

# **Estimation of Bycatch with Sea Turtles, Seabirds, and Fish in the 2014 and 2015 Hawaii Permitted Deep-Set Longline Fishery<sup>1</sup>**

Marti L. McCracken  
Pacific Islands Fisheries Science Center  
National Marine Fisheries Service

The attached Excel Workbook (pir.hll.nbr1415.xlsx) includes bycatch estimates for years 2014 and 2015 as requested for the update of the National Bycatch Report. The workbook includes a worksheet labeled 'key' that provides definitions of the column headings and the items being estimated.

McCracken (2017b) describes the sample design used to sample the deep-set fleet and point estimators used, and McCracken (2017a) describes the estimators of standard error for the estimated number of bycatch events.

## References

McCracken, M. L.

2017a. Interval Estimation of Annual Bycatch in the Hawaii Deep-set Longline Fishery, Technical Memorandum (in prep), PIFSC, NOAA, U.S. Department of Commerce

McCracken, M. L.

2017b. Sampling the Hawaii Deep-set Longline Fishery and Point Estimators of Bycatch, Technical Memorandum (in prep), PIFSC, NOAA, U.S. Department of Commerce.

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<sup>1</sup> PIFSC Internal Report IR-17-010.

## Definitions

bycatch	The event that an animal is observed hooked or entangled in the gear (as bycatch)
NA	Not available; see Note 2 for explanation

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

column names	definition
Species code	Species code in Longline Observer Data System (LODS).
Landing year	Calendar year when the vessel returned to port after the fishing trip
Observed Bycatch	Observed bycatch for the landing year (numbers of animals) on the observed trips .
Point Estimate	Estimated total bycatch for the landing year.
Standard Error	Standard error of the estimated total bycatch.

## 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 animal can only be taken by the fishery once during a year.
2	On 27 August 2012 there was a change in the regulations of the Hawaii longline deep set fishery that prevents the collection of a random probability sample of trips in the fishery. The regulation imposed new limits on swordfish landed. The new limits are as follows: (1) With a NMFS observer onboard, there is no limit on the number of swordfish landed or possessed on a trip, regardless of the type of hook used. (2) With no NMFS observer onboard, the limit is 25 swordfish landed or possessed on a trip, if the vessel uses only circle hooks. (3) With no NMFS observer onboard, and if the vessel uses any hooks other than circle hooks, the limit is 10 swordfish landed or possessed on a trip. In essence, this regulation created three components of the deep-set fleet defined by the number of swordfish a trip can keep. The first component has no limit on swordfish kept and has 100% coverage. The second and third component has a limit on the number of swordfish kept that is determined by the type of hooks being used. These two components have no observer coverage. These regulations introduce the possibility of exclusion bias (bias introduced as a result of excluding part of the population from being sampled) in all take estimates. Because vessels with an observer onboard have no limit on the number of swordfish that can be landed and vessels without an observer do have a limit, take estimates for swordfish are not provided.

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**Cheloniidae-Hard shelled sea turtles**

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**Turtle, Green**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
502	2014	3	16	8.138
502	2015	1	4	3.807

**Turtle, Loggerhead**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
504	2014	0	0	4.219
504	2015	2	9	6.078

**Turtle, Olive Ridley**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
505	2014	8	50	15.105
505	2015	13	69	15.298

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**Dermodochelyidae-Leatherback sea turtles**

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**Turtle, Leatherback**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
506	2014	7	38	11.800
506	2015	4	18	8.320

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**Diomedeidae-Albatrosses**

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**Albatross, Black-footed**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
681	2014	32	175	36.096
681	2015	107	541	75.058

**Albatross, Laysan**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
682	2014	13	77	22.317
682	2015	24	119	31.438

**Albatross, Short-tailed**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
683	2014	0	0	4.219
683	2015	0	0	4.362

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**Sulidae-Boobies & Gannets**

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**Booby, Red-footed**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
664	2014	0	0	4.219
664	2015	1	6	5.721

**Booby, Brown**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
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662	2014	0	0	4.219
662	2015	0	0	4.362

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**Procellariidae-Gadfly & Diving petrels**

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**Shearwater, unidentified**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
670	2014	1	7	6.624
670	2015	5	21	8.837

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**Alepisauridae-Lancetfish**

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**Longnose Lancetfish**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
121	2014	55126	241053	10347.451
121	2015	42858	204170	5480.958

**Shortnose Lancetfish**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
122	2014	2	9	5.310
122	2015	3	11	5.937

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**Balistidae-Triggerfishes**

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**Rough Triggerfish (Pelegic)**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
151	2014	2	8	5.108
151	2015	0	0	4.362

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**Bramidae-Pomfrets**

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**Pomfret, unidentified**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
180	2014	1	4	3.238
180	2015	35	161	43.318

**Sickle Pomfret**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
185	2014	633	2942	510.697
185	2015	462	2299	353.800

