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Title: SSL Groundfish Prey Fields in the Aleutian Islands

Authors: AFSC Fisheries Interaction Team: Elizabeth A Logerwell, Steven J. Barbeaux, M. Elizabeth Conners, Susanne F. McDermott, Sandra K. Neidetcher, Kimberly M. Rand

Date: October, 2013

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Summary:

Existing data and published sources are used to support portions of the Biological Opinion that describe the base status of Stellar sea lion (SSL) critical habitat in terms of the distribution and abundance of groundfish prey. The primary data used are catch data from the AFSC summer bottom trawl survey of the Aleutian Islands and existing biomass estimates formed from those data. The analyses focus on major SSL groundfish prey species and groups: Atka mackerel, Pacific cod, walleye pollock, sculpins (all species), and rockfish (all species). A series of meeting within AFSC concluded that any spatial scale smaller than the survey strata would not have enough observations to support a reliable separate analysis. Biomass estimates for these subareas are presented in for key groundfish prey species, based on summer survey data since 1991.

Both benthic and pelagic fish habitats around the AI reflect their mountainous structure, with highly complex bottom substrates and strong local currents. Groundfish habitat occurs primarily in narrow bands around the island chain. At depths less than 200m, approximately 80% of the area is within the designated critical habitat for SSL. Atka mackerel was the most abundant groundfish in AI surveys in 1991-2006, but rockfish abundance has increased in the most recent surveys. Atka mackerel are found in all of the subareas in the central and western AI, but are abundant in the eastern AI only in the areas around Seguam Pass. Rockfish are abundant throughout the AI, with particularly large biomass in the two subareas of 543. Trend testing shows that estimated biomass of rockfish has generally increased over the period of 1991-2012. Pacific cod are more consistently distributed across the AI but at a much smaller biomass; trend testing shows that cod are generally decreasing in biomass across the AI. Walleye pollock are much less abundant in the AI than in the Bering Sea, and are a fairly minor component of AI groundfish biomass. Both of the two main groundfish species in the AI (Atka mackerel and POP) are schooling fishes with very high sampling uncertainty. Observer data from 1989 through June 2013 are summarized as frequency of occurrence of SSL prey species in commercial bottom trawls; these frequencies are compared by survey subarea and season. Data from field studies show that species composition, especially proportions of Atka mackerel, rockfish, and Pacific cod in the catch, differed strongly between specific locations. Seasonal variation was less pronounced that spatial differences between study sites. Available information on spatial and temporal aspects of spawning of SSL prey species in the AI is summarized.

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SECTION 515 PRE-DISSEMINATION REVIEW & DOCUMENTATION FORM

AUTHOR/RESPONSIBLE OFFICE: AFSC Fisheries Interaction Team: Elizabeth A Logerwell, Steven J. Barbeaux, M. Elizabeth Conners, Susanne F. McDermott, Sandra K. Neidetcher, Kimberly M. Rand

TITLE/DESCRIPTION: Memorandum in support of 2014 Biological Opinion: SSL Groundfish Prey Fields in the Aleutian Islands

PRESENTATION/RELEASE DATE: January 2014

MEDIUM: AFSC web site

PRE-DISSEMINATION REVIEW: Sandra Lowe, Paul Spenser, Grant Thompson

Name and Title of Reviewing Official: Patricia Livingston, Director, REFM

(Must be at least one level above person generating the information product) Pursuant to Section 515 of Public Law 106-554 (the Data Quality Act), this product has undergone a pre-dissemination review.

_______________________________ 12/5 2013

Signature Date

Name and Title of Reviewer(s): Sandra Lowe

Sandra Lowe, Paul Spenser, Grant Thompson, Stock Assessment Authors

_______________________________ _______________

Signature Date

_______________________________ _______________

Signature Date

SECTION 515 INFORMATION QUALITY DOCUMENTATION

I. Utility of Information Product

Explain how the information product meets the standards for utility:

Summary of existing data and presentation of existing survey data at finer spatial scale, to support description of Stellar sea lion groundfish prey species in the Aleutian Islands in the 2014 review of the agency Biological Opinion on fishery management alternative in the Aleutian Islands.

A. Is the information helpful, beneficial or serviceable to the intended user?

Yes

B. Is the data or information product an improvement over previously available information? Is it more current or detailed? Is it more useful or accessible to the public? Has it been improved based on comments from or interactions with customers?

Existing data presented at smaller spatial scale, with more emphasis on the Aleutian Islands

C. What media are used in the dissemination of the information? Printed publications? CD-ROM? Internet? Is the product made available in a standard data format? Does it use consistent attribute naming and unit conventions to ensure that the information is accessible to a broad range of users with a variety of operating systems and data needs?

Internet - AFSC web site Yes

II. Integrity of Information Product

1. Explain (Check) how the information product meets the standards for integrity:

☑ A. All electronic information disseminated by NOAA adheres to the standards set out in Appendix III, "Security of Automated Information Resources," OMB Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

☐ B. If information is confidential, it is safeguarded pursuant to the Privacy Act and Titles 13, 15, and 22 of the U.S. Code (confidentiality of census, business and financial information).

☐ C. Other/Discussion (e.g., Confidentiality of Statistics of the Magnuson-Stevens Fishery Conservation and Management Act; NOAA Administrative Order 216-100 - Protection of Confidential Fisheries Statistics; 50 CFR 229.11, Confidentiality of information collected under the Marine Mammal Protection Act.)

III. Objectivity of Information Product

(1) Indicate which of the following categories of information products apply for this product:

- ☐ Original Data
- ☑ Synthesized Products
- ☑ Interpreted Products
- ☐ Hydrometeorological, Hazardous Chemical Spill, and Space Weather Warnings, Forecasts, and Advisories
- ☐ Experimental Products
- ☐ Natural Resource Plans
- ☐ Corporate and General Information

(2) Describe how this information product meets the applicable objectivity standards. (See the DQA Documentation and Pre-Dissemination Review Guidelines for assistance and attach the appropriate completed documentation to this form.)

Most data in the memorandum are non-confidential AFSC survey data and previously published material. Confidential observer data are summarized over a 34-year period at a large spatial scale (> 20nm).

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Alaska Fisheries Science Center
REFM Division
7600 Sand Point Way N.E.
Seattle, Washington 98115-6349

DATE: October, 2013

MEMORANDUM FOR: Doug DeMaster, Director, Alaska Fisheries Science Center
Pat Livingston, Division Director, REFM

FROM: AFSC Fisheries Interaction Team: Elizabeth A Logerwell, Steven J. Barbeaux, M. Elizabeth Conners, Susanne F. McDermott, Sandra K. Neidetcher, Kimberly M. Rand

SUBJECT: SSL Groundfish Prey Fields in the Aleutian Islands

Summary

Existing data and published sources are used to support portions of the BiOp that describe the base status of SSL critical habitat in terms of the distribution and abundance of groundfish prey. The primary data used are catch data from the AFSC summer bottom trawl survey of the AI and existing biomass estimates formed from those data. The analyses focus on major SSL groundfish prey species and groups: Atka mackerel, Pacific cod, walleye pollock, sculpins (all species), and rockfish (all species). A series of meeting within AFSC concluded that any spatial scale smaller than the survey strata would not have enough observations to support a reliable separate analysis. Biomass estimates for these subareas are presented in for key groundfish prey species, based on summer survey data since 1991.

Both benthic and pelagic fish habitats around the AI reflect their mountainous structure, with highly complex bottom substrates and strong local currents. Groundfish habitat occurs primarily in narrow bands around the island chain. At depths less than 200m, approximately 80% of the area is within the designated critical habitat for SSL. Atka mackerel was the most abundant groundfish in AI surveys in 1991-2006, but rockfish abundance has increased in the most recent surveys. Atka mackerel are found in all of the subareas in the central and western AI, but are abundant in the eastern AI only in the areas around Seguam Pass. Rockfish are abundant throughout the AI, with particularly large biomass in the two subareas of 543. Trend testing shows that estimated biomass of rockfish has generally increased over the period of 1991-2012. Pacific cod are more consistently distributed across the AI but at a much smaller biomass; trend testing shows that cod are generally decreasing in biomass across the AI. Walleye pollock are much less abundant in the AI than in the Bering Sea, and are a fairly minor component of AI groundfish biomass. Both of the two main groundfish species in the AI (Atka mackerel and POP) are schooling fishes with very high sampling uncertainty. Observer data from 1989 through June 2013 are summarized as frequency of occurrence of SSL prey species in commercial bottom trawls; these frequencies are compared by survey subarea and season. Data from field studies show that species composition, especially proportions of Atka mackerel, rockfish, and Pacific cod in the catch, differed strongly between specific locations. Seasonal variation was less pronounced that spatial differences between study sites. Available information on spatial and temporal aspects of spawning of SSL prey species in the AI is summarized.

Objectives

Scientists at the AFSC are providing support to the 2014 Biological Opinion in the area of characterization of critical prey resources for Steller sea lions (SSL) in the Aleutian Islands (AI). Existing data and published sources are used to support portions of the BiOp that 1) describe the base status of SSL critical habitat in terms of the distribution and abundance of groundfish prey, and 2) assess the possible effects of the proposed alternatives for commercial groundfish harvest on the conservation value of critical habitat in the AI. The primary data used are catch data from the AFSC summer bottom trawl survey of the AI and existing biomass estimates formed from those data. Material from previously published sources (Logerwell et al. 2005, McDermott et al 2005, Lowe et al 2004, Barbeaux 2010) that describe groundfish distributions in the AI are also excerpted. The analyses focus on major SSL groundfish prey species and groups: Atka mackerel, Pacific cod, walleye pollock, sculpins (all species), and rockfish (all species).

Methods

Analyses are based on AFSC Aleutian Islands summer bottom trawl survey strata, which are divided into depth zones from 0-500m in 100 m increments and horizontal subareas of two to four degrees of latitude (Figure 1). There are generally two of these subareas on each side of the Aleutian chain (Bering Sea and North Pacific sides) within each longitudinal management area (541,542,543); Petrel Bank in area 542 has its own subarea.

A team of AFSC scientists met to examine the available data and determine if there was any basis for analysis or biomass estimation at smaller spatial scales; it was the strong consensus of these meetings that any spatial scale smaller than the survey strata would not have enough observations to support a reliable separate analysis. The survey subareas are used as a common scale for several analyses: GIS was used to calculate the amount of benthic habitat within each depth zone by management area, and to determine what percentage of that habitat lies within SSL critical habitat (defined as 20 nm from rookeries plus the SSL conservation area N of Seguam Pass).

Estimated biomass of major SSL prey species from the summer AI bottom trawl surveys in 1991-2012 was reviewed. The total biomass by year and survey subarea (with depth ranges added together) was tabulated. The nonparametric Mann-Kendall test (Gilbert, 1987) was used to check for gross time trends in biomass over the nine surveys. The biomass estimates are the same information used in the stock assessments, just presented in slightly finer spatial detail.

There was much discussion among AFSC scientists about any possible use of fishery-dependent data to represent groundfish spatial and temporal distribution. Observer data from commercial trawl tows are available in units of catch per distance towed, but it was agreed that use of these data to try and describe fish distribution or local abundance estimates would have serious problems, given the irregular spatial distribution of fishing effort; the variation in net width, roller gear, trawling speeds, and horsepower among the fleet; and the lack of mensuration of effective net width and bottom contact time for these tows. The only summarization of these data used was the frequency of occurrence of SSL prey species in the observed tows, by survey subarea and season (winter, Jan-April and summer, May-Sept). The number of observed tows was also summarized as a rough spatial index of fishing effort.

Figures from previously published material and recently reported research have been selected to convey the overall description of groundfish prey distribution in the AI. This includes recent AI trawl survey results (published in the stock assessments and on AFSC web site http://www.afsc.noaa.gov/RACE/groundfish/survey_data/default.htm) and figures from Logerwell et al. (2005) showing the cluster analysis of groundfish species groups. A figure previously published in an appendix to the 2004 Atka mackerel stock assessment has been updated, showing the frequency distribution of Atka mackerel CPUE from individual tows over several years of the AI survey. Recent and historical literature was also reviewed to compile a table of the seasonality of spawning (high prey energy density) for the groundfish species included in SSL diets in the AI.

In addition to previously published results of Atka mackerel tagging studies that are included in the existing BiOp, some more recent data (McDermott et al. 2013) shows the species composition of bottom trawls taken in different areas during tag recovery cruises and the relative abundance of prey species in three study areas in summer 2011 and spring 2012.

Results

General Habitat:

The Aleutian Islands are the tips of a submerged volcanic mountain chain that stretches over 1,600km (1,000 mi). Both benthic and pelagic fish habitats around the islands reflect this mountainous structure. Bottom habitats are highly complex, with primarily rough bottom (rock, boulders, and corals), steep slopes and drop-offs, and few areas of fine sediments. Both bottom and pelagic habitats are subject to strong currents and tidal movements funneled through the many passes in the chain. Because of this difficult topography, a large fraction of the underwater habitat around the AI is not suitable for fishing with trawl gear, either commercially or by the AFSC survey. The AFSC survey uses a sampling frame of known trawlable habitat which covers approximately 19% of the total area of the AI. Commercial trawlers use heavier fishing gear than the survey and are able to work in some areas where the survey cannot, but most rely on past fishing history to locate and select fishable sites.

Areas inside and outside CH:

Table 1 and Figure 1 show the relative steepness of slopes in the Aleutian Islands. Shelf habitat occurs primarily in narrow bands around the island chain. With the exception of Petrel Bank and Bowers Ridge, there are few offshore shelf areas. This results in the majority of the habitat suitable for groundfish in the AI being within the 20nm critical habitat buffer around Steller sea lion haulouts and rookeries (Table 1). At depths less than 200m, approximately 80% of the area is within critical habitat in all three statistical regions. The only shelf area outside CH in area 541 is part of the southern side of Atka Is., which is an area with historically low groundfish catches. Depths <200 m in area 542 are almost entirely within CH, except for parts of Petrel Bank. There are two offshore areas 200-400 m deep in 543 that are outside CH; these include the Tahoma Reef seamounts south of Buldir Island, and Stalemate Bank at the far western end of the chain.

Groundfish prey distribution – general:

Species distribution of groundfish in the AI was reviewed by Logerwell et al (2005). Many of the species common to the Bering Sea shelf and Gulf of Alaska were not found west of Samalga Pass, and there appeared to be another break in species ranges near Amchitka Pass. The dominant groundfish in all parts of the AI are Atka mackerel and rockfishes, primarily Pacific ocean perch (POP) and northern rockfish (Table 2). Atka mackerel was the most abundant groundfish in AI surveys in 1991-2006, but rockfish abundance has increased in the most recent surveys. The shallower strata (0-200 m) are dominated by Atka mackerel (Figure 2); Pacific cod are are also found throughout the AI in these strata. Northern rockfish frequently co-occur with Atka mackerel, but POP are primarily found at slightly greater depth, and dominate the 200-300m strata. Walleye pollock are present in the AI, especially around Bogoslov Is. in the eastern AI, but are generally not as abundant in the AI as they are in the Bering Sea. Common groundfish also include arrowtooth and Kamchatka flounder, northern and southern rock sole, Pacific halibut, and various species of sculpins and skates (Table 2). Salmon and Pacific herring are not managed by NMFS but are also present seasonally in the AI and in SSL diets. Herring are reported from several locations along the AI chain and commercial herring fisheries are managed by the State of Alaska in the eastern AI near Akutan and Unalaska and in the central AI near Adak (Jackson and Poetter 2006). A review of salmon migration studies indicates that several species of salmon migrate seasonally through the AI or congregate in the North Pacific just south of AI in winter (Myers et al 2006).

Groundfish prey distribution – finer scale:

A team of AFSC scientists met to examine the available data and determine if there was any basis for describing groundfish prey distributions in the AI at smaller spatial scales; it was the strong consensus of these meetings that any spatial scale smaller than the survey strata shown in Figure 1 would not have enough observations to support a reliable separate analysis. Biomass estimates for these subareas are presented in Table 3 and Figure 3 for key groundfish prey species, based on summer survey data since 1991. The nonparameteric Mann- Kendall test for trend over time was applied to these biomass estijmates, and the test statistic and p-value for this test are included in Table 3. This test is based on the direction of change over time, and is relatively insensitive to changes in the magnitude of the estimate. This test is appropriate to the high uncertainty in individual biomass estimates for the subareas and is best suited to detect trends that are consistent over time.

Atka mackerel are found in all of the subareas in the central and western AI, but are abundant in the eastern AI only in the areas around Seguam Pass. Subareas with the highest estimated biomass of Atka mackerel are the eastern side of area 543 around Buldir Is., the southern shores of Amchitka and Tanaga Is. in area 542, and the eastern side of 541 around Seguam Pass. Examination of individual survey tows and underwater video data (Lauth 2007) suggests that Atka mackerel habitat is very specific to small areas with rocky substrates and higher current velocities. Atka mackerel are a strongly schooling species, and survey tows tend to have either very small catches or very large catches when a school is encountered. The locations encountering a high catch of Atka mackerel are consistent in the sense that survey tows with very large catch tend to re-occur at the same locations in different years, although tows may also encounter low catches in these locations. The number of locations with historically high Atka mackerel tows increases toward the western end of the AI chain (Logerwell et al. 2005). Trend testing of the subarea biomass estimates for Atka mackerel generally shows no significant trends for most areas over the period from 1991 – 2012; there has been a small but steady increasing trend in the Petrel Bank subarea and a significant decreasing trend in the S. Amchitka subarea, which includes some fishing areas outside CH.

