species Code 423 423 Unidentified Hamme Species Code 421	Landing Year 2014 2015 erhead Shark Landing Year 2014 2015	1 0 Observed Bycatch 0	3 0 Point Estimate 0	2.952 1.709 Standard Error 1.644
Species Code 423 423 Unidentified Hamme Species Code 421 421 421	Landing Year 2014 2015 erhead Shark Landing Year 2014 2015 s	1 0 Observed Bycatch 0	3 0 Point Estimate 0	2.952 1.709 Standard Error 1.644
Species Code 423 423 Unidentified Hamme Species Code 421 421 5qualidae-Dogfishe Deepwater Dogfishe	Landing Year 2014 2015 erhead Shark Landing Year 2014 2015 s	1 0 Observed Bycatch 0 1	3 0 Point Estimate 0 7	2.952 1.709 Standard Error 1.644 7.019
Species Code 423 423 Unidentified Hamme Species Code 421 421 Squalidae-Dogfishe Species Code	Landing Year 2014 2015 Prhead Shark Landing Year 2014 2015 S Landing Year	1 0 Observed Bycatch 0 1 Observed Bycatch	3 0 Point Estimate 0 7 Point Estimate	2.952 1.709 Standard Error 1.644 7.019 Standard Error
Species Code 423 423 Unidentified Hamme Species Code 421 421 5qualidae-Dogfisher Deepwater Dogfisher	Landing Year 2014 2015 erhead Shark Landing Year 2014 2015 s	1 0 Observed Bycatch 0 1	3 0 Point Estimate 0 7	2.952 1.709 Standard Error 1.644 7.019

400         2014         5         14         5.8           400         2015         10         58         23.6           Identified Uncoded Shark           Species Code         Landing Year         Observed Bycatch         Point Estimate         Standard Erro           401         2014         0         0         1.7           Dasyatidae-Stingrays         Pelagic Stingray         Point Estimate         Standard Erro           457         2014         1469         6416         1071.6           457         2015         1767         9267         1513.4           Mobulidae-Manta & Mobulas         Mobulas         Standard Erro         Standard Erro           455         2014         1         2         2.4           455         2015         0         3         3.3           Mobulidae-Manta & Mobulas         Observed Bycatch         Point Estimate         Standard Erro           455         2014         1         2         2.4           455         2015         0         3         3.3           Mobula         Species Code         Landing Year         Observed Bycatch         Point Estimate         Standard Erro         Standard Erro	Unidentified Sharks	and Identified Un	coded Sharks		
400         2014         5         14         5.4           400         2015         10         58         23.6           Identified Uncoded Shark         Species Code         Landing Year         Observed Bycatch         Point Estimate         Standard Error           401         2014         0         0         1.7           Dasyatidae-Stingrays	Unidentifed Shark				
4002015105823.6Identified Uncoded SharkSpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4012015001.7Dasyatidae-StingraysPelagic StingraySpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4572014146964161071.54572015176792671513.4Mobulidae-Manta & MobulasGiant Manta RaySpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4552014122.24552015033.3MobulaSpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4542014284.44542014284.44542014284.44532014132.5Manta/Mobula RaySpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4532014132.5Midentified RayUnidentified RayStandard Erro4.52.5Species CodeLanding YearObserved BycatchPoint EstimateStandard Erro45320140001.7	Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
Identifed Uncoded SharkSpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4012015001.6dot 2015001.7Dasyatidae-StingraysPelagic StingraySpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4572014146964161071.54572015176792671513.4Mobulidae-Manta & MobulasGiant Manta RaySpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4552014122.44552015033.3MobulaUnidentified RayObserved BycatchPoint EstimateStandard Erro4532014284.44532015033.3Manta/Mobula RayObserved BycatchPoint EstimateStandard Erro4532015001.74532015001.7Unidentified RayUnidentified RayStandard ErroSpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4532014132.64532015001.7MataMataMataMataMata52014132.645320140 <td>400</td> <td>2014</td> <td>5</td> <td>14</td> <td>5.996</td>	400	2014	5	14	5.996
