

Alaska Fisheries Science Center  
Resource Ecology & Fisheries Management  
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Seattle, WA 98115  
June 1, 2015

## **Cruise Report**

### **F/T Seafisher Cruise**

#### **SF201501 (April 4- May 6 2015)**

**Project Title: Atka Mackerel Tag Recovery Cruise, Central and Western Aleutian Islands, Alaska**

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#### **SCIENTIFIC PURPOSE**

The goal of our on-going tag release-recovery studies is to determine the efficacy of trawl exclusion zones (TEZs) as a management tool to protect critical habitat. TEZs have been established around Steller sea lion rookeries to protect sea lion habitat and prey resources, including local populations of prey such as Atka mackerel. Localized fishing may affect Atka mackerel abundance and distribution near sea lion rookeries. Our tagging experiments estimate local abundance and movement between areas open and closed to the Atka mackerel fishery. From 1999 through 2014, a total of approximately 130,000 tagged Atka mackerel have been released in the central and western Aleutian Islands. To date, over 3,000 tagged Atka mackerel have been recovered. These data have contributed greatly to our understanding of small-scale movements and distributions of Atka mackerel around sea lion rookeries.

In May and June 2014, a cooperative venture between the North Pacific Fisheries Foundation and NMFS tagged and released approximately over 20,000 fish in the Western Aleutian Islands (Buldir Island, WAI Seamounts, Aggatu Island, and Ingenstrem Rock) as well as Seguam Pass in the Central Aleutian Islands. The primary objective of this cruise on the F/T Seafisher was to recover these tagged fish both in areas open to the Atka mackerel fishery and within trawl exclusion zones that are closed to the fishery (Figures 1-2). Recovery of tagged fish is also being augmented by the fishery outside of trawl exclusion zones.

Additional objectives included collecting Atka mackerel biological data including stomach samples, gonad samples, and age structures. We also conducted 4 special projects at the request of other researchers: stomach collections from the predominant fish species encountered, stable isotope samples for dietary and mercury content analysis from a range of fish species, rockfish maturity samples, and Pacific cod maturity samples.

#### **PARTICIPANTS**

Susanne McDermott	Lead Scientist/NMFS
Phil Dang	Scientific Liasion/NPFF
Mike Levine	Watch leader/Contract Biologist
Troy Buckley	Factory leader/NMFS

Ellen Sikes	Factory Scientist/Contract biologist
John Edwards	Factory Scientist/Contract biologist
Monette Schwoerer	Factory Scientist/Contract biologist

## **CRUISE SCHEDULE**

04 April	Depart Dutch Harbor, AK
05 April	Tag recovery tows, Seguam Pass
06-08 April	Transit to Western Aleutian Islands
08-16 April	Tag recovery tows, Western Aleutian Islands
17 April	Offload, Kiska Island
18-27 April	Tag recovery tows, Western Aleutian Islands
27 April-01 May	Offload, Adak Island; Transit to Seguam Pass
01 May-04 May	Tag recovery tows, Seguam Pass
05 May	Transit to Dutch Harbor; offload
06 May	Disembarked vessel, Dutch Harbor

## **Summary of Results**

During May-June 2014, we released 6411 tagged Atka mackerel at Seguam Pass and 14375 tagged Atka mackerel in the Western Aleutian Islands. The current tag recovery effort onboard the Seafisher was the second tag recovery cruise of the study. As with the initial Seafisher cruise in October 2014, this study was conducted both inside and outside of trawl exclusion zones (TEZs). In January 2015, the Western Aleutian Islands (Area 543) were opened to the Atka mackerel fishery for the first time since 2011; the fishery has provided another source of tag recovery in the open areas outside of the TEZs. At Seguam Pass (Area 541), the fishery has been, and will continue to, provide additional tag recovery outside of the TEZ.

During this cruise, we conducted 132 total trawl hauls. We examined 1,016,127 Atka mackerel (790.62 metric tons) for tags at Seguam Pass and 2,409,483 Atka mackerel (1133.59 metric tons) for tags in the Western Aleutian Islands. Figures 1 and 2 show the locations of tag recovery and release tows. Table 1 shows the number of tows, the total Atka mackerel catch, and the total bycatch of species other than Atka mackerel in each study area. Total bycatch was 107.38 mt in Seguam Pass and 1241.71 mt in the Western Aleutian Islands.

### ***Length-frequency distribution***

Approximately 100 fish were randomly collected, sexed and lengthed per haul in all study areas for a total of 12,368 lengths collected. Figure 3 and Table 2 summarize the length frequency distributions for Atka mackerel in each study area by sex. Figure 4 compares the observed length frequencies from each cruise (May-June 2014, October 2014, and the current cruise). In general, the largest Atka mackerel were found at study sites located near shore (Seguam Pass, Buldir, Kiska, and Agattu) while considerably smaller fish were found at the offshore seamounts (Tahoma Reef, Tahoma Seamount, Heck Canyon, and Walls Plateau).

We also examined the sex ratio of Atka mackerel (percentage of male fish: percentage of female fish) to identify areas where habitat use may differ by sex (Figures 5 and 6). At Agattu and in Seguam Pass stratum 3 and 4, a relatively high percentage of female Atka mackerel were captured; relatively more male fish were captured at Heck Canyon and at Kiska. However we conducted only 2 hauls at Kiska and sample size was low (185 sexed lengths collected). In all other locations, a nearly equal proportion of male and female fish were captured.