Rockfish are abundant throughout the AI, with particularly large biomass in the two subareas of 543. POP are fairly evenly distributed throughout the AI, but northern rockfish are more common in the western AI. In recent surveys, estimated rockfish biomass has also been high in the subarea north of Seguam. Trend testing shows that estimated biomass of rockfish has generally increased over the period of 1991-2012, with significant increases in the Aggatu, S. Tanaga, and N. Seguam subareas. The increases in rockfish abundance include recent increases in POP and northern rockfish. Like Atka mackerel, POP are a strongly schooling species, and there is a large variability in survey catches.

Pacific cod are more consistently distributed across the AI but at a much smaller biomass than either Atka mackerel or rockfish. The subarea with the highest estimated biomass of cod is N. Seguam. Trend testing shows that cod are generally decreasing in biomass across the AI, especially in the Buldir, Petrel Bank, and N. Amchitka subareas.

Walleye pollock are much less abundant in the AI than in the Bering Sea, and are a fairly minor component of AI groundfish biomass. There are occasional catches of pollock that result in higher biomass estimates in different regions and years; the only survey subarea with a consistent higher biomass of pollock is N. Seguam. Trend testing indicates that estimated pollock biomass in most subareas decreased from 1991-2012, especially at Buldir, S Amchitka, and S Adak.

Sculpins are a small component of AI groundfish biomass but are sometimes important in SSL diets. The subareas with highest sculpin biomass are S. Seguam, Petrel Bank, and Aggatu. Estimated sculpin biomass shows a significant decreasing trend in the Aggatu subregion (due largely to a high biomass in 1991), but increasing trends in several other subregions, especially S. Adak and S. Seguam. The most abundant sculpin in the AI is yellow Irish lord, but there are a number of other species that are common, including species with generally large (great sculpin, bigmouth sculpin) and small (spectacled sculpin, darkfin sculpin) body sizes.

Variance and uncertainty in survey biomass estimates:

The AFSC bases most of its estimates of biomass on the bottom trawl survey, which takes place annually in the Bering Sea and every 2-3 years in the AI. This survey is well designed with substantial attention to quality control, but there are several sources of uncertainty that are always present in use of trawl survey data. One is seasonally variability in the distribution and density of fish. The AI trawl survey is conducted May-August, and so may not accurately represent fish abundance and distribution in the winter months. Estimating absolute biomass from trawl survey data also includes a catchability factor. This factor estimates the proportion of fish present in the sampled area actually captured in the net, and may be either greater than 100% (fish herded into the net by pressure waves or bottom disturbance) or less than 100% (fish avoiding the net by going under or over the net opening or by outswimming the net). In the absence of species and trawl-specific data, this factor is usually assumed to be 100%, but uncertainty in this factor carries into any estimates of absolute biomass. A final uncontrolled factor, very important in the AI, is that trawl nets cannot be used in all fish habitats. Fish densities measured by tows in accessible areas must be used to estimate fish biomass in areas where trawl nets cannot be used. If a particular species tends to be more or less abundant in the trawlable habitats than in the untrawlable ones, biomass estimates based on observed tows may be biased.

An uncertainty that <u>can</u> be estimated is the sampling variability associated with calculating biomass estimates. This type of uncertainty is reflected in the observed variability between tows, and is estimated along with the biomass estimates. If a species is fairly uniformly distributed over space, then the variability between tows will be small and the sampling uncertainty small. When fish are irregularly distributed, the sampling variability increases. Both of the two main groundfish species in the AI (Atka mackerel and POP) are schooling fishes who show high spatial and temporal variation in density, and so have very high sampling uncertainty. Figure 4 shows a frequency distribution for Atka mackerel catch in all of the AI bottom trawl survey tows from 1980 – 2012. In nearly 60% of the tows, no Atka mackerel were caught (observed CPUE is zero). In another 30%, only a very small Atka mackerel catch occurs. In 6% of the tows, however, catch of Atka mackerel was over 10 tons! This strong skewness in the tow-by-tow data leads to very high sampling uncertainty. This type of sampling variability is present in most fisheries data, but AI Atka mackerel and POP are among the species where spatially specific school distributions produce the strongest examples of this effect.

Sampling variability becomes higher as a biomass estimate is based on fewer tows; as a result the biomass estimates for individual survey strata shown in Table 3 have a higher uncertainty than estimates for the AI statistical reporting areas or the AI as a whole. The coefficient of variation (CV, ratio of sample standard error to sample mean) for the biomass values in Table 3 range from 35% to over 100% for Atka mackerel, 26 to >100% for Rockfish, 32 to >100% for walleye pollock, and 17-100% for Pacific cod. In most cases these individual subarea estimates have a CV over 50% so that the estimated 90% confidence interval includes zero. For comparison, the CV's of 2012 survey estimates of Atka mackerel biomass for the three AI statistical areas were 27-46%, with the highest uncertainty in area 541, and the overall biomass estimate for the AI had a CV of only 18%. The Atka mackerel stock assessment uses the trawl survey biomass estimates as a time series input and produces a model-based estimate of total biomass with CV's of 14-22 % (Lowe et al. 2012).

Observed commercial trawl data:

There is a substantial history of fishery-dependent data collected by observers from the commercial fisheries in the AI. There are, however, limits to the use of these data to represent groundfish spatial and temporal distribution. Observer data of catch and distance towed are recorded, but there is variation in net width, roller gear, trawling speeds, and horsepower among the commercial fleet, and there is usually no reliable record of effective net width and bottom contact time for these tows. This makes measurement of catch per unit effort difficult and comparison of catch rates between vessels questionable. The irregular spatial distribution of fishing effort and the tendency to focus on known areas of high fish abundance limits use of commercial data for describing spatial patterns in fish density. We have, however, reviewed and summarized all of the available observer data from the AI from 1989 through June 2013 to look at the frequency of occurrence of SSL prey species, and compared this frequency by survey subarea and season (winter, Jan-April and summer, June-Sept). The number of observed tows was also summarized as a rough spatial index of fishing effort. It is important to note that this analysis includes only trawl tows sampled by fisheries observers. While most of the recent commercial fishing effort in the AI is observed, not all vessels have 100% coverage, especially in the older data, and not all tows are sampled even on fully-observed vessels.

Maps of the numbers of observed tows and the frequency of occurrence of major groundfish groups are provided in an ArcView project and individual map files to facilitate reading. The number of observed hauls is greatest for the winter season (Jan – April) but there are also data available for most of the AI for the summer season (May – Sept). The largest number of tows in the winter was in the 200-300m depth interval in the eastern portion of area 541, including the area around Seguam pass. Numbers of winter tows were also high in this depth interval in the western portion of area 541, around Petrel Bank and south of Amchitika Is. in area 542, and in the shelf areas around Attu Is. in 543. Summer trawl effort was highest in the same depth interval and regions seen in the winter data, except that there were few observed tows in the western half of area 541. Seasonal differences in frequency of occurrence of individual species may reflect changes in fishing methods based on target species rather than seasonal distribution of fish. The spatial distribution of fishing effort also changed at several points during the period summarized as regulations and closures affected different fisheries and different areas. The maps presented are intended as an overall summary only.

Atka mackerel ranged in frequency of occurrence from <10% to > 95% of observed trawl tows, and showed some seasonal differences. Atka mackerel were present in nearly all commercial tows in several regions both winter and summer: the eastern half of 541 south of Seguam and Amukta passes, near Tanaga Pass and along the southern side of Amchitka Is., and in the eastern half of 543 around Buldir Is. Atka mackerel were present at high frequency on Petrel bank and in western 543 around Attu Is. in summer tows, but occurred in smaller proportions of winter tows. Rockfish were found in nearly all tows in the AI during the summer period, and in most areas during the winter period. The only areas with low frequency of rockfish are in western 541 and eastern 542 during the winter. Pacific cod were present in nearly all commercial tows throughout the AI during the winter; the only areas where cod were less frequent during winter were eastern 541, the deeper strata at Petrel Bank, and in eastern 543. Cod were somewhat less frequent in all areas during the summer; spatial patterns were similar except that the frequency in the far western subareas was reduced. Walleye pollock were found in only a small proportion of winter tows, but were more frequent in the western half of area 541 in observed summer tows. Sculpins showed an interesting seasonal pattern in frequency of occurrence; sculpins were most frequent in tows in the eastern AI during summer, but in the far western AI during winter.

Seasonal variability in species composition:

The majority of scientific data about groundfish in the AI comes from the summer trawl survey and other studies conducted during the summer months. There is very little information available on fish distributions during the winter and spring seasons, when prey is most critical to sea lions. Ongoing studies of Atka mackerel in the AI (McDermott et al 2005, McDermott et al 2013) have provided some winter sampling. Figures 5 and 6 show species composition data from experimental trawls in three locations in the eastern and central AI. It is evident that species composition, especially proportions of Atka mackerel, rockfish, and Pacific cod in the catch, differed strongly between locations. While Atka mackerel was the main component of catch in all three locations, POP were more abundant in catches near Seguam Pass, northern rockfish more abundant on Petrel Bank, and Pacific cod more abundant near Tanaga Pass. There was some seasonal variation in catches between summer 2011 and late spring 2012, but in general seasonal variation seems to be less pronounced that spatial differences between the three study sites.

Reproductive seasons of SSL prey species in the AI:

Groundfish that are close to spawning stage are often an important food resource, as the eggs and reproductive structures are high in lipids and energy (Wilson and Halupka 1995). In some species, fish aggregate in high densities over local areas during spawning season. Available information on the spatial and temporal aspects of spawning were reviewed for SSL prey species in the AI, and are summarized below and in Figure 7.

Atka mackerel *Pleurogrammus monopterygius* migrate from the shelf edge to shallow coastal waters to spawn; mean depth of nests was found to range around 100m (Lauth et. al. 2007). Eggs are adhesive and deposited in rock crevices and these nests are guarded by the males until hatching (Zolotov 1993). Males establish territories along the Aleutian Islands in mid-summer and guard nests for up to five months, from July through November (McDermott and Lowe 1997).

As live-bearers, rockfish (genus *Sebastes*) employ internal fertilization and give birth to planktonic larvae (Kendall and Lenarz 1987, Leaman 1991). In Pacific ocean perch (*S. alutis*), oocyte development begins from July through September. Vitellogenesis advances between October and January with yolk increasing in the oocytes until February. Embryos appeared within the ovaries during February and March. Parturition occurs in April and May (Conrath and Knoth 2013); April in the Aleutian Islands (Tenbrink and Spencer 2013). Northern rockfish (*S. polyspinis*) have oocytes with yolk development observed through most of the year, late stage vitellogenesis occurs in April with an increase in postpartum observed in May and June (Chilton 2007). Parturition occurs in April in the Aleutian Islands (Tenbrink and Spencer 2013). Shortraker and rougheye rockfish (S, borealis and *S. aleutianus*, respectively) have protracted reproductive periods and parturition takes place in from early spring through summer (McDermott 1994). Shortspine thornyhead (*Sebastolobus alascanus*) show peak spawning biomass in the deep “oxygen minimum zone” at 1,200 to 3,000 feet in late winter and early spring (Moser 1974).

Spawning Pacific cod (*Gadus macrocephalus*) have been observed widely distributed along the upper slopes of the continental shelves of North Pacific Ocean primarily between 100 and 200 m isobaths. Pacific cod form dense spawning schools in discrete locations in the GOA, BS and AI. Total body length at 50% maturity was found to be smaller (50.3 cm) in the Gulf of Alaska than in the eastern Bering Sea (58.0 cm) (Stark 2007). Spawning begins in January and extends through late March (Neidetcher 2012).

Walleye pollock (*Theragra chalcogramma*) are described as partial batch spawners and spawning is found to shifts from winter to spring with increasing latitude (Hinckely 1986). The spawning season varies from two to seven months depending on the region and may extend into the mid autumn (Hinckely 1986).

Arrowtooth flounder (*Atheresthes stomias*) are reported to spawn during fall and winter in the northwestern Bering Sea (Pertseva-Ostroumova 1961, Novikov 1974). Individuals of this species in spawning condition have also been collected, however, along the outer shelf east of Kodiak Island from March to August (Hirshberger and Smith 1983). Blood et al. (2007) found spawning arrowtooth flounder along the continental slope southeast, south, and southwest of Kodiak Island in late January through February. Spawning was observed to occur earlier in the more southern locations of the Shumagin Islands and later in further north areas closer to Kodiak Islands (Blood et al. 2007) and spawning was found at a reduced rate as late as July (Stark 2008).

Two species of rock sole are found in Alaskan waters, southern rock sole (*Lepidopsetta bilineata*) and northern rock sole (*Lepidopsetta polyxystra*). Southern rock sole are found in the north Pacific from Baja California to the eastern Aleutian Islands and southeastern Bering Sea (Fishbase 2013). Northern rock sole are distributed in the north Pacific from Puget Sound, WA through the Bering Sea and Aleutian Islands to the Kuril Islands (Mecklenburg et al. 2002). In the Gulf of Alaska, northern rock sole reach sexual maturity around 7 years, while southern rock sole reach maturity at 9 years of age (Stark and Somerton 2002). In the Bering Sea, southern rock sole reach sexual maturity around 8 years (Fargo and Wilderbuer 2000). The bottom depth for spawning northern rock sole ranged from 43 to 61 m and averaged 45 m; spawning depth for southern rock sole ranged from 35 to 120 m and averaged 78 m. Both species appeared to develop a single stock of oocytes which ovulate in a single spawning. Northern rock sole spawn from January through March in the BSAI (Wilderbuer and Nichol 2009). In the Gulf of Alaska Northern rock sole spawn at depths of 43 to 61 m in the midwinter with peaks in the spring and southern rock sole spawn during the summer at depths of 35 to 120 m (Stark and Somerton 2002).

There is little information on life histories of sculpins in Alaska. Spawning of plain sculpin (*Myoxocephalus jaok*) occurs during December and January (Tokranov 1988, Panchenko 2001). A one-time spawning of great sculpin (*Myoxocephalus polyacanthocephalus*) was observed during winter (Tokranov, 1984). Reproductive effort in this species by mature females was highest during the winter months, peaking in January and February (Tenbrink and Aydin 2009). In Yellow Irish Lord (*Hemilepidotus jordani*), early signs of hydration suggest that spawning begins in late June and July. Oocytes were observed with developing yolk during February and March, ripening in June and July, and spent ovaries were observed in September in the eastern Bering Sea (Tenbrink and Aydin 2009). In the Aleutian Islands, ripening was observed in specimens in June-August with a few spawning as evidenced by presence of hydrated oocytes. By October, specimens were spent (Tenbrink and Aydin 2009). Spawning females of bigmouth sculpin (*Hemitripterus bolini*) were encountered in February and early March. Multiple vitellogenic oocyte size classes were observed through histological examination of ovaries indicating that bigmouth sculpins are batch spawners. The sampling data here show that peak reproductive effort for the bigmouth sculpin likely occurs during winter and that spawning terminates in March (Tenbrink and Aydin 2009).

Pacific sandfish (*Trichodon trichodon*) are a prominent species in the inshore sand and gravel community along the Aleutian Islands (Isakson et al. 1971). This species is known to burrow into soft substrates and spawn on rocky intertidal shorelines (Thedinga et al. 2006) They incubate eggs for about one year and larvae develop in shallow near-shore areas (Marliave, 1980).

Pacific sand lance (*Ammodytes hexapterus*) feed and school diurnally and burrow nocturnally into sand substrate. This species also burrows into substrate to pass the winter in a dormant state. Spawning occurs in dense formations in late summer, early fall showing high site fidelity (Robards et al. 1999).

Little is known about the spawning patterns of cephalopods (octopus and squid) in Alaska waters. A study by Conrath and Conners (in press) observed mature oocytes in specimens of giant Pacific octopus (*Enteroctopus dofleini*) collected from water near Kodiak throughout the year, suggesting that spawning in this species is not fully synchronous. *E. dofleini* in Japan are reported to move to deeper waters to mate during July – October and move to shallower waters to spawn during October – January (Kanamaru 1964). Populations of *Berryteuthis magister* and other squids are comprised of multiple cohorts spawned throughout the year. *B. magister* are dispersed during summer months in the western Bering Sea, but form large, dense schools over the continental slope between September and October (Ormseth 2012, Arkhipkin 1996).