Species Code       Landing Year       Observed Bycatch       Point Estimate       Standard Erro         401       2015       0       0       1.7         Dasyatidae-Stingrays       Pelagic Stingray       Pelagic Stingray         Species Code       Landing Year       Observed Bycatch       Point Estimate       Standard Erro         457       2014       1469       6416       1071.5         457       2015       1767       9267       1513.4         Mobulidae-Manta & Mobulas       Giant Manta Ray       Standard Erro       Standard Erro         Species Code       Landing Year       Observed Bycatch       Point Estimate       Standard Erro         455       2014       1       2       2.4         455       2015       0       3       3.3         Mobula       Species Code       Landing Year       Observed Bycatch       Point Estimate       Standard Erro         Species Code       Landing Year       Observed Bycatch       Point Estimate       Standard Erro         454       2014       2       8       4.4       4.5         55       2015       4       15       5.5         Mata/Mobula Ray       Species Code       Landing Year	400	2015	10	58	23.664
401         2014         0         0         1.6           401         2015         0         0         1.7           Dasyatidae-Stingrays         Pelagic Stingray         Species Code         Landing Year         Observed Bycatch         Point Estimate         Standard Erro           457         2014         1469         6416         1071.5         457         2015         1767         9267         1513.4           Mobulidae-Manta & Mobulas         Mobulas         Point Estimate         Standard Erro         Standard Erro           Giant Manta Ray         Species Code         Landing Year         Observed Bycatch         Point Estimate         Standard Erro           Mobulia         Species Code         Landing Year         Observed Bycatch         Point Estimate         Standard Erro           Mobula         Species Code         Landing Year         Observed Bycatch         Point Estimate         Standard Erro           Manta/Mobula Ray         Species Code         Landing Year         Observed Bycatch         Point Estimate         Standard Erro           Manta/Mobula Ray         Species Code         Landing Year         Observed Bycatch         Point Estimate         Standard Erro           Mindentified Ray         Species Code         Landing Year	Identifed Uncoded S	Shark			
4012015001.7Dasyatidae-StingraysPelagic StingraySpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4572015176792671513.4Mobulidae-Manta & MobulasMobuliae-Manta & MobulasVertex (1000)Standard ErroGiant Manta RayObserved BycatchPoint EstimateStandard ErroSpecies CodeLanding YearObserved BycatchPoint EstimateStandard ErroMobulaVertex (1000)Observed BycatchPoint EstimateStandard ErroMobulaSpecies CodeLanding YearObserved BycatchPoint EstimateStandard ErroMobulaSpecies CodeLanding YearObserved BycatchPoint EstimateStandard ErroManta/Mobula RayVertex (1000)Observed BycatchPoint EstimateStandard ErroMindentified RayVertex (1000)Observed BycatchPoint EstimateStandard ErroMindentified RayVertex (1000)Observed BycatchPoint EstimateStandard ErroMindentified RayVertex (1000)SecceeMantard ErroMantardMindentified RayMerecx (1000)SecreeMerecx (1000)<	Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
Dasyatidae-Stingrays           Pelagic Stingray           Species Code         Landing Year         Observed Bycatch         Point Estimate         Standard Erro           457         2014         1469         6416         1071.5           457         2015         1767         9267         1513.4           Mobulidae-Manta & Mobulas         Mobula         Point Estimate         Standard Erro           Giant Manta Ray	401	2014	0	0	1.644
Pelagic Stingray         Species Code       Landing Year       Observed Bycatch       Point Estimate       Standard Erro         457       2014       1469       6416       1071.5         457       2015       1767       9267       1513.4         Mobulidae-Manta & Mobulas       Mobulas       Standard Erro         Giant Manta Ray       Species Code       Landing Year       Observed Bycatch       Point Estimate       Standard Erro         455       2014       1       2       2.4         455       2015       0       3       3.3         Mobula       Species Code       Landing Year       Observed Bycatch       Point Estimate       Standard Erro         454       2014       2       8       4.4         454       2015       4       15       5.3         Manta/Mobula Ray       Species Code       Landing Year       Observed Bycatch       Point Estimate       Standard Erro         453       2015       0       0       1.7         Manta/Mobula Ray       Unidentified Ray       Species Code       Landing Year       Observed Bycatch       Point Estimate       Standard Erro         453       2015       0       0       1.7<	401	2015	0	0	1.709
