Preliminary Results on the Diet of Laysan Albatross and the Use of Fisheries By-caught Marine Birds in Investigations of Natural Feeding Strategy

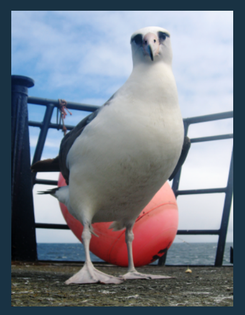

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Table 1. Taxonomic summary of the number and frequency of occurrence (FO) of naturally occurring food remains identified from the stomachs of fisheries by-caught Laysan albatrosses collected in the Hawaiian and Alaska regions.

	HAWAIIAN REGION (N = 50)				ALASKAN REGION (N = 65)			
	N	% N	FO	% FO	N	% N	FO	% FO
TOTALS	**337**	**100.0**	**50**	**100.0**	**534**	**100.0**	**65**	**100**
FISHES	**19**	**5.6**	**11**	**22.0**	**39**	**7.3**	**12**	**18.5**
Eptatretidae								
Eptatretus sp.	1	0.3	1	2.0	2	0.4	2	3.1
Synaphobrachiidae								
Synaphobrachius sp.	1	0.3	1	2.0	1	0.2	1	1.5
Phosichthyidae								
Vinciguerria sp.	3	0.9	1	2.0	-	-	-	-
Myctophidae	**10**	**3.0**	**5**	**10.0**	**1**	**0.2**	**1**	**1.5**
Stenobrachius leucopsaurus	-	-			1	0.2	1	1.5
Lampanyctus jordani	3	0.9	2	4.0	-	-	-	-
Tarletonbeania sp.	2	0.6	2	4.0	-	-	-	-
Bolinichthys pyrsobolus	1	0.3	1	2.0	-	-	-	-
Myctophum sp.	2	0.6	1	2.0	-	-	-	-
unident. myctophids	2	0.6	2	4.0	-	-	-	-
Paralepididae								
Paralepis atlantica	-	-	-	-	1	0.2	1	1.5
Trichluridae								
Benthodesmus sp.	1	0.3	1	2.0	-	-	-	-
Tetragonuridae								
Tetragonurus cuvieri	1	0.3	1	2.0	-	-	-	-
Moridae								
Antimora rostratus	-	-	-	-	1	0.2	1	1.5
Macrouridae *	**1**	**0.3**	**1**	**2.0**	**33**	**6.2**	**12**	**18.5**
Coryphaenoides cinereus	-	-	-	-	21	3.9	9	13.8
Coryphaenoides acrolepis	-	-	-	-	11	2.1	3	4.6
unident. macrourid	1	0.3	1	2.0	1	0.2	1	1.5
Tetradontidae								
Arothron sp.	1	0.3	1	2.0	-	-	-	-
CEPHALOPODS	**315**	**93.5**	**46**	**92.0**	**477**	**89.3**	**61**	**93.8**
Enoploteuthidae	**3**	**0.9**	**3**	**6.0**	**2**	**0.4**	**2**	**3.1**
Ancistrocheirus lesueuri	2	0.6	2	4.0	-	-	-	-
Abraliopsis sp.	1	0.3	1	2.0	1	0.2	1	1.5
Enoploteuthis sp.	-	-	-	-	1	0.2	1	1.5
Octopoteuthidae	**10**	**3.0**	**4**	**8.0**	**20**	**3.7**	**16**	**24.6**
Octopoteuthis deletron	7	2.1	2	4.0	19	3.6	16	24.6
Octopoteuthis neilsoni	1	0.3	1	2.0	1	0.2	1	1.5
Octopoteuthis sp.	1	0.3	1	2.0	-	-	-	-
Taningia danae	1	0.3	1	2.0	-	-	-	-
Onychoteuthidae	**10**	**3.0**	**6**	**12.0**	**28**	**5.2**	**14**	**21.5**
Onychoteuthis compacta	5	1.5	4	8.0	21	3.9	6	9.2
Onychoteuthis borealijaponica	2	0.6	2	4.0	7	1.3	7	10.8