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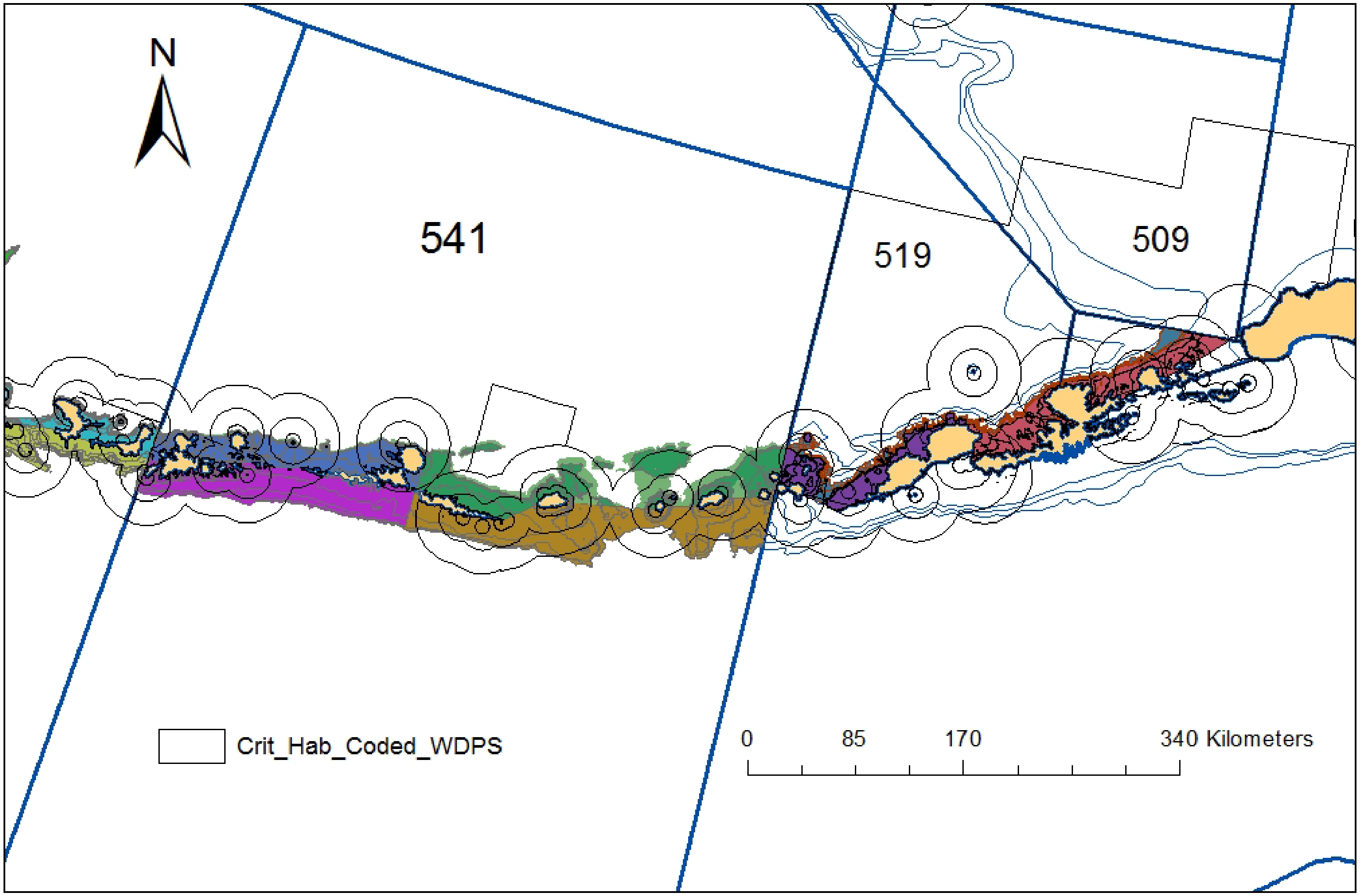


Figure 1a. Management areas (numbered), survey subareas (colored), and critical habitat zones for the eastern Aleutian Islands.

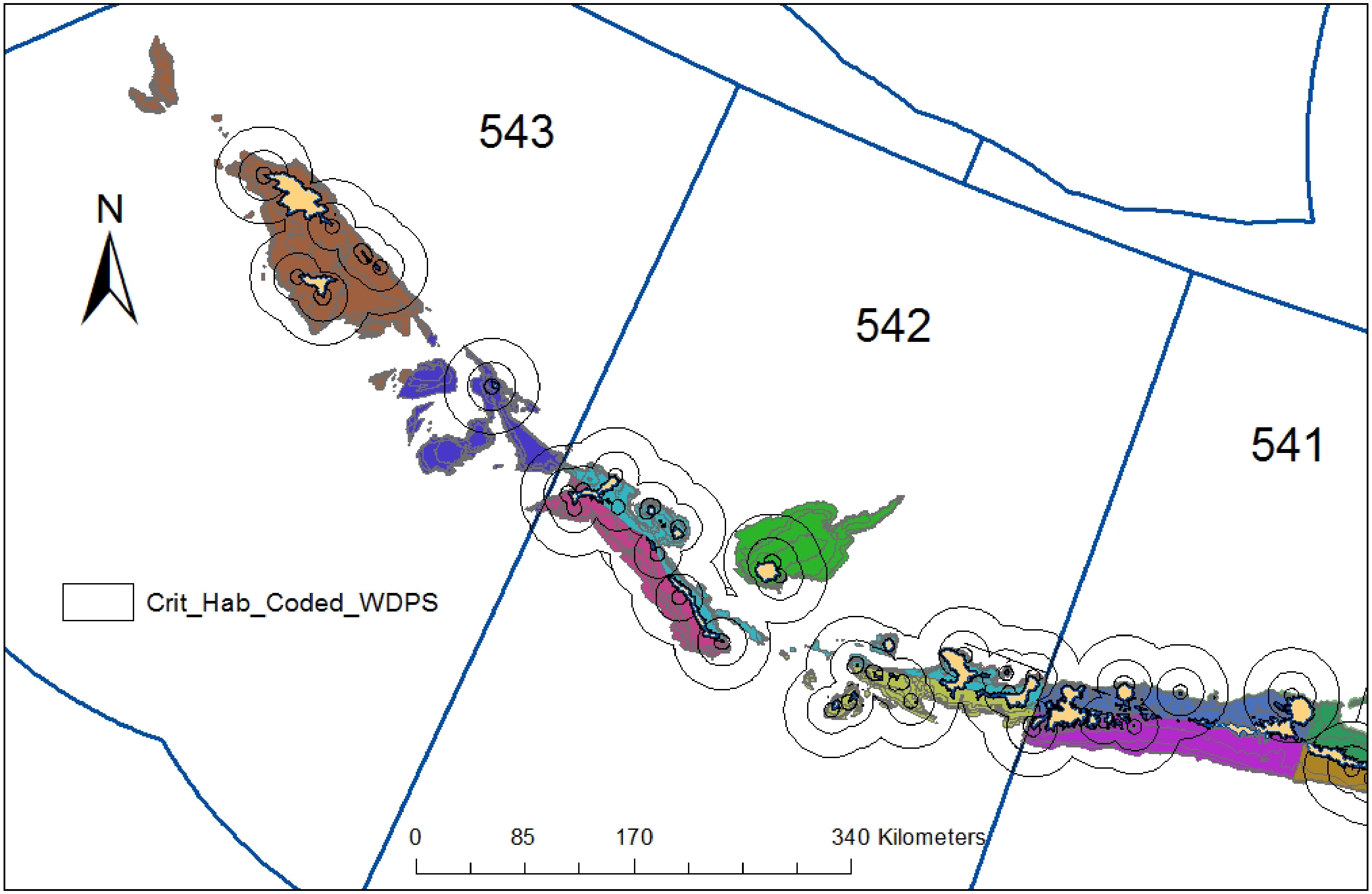


Figure 1b. Management areas (numbered), survey subareas (colored), and critical habitat zones for the central and western Aleutian Islands.

Figure 2. Cluster analysis of the Aleutian Islands survey data using a dissimilarity matrix and agglomerative cluster analysis. [From Logerwell et al., 2005]

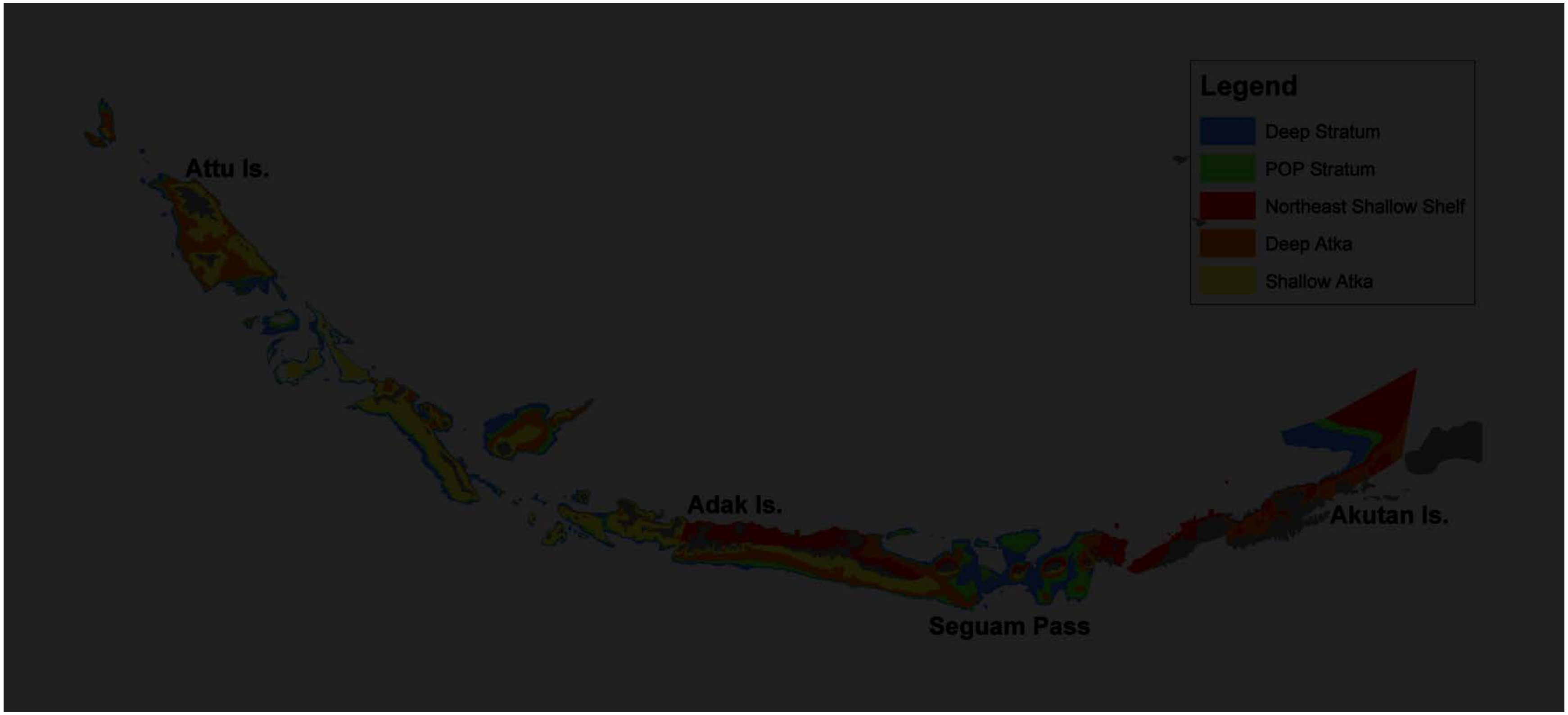


Figure 3a. AFSC trawl survey biomass estimates (in thousands of tons) for AI substrata: **Atka mackerel**.

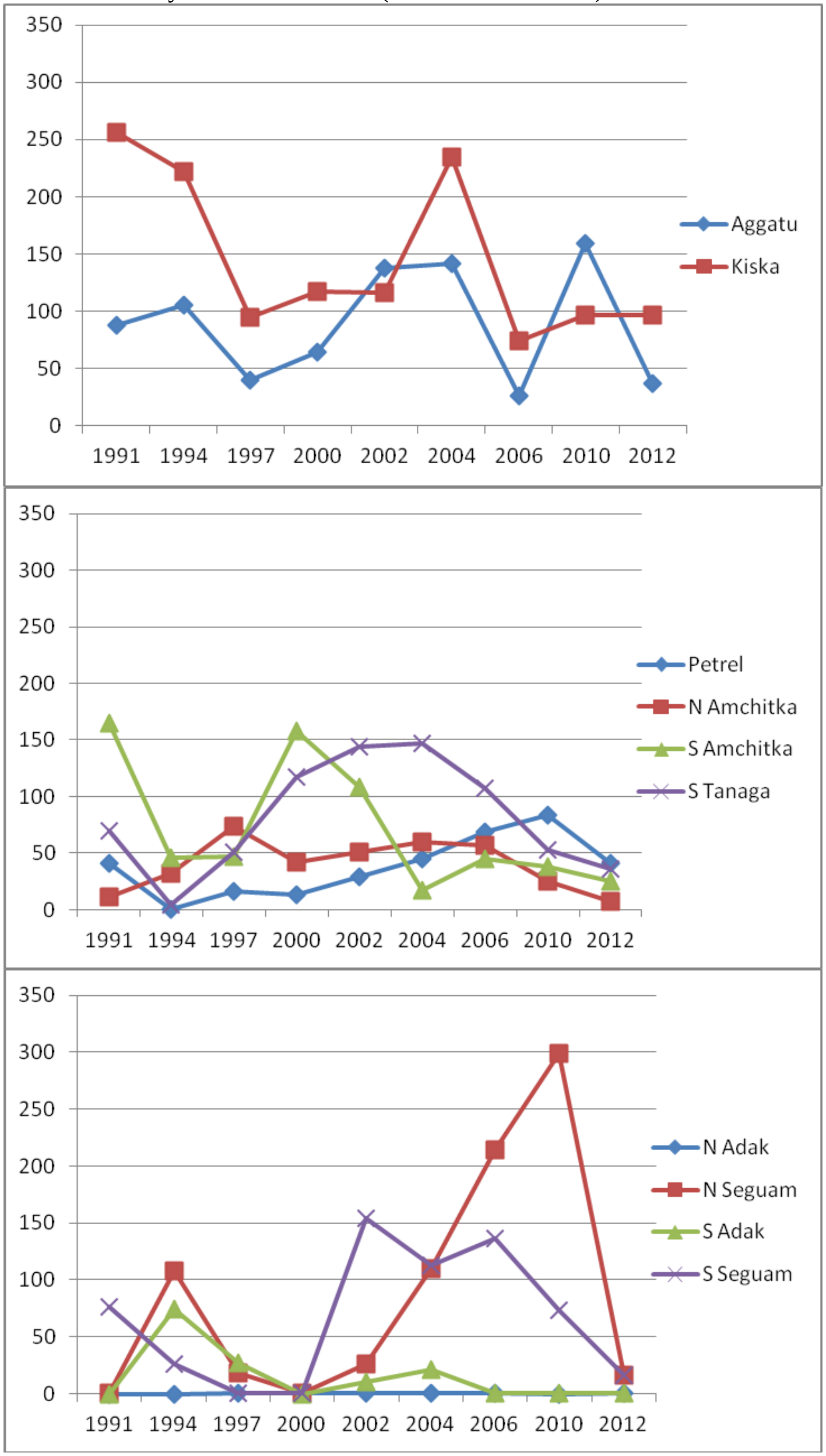


Figure 3b. AFSC trawl survey biomass estimates (in thousands of tons) for AI substrata: **Rockfish (all spp.)**