Species CodeLanding YearObserved BycatchPoint EstimateStandard Erro4572014146964161071.54572015176792671513.4Mobulidae-Manta & MobulasMobulasGiant Manta RaySpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4552014122.44552015033.3MobulaSpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4542014284.445420154155.3Manta/Mobula RaySpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4532014132.54532015001.7Unidentified RayUnidentified RayUnidentified RaySpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4502014054.5	Dasyatidae-Stingray	/S			
4572014146964161071.t4572015176792671513.4Mobulidae-Manta & MobulasGiant Manta RaySpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4552014122.44552015033.3MobulaSpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4542014284.445420154155.3Manta/Mobula RaySpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4532015001.74532015001.7Unidentified RayUnidentified RayStandard Erro4502014054.5	Pelagic Stingray				
4572015176792671513.4Mobulidae-Manta & MobulasGiant Manta RaySpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4552014122.44552015033.3MobulaSpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4542014284.445420154155.3Manta/Mobula RayValueObserved BycatchPoint EstimateStandard Erro4532014132.64532015001.7Unidentified RayValueObserved BycatchPoint EstimateStandard Erro4502014054.5	Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
Mobulidae-Manta & Mobulas           Giant Manta Ray           Species Code         Landing Year         Observed Bycatch         Point Estimate         Standard Erro           455         2014         1         2         2.4           455         2015         0         3         3.3           Mobula         Value         Value         Point Estimate         Standard Erro           454         2014         2         8         4.4           454         2014         2         8         4.4           454         2015         4         15         5.3           Manta/Mobula Ray         Value         Value         Point Estimate         Standard Erro           453         2015         0         0         1.7           Species Code         Landing Year         Observed Bycatch         Point Estimate         Standard Erro           453         2015         0         0         1.7         3         2.5           Unidentified Ray         Value         Value         Point Estimate         Standard Erro           450         2014         0         5         4.5	457	2014	1469	6416	1071.552
Giant Manta Ray         Species Code       Landing Year       Observed Bycatch       Point Estimate       Standard Erro         455       2014       1       2       2.4         455       2015       0       3       3.3         Mobula       Species Code       Landing Year       Observed Bycatch       Point Estimate       Standard Erro         454       2014       2       8       4.4         454       2015       4       15       5.3         Manta/Mobula Ray       Species Code       Landing Year       Observed Bycatch       Point Estimate       Standard Erro         453       2015       0       0       1.7       3       2.9         Manta/Mobula Ray       2014       1       3       2.9       3       2.9         Unidentified Ray       2015       0       0       1.7       3       2.9         Unidentified Ray       Species Code       Landing Year       Observed Bycatch       Point Estimate       Standard Erro         450       2014       0       5       4.5	457	2015	1767	9267	1513.494
Species CodeLanding YearObserved BycatchPoint EstimateStandard Erro4552014122.44552015033.3MobulaSpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4542014284.445420154155.3Manta/Mobula RaySpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4532014132.94532015001.7Unidentified RayVinidentified RaySpecies CodeLanding YearObserved BycatchPoint EstimateSpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4532014132.94532014054.5	Mobulidae-Manta &	Mobulas			