Onykia sp. A	3	0.9	2	4.0	-	-	-	-
Gonatidae	**70**	**20.8**	**16**	**32.0**	**148**	**27.7**	**44**	**67.7**
Gonatopsis borealis	10	3.0	4	8.0	28	5.2	18	27.7
Gonatopsis sp. A	6	1.8	3	6.0	-	-	-	-
Berryteuthis anonychus	26	7.7	3	6.0	51	9.6	8	12.3
Eogonatus tinro	2	0.6	1	2.0	13	2.4	9	13.8
Gonatus berryi	6	1.8	6	12.0	3	0.6	3	4.6
Gonatus pyros	10	3.0	8	16.0	19	3.6	13	20.0
Gonatus onyx	1	0.3	1	2.0	4	0.7	3	4.6
Gonatus californiensis	-	-	-	-	3	0.6	2	3.1
Gonatus middendorffi	6	1.8	3	6.0	15	2.8	13	20.0
Gonatus spp. (damaged)	3	0.9	2	4.0	12	2.2	10	15.4
Histioteuthidae	**72**	**21.4**	**27**	**54.0**	**41**	**7.7**	**24**	**36.9**
Stigmatoteuthis hoylei	14	4.2	12	24.0	6	1.1	5	7.7
Stigmatoteuthis dofleini	5	1.5	4	8.0	4	0.7	4	6.2
Histioteuthis sp. A	1	0.3	1	2.0	-	-	-	-
Histioteuthis berryi	2	0.6	1	2.0	-	-	-	-
Histioteuthis oceani	18	5.3	9	18.0	1	0.2	1	1.5
Histioteuthis heteropsis	4	1.2	2	4.0	10	1.9	10	15.4
Histioteuthis spp. (damaged)	27	8.0	15	30.0	14	2.6	8	12.3
unid. histioteuthids	1	0.3	1	2.0	6	1.1	2	3.1
Psycroteuthidae								
Discoteuthis discus	1	0.3	1	2.0	-	-	-	-
Architeuthidae								
Architeuthis sp. (juven.)	1	0.3	1	2.0	-	-	-	-
Ommastrephidae								
unid.Ommastrephidae (juven.)	2	0.6	2	4.0	-	-	-	-
Cycloteuthidae								
Cycloteuthis sirventyi	1	0.3	1	2.0	-	-	-	-
Chiroteuthidae	**7**	**2.1**	**6**	**12.0**	**27**	**5.1**	**18**	**27.7**
Chiroteuthis calyx	2	0.6	2	4.0	17	3.2	13	20.0
Chiroteuthis picteti	-	-	-	-	1	0.2	1	1.5
Chiroteuthis sp. (p) (damaged)	3	0.9	3	6.0	1	0.2	1	1.5
Grimalditeuthis bonplandi	2	0.6	2	4.0	8	1.5	5	7.7
Mastigoteuthidae	**5**	**1.5**	**5**	**10.0**	**7**	**1.3**	**7**	**10.8**
Mastigoteuthis microlucens	1	0.3	1	2.0	-	-	-	-
Mastigoteuthis pyrodes	3	0.9	3	6.0	7	1.3	7	10.8
Mastigoteuthis sp. A	1	0.3	1	2.0	-	-	-	-
Cranchiidae	**95**	**28.2**	**33**	**66.0**	**184**	**34.5**	**51**	**78.5**
Taonius belone	54	16.0	14	28.0	16	3.0	6	9.2
Taonius borealis	38	11.3	25	50.0	166	31.1	48	73.8
Galiteuthis phyllura	1	0.3	1	2.0	1	0.2	1	1.5
Megalocranchia sp.(juven.)	1	0.3	1	2.0	1	0.2	1	1.5
Helicocranchia sp.	1	0.3	1	2.0	-	-	-	-
unidentifiable oegopsid beaks	33	9.8	16	32.0	19	3.6	15	23.1
Bolitaenidae								
Japetella sp.	2	0.6	2	4.0	1	0.2	1	1.5
Alloposidae								
Haliphron atlantica	2	0.6	2	4.0	-	-	-	-
Vampyroteuthidae								
Vampyroteuthis infernalis	1	0.3	1	2.0	-	-	-	-
OTHER INVERTEBRATES								
unident. shrimp	3	0.9	1	2.0	-	-	-	-
Halobates sp.	-	-	-	-	18	3.4	1	1.5