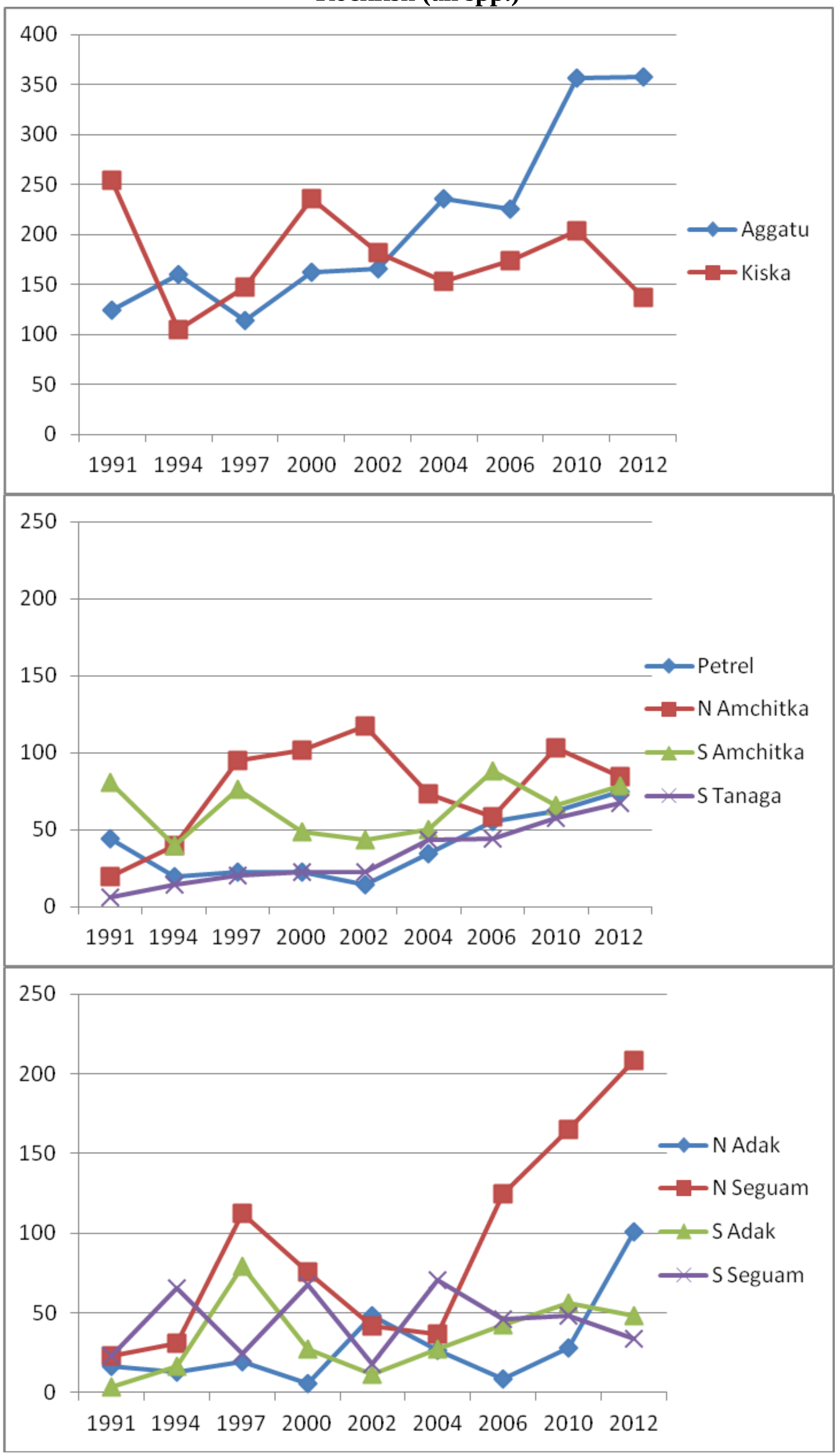


Figure 3c. AFSC trawl survey biomass estimates (in thousands of tons) for AI substrata: **Pacific cod.**

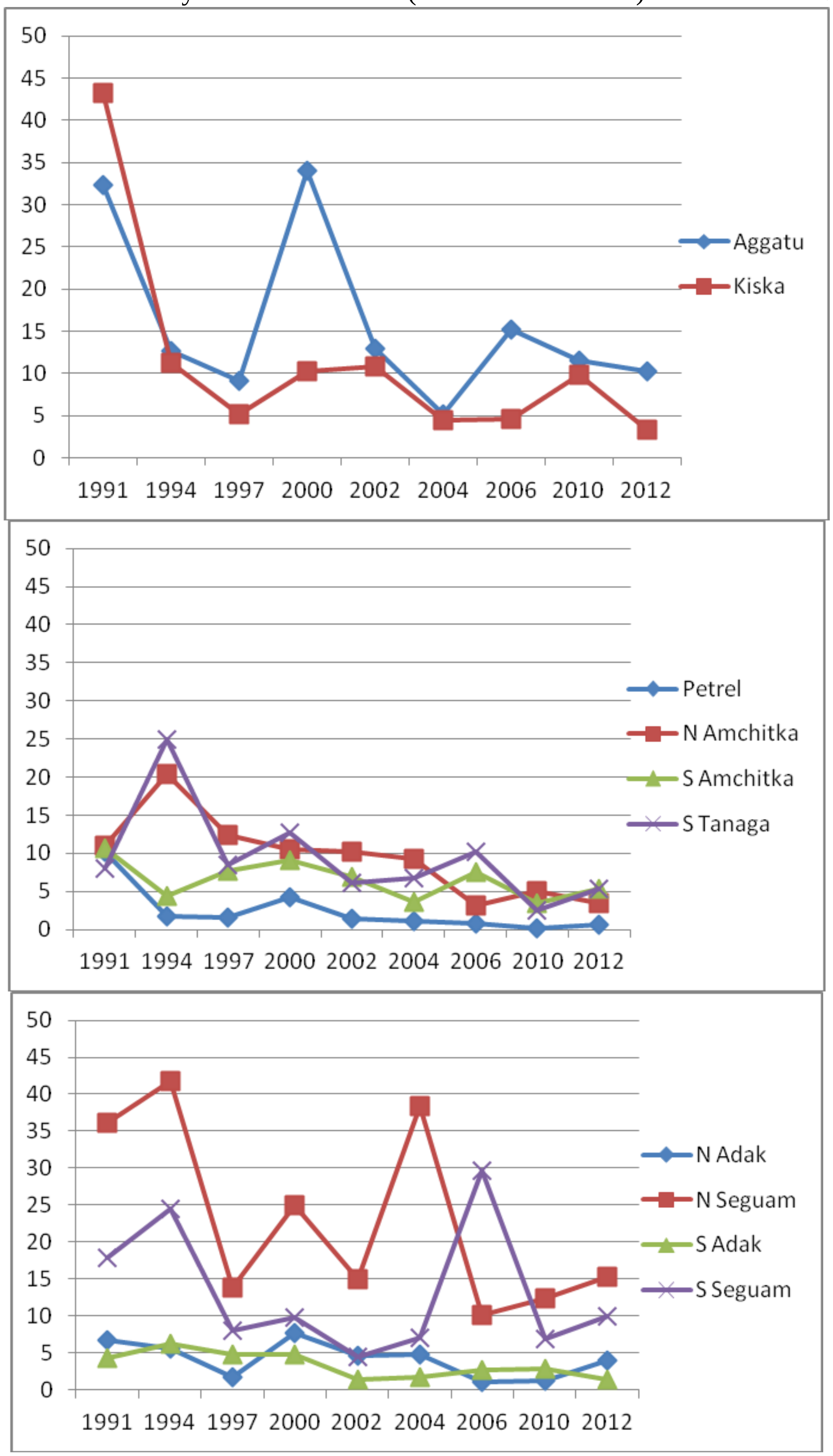


Figure 3d. AFSC trawl survey biomass estimates (in thousands of tons) for AI: **Walleye pollock**.

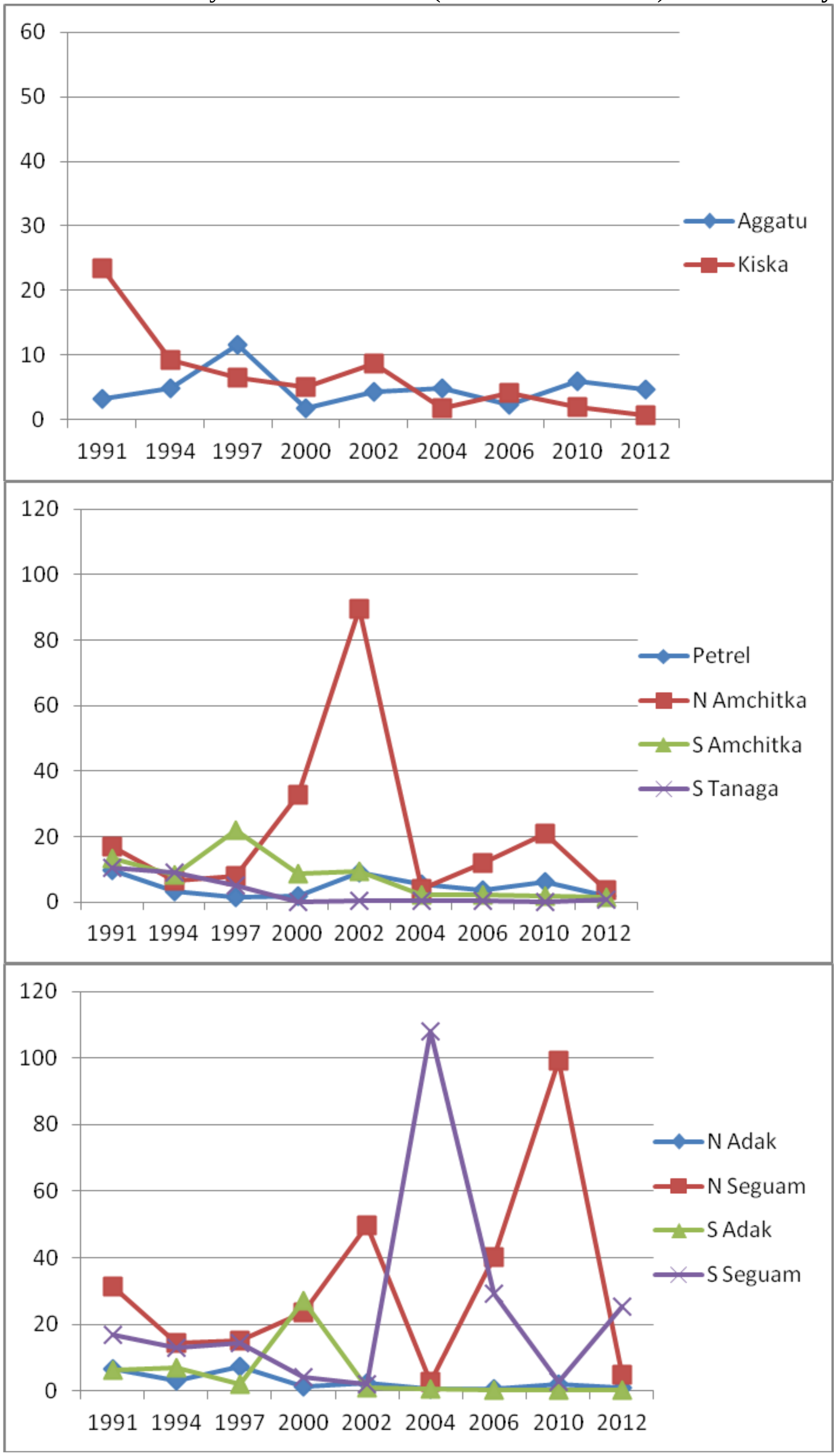


Figure 3e. AFSC trawl survey biomass estimates (in thousands of tons) for AI: **Sculpins (all spp.).**

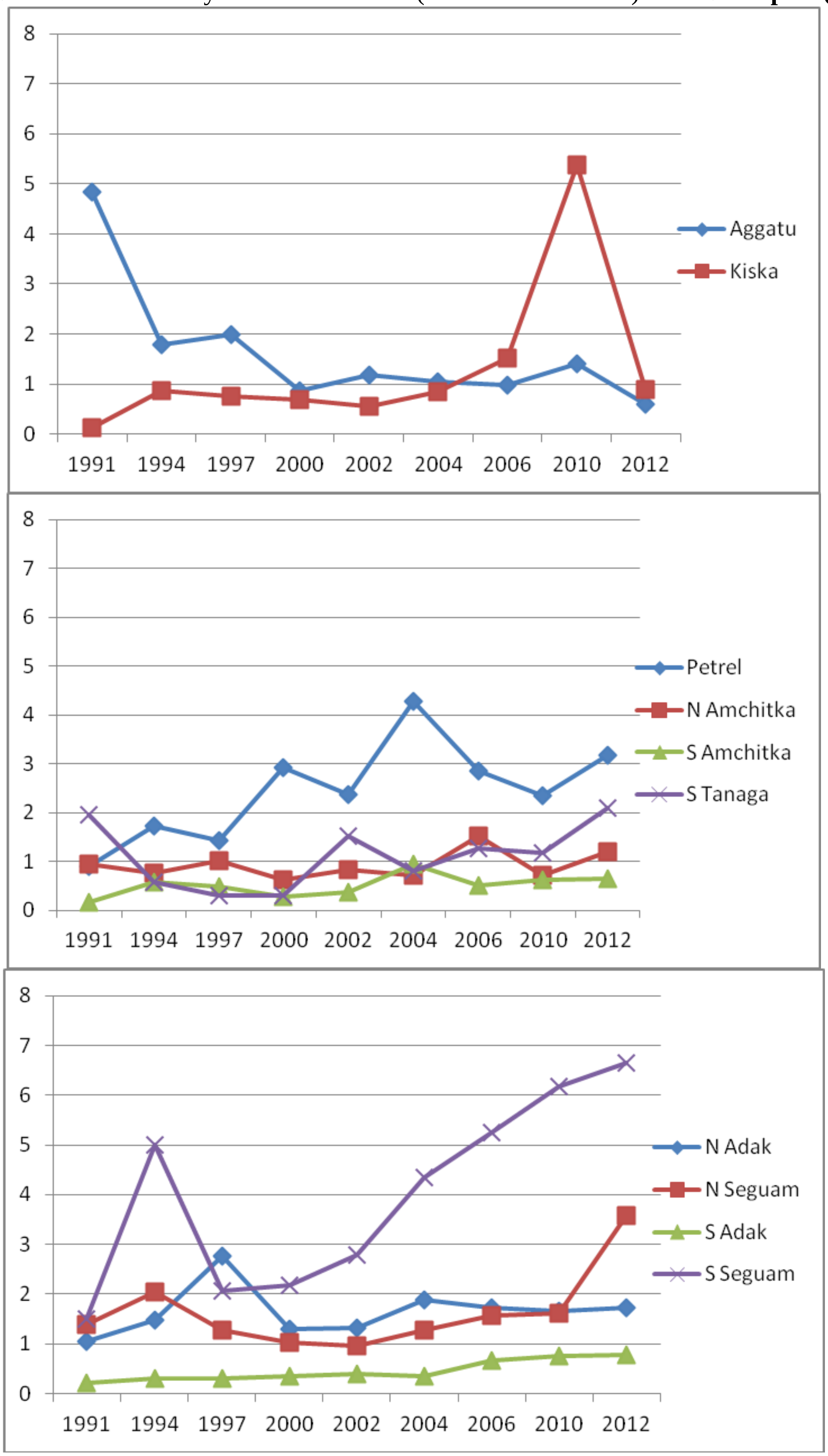


Figure 4. Frequency distribution of haul-by-haul CPUE from AI bottom trawl surveys 1980 – 2012.

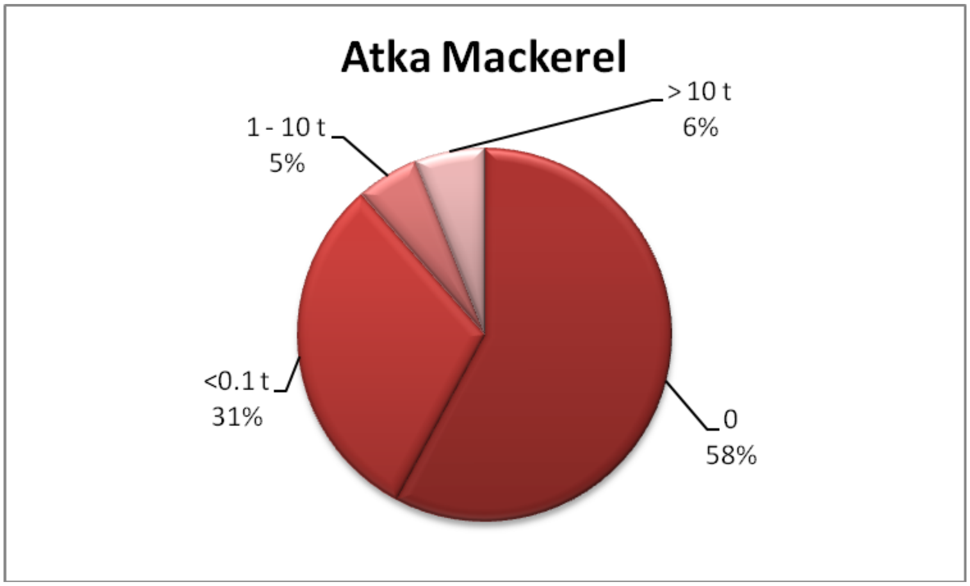


Figure 5. Haul locations and species composition in the three study areas from the Atka mackerel tagging study in the summer 2011 and spring 2012. Areas in grey represent Steller Sea lion critical habitat closed to commercial Atka mackerel fishing. [From NPRB Project 1007, AFSC Atka mackerel tagging, Progress Report Jan 2013]