### ***Wild tag recoveries***

A total of 40 wild tags were recovered. Tag recoveries are summarized by area and strata in Table 3. 'Wild tagged' fish are fish that were tagged and released during the tag release cruise as opposed to tagged fish that were seeded into the catch already on board during the tag recovery cruise to obtain the tag reporting rate (see below).

### ***Tag reporting rate***

Reporting rate is defined as the proportion of tagged fish caught by the vessel that are actually found and reported. To determine tag reporting rate, scientists tagged 10 Atka mackerel per haul and distributed them randomly throughout the catch. Seeded tagged fish appeared identical to wild tagged fish and could only be distinguished by their tag number. This was done for nearly all hauls during the cruise. These seeded tagged fish were recovered in the factory by the vessel and scientific crew. The tag reporting rate is summarized in Table 4. Tag reporting rates were approximately 95% for single tagged fish and 99% for double tagged fish.

### ***Biological samples***

Table 5 summarizes the biological samples taken from Atka mackerel during the tag recovery cruise. Samples were randomly collected from 10 fish (5 females and 5 males) from almost every tow for a total of 1070 biological samples collected. All 1070 samples consisted of a stomach and otolith collection. In approximately half of all samples, we also collected gonads. In addition, we noted gross maturity stage for both sexes and male spawning coloration for every lengthed male Atka mackerel.

### ***Species Catch Composition***

A total of 117 other species or species groups were caught during the hauls in each of the study areas (Appendix 1). The most abundant bycatch species were northern rockfish (697.74 mt), Pacific ocean perch (419.07 mt), and Pacific cod (151.32 mt). Approximately 94% of the bycatch (by weight) consisted of these three species. The total catch of all species is summarized in Table 1 and Appendix 1.

### ***Special projects***

We conducted four special projects at the request of other researchers. The species and sample size for each collection is summarized in Table 6. A brief outline of each project follows below:

#### 1. Aleutian Islands Stomach Collection

Requested by:

Troy Buckley

Alaska Fisheries Science Center

Troy.Buckley@noaa.gov

Stomach samples were collected from a variety of species, especially the Aleutian Island core species of walleye pollock, Pacific cod, arrowtooth flounder, Pacific ocean perch, and Northern rockfish. These samples were especially valuable as they were taken during the spring season, when few stomach samples from the Aleutian Islands have been collected.

#### 2. Maturity collections for female rockfish in the Aleutian Islands

Requested by:

Todd Tenbrink

Alaska Fisheries Science Center

Todd.Tenbrink@noaa.gov

This project is part of a larger study focusing on data-poor commercial rockfish species in the Aleutian Islands. We collected ovary and otolith samples from female harlequin, shortraker, and shortspine thornyhead rockfish. This information will help to improve the understanding of age and length at maturity for these rockfish species.

### 3. Stable isotope and mercury analysis

Requested by:

Lori Rea  
University of Alaska Fairbanks  
ldrea@alaska.edu

This collection was part of an ongoing project in the Aleutian Islands. The goal of this project is to improve the ability to model the diet composition of Steller sea lion females in the Aleutian Islands using stable isotopes, and to try to understand which potential prey species may be contributing to accumulation of high mercury concentrations in some sea lions in the western Aleutian Islands.

### 4. Pacific cod maturity collection

Requested by:  
Sandi Neidetcher  
Alaska Fisheries Science Center  
Sandi.Neidetcher@noaa.gov

This collection was part of an ongoing project in the Aleutian Islands. The goal of this project is to improve knowledge of the spawning strategy along with rates of maturation, and the location and phenology of Pacific cod spawning.

### ***Underwater Camera tows***

During this cruise we attempted to conduct underwater camera tows to identify fish species composition and size as well as fish association with differing substrate types. However, we lost our camera system after it hung up at Heck Canyon in an early testing run. The heroic efforts of chief engineer Ben Dupree, factory engineer Khan Le, and Phil Dang were nearly enough to get this project back on track, but the damage to the winch was unfortunately too extensive to repair at sea. However, we sincerely appreciate all of the time and effort Ben Dupree spent repairing the winch and Khan Le spent to build a new camera cage and davit.

