Estimating Red Abalone Density for Managing California's Recreational Red Abalone Fishery

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Summary

The recreational fishery for red abalone, *Haliotis rufescens*, in northern California is managed by the California Department of Fish & Wildlife (CDFW) using a combination of traditional regulatory measures along with a quantitative assessment of abalone density on the fishing grounds. Density estimates are particularly important for species susceptible to reduced reproduction at low densities (reproductive Allee Effects, Allee 1931). In August 2011, a Harmful Algal Bloom (HAB) resulted in high abalone mortalities along the Sonoma County coast, reducing densities of red abalone and other marine invertebrates (Rogers-Bennett et al. 2012). Fishery-independent, depth stratified dive surveys were used to detect changes in the relative densities of red abalone at eight index sites in the fishery; four in Sonoma County and four in Mendocino County. The number of abalone were counted along randomly placed transects (30 x 2m) within 4 depth strata at each site. The density surveys conducted at the index sites revealed that abalone density in the most recent survey cycle (2009-2012) had dropped significantly, 36% lower than the earliest survey cycle (2003-2007). The decline in the fishery overall was driven by declines in the Sonoma County portion of the fishery (60% decline) which was impacted by the HAB. Abalone populations along the Mendocino County coast did not show significant declines. Power analyses indicate that, with the current level of variance and sampling intensity, the red abalone density surveys will detect changes (effect size) in overall density greater than 15 percent. The goals of this density review are to examine the survey methods used to assess density and the results of those surveys for the red abalone fishery in northern California.

Introduction

What is our Purpose in this Technical Review?

We present the methods used to assess the density of red abalone at the fishery index sites in the northern California recreational red abalone fishery. The fishery-independent scuba surveys are random, depth-stratified surveys used to assess density and are a *relative* measure of the density at select index sites to compare with density surveys conducted at these sites at earlier time points. These density data are used in combination with traditional management measures to adaptively manage the red abalone fishery. The purpose of this summary is to describe the methods used by the

CDFW to estimate densities at these sites and significant changes in density if they exist. We also present statistical analyses of the data, examining the power of the data to detect changes in mean density across time periods and at different spatial scales.

The Recreational Red Abalone Fishery in Northern California

The recreational red abalone, *Haliotis rufescens*, fishery in northern California (centered in the coastal counties of Sonoma and Mendocino) is the largest in the world, averaging more than 260,000 red abalone fished (310 mtons) per year (Kalvass and Geibel 2006). Given the importance of this fishery to the local coastal economy as well as to California's natural heritage, the state is actively managing the fishery to ensure the long-term sustainability of the resource. The fishery is managed under the Abalone Recovery and Management Plan (ARMP) by use of both traditional fishery management strategies as well as an innovative adaptive management approach incorporating density survey data. The adaptive feature of the plan uses information about the density of abalone on the fishing grounds to determine if the fishing is sustainable (fishing only the surplus production) or if fishing is reducing abalone density. Pre-established harvest control rules in the ARMP state that if the average density across the eight index sites in the fishery drops 25% below the established baseline then fishing effort is to be reduced by 25%. A site closure trigger was established at 0.25 ab/m^2. Reductions in fishing pressure across the fishery are designed to reduce the impacts of potential shifts in fishing effort and to maintain a sustainable fishery.

In northern California, surveys are conducted at eight index sites (fished sites) to assess whether fishing regulations are maintaining densities through time. Catch from these eight index sites accounts for roughly half the catch in the fishery. These index sites are designed to act as 'canaries in the coal mine', providing early warning for declines in density in the fishery overall. If fishing is unsustainable then these fished sites could decline before other less popular sites or reserves, thus providing an early indication that management needs to respond. The density of red abalone at these index sites is examined *relative* to previous density measures at the same index sites to determine if there have been significant changes over time. The ARMP recommends that the densities at the index sites be collected over a period of years and estimates that this will take approximately three years given the resources available.

Null Hypothesis: We have explored changes in density in statistical terms by constructing a null hypothesis which compares the mean densities between early and current time periods. The null hypothesis is : The mean density of abalone at eight index sites is not significantly different in the current time period (2009-2012) compared with the earliest time period (2003-2007).

Methods

Index Sites

Scuba surveys are used to estimate densities of red abalone in northern California. Surveys are conducted at four Sonoma and four Mendocino county sites (Fig. 1). The catch from these eight index sites accounts for 48% of the catch in the fishery overall. The eight index sites vary in size from 2.4 to 3.1 km (1.5 to 2.0 miles) of coastline and extend out to the 18m depth contour (Table 1). These sites were chosen in part because they represent a large portion of the catch and fishing effort and a combination of high and moderate use and productivity. For Sonoma County, Fort Ross and Salt Point are high use and Timber Cove and Ocean Cove see moderate effort. In Mendocino County, Point Arena and Van Damme are high use sites, complimented by Caspar and Todds Point as moderate use sites.