Species CodeLanding YearObserved BycatchPoint EstimateStandard Erro4552014122.44552015033.3MobulaSpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4542014284.445420154155.3Manta/Mobula RaySpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4532014132.94532015001.7Unidentified RayUnidentified RaySpecies CodeLanding YearObserved BycatchPoint Estimate5pecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4532014132.94532014054.5	Giant Manta Rav				
4552014122.44552015033.3MobulaSpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4542014284.445420154155.3Manta/Mobula RaySpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4532015001.74532015001.7Unidentified RayUnidentified RaySpecies CodeLanding YearObserved BycatchPoint Estimate5pecies CodeLanding Year0bserved BycatchPoint EstimateStandard Erro4532015001.7Unidentified Ray54.54.5		Landing Year	Observed Bycatch	Point Estimate	Standard Error
MobulaSpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4542014284.445420154155.3Manta/Mobula RaySpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4532014132.94532015001.7Unidentified RaySpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4532015001.7Unidentified RaySpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4502014054.5	455	2014	1	2	2.495
Species CodeLanding YearObserved BycatchPoint EstimateStandard Erro4542014284.445420154155.3Manta/Mobula RaySpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4532014132.94532015001.7Unidentified RayUnidentified RaySpecies CodeLanding YearObserved BycatchPoint Estimate5pecies Code2014054.5	455	2015	0	3	3.317
4542014284.445420154155.3Manta/Mobula RaySpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4532014132.94532015001.7Unidentified RayUnidentified RaySpecies CodeLanding YearObserved BycatchPoint EstimateStandard Erro4502014054.5	Mobula				
45420154155.3Manta/Mobula RaySpecies CodeLanding YearObserved BycatchPoint EstimateStandard Error4532014132.54532015001.7Unidentified RayUnidentified RaySpecies CodeLanding YearObserved BycatchPoint EstimateStandard Error4502014054.5	Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
Manta/Mobula Ray         Species Code       Landing Year       Observed Bycatch       Point Estimate       Standard Erro         453       2014       1       3       2.9         453       2015       0       0       1.7         Unidentified Ray       Unidentified Ray       Species Code       Landing Year       Observed Bycatch       Point Estimate       Standard Erro         450       2014       0       5       4.5	454	2014	2	8	4.429
Species Code       Landing Year       Observed Bycatch       Point Estimate       Standard Erro         453       2014       1       3       2.9         453       2015       0       0       1.7         Unidentified Ray       Unidentified Ray       Species Code       Landing Year       Observed Bycatch       Point Estimate       Standard Erro         450       2014       0       5       4.5	454	2015	4	15	5.308
4532014132.54532015001.7Unidentified RayUnidentified RaySpecies CodeLanding YearObserved BycatchPoint EstimateStandard Error4502014054.5	Manta/Mobula Ray				
453       2015       0       0       1.7         Unidentified Ray	Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
Unidentified Ray Unidentified Ray Species Code Landing Year Observed Bycatch Point Estimate Standard Erro 450 2014 0 5 4.5	453	2014	1	3	2.952
Unidentified Ray Species Code Landing Year Observed Bycatch Point Estimate Standard Erro 450 2014 0 5 4.5	453	2015	0	0	1.709
Species CodeLanding YearObserved BycatchPoint EstimateStandard Erro4502014054.5	Unidentified Ray				
Species CodeLanding YearObserved BycatchPoint EstimateStandard Erro4502014054.5	Unidentified Rav				
450 2014 0 5 4.5		Landing Year	Observed Bycatch	Point Estimate	Standard Error
	•		•		4.507
					8.357
		<b>-</b>	C C		

Delp	hinidae∙	-Dolphins
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False Killer Whale					
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error	
PC	2014	0	0	1.644	
PC	2015	2	5	4.847	
Short-finned Pilot W	hale				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error	
GM	2014	1	2	2.952	
GM	2015	0	0	1.709	
Blackfish (undetermined if a false killer whale or a short-finned pilot whale)					
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error	
BF	2014	0	0	1.644	
BF	2015	0	0	1.709	
Rough-Toothed Dolp	ohin				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error	
SB	2014	0	0	1.644	
SB	2015	0	0	1.709	
Ziphiidae-Beaked W	hale				
Cuviers Beaked What	ale				
Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error	
ZI	2014	0	0	1.644	
ZI	2015	0	0	1.709	