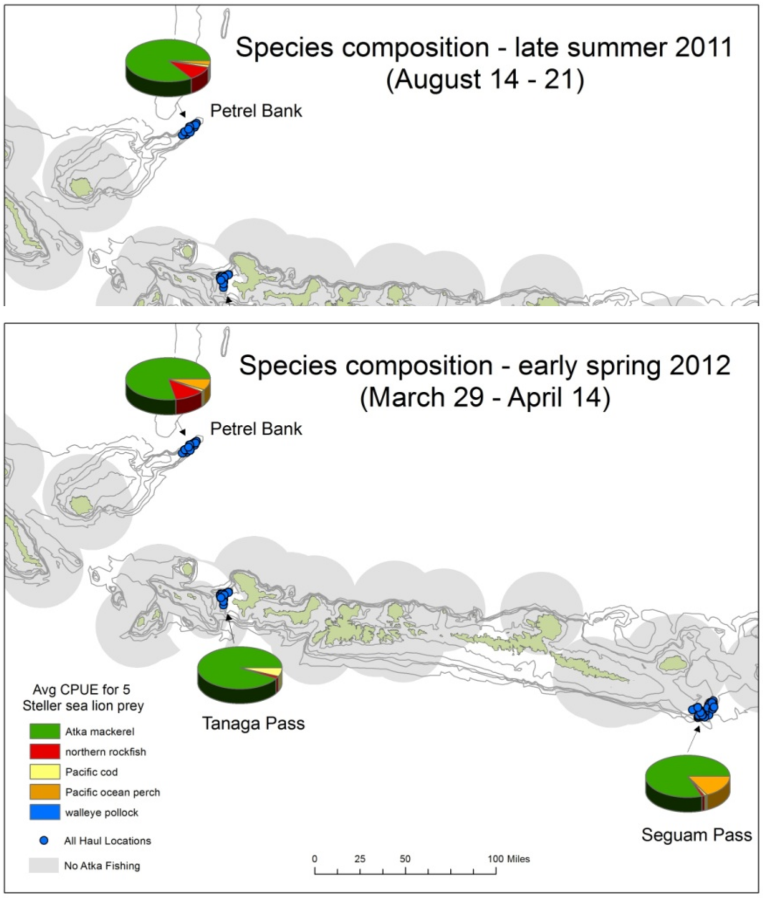


Figure 6. Relative abundance (CPUE, metric tons caught per hour) for the five major prey species of Steller sea lion in three study areas during summer 2011 (lighter colors) and spring 2012 (darker colors). Note that the scale for CPUE on the y axis is different for each species. Study locations are, from left to right, Seguam, Tanaga, and Petrel Bank. [From NPRB Project 1007 Progress Report Jan 2013]

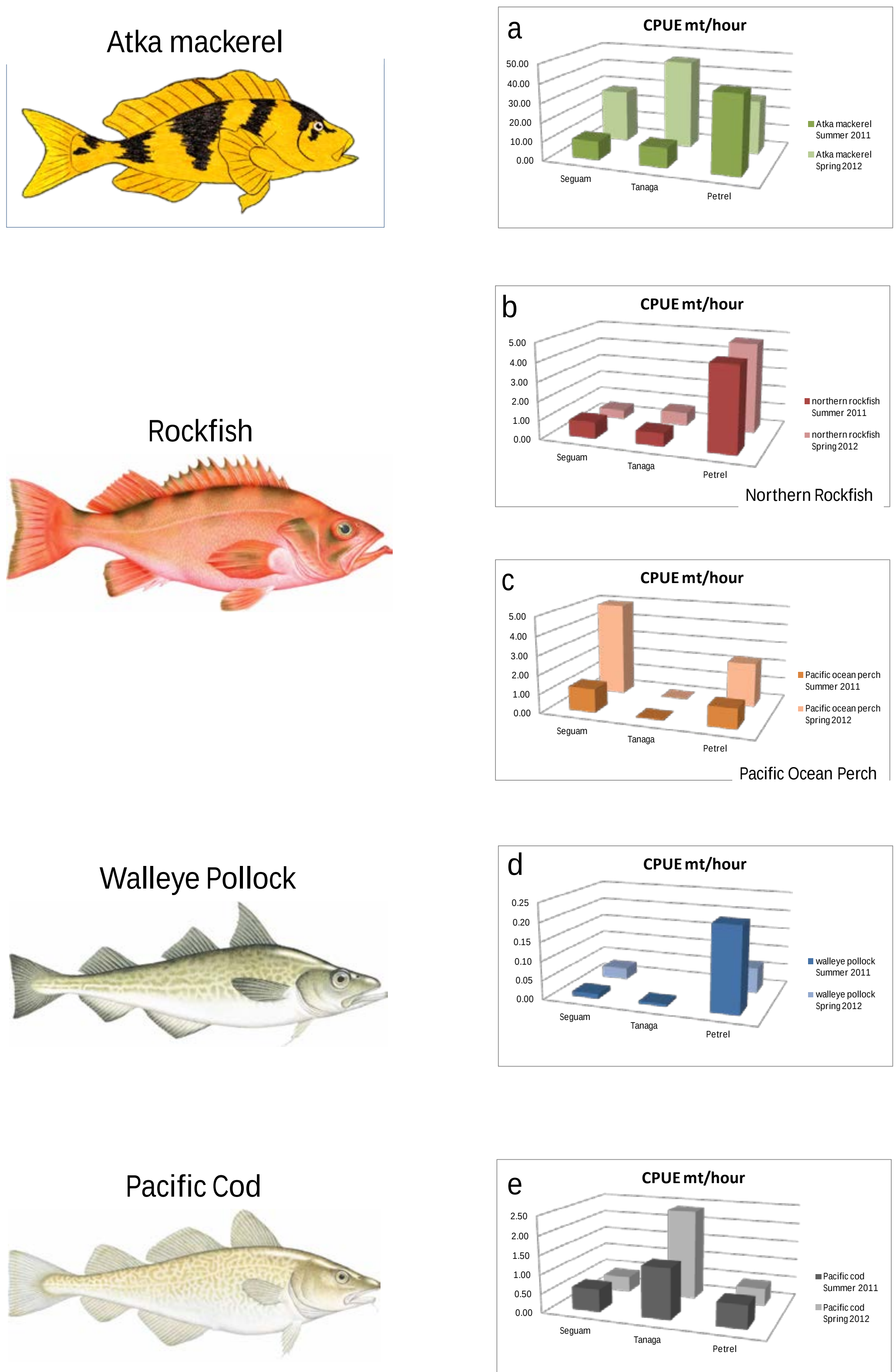


Fig 7. Steller sea lion prey species with seasonal spawning phenology represented by month. Dark shading indicates peak spawning times and grey shading indicates times when spawning has been observed.

Species	Area	J	F	M	A	M	J	J	A	S	O	N	D
Arrowtooth Flounder (*Atheresthes stomias*)	Deep water												
Atka mackerel (*Pleurogrammus monopterygius*)	nesting sites ~ 100 m depth												
Octopus (*Enteroctopus dofleini*)													
Squid (*Berryteuthis magister*)	Spawning aggregations												
Pacific cod (*Gadus macrocephalus*)	Spawning aggregations 50-200 m depth												
Pacific herring (*Clupea pallasi*)	Near-shore spawning aggregations												
Pacific sandfish (*Trichodon trichodon*)	Rocky intertidal shorelines												
Pacific sand lance (*Ammodytes hexapterus*)	In distinct intertidal or subtidal locations												
Pacific Ocean Perch (*Sebastes alutus*)	Deep water												
Northern Rockfish (*Sebastes polyspinis*)													
Shortraker Rockfish (*Sebastes aleutianus*)													
Shortspine Thornyhead (*Sebastolobus altivelis*)	Deep water												
Southern rock sole (*Lepidopsetta bilineata*)													
Northern rock sole (*Lepidopsetta polyxystra*)													
Chinook salmon (*Oncorhynchus tshawytscha*)	anadomrous												
Chum salmon (*Oncorhynchus keta*)	anadomrous												
Coho salmon (*Oncorhynchus kisutch*)	anadomrous												
Pink salmon (*Oncorhynchus gorbuscha*)	anadomrous												
Sockeye salmon (*Oncorhynchus nerka*)	anadomrous												
Great sculpin *Myoxocephalus polyacanthocephalus*													
Irish Lords (*Hemilepidotus sp.*)													
Bigmouth sculpin *Hemitripterus bolini*													
Snailfish (*Liparididae*)	Varied among spp.												
walleye pollock (*Theragra chalcogramma*)	Spawning aggregations												

Table 1. Continental shelf areas in the Aleutian Islands, calculated from bathymetry data used for AI survey strata and subareas (Figures 1 and 2).

Depth Zone	Area (Sq Km)				Percentage Inside Critical Habitat			
(m)	541	542	542	Total	541	542	543	Total
1 - 100m	6,848	5,847	4,877	17,572	81%	97%	81%	86%
101-200m	7,768	4,602	5,318	17,700	80%	82%	73%	78%
201-300m	4,901	2,109	1,724	8,734	80%	79%	47%	73%
301-500m	5,683	3,981	3,272	12,937	83%	87%	42%	74%
Total	25,741	17,081	15,732	56,943	81%	88%	66%	79%

Table 2. Results of the 2012 Aleutian Islands bottom trawl survey. Species are shown in descending order of estimated biomass (species under 1,000 t not shown). The percentage of survey hauls where each species was present and a 95% confidence interval on the biomass estimate are also shown.

Common Name	Percentage of hauls	Estiomated Biomass (t)	95% Conf Interval Low_CI	Hi_CI
Pacific ocean perch	69%	902,398	592,377	1,212,419
northern rockfish	44%	285,164	-	578,273
Atka mackerel	48%	276,877	176,849	376,904
giant grenadier	5%	86,556	16,784	156,328
Pacific cod	66%	65,858	47,432	84,284
northern rock sole	62%	65,460	49,897	81,022
arrowtooth flounder	80%	60,371	37,040	83,703
walleye pollock	65%	57,518	6,251	108,784
Kamchatka flounder	61%	35,100	-	73,902
Pacific halibut	46%	31,552	23,318	39,786
shortraker rockfish	10%	16,230	7,385	25,074
whiteblotched skate	20%	15,360	9,030	21,690
shortspine thornyhead	21%	14,895	10,016	19,774
yellow Irish lord	40%	14,166	8,919	19,412
rex sole	45%	14,102	6,379	21,824
blackspotted rockfish	24%	12,614	2,494	22,734
leopard skate	15%	10,421	5,295	15,547
southern rock sole	13%	8,661	2,679	14,643
Aleutian skate	14%	6,072	3,724	8,420
flathead sole	33%	5,566	3,854	7,277
darkfin sculpin	53%	4,514	2,948	6,079
magistrate armhook squid	32%	4,011	378	7,643
sablefish	8%	3,540	1,082	5,998
prowfish	14%	2,830	1,686	3,973
giant octopus	16%	2,739	-	6,430
Greenland turbot	5%	2,600	-	5,354
great sculpin	6%	1,930	-	4,179
Alaska skate	4%	1,503	318	2,688
mud skate	18%	1,277	837	1,717
Dover sole	10%	1,214	545	1,882

Table 3a. AI trawl survey biomass estimates (thousands of t) for **Atka mackerel** by survey subarea and year. Refer to Figure 1 for subarea locations (listed in the table from west to east, N and S indicate north and south sides of the Aleutian chain). Test statistic and p-value for a one-tailed Mann-Kendal test of trend over time are shown for each subarea. A positive test statistic indicates increasing trend, negative indicates decreasing trend. Significant trends (p<0.05) are in bold type.

					Atka mackerel						One tailed MK test	
Area	Subarea	1991	1994	1997	2000	2002	2004	2006	2010	2012	SSUM	P
543	Aggatu	87.6	105.7	39.8	64.1	137.8	141.9	26.7	159.0	36.9	2	0.460
	Buldir	255.8	221.5	94.5	117.0	115.9	234.5	74.0	96.4	96.7	-14	0.090
542	Petrel	40.7	0.7	16.1	12.8	28.7	45.1	68.4	83.2	41.1	20	**0.022**
	N Amchitka	11.5	32.3	73.4	41.5	51.3	60.1	57.2	25.5	6.9	-2	0.460
	S Amchitka	165.3	46.2	46.5	158.2	108.2	17.3	45.5	37.7	25.2	-20	**0.022**
	S Tanaga	70.1	4.6	50.8	117.7	143.6	146.6	107.1	52.5	35.8	2	0.460
541	N Adak	0.0	0.0	0.1	0.1	0.2	0.1	0.0	0.0	0.0	2	0.460
	N Seguam	0.4	107.4	17.9	0.8	25.8	109.6	213.8	298.7	16.5	16	0.060
	S Adak	0.0	74.9	27.1	0.0	10.5	21.6	0.0	0.0	0.9	-4	0.381
	S Seguam	76.8	26.1	0.1	0.1	154.4	112.7	136.3	73.7	15.8	2	0.460

Table 3b. AI trawl survey biomass estimates (thousands of t) for **Rockfish (all species)** by survey subarea and year. Refer to Figure 1 for subarea locations (listed in the table from west to east, N and S indicate north and south sides of the Aleutian chain). Test statistic and p-value for a one-tailed Mann-Kendal test of trend over time are shown for each subarea. A positive test statistic indicates increasing trend, negative indicates decreasing trend. Significant trends ($p<0.05$) are in bold type.

		Rockfish (all species, primarily POP & Northern)									One tailed MK test	
Area	Subarea	1991	1994	1997	2000	2002	2004	2006	2010	2012	SSUM	P
543	Aggatu	124.0	159.8	113.8	162.6	165.9	236.1	225.0	357.0	357.2	30	**0.000**
	Buldir	254.2	104.8	147.5	235.6	181.2	153.2	173.3	203.6	137.2	-4	0.381
542	Petrel	44.2	19.8	22.7	22.4	14.1	34.7	55.0	62.0	75.0	18	**0.038**
	N Amchitka	19.3	39.6	94.8	101.9	117.6	73.5	58.7	103.1	84.5	12	0.130
	S Amchitka	80.5	39.8	76.1	48.4	43.3	50.0	88.0	65.9	78.4	8	0.238
	S Tanaga	5.8	14.3	19.9	22.3	22.6	43.5	44.0	57.3	67.5	36	**0.000**
541	N Adak	16.7	13.1	19.4	5.7	48.5	26.9	8.5	28.4	100.9	14	0.090
	N Seguam	23.2	30.7	112.2	75.9	41.5	36.7	124.7	165.2	208.1	24	**0.006**
	S Adak	3.4	16.3	79.4	27.2	11.8	27.3	42.5	56.2	48.4	18	**0.038**
	S Seguam	22.9	65.3	24.3	67.8	17.8	70.7	46.0	48.6	34.1	4	0.381

Table 3c. AI trawl survey biomass estimates (thousands of t) for **Pacific cod** by survey subarea and year. Refer to Figure 1 for subarea locations (listed in the table from west to east, N and S indicate north and south sides of the Aleutian chain). Test statistic and p-value for a one-tailed Mann-Kendal test of trend over time are shown for each subarea. A positive test statistic indicates increasing trend, negative indicates decreasing trend. Significant trends (p<0.05) are in bold type.

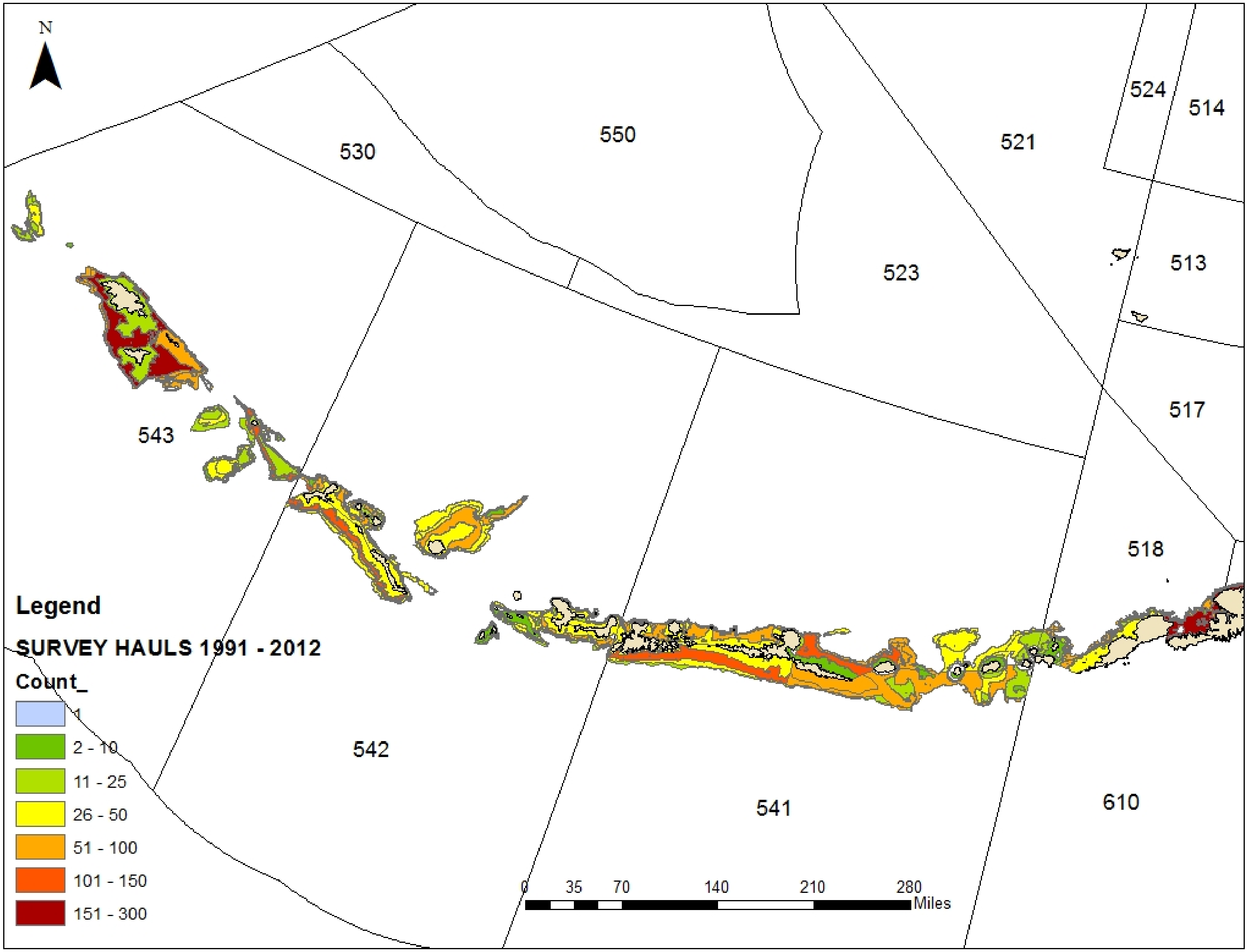
		Pacific cod									One tailed MK test	
Area	Subarea	1991	1994	1997	2000	2002	2004	2006	2010	2012	SSUM	P
543	Aggatu	32.3	12.6	9.1	34.0	12.9	5.1	15.2	11.5	10.2	-10	0.179
	Buldir	43.2	11.2	5.2	10.2	10.7	4.5	4.6	9.8	3.3	-22	**0.012**
542	Petrel	10.2	1.7	1.6	4.2	1.5	1.1	0.8	0.1	0.6	-30	**0.000**
	N Amchitka	10.9	20.4	12.4	10.5	10.2	9.3	3.2	5.1	3.5	-28	**0.001**
	S Amchitka	10.7	4.4	7.7	9.1	6.9	3.5	7.6	3.5	5.3	-16	0.060
	S Tanaga	7.9	25.0	8.5	12.7	6.1	6.8	10.3	2.5	5.4	-16	0.060
541	N Adak	6.7	5.6	1.7	7.7	4.5	4.8	1.1	1.2	4.0	-16	0.060
	N Seguam	36.1	41.8	13.8	24.9	14.9	38.3	10.1	12.4	15.3	-12	0.130
	S Adak	4.3	6.2	4.8	4.7	1.3	1.8	2.6	2.8	1.4	-16	0.060
	S Seguam	17.8	24.5	8.0	9.8	4.5	7.0	29.6	6.9	9.9	-6	0.306