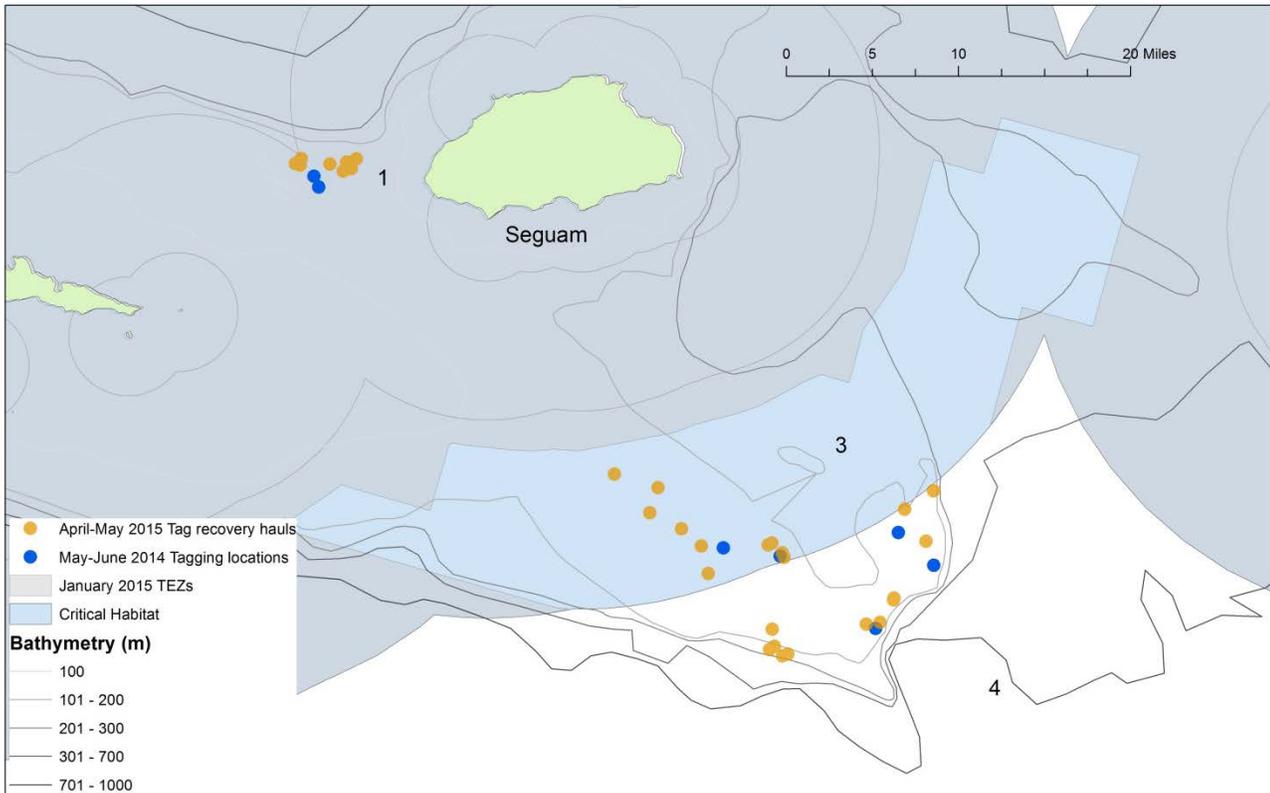


Figure 1. Location of tag recovery hauls (orange) and tag release locations (blue) at Seguam Pass (Area 541). Numbers on map indicate research strata.

