American Samoa Longline Fishery Marine Mammal, Seabirds, Sea Turtles, and Fish Bycatch for Years 2014 and 2015[1]

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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 intervals— within 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 bycatch 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, https://inport.nmfs.noaa.gov/inport/item/9027.

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 shelled 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-Leatherback sea turtles

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-Albatrosses

Albatross, Black-footed

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
681	2014	0	0	1.644
681	2015	13	13	1.709

Fregatidae-Frigate birds

Frigatebird, Unidentified

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
610	2014	0	0	1.644
610	2015	0	0	1.709

Procellariidae-Gadfly & Diving petrels

Shearwater, unidentified

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
670	2014	0	0	1.644
670	2015	0	0	1.709

Alepisauridae-Lancetfish

Longnose Lancetfish

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
121	2014	659	3924	498.662
121	2015	1200	5044	745.719

Shortnose Lancetfish

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
122	2014	1	3	2.952
122	2015	0	0	1.709

Balistidae-Triggerfishes

Rough Triggerfish (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	2015	85	381	103.346

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-Needlefish

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-Dolphinfishes

Dolphinfish

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
218	2014	34	373	167.896
218	2015	23	94	31.898

Pompano Dolphinfish

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
219	2014	0	2	2.495
219	2015	1	3	3.317

Echeneidae-Remoras

Remora or Suckerfish

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
199	2014	1	4	3.662
199	2015	0	0	1.709

Gempylidae-Snake 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 Mackerel

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
190	2014	0	0	1.644
190	2015	1	1	1.709

Istiophoridae-Billfishes

Shortbill Spearfish

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
303	2014	77	502	173.593
303	2015	87	551	166.605

Blue Marlin

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
305	2014	130	700	302.098
305	2015	110	446	163.452

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

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-Crestfishes

Crestfishes

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
145	2014	54	247	55.622
145	2015	26	139	42.560

Molidae-Molas or Ocean sunfishes

Common Mola

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
315	2014	5	18	8.665
315	2015	3	9	4.449

Sharptail Mola

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
316	2014	1	4	3.662
316	2015	0	0	1.709

Slender Mola

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
317	2014	457	2223	915.371
317	2015	424	2465	882.779

Nomeidae-Cigarfishes

Cigarfishes

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
233	2014	5	24	8.402
233	2015	1	9	4.449

Omosudidae-Hammerjaw

Hammerjaw

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
238	2014	11	42	16.305
238	2015	4	20	11.326

Scrombridae-Mackerels, Tunas & Seerfishes

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. Pacific)

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
214	2014	0	0	1.644
214	2015	0	0	1.709

Yellowfin Tuna

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
216	2014	217	1665	562.714
216	2015	368	1716	360.405

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 Soapfish

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
262	2014	4	10	6.431
262	2015	1	14	9.057

Sphyraenidae-Barracudas

Great Barracuda

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
263	2014	67	501	152.190
263	2015	86	315	108.419

Tetrodontidae-Pufferfishes

Pelagic Puffer (Oceanic)

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
261	2014	1	4	2.986
261	2015	1	7	4.144

Unidentified Puffer

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
260	2014	0	0	1.644
260	2015	1	3	2.834

Trachipteridae-Ribbonfishes

Scalloped Ribbonfish

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
147	2014	0	0	1.644
147	2015	0	0	1.709

Tapertail Ribbonfish

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
148	2014	12	60	11.709
148	2015	9	50	13.780

Trichiuridae-Cutlassfishes & Scabbardfishes

Razorback Scabbardfish

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
232	2014	0	0	1.644
232	2015	3	15	8.489

Xiphiidae-Swordfish

Swordfish (see Note 2 in key)

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
301	2014	61	241	83.079
301	2015	53	237	42.724

Unidentified or Identified Uncoded Fish

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 Shark

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 Shark

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
426	2014	1	3	2.952
426	2015	0	0	1.709

Unidentified Thresher Shark

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
420	2014	5	27	14.224
420	2015	7	25	10.517

Dalatiidae-Kitefin Sharks

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-Requiem 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 Shark

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
419	2014	104	464	124.644
419	2015	168	827	151.184

Sandbar Shark

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
405	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

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

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
433	2014	11	48	19.457
433	2015	3	10	4.614

Unidentified Mako Shark

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
430	2014	0	0	1.644
430	2015	1	7	7.019

Pseudocarcharinidae-Crocodile Shark

Crocodile Shark

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
438	2014	10	32	20.864
438	2015	3	14	7.903

Sphyrnidae-Hammerhead Sharks

Scalloped Hammerhead Shark

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
422	2014	1	6	4.115
422	2015	1	3	3.317

Smooth Hammerhead Shark

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
423	2014	1	3	2.952
423	2015	0	0	1.709

Unidentified Hammerhead Shark

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
421	2014	0	0	1.644
421	2015	1	7	7.019

Squalidae-Dogfishes

Deepwater Dogfishes

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
436	2014	9	25	22.325
436	2015	1	3	2.834

Unidentified Sharks and Identified Uncoded Sharks

Unidentifed Shark

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
400	2014	5	14	5.996
400	2015	10	58	23.664

Identifed Uncoded Shark

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
401	2014	0	0	1.644
401	2015	0	0	1.709

Dasyatidae-Stingrays

Pelagic Stingray

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
457	2014	1469	6416	1071.552
457	2015	1767	9267	1513.494

Mobulidae-Manta & Mobulas

Giant Manta Ray

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
455	2014	1	2	2.495
455	2015	0	3	3.317

Mobula

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
454	2014	2	8	4.429
454	2015	4	15	5.308

Manta/Mobula Ray

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
453	2014	1	3	2.952
453	2015	0	0	1.709

Unidentified Ray

Unidentified Ray

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
450	2014	0	5	4.507
450	2015	3	13	8.357

Delphinidae-Dolphins

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 Whale

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 Dolphin

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
SB	2014	0	0	1.644
SB	2015	0	0	1.709

Ziphiidae-Beaked Whale

Cuviers Beaked Whale

Species Code	Landing Year	Observed Bycatch	Point Estimate	Standard Error
ZI	2014	0	0	1.644
ZI	2015	0	0	1.709