Table 3d. AI trawl survey biomass estimates (thousands of t) for **Walleye pollock** by survey subarea and year. Refer to Figure 1 for subarea locations (listed in the table from west to east, N and S indicate north and south sides of the Aleutian chain). Test statistic and p-value for a one-tailed Mann-Kendal test of trend over time are shown for each subarea. A positive test statistic indicates increasing trend, negative indicates decreasing trend. Significant trends (p<0.05) are in bold type.

				Walleye pollock							One tailed MK test	
Area	Subarea	1991	1994	1997	2000	2002	2004	2006	2010	2012	SSUM	P
543	Aggatu	3.2	4.9	11.7	1.8	4.4	4.8	2.4	6.1	4.8	2	0.460
	Buldir	23.5	9.3	6.4	5.1	8.8	1.8	4.1	1.9	0.6	-28	**0.001**
542	Petrel	9.6	3.4	1.6	1.7	9.2	5.3	3.6	6.1	1.7	-4	0.381
	N Amchitka	17.0	6.3	8.1	32.7	89.4	3.9	11.9	20.8	3.6	-4	0.381
	S Amchitka	13.2	8.3	21.9	8.5	9.3	2.3	2.2	1.7	1.5	-26	**0.003**
	S Tanaga	10.5	9.1	5.2	0.1	0.3	0.4	0.4	0.1	0.7	-16	0.060
541	N Adak	6.5	3.1	7.3	1.3	2.2	0.6	0.5	2.0	0.9	-20	**0.022**
	N Seguam	31.5	14.3	15.0	23.6	49.7	2.8	40.0	99.2	4.8	4	0.381
	S Adak	6.2	7.0	1.9	27.1	0.7	0.5	0.3	0.4	0.3	-26	**0.003**
	S Seguam	16.7	12.9	14.4	4.1	2.0	108.2	29.2	2.7	25.5	0	0.540

Table 3e. AI trawl survey biomass estimates (thousands of t) for **Sculpins (all species)** by survey subarea and year. Refer to Figure 1 for subarea locations (listed in the table from west to east, N and S indicate north and south sides of the Aleutian chain). Test statistic and p-value for a one-tailed Mann-Kendal test of trend over time are shown for each subarea. A positive test statistic indicates increasing trend, negative indicates decreasing trend. Significant trends ($p<0.05$) are in bold type.