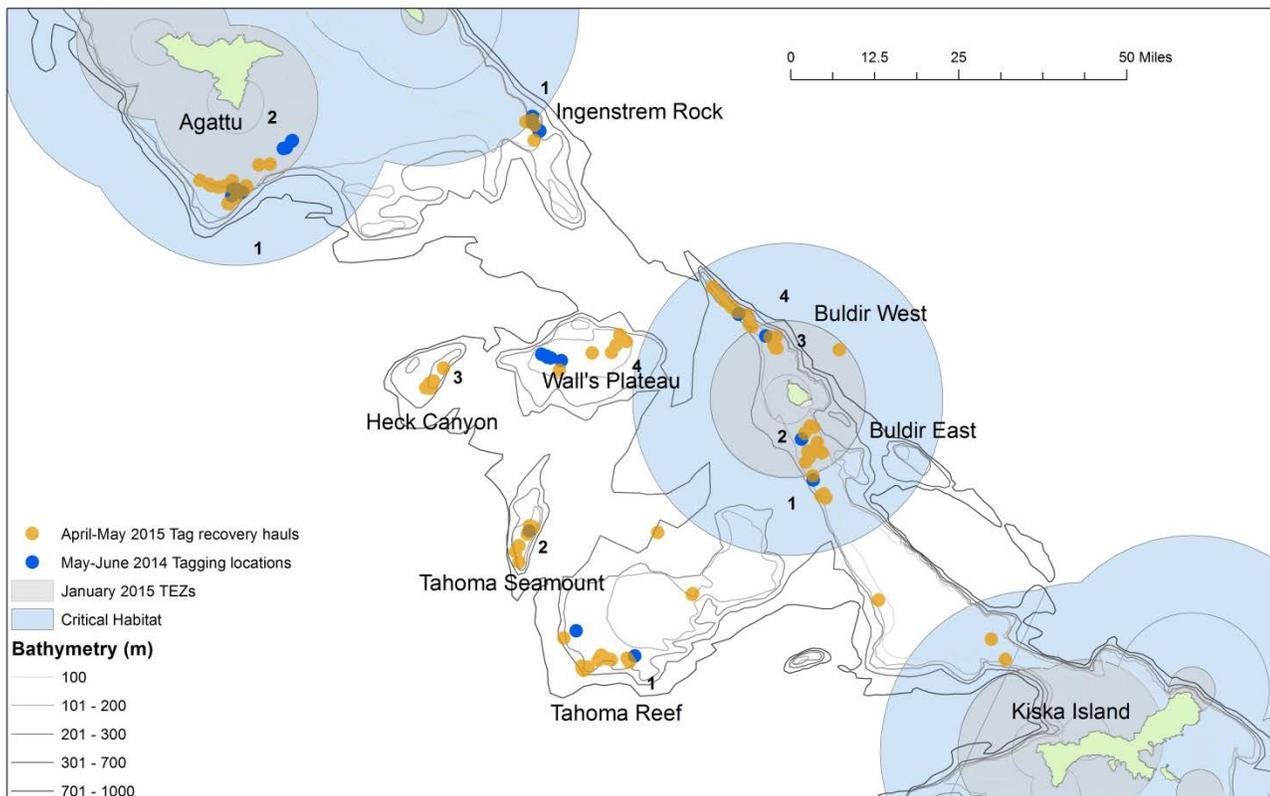


Figure 2. Location of tag recovery hauls (orange) and tag release locations (blue) in the Western Aleutian Islands (area 543). Numbers on map indicate research strata.

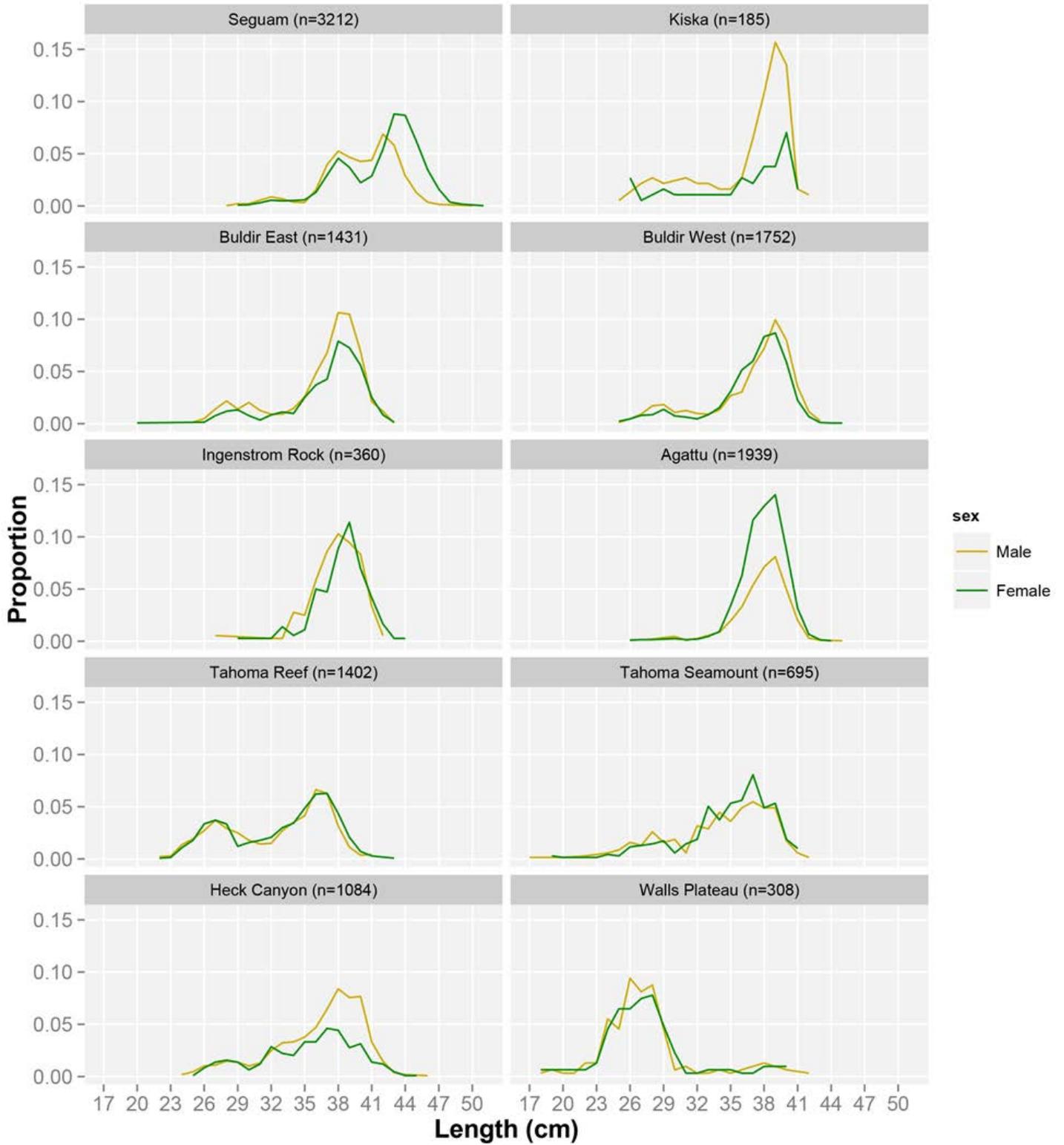


Figure 3. Size frequency of male and female Atka mackerel by length at each study area.