**Lustrous Pomfret**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
186	2014	29	139	37.508
186	2015	14	74	22.627

**Dagger Pomfret**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
187	2014	1031	4699	296.797

187                      2015                      1309                      6296                      541.647

**Rough Pomfret**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
188	2014	169	728	171.446
188	2015	101	470	96.201

**Brama Pomfret**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
189	2014	694	3634	257.318
189	2015	704	3670	381.791

**Fanfishes**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
195	2014	26	112	23.97143
195	2015	12	59	13.35755

**Carangidae-Jacks**

**Rainbow Runner**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
177	2014	1	5	4.102
177	2015	2	12	6.861

**Yellowtail**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
178	2014	0	0	4.255
178	2015	0	0	4.362

**Cottonmouth Jack**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
168	2014	2	10	6.061
168	2015	0	0	4.362

**Jack, Unidentified**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
174	2014	2	11	6.427
174	2015	0	0	4.362

**Chiasmodontidae-Swallowers**

**Swallowers**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
241	2014	29	122	23.971
241	2015	23	120	31.848

**Coryphaenidae-Dolphinfishes**

**Dolphinfish**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
218	2014	1615	7878	734.199
218	2015	1748	8524	812.642

**Pompano Dolphinfish**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
219	2014	9	46	15.852
219	2015	16	69	17.423

**Gempylidae-Snake Mackerels****Longfin Escolar**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
196	2014	439	2101	222.215
196	2015	463	2306	256.546

**Roudi Escolar**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
197	2014	28	146	27.214
197	2015	90	429	95.119

**Escolar**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
191	2014	3090	15346	1184.755
191	2015	4349	21807	1932.994

**Oilfish**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
192	2014	237	1019	147.794
192	2015	155	772	253.074

**Snake Mackerel**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
193	2014	17311	87836	6024.362
193	2015	25215	128303	7145.519

**Black Gemfish**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
194	2014	49	223	32.840
194	2015	22	102	19.639

**Unidentified Snake Mackerel**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
190	2014	1	10	9.488
190	2015	1	4	3.703

**Istiophoridae-Billfishes**

**Shortbill Spearfish**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
303	2014	320	1662	265.305
303	2015	424	2106	176.456

**Blue Marlin**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
305	2014	43	173	26.207
305	2015	56	263	30.968

**Striped Marlin**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
302	2014	228	1222	187.598
302	2015	168	844	130.072

**Sailfish**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
304	2014	7	26	9.688
304	2015	8	35	12.241

**Black Marlin**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
311	2014	0	0	4.255
311	2015	0	0	4.362

**Unidentified Billfish**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
300	2014	102	533	76.837
300	2015	129	606	57.309

**Lampridae-Opah****Opah**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
144	2014	258	1124	168.975
144	2015	284	1316	181.400

**Lophotidae-Crestfishes****Crestfishes**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
145	2014	38	171	22.222
145	2015	24	116	28.671

**Louvaridae-Louvar****Louvar**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
251	2014	0	0	4.255

251                      2015                      1                      5                      4.858

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**Molidae-Molas or Ocean sunfishes**

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**Common Mola**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
315	2014	32	145	22.182
315	2015	40	189	28.345

**Sharptail Mola**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
316	2014	22	110	25.473
316	2015	15	74	9.437

**Slender Mola**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
317	2014	247	1420	160.308
317	2015	197	1124	219.363

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**Nomeidae-Cigarfishes**

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**Cigarfishes**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
233	2014	10	54	18.054
233	2015	10	50	18.084

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**Omosudidae-Hammerjaw**

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**Hammerjaw**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
238	2014	64	332	38.380
238	2015	55	287	53.147

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**Regalecidae-Oarfish**

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**Oarfish**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
146	2014	0	0	4.255
146	2015	0	0	4.362

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**Scrombridae-Mackerels, Tunas & Seerfishes**

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**Bigeye Tuna**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
211	2014	2596	12753	1075.361
211	2015	2934	14572	1089.565

**Skipjack Tuna**

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Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
212	2014	580	2897	310.515
212	2015	886	4619	726.786

#### **Albacore Tuna**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
215	2014	35	158	34.043
215	2015	38	179	38.159

#### **Bluefin Tuna, (N. Pacific)**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
214	2014	0	0	4.255
214	2015	0	0	4.362

#### **Yellowfin Tuna**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
216	2014	328	1890	299.170
216	2015	756	3843	315.205

#### **Unidentified Tuna**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
210	2014	691	3695	526.692
210	2015	849	4170	488.421

#### **Wahoo**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
221	2014	304	1427	130.126
221	2015	329	1662	85.313

#### **Mackerel**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
224	2014	1	5	4.467
224	2015	0	0	4.362

#### **Sphyraenidae-Barracudas**

##### **Great Barracuda**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
263	2014	29	138	37.013
263	2015	59	277	56.394

#### **Tetrodontidae-Pufferfishes**

##### **Pelagic Puffer (Oceanic)**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
261	2014	51	258	42.812
261	2015	87	453	71.565