		Sculpins (all species)									One tailed MK test	
Area	Subarea	1991	1994	1997	2000	2002	2004	2006	2010	2012	SSUM	P
543	Aggatu	4.8	1.8	2.0	0.9	1.2	1.0	1.0	1.4	0.6	-20	**0.022**
	Buldir	0.1	0.9	0.7	0.7	0.6	0.8	1.5	5.4	0.9	18	**0.038**
542	Petrel	0.9	1.7	1.4	2.9	2.4	4.3	2.8	2.4	3.2	18	**0.038**
	N Amchitka	0.9	0.7	1.0	0.6	0.8	0.7	1.5	0.7	1.2	2	0.460
	S Amchitka	0.2	0.6	0.5	0.3	0.4	1.0	0.5	0.6	0.6	18	**0.038**
	S Tanaga	2.0	0.6	0.3	0.3	1.5	0.8	1.3	1.2	2.1	8	0.238
541	N Adak	1.0	1.5	2.8	1.3	1.3	1.9	1.7	1.7	1.7	10	0.179
	N Seguam	1.4	2.1	1.3	1.0	1.0	1.3	1.6	1.6	3.6	8	0.238
	S Adak	0.2	0.3	0.3	0.3	0.4	0.4	0.7	0.8	0.8	34	**0.000**
	S Seguam	1.5	5.0	2.1	2.2	2.8	4.3	5.3	6.2	6.6	28	**0.001**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Legend
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2 - 10
11 - 25
26 - 50
51 - 100
101 - 150
151 - 300
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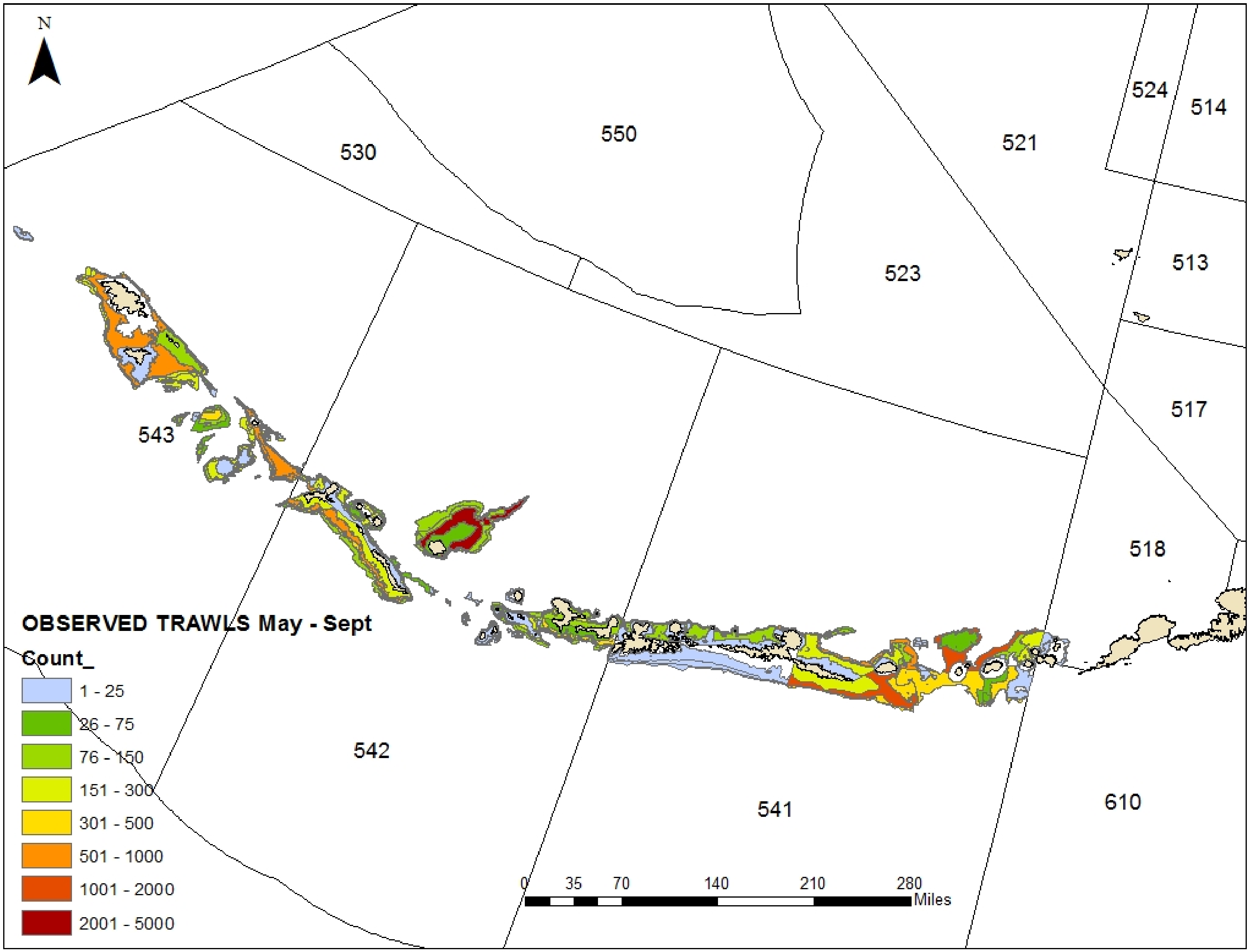
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301 - 500
501 - 1000
1001 - 2000
2001 - 5000
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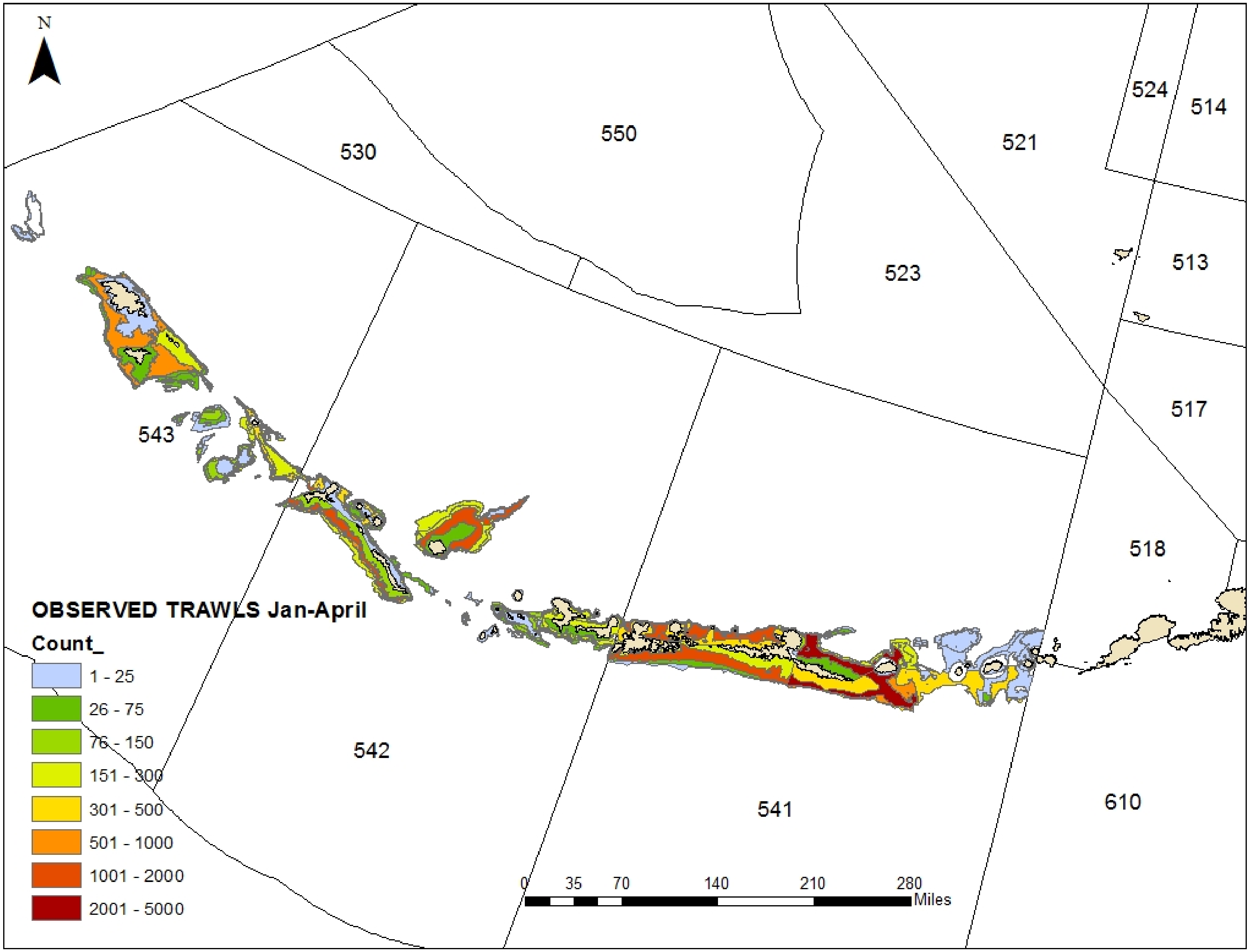
Miles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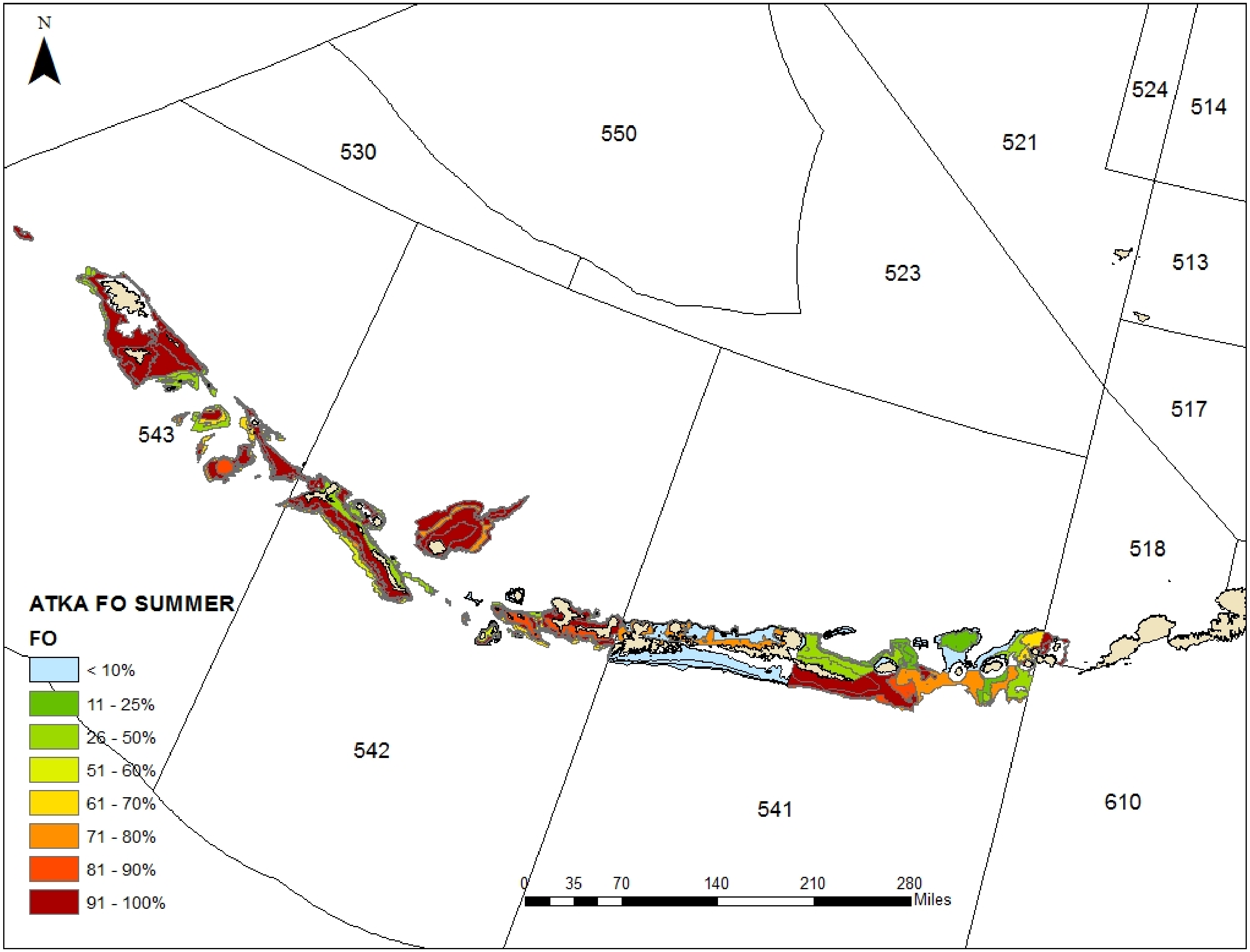
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11 - 25%
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61 - 70%
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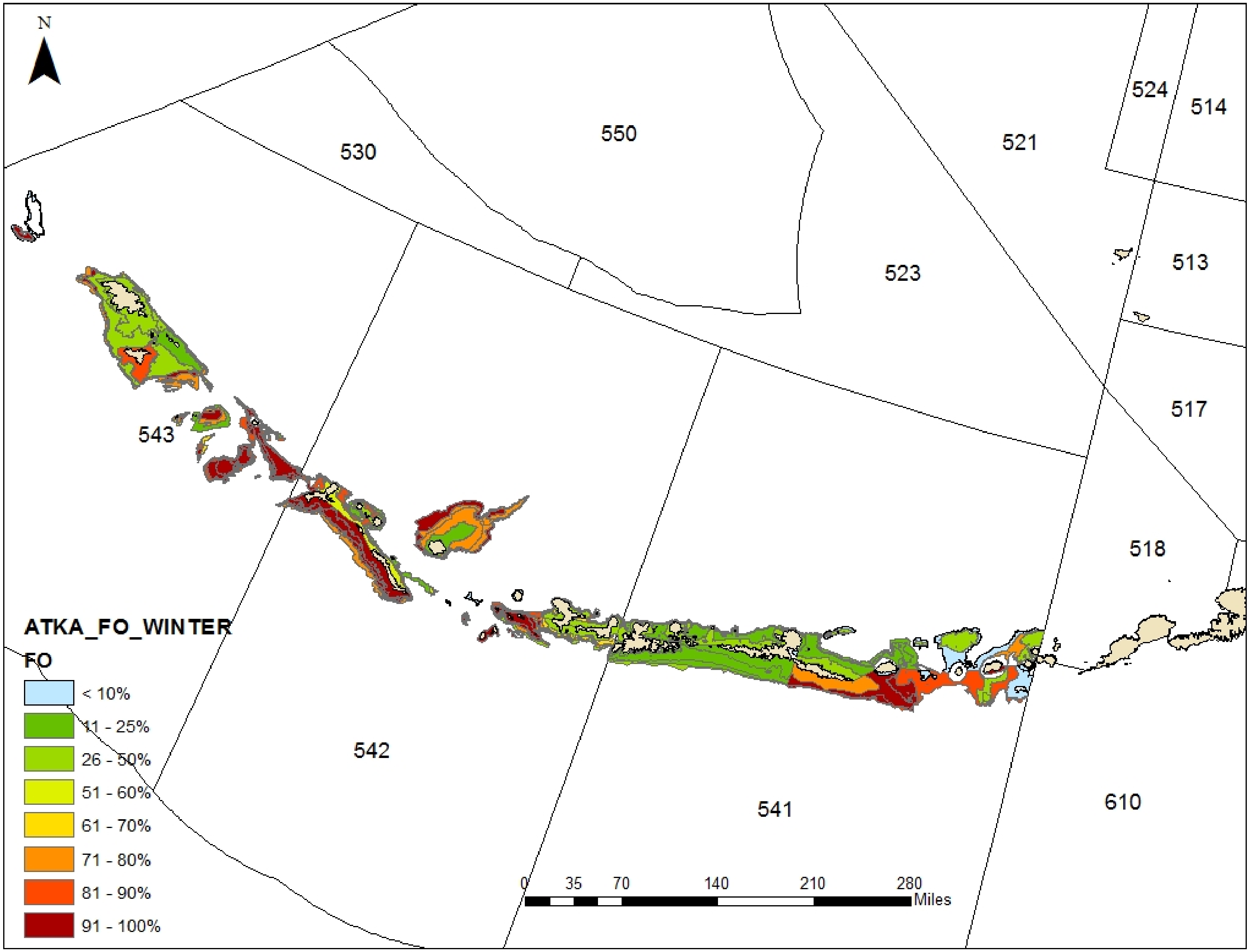
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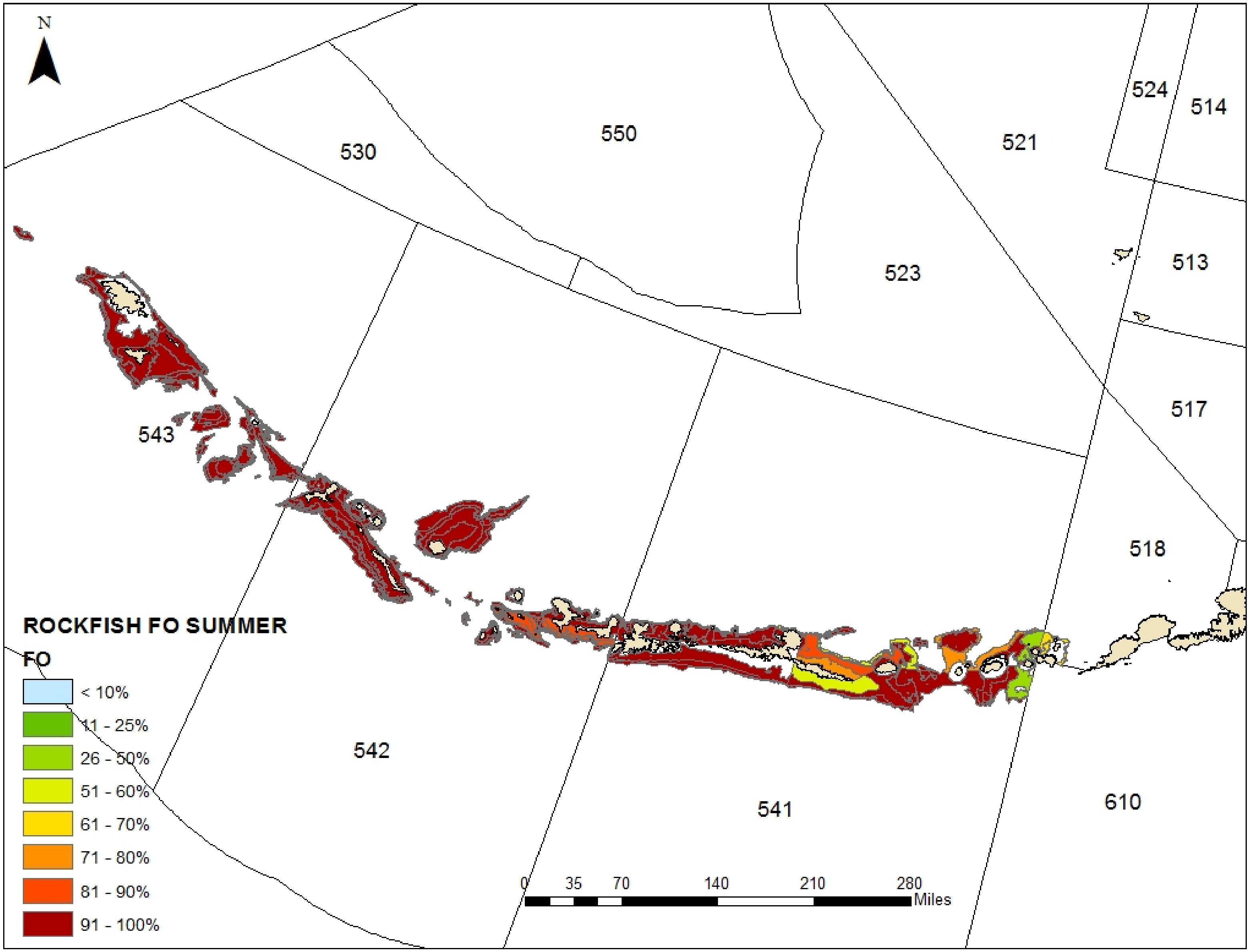
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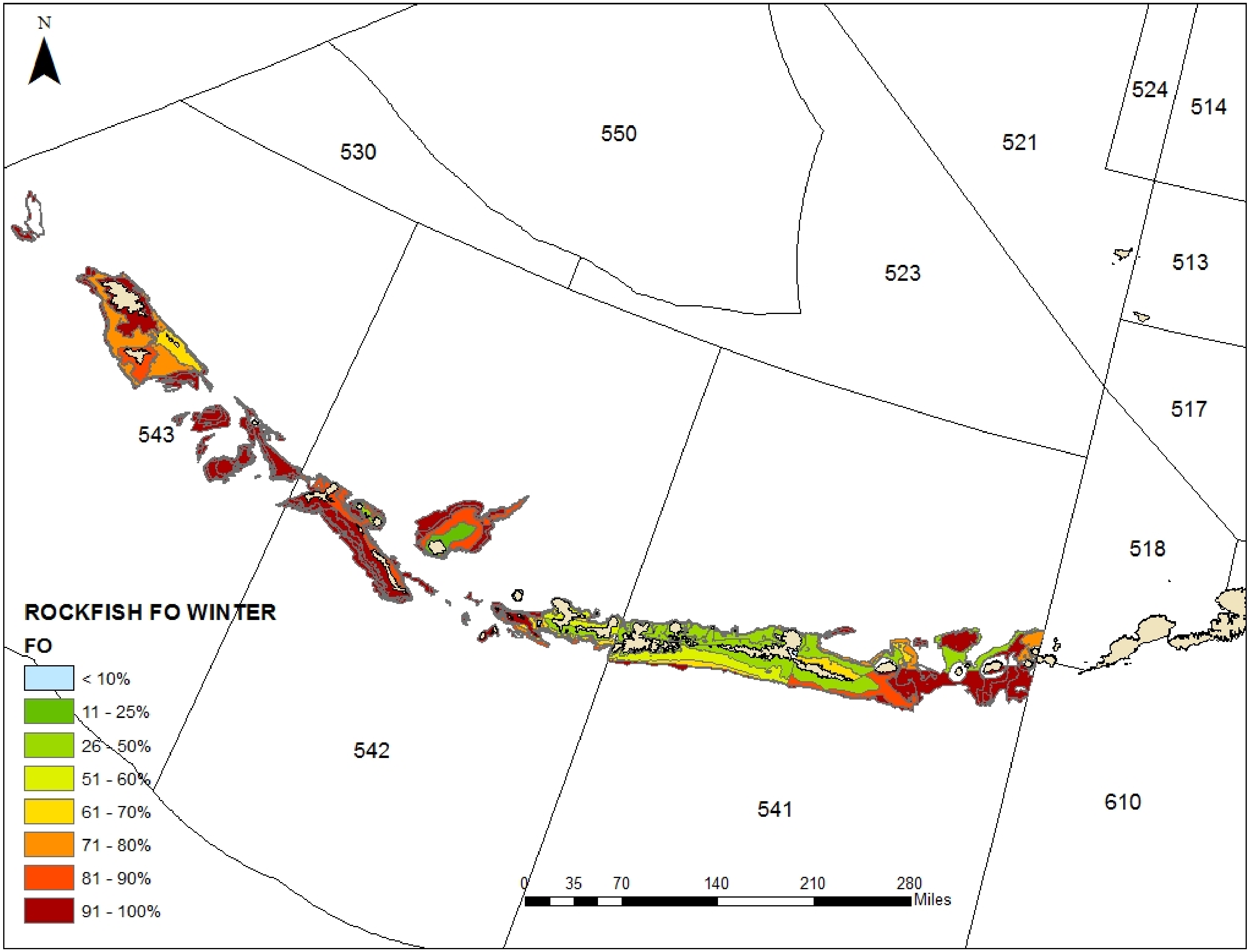
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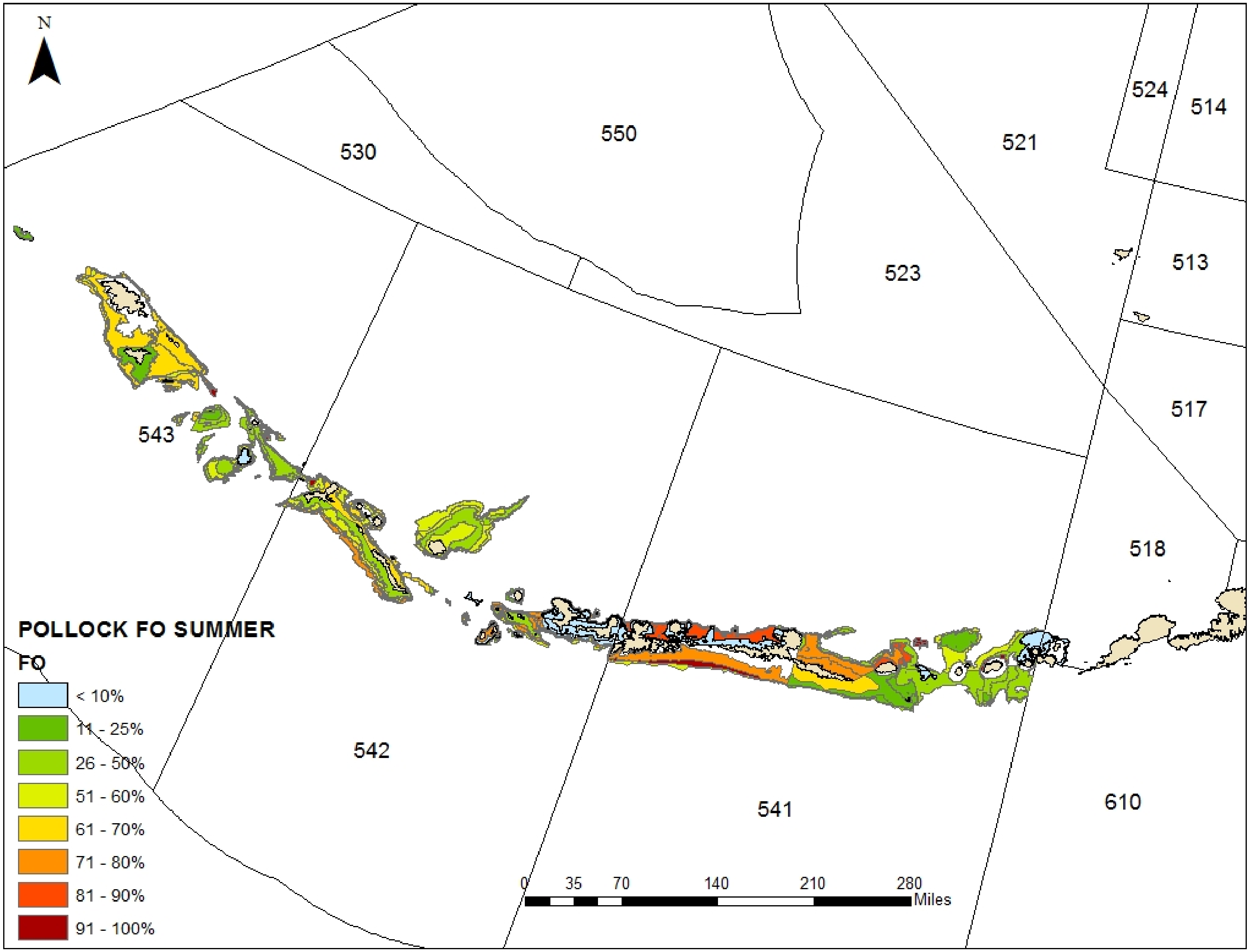