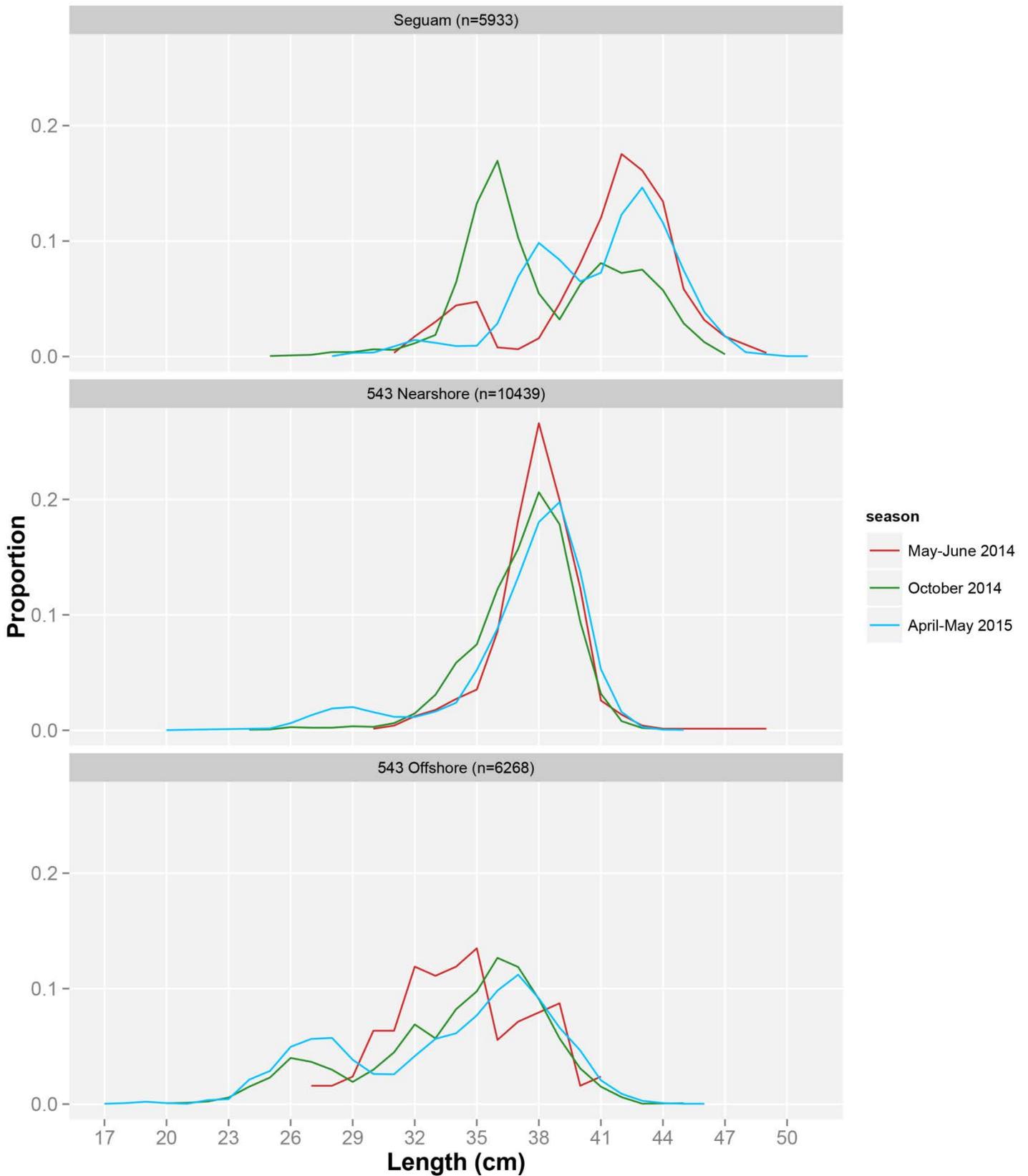


Figure 4. Size frequency distribution of Atka mackerel during the tag release cruise (May-June 2014) and the two tag recovery cruises (October 2014 and April-May 2015). The group “543 Nearshore” consists of Kiska, Buldir East, Buldir West, Ingenstrom Rock, and Agattu; the group “543 Offshore” consists of Tahoma Reef, Tahoma Seamount, Heck Canyon, and Walls Plateau.