##### **Unidentified Puffer**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
260	2014	9	48	13.491
260	2015	7	40	16.530

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### Trachipteridae-Ribbonfishes

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#### Scalloped Ribbonfish

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
147	2014	5	19	7.703
147	2015	3	11	4.210

#### Tapertail Ribbonfish

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
148	2014	34	168	38.321
148	2015	71	378	71.906

#### King-of-the-Salmon

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
149	2014	0	0	4.255
149	2015	0	0	4.362

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### Trichiuridae-Cutlassfishes & Scabbardfishes

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#### Scabbardfish, other

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
230	2014	1	7	6.359
230	2015	0	0	4.362

#### Razorback Scabbardfish

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
232	2014	11	57	16.434
232	2015	10	46	11.674

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### Xiphiidae-Swordfish

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#### Swordfish (see Note 2 in key)

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
301	2014	498	NA	NA
301	2015	655	NA	NA

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### Unidentified or Identified Uncoded Fish

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#### Unidentified Fish

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
100	2014	127	561	90.790
100	2015	105	499	83.194

#### Identified Uncoded Fish

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
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101	2014	20	88	18.572
101	2015	13	60	15.367

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### **Alopiidae-Thresher Sharks**

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#### **Bigeye Thresher Shark**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
424	2014	3730	20138	3021.090
424	2015	3672	18636	3934.690

#### **Common Thresher Shark**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
425	2014	0	0	4.255
425	2015	1	4	3.559

#### **Pelagic Thresher Shark**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
426	2014	30	135	48.436
426	2015	17	86	28.170

#### **Unidentified Thresher Shark**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
420	2014	110	524	120.624
420	2015	127	648	96.482

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### **Dalatiidae-Kitefin Sharks**

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#### **Cookie Cutter Shark**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
437	2014	1	4	3.248
437	2015	1	4	4.192

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### **Carcharinidae-Requiem Sharks**

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#### **Blacktip Shark**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
406	2014	0	0	4.255
406	2015	0	0	4.362

#### **Blue Shark**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
418	2014	18916	83449	2584.423
418	2015	19284	93363	3882.622

#### **Galapagos Shark**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
407	2014	7	28	10.565
407	2015	3	14	8.018

**Gray Reef Shark**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
408	2014	0	0	4.255
408	2015	0	0	4.362

**Oceanic Whitetip Shark**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
419	2014	370	1670	162.658
419	2015	531	2654	197.563

**Sandbar Shark**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
405	2014	3	15	8.975
405	2015	4	20	7.491

**Silky Shark**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
413	2014	259	1003	264.612
413	2015	312	1665	438.434

**Tiger Shark**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
415	2014	5	28	12.972
415	2015	6	29	10.206

**Lamnidae-Mackerel Sharks****Great White Shark**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
431	2014	0	0	4.255
431	2015	0	0	4.362

**Shortfin Mako Shark**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
432	2014	800	3884	258.422
432	2015	902	4497	330.382

**Longfin Mako Shark**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
433	2014	60	254	36.047
433	2015	62	306	45.561

**Salmon Shark**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
434	2014	1	3	2.937
434	2015	0	0	4.362

**Unidentified Mako Shark**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
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430	2014	18	71	24.285
430	2015	16	68	16.441

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**Magachasmidae-Megamouth Shark**

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**Megamouth Shark**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
442	2014	0	0	4.255
442	2015	0	0	4.362

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**Odontaspidae-Sand Tiger Shark**

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**Bigeye Sand Tiger Shark**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
439	2014	1	3	2.600
439	2015	2	10	6.961

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**Pseudocarcharinidae-Crocodile Shark**

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**Crocodile Shark**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
438	2014	146	629	116.877
438	2015	219	1098	83.637

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**Sphyrnidae-Hammerhead Sharks**

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**Scalloped Hammerhead Shark**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
422	2014	0	0	4.255
422	2015	1	5	4.877

**Smooth Hammerhead Shark**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
423	2014	20	109	22.034
423	2015	24	129	39.248

**Unidentified Hammerhead Shark**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
421	2014	6	34	17.806
421	2015	12	65	22.858

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**Squalidae-Dogfishes**

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**Deepwater Dogfishes**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
436	2014	425	1782	216.107
436	2015	260	1240	142.053

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**Unidentified Sharks and Identified Uncoded Sharks**

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**Unidentified Shark**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
400	2014	199	827	104.292
400	2015	272	1240	150.882

**Identified Uncoded Shark**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
401	2014	0	0	4.255
401	2015	0	0	4.362

**Dasyatidae-Stingrays****Pelagic Stingray**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
457	2014	839	3895	198.332
457	2015	835	4191	358.931

**Mobulidae-Manta & Mobulas****Giant Manta Ray**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
455	2014	3	11	7.411
455	2015	2	10	5.786

**Mobula**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
454	2014	5	23	11.208
454	2015	12	60	14.848

**Unidentified Ray****Unidentified Ray**

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
450	2014	0	0	4.255
450	2015	4	21	10.978