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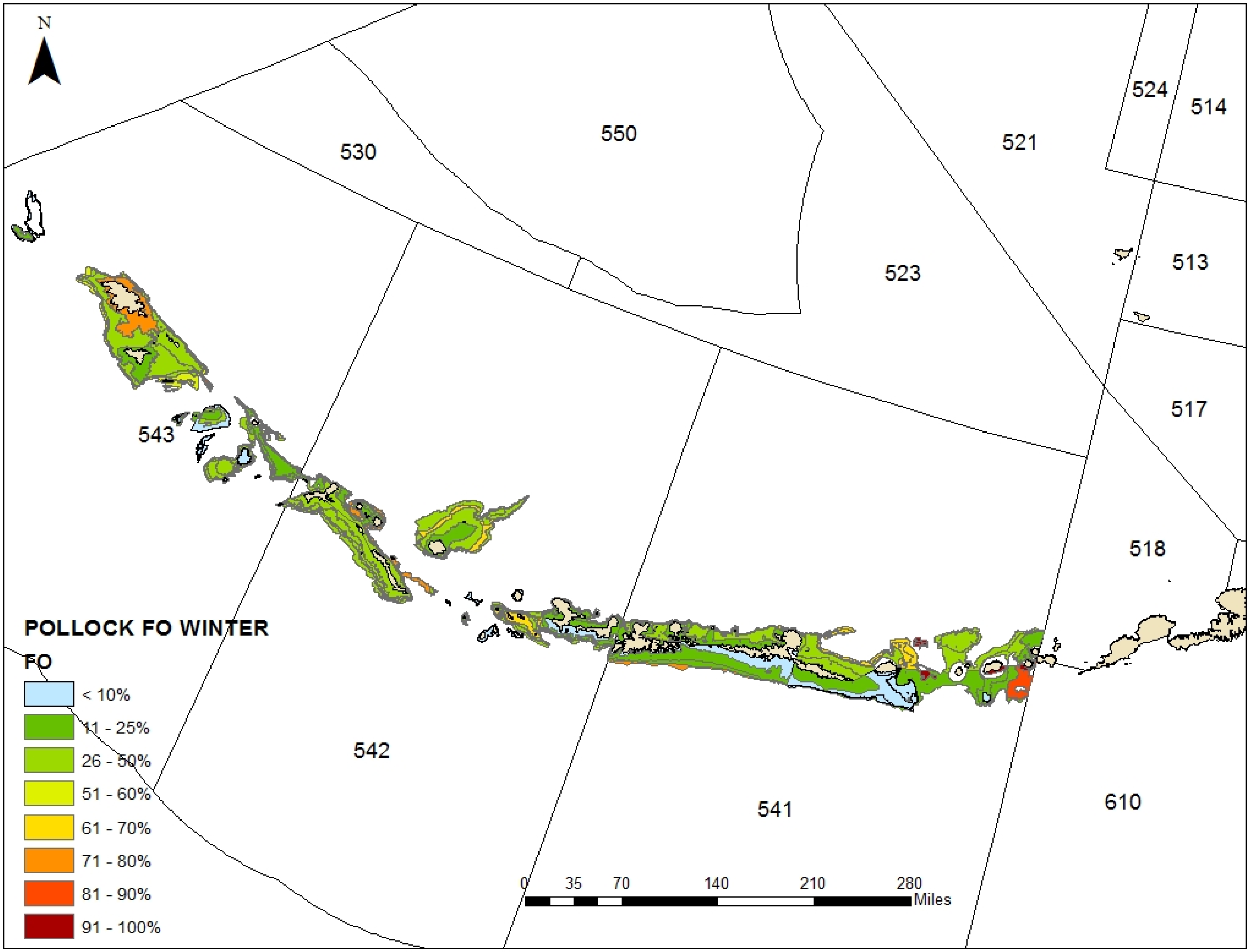
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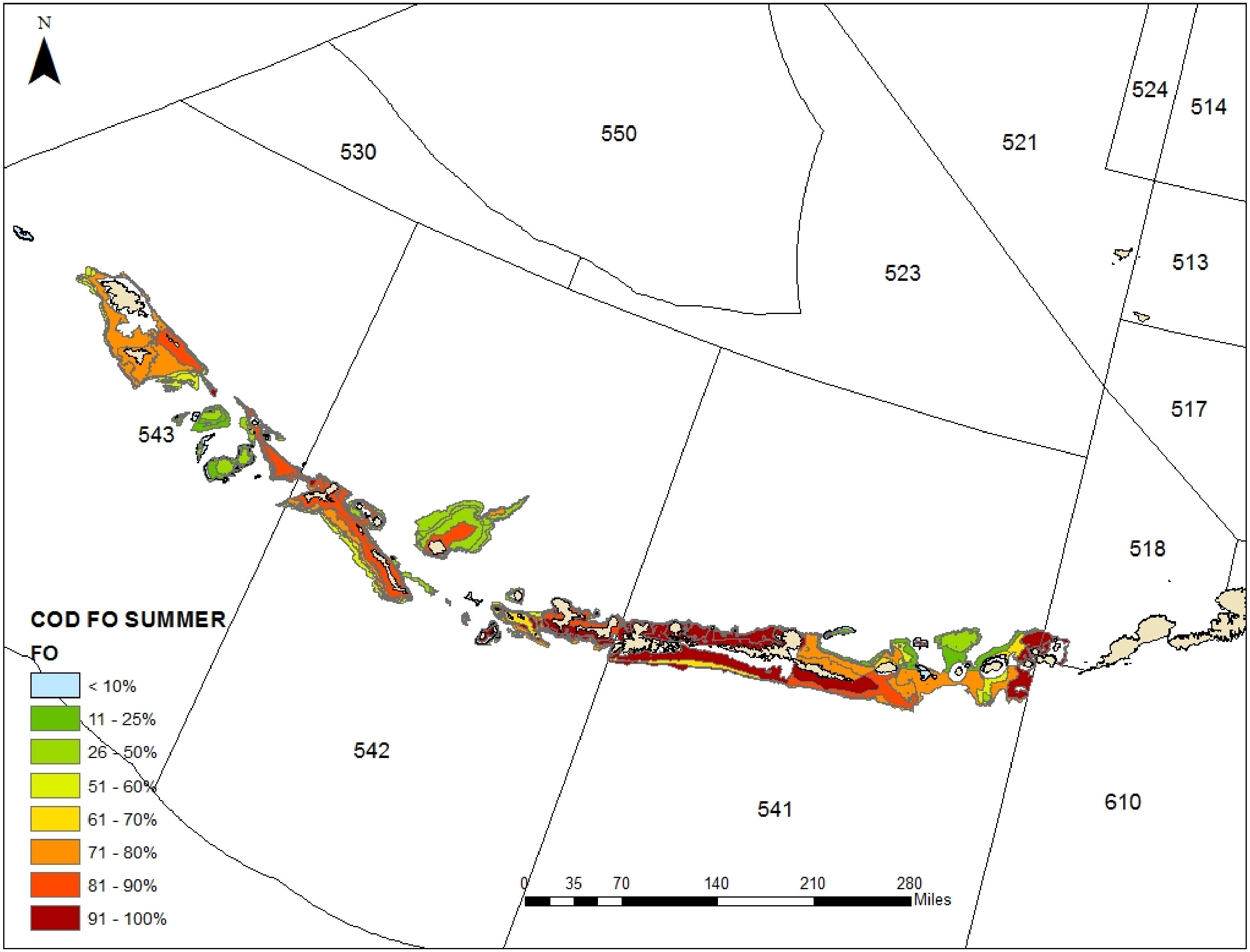
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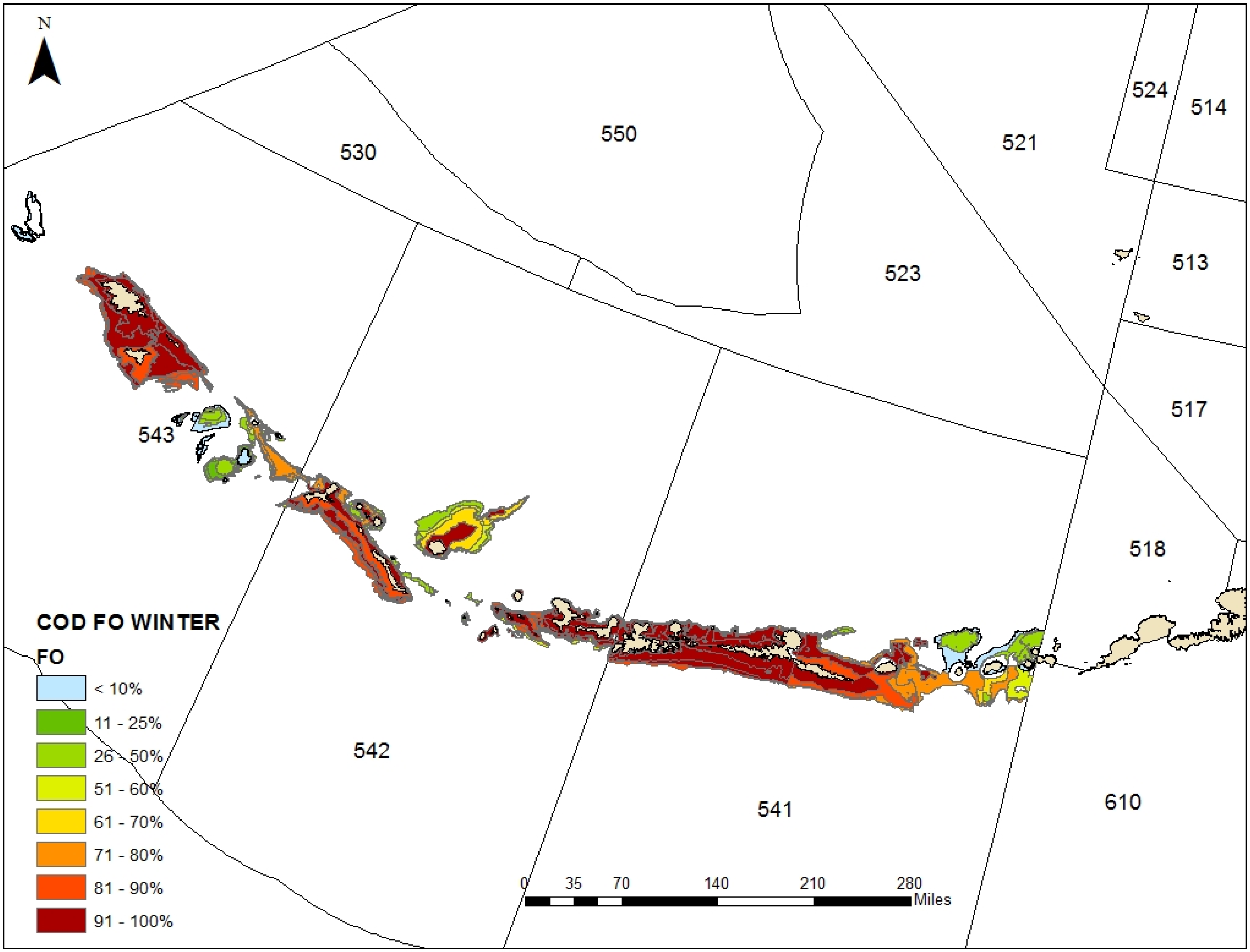

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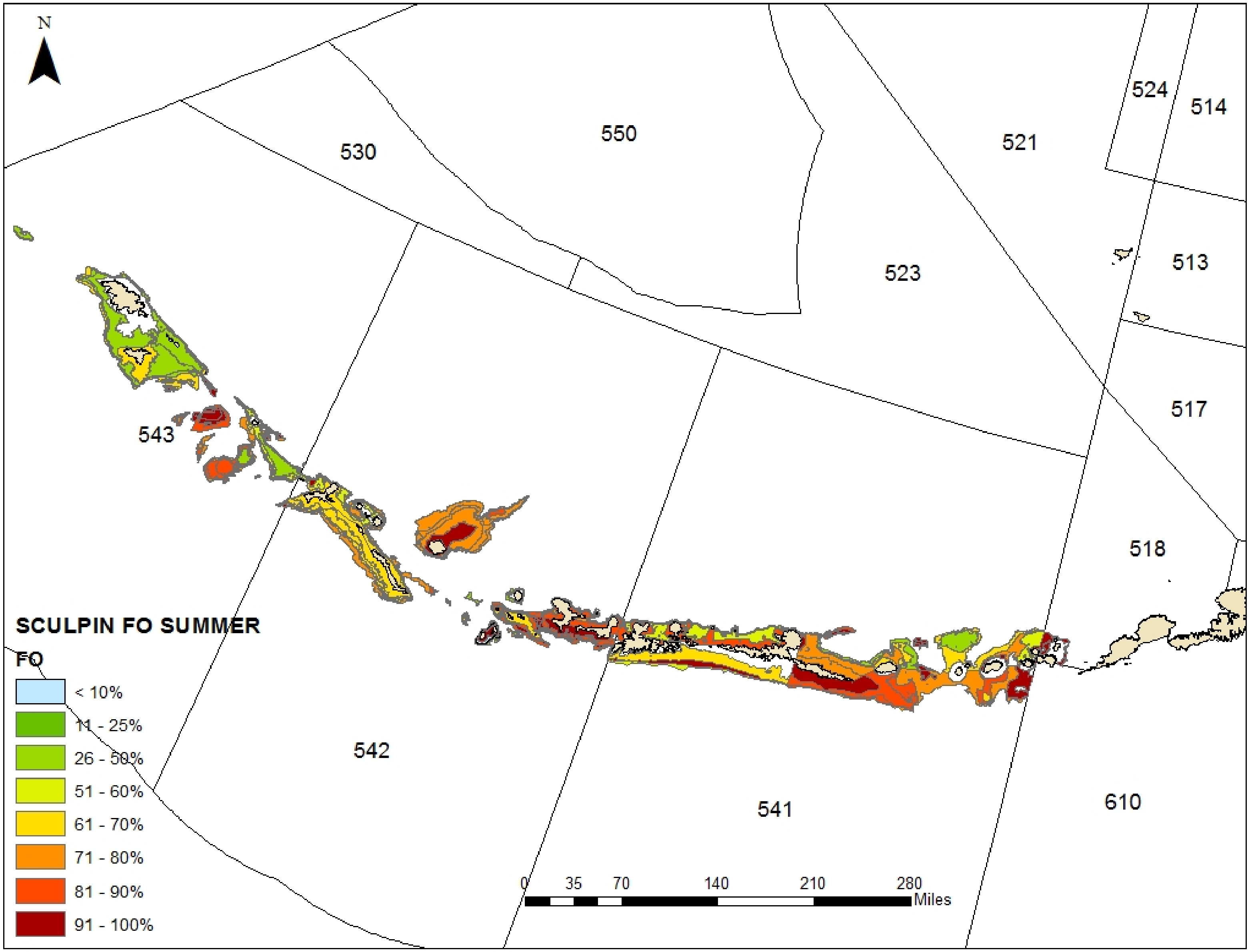
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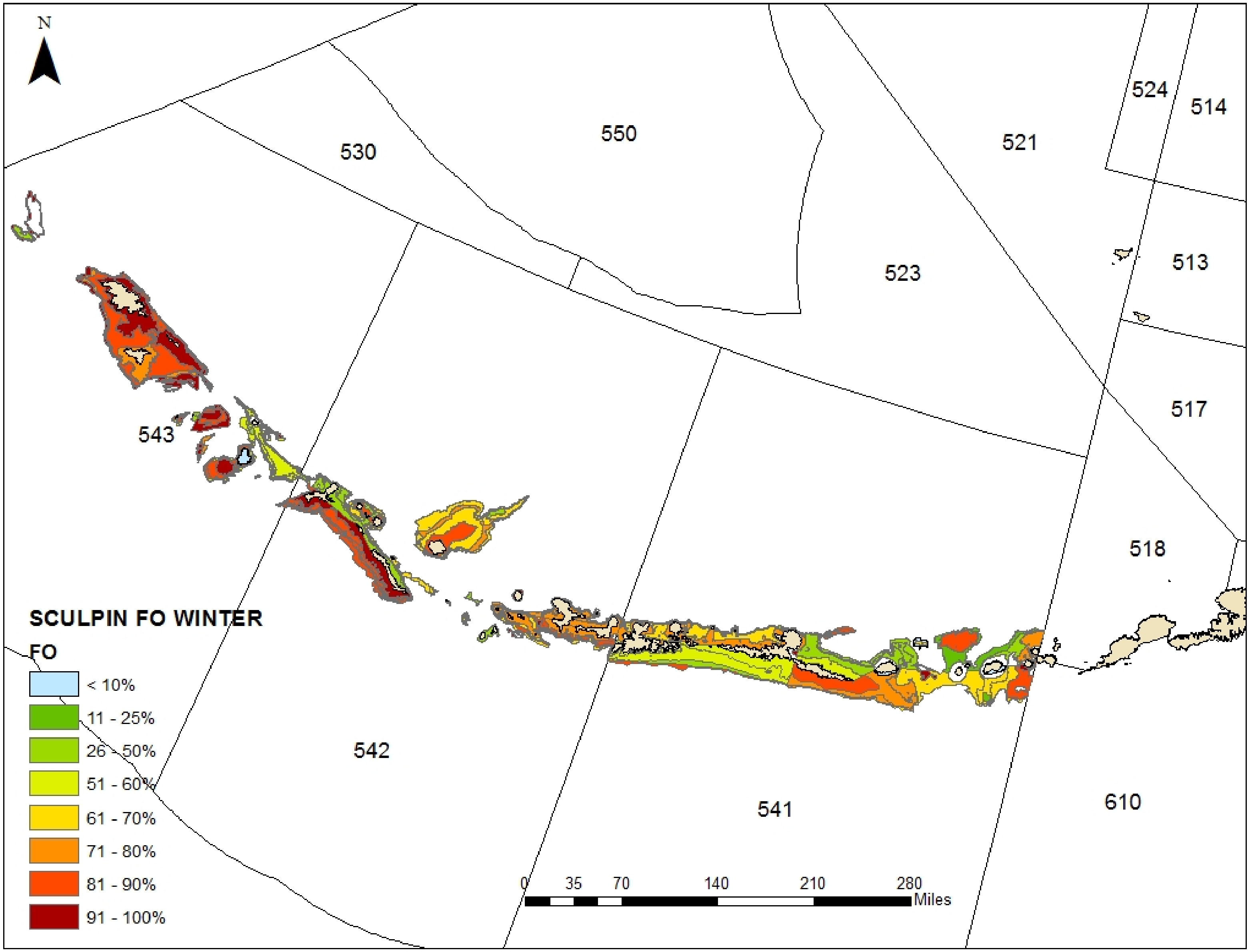
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