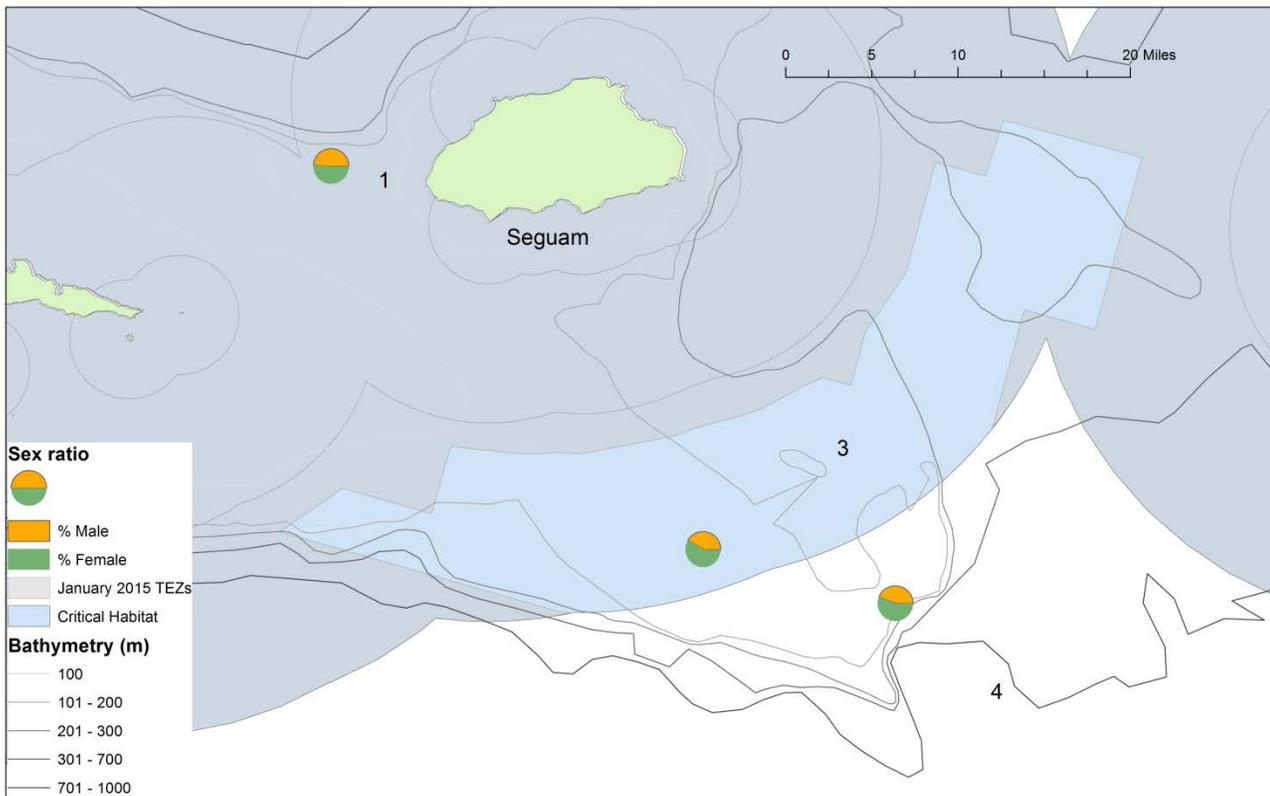


Figure 5. Sex ratio of Atka mackerel at Seguam Pass (Area 541).

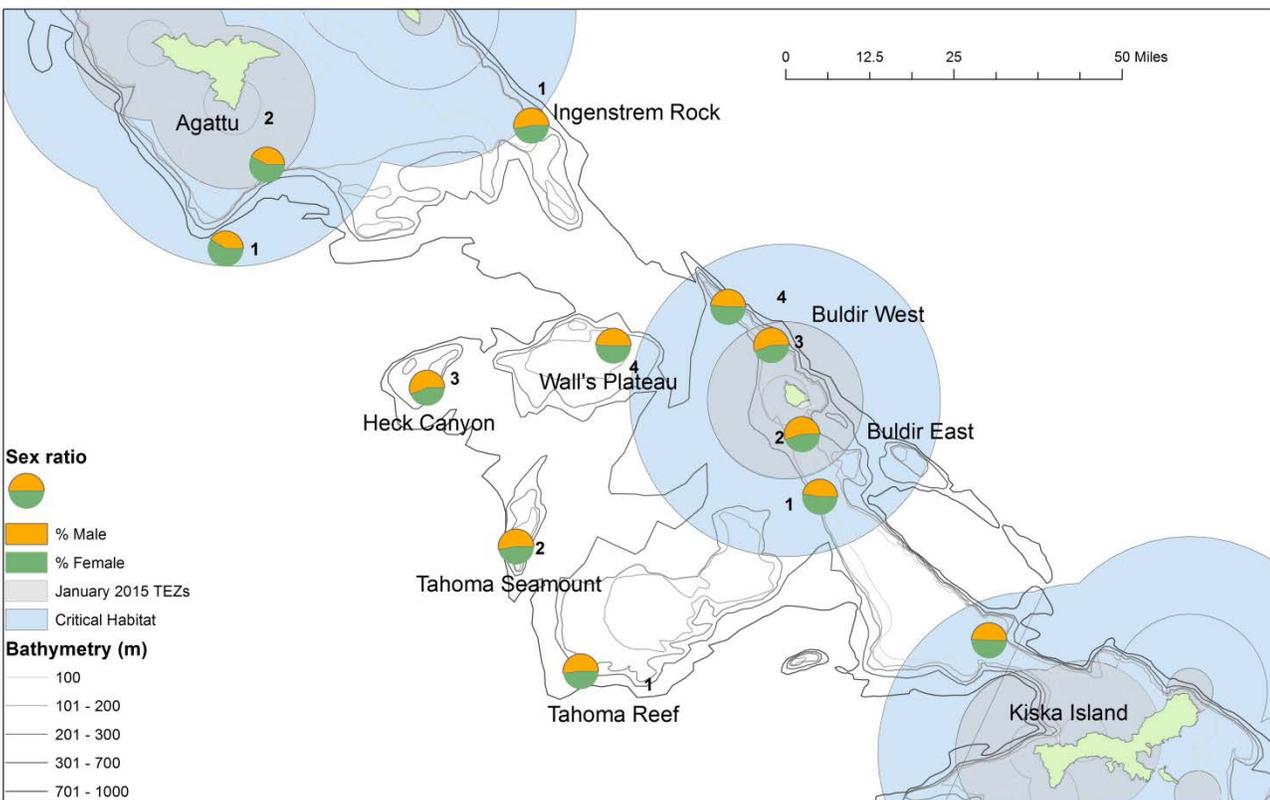


Figure 6. Sex ratio of Atka mackerel in the Western Aleutian Islands (area 543).