* Currently, classification of the grenadier family Macrouridae as a naturally occurring food species is tentative additional research may reveal these fishes to be introduced as fishery by-catch.

BACKGROUND

National Marine Fisheries Service (NOAA Fisheries) certified fisheries observers deployed to commercial fishing vessels have been collecting marine bird carcasses periodically from 2000 to present, with extra emphasis on this work beginning in 2006. While the collection of birds is ongoing, to date, observers have returned well over 1,000 marine birds from these fisheries, which include the Hawaiian pelagic longline fisheries and the Alaskan groundfish trawl and demersal longline fisheries. Birds are returned to NMFS offices in Alaska or Hawaii, processed, and then shipped to our partners Oikonos for necropsy. Detailed stomach content examination is a high priority component of the necropsy procedure of all birds collected.

METHODS

To date, food items from the stomachs of 115 Laysan (*Phoebastria immutabilis*, LAAL) and 54 Black-footed albatrosses (*Phoebastria nigripes*, BFAL) collected during the 2005 to 2011 period have been identified to the lowest possible taxon. Species identification and enumeration of food remains utilized bones and otoliths (fish) and lower beaks of cephalopods. Food remains were classified into two categories:

1) fisheries introduced food items; those species ingested through fisheries interactions such as longline bait, offal from fish processors and discarded by-catch

2) naturally occurring food items; those species ingested independently of fisheries activity

For purposes of this study, we elected to eliminate the fisheries introduced food component of the samples and report only on the naturally occurring food items. Due to the currently low sample sizes of BFAL in both the Alaskan and Hawaiian fishery samples, we also elected to confine this preliminary study to the Laysan albatross sample.

RESULTS

Preliminary results from this study indicate that while Laysan albatrosses are opportunistically taking advantage of the various fisheries activities in the offshore waters of the Gulf of Alaska, Bering Sea and Hawaiian Island regions, they also exhibit the same natural feeding strategy in both regions. Both the Alaskan (AK) and Hawaiian (HI) samples were very similar in that, by number, a wide variety of mesopelagic cephalopods composed approximately 90% of the naturally occurring dietary component. Fish species were of decidedly lesser importance in both the AK and HI regions in that, by number, they represented only 7.3% and 5.6% (respectively) of the food component (Table 1). Due to retention of beaks and the well- documented long distance flight capabilities of albatrosses, there is considerable overlap of cephalopod species endemic to the central tropical (HI) and northern sub-arctic (AK) current systems in both samples. However, it is evident that there are general similarities in the feeding strategy in that collectively, by number, 70% of the diet in both the AK and HI samples is made up of mesopelagic cephalopods representing the families, Gonatidae, Histioteuthidae and Cranchiidae. These findings are very similar to the findings of Pitman et al. (2004) who reported 72.2 % by number for these families in the diet of LAAL nesting on Guadalupe Island, Mexico.

At-sea bird sampling and laboratory identification of stomach contents are still in progress. Collection of additional LAAL and BFAL diet samples is currently a priority. The increase in sample size for both species will allow for reliable comparison of the natural diet in the future and should allow for more detailed investigation into the temporal and spatial aspects of bird feeding strategy. In addition, increased data on cephalopod beak measurements will also allow for accurate estimation of length frequency and state of maturity of the dominant mesopelagic cephalopods in the diet.

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