Table 1. Fishing effort in each area and stratum, Atka mackerel catch, and other species catch.

Area	Stratum	No. of Hauls	Atka mackerel (thousands of fish captured)	Atka mackerel catch (mt)	Atka mackerel average weight (g)	Other Species Catch (mt)	% Atka mackerel in catch
Seguam	1	10	570.95	453.89	794.97	31.03	93.60
	3	10	226.64	183.18	808.23	47.87	79.28
	4	12	218.54	153.56	702.66	28.48	84.35
<b>Kiska Island</b>	1	2	15.60	9.23	592.01	18.46	33.34
<b>Buldir East</b>	1	6	60.48	34.23	566.00	58.30	36.99
	2	10	55.17	31.52	571.41	114.94	21.52
<b>Buldir West</b>	3	5	73.89	40.83	552.57	64.41	38.80
	4	12	626.68	346.60	553.08	154.15	69.22
<b>Ingenstrom Rock</b>	1	5	22.45	15.45	688.12	64.30	19.37
<b>Agattu</b>	1	13	295.38	179.52	607.76	200.75	47.21
	2	6	50.08	28.53	569.71	73.33	28.01
<b>Tahoma Reef</b>	1	17	276.10	101.18	366.46	266.12	27.55
<b>Tahoma Seamount</b>	2	7	340.29	149.47	439.23	90.45	62.30
<b>Heck Canyon</b>	3	11	300.00	143.63	478.76	126.62	53.15
<b>Walls Plateau</b>	4	6	293.39	53.40	182.01	9.88	84.39

Table 2. Male, female, and combined average lengths of Atka mackerel in each study area. n= number of Atka mackerel measured.

Area	Male length (cm)	n	Female length (cm)	n	combined length (cm)	n
<b>Seguam</b>	39.96	1440	41.76	1772	40.95	3212
<b>Kiska Island</b>	36.69	129	35.82	56	36.43	185
<b>Buldir East</b>	36.50	826	36.88	605	36.66	1431
<b>Buldir West</b>	36.83	908	36.84	844	36.83	1752
<b>Ingenstrom Rock</b>	37.82	190	38.29	170	38.04	360
<b>Agattu</b>	37.65	706	37.90	1233	37.81	1939
<b>Tahoma Reef</b>	32.52	682	32.91	720	32.72	1402
<b>Tahoma Seamount</b>	34.04	336	34.76	359	34.42	695
<b>Heck Canyon</b>	36.25	661	35.33	423	35.89	1084
<b>Walls Plateau</b>	27.17	158	27.51	150	27.34	308

Table 3. Number of tags released in May-June 2014 and number of tags recovered in each study area during the current tag recovery trip.

<b>Area</b>	<b>Stratum</b>	<b>Tags released</b>	<b>Tags recovered</b>
<b>Seguam</b>	1	2135	2
	3	2090	4
	4	2186	1
<b>Kiska Island</b>	1	0	0
<b>Buldir East</b>	1	913	1
	2	1143	0
<b>Buldir West</b>	3	2449	0
	4	1951	19
<b>Ingenstrom Rock</b>	1	1888	3
<b>Agattu</b>	1	1663	6
	2	597	0
<b>Tahoma Reef</b>	1	211	0
<b>Tahoma Seamount</b>	2	551	4
<b>Heck Canyon</b>	3	0	0
<b>Walls Plateau</b>	4	3009	0
<b>Total</b>		<b>20786</b>	<b>40</b>

Table 4. Tag reporting rate for all areas.

<b>Tags</b>	<b>Number released</b>	<b>Number recovered</b>	<b>Percent recovered</b>
Single pink tag	1152	1100	95.49
Double pink tag	128	127	99.22

Table 5. Number of Atka mackerel biological samples in each study area.

<b>Area</b>	<b>Stratum</b>	<b>Number of biological samples</b>
<b>Seguam</b>	1	100
	3	70
	4	80
<b>Kiska Island</b>	1	20
<b>Buldir East</b>	1	40
	2	70
<b>Buldir West</b>	3	40
	4	120
<b>Ingenstrom Rock</b>	1	40
<b>Agattu</b>	1	120
	2	50
<b>Tahoma Reef</b>	1	130
<b>Tahoma Seamount</b>	2	70
<b>Heck Canyon</b>	3	90
<b>Walls Plateau</b>	4	30
<b>Total</b>		<b>1070</b>

Table 6. Special project specimen collection. Numbers are total number of samples collected per species across all study areas.

Species	Specimen type			Stomach
	Isotope	P Cod maturity	Rockfish maturity	
Arrowtooth flounder	7			28
Atka mackerel	70			See Table 5
Bigmouth sculpin	1			
Blackspotted rockfish	1			44
Dark rockfish				1
Darkfin sculpin	1			31
Flathead sole				11
Harlequin rockfish			41	32
Kamchatka flounder	2			18
Light dusky rockfish	3			68
Longfin Irish lord	2			
Northern rock sole				13
Northern rockfish	16			399
Octopus Sp.	1			
Pacific cod	20	61		169
Pacific Halibut				20
Pacific ocean perch				321
Redbanded rockfish				2
Rex sole				9
sculpin unident.				2
Searcher				11
Shortraker rockfish			1	3
Shortspine thornyhead			7	14
Squid	20			
Walleye pollock	21			44
Whiteblotch skate				4
Yellow Irish lord	20			72
Walleye pollock				19
Southern rock sole				1
<b>Total</b>	<b>185</b>	<b>61</b>	<b>49</b>	<b>1346</b>

Appendix 1. Total catch (MT) in each study area.

Species	Area 541	Area 543									Grand Total
	Seguam	Kiska Island	Buldir East	Buldir West	Ingenstrom Rock	Agattu	Tahoma Reef	Tahoma Seamount	Heck Canyon	Walls Plateau	
<b>Grand Total</b>	<b>898.01</b>	<b>27.70</b>	<b>238.99</b>	<b>605.99</b>	<b>79.75</b>	<b>482.13</b>	<b>367.30</b>	<b>239.92</b>	<b>270.24</b>	<b>63.28</b>	<b>3273.30</b>
<b>Atka mackerel</b>	<b>790.62</b>	<b>9.23</b>	<b>65.75</b>	<b>387.43</b>	<b>15.45</b>	<b>208.05</b>	<b>101.18</b>	<b>149.47</b>	<b>143.63</b>	<b>53.40</b>	<b>1924.21</b>
northern rockfish	22.14	13.71	145.93	179.19	36.43	196.67	52.45	14.76	35.65	<1 MT	697.74
Pacific ocean perch	9.15	0.00	12.59	18.93	6.98	2.94	202.61	72.97	84.94	7.96	419.07
Pacific cod	50.66	4.68	8.34	15.62	5.88	65.99	0.00	<1 MT	<1 MT	<1 MT	151.32
yellow Irish lord	6.30	0.00	<1 MT	<1 MT	<1 MT	1.51	4.74	<1 MT	<1 MT	0.00	13.90
walleye pollock	<1 MT	0.00	<1 MT	<1 MT	12.87	<1 MT	0.00	<1 MT	<1 MT	<1 MT	13.65
whiteblotched skate	11.46	0.00	<1 MT	0.00	0.00	0.00	<1 MT	0.00	0.00	0.00	11.66
prowfish	<1 MT	<1 MT	<1 MT	1.47	<1 MT	<1 MT	1.43	<1 MT	3.24	<1 MT	9.01
leopard skate	<1 MT	0.00	1.57	1.14	<1 MT	1.03	1.45	<1 MT	<1 MT	<1 MT	5.77
light dusky rockfish	2.49	<1 MT	<1 MT	<1 MT	1.14	1.21	<1 MT	<1 MT	<1 MT	<1 MT	5.26
darkfin sculpin	<1 MT	0.00	<1 MT	<1 MT	0.00	<1 MT	<1 MT	<1 MT	1.30	<1 MT	2.76
sponge unident.	<1 MT	<1 MT	1.53	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT	2.72
dusky rockfish unident.	<1 MT	0.00	0.00	<1 MT	<1 MT	1.71	0.00	0.00	0.00	0.00	2.33
Aleutian skate	<1 MT	0.00	<1 MT	<1 MT	0.00	0.00	<1 MT	<1 MT	<1 MT	<1 MT	2.19
Pacific halibut	2.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.15
blackspotted rockfish	<1 MT	0.00	<1 MT	<1 MT	0.00	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT	1.39
northern rock sole	<1 MT	0.00	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT	0.00	0.00	0.00	1.01
bubblegum coral	<1 MT	0.00	<1 MT	<1 MT	<1 MT	<1 MT	0.00	<1 MT	<1 MT	<1 MT	<1 MT
arrowtooth flounder	<1 MT	0.00	<1 MT	<1 MT	0.00	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT
harlequin rockfish	<1 MT	0.00	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT
squid unident.	<1 MT	0.00	<1 MT	0.00	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT
bigmouth sculpin	<1 MT	0.00	0.00	<1 MT	0.00	<1 MT	0.00	0.00	0.00	0.00	<1 MT
basketstarfish unident.	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT
Kamchatka flounder	<1 MT	0.00	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT
rex sole	0.00	0.00	0.00	<1 MT	<1 MT	<1 MT	<1 MT	<1 MT	0.00	<1 MT	<1 MT
flathead sole	0.00	0.00	0.00	0.00	<1 MT	<1 MT	<1 MT	0.00	0.00	0.00	<1 MT
rock	<1 MT	0.00	<1 MT	<1 MT	0.00	<1 MT	<1 MT	0.00	<1 MT	<1 MT	<1 MT
shortspine thornyhead	0.00	0.00	0.00	0.00	0.00	0.00	<1 MT	<1 MT	<1 MT	0.00	<1 MT