It takes approximately three years to complete all eight index sites in the fishery survey, and additional sites when possible. Index sites were selected based on their level of use in the fishery. The goal is to select sites in which fishing may have a detectable impact on density, to be used as an indicator of the efficacy of the existing management measures. If the density at fished sites is declining, then the plan calls for a reduction in fishing pressure. Since 2002, abalone report cards are used to track fishery use by site. While areas closed to fishing (reserve sites) are also surveyed, to see if there are non-fishing related impacts to abalone density, the densities from the reserve sites are not used in the density calculations outlined in the ARMP for management (Table 2). The ARMP calls for current density estimates at the eight index sites to be compared with pre-adopted management triggers, based on baseline estimates of three index sites surveyed in 1999-2000 (section 7.1.2.1). The first series of surveys which included all eight index sites was completed in 2003-2007. The most recent series of surveys was completed in 2009-2012. The most recent time period is defined as those years that encompass at least one survey being conducted from every index site, counting back from the current year. Since surveys are conducted on a rotating basis, this results in a time span of several years.

Scuba Survey Design

The Scuba surveys are ecosystem based and are designed as random surveys stratified by depth. Random placement of transects helps to ensure that the density estimate is representative of the density across the site. Red abalone are more abundant in the shallower depth strata, as determined by previous dive surveys (Karpov et al. 2001). Survey locations at each index site are within four depth strata from 0m to 18m to accommodate the known differences in red abalone density by depth. The first two shallow depth strata (A) 0 – 4.5m (1 – 15ft) and (B) 4.5 – 8.3m (16 – 30ft) are within typical recreational free diving fishing depths. The two deeper depth strata (C) 9 – 13.7m (31 – 45ft) and (D)13.7 – 18.3m (46 – 60ft) are beyond the free-diving capability of most fishermen. Depths beyond 9m are defined as deep depths and are considered to provide a refuge from fishing for deep abalone populations (Karpov et al. 2001). Abalone densities at these deeper depths tend to be lower than those in more optimal shallower habitat where kelp is more abundant.

Transects (30 x 2m) are placed at pre-determined random GPS coordinates within each index site. Random points are generated with GIS software (Arc View v 3.2) and Random Point Generator software (RPG v 1.3). The base maps used are USGS topographic maps (datum NAD 1983) which show depth contours at 18 and 60 feet. We use a random points shape file with 400 to 500 points separated by a minimum of 70m. We also generate additional (alternate) transect locations to use if the primary transect location is unsuitable for any reason. In the field the divers and boat operators are given handheld GPS units with the random transect locations for that site pre-programmed into the unit. They use the GPS units to locate the random transect and then they drop a pelican marker buoy to use as the start of the transect. Divers descend at the marker buoy, record the transect heading on the data sheet and deploy the transect tape out 30m. Divers are instructed to remain within the designated depth stratum.

Transects are placed at random within a depth stratum (as opposed to fixed transects) since red abalone are patchily distributed and the goal is to have the density estimate representative of the site overall for that time period. Transects are deployed by the divers along the target depth stratum (e.g. 30 to 45 feet), generally parallel to shore. A total of 36 transects (based on the power analysis) is the goal for each site with nine transects per depth stratum. The total number of transects completed at each site ranged between 31 and 41 (Table 3). Twenty additional transects (N=55) were completed at Caspar Cove in the most recent time period to account for a sea urchin reserve.

Transects are located in rocky reef habitats. The divers will move transects if they encounter more than 50% sandy substrate (defined as unsuitable abalone habitat) which is uncommon along the rocky outer coast in northern California. In a situation where a transect is moved due to sand, the divers pick suitable rocky habitat as close as possible to the original GPS point. The new GPS point is recorded at the start of the transect. Transect heading is recorded by the divers at the start of the dive.

Abalone and sea urchins are counted and measured along the transects by a two-person dive team. Only emergent abalone and sea urchins are counted, meaning that all animals that can be seen in cracks and crevices and out in the open without the use of dive lights are counted and measured. The first 25 animals are measured for each species of abalone and sea urchin observed. In many cases more than 25 are measured. Calipers are used by the divers to measure the abalone along the longest length of the shell and across the width of the sea urchin test excluding the spines. Divers may use yellow lumber crayons to mark abalone they have measured which may be near the center of the transect line to indicate to their dive buddy that this is an abalone that has been counted and measured. In some cases, abalone and sea urchins can be seen but are situated where they cannot be measured accurately. In these cases, counts are made and the animal is recorded as NM (not measured). If densities are very high (e.g. more than 100 along one side of the transect tape) all animals are counted but not all animals are measured.

We use the size frequency data to determine the % of abalone within different size classes. During the emergent transects size data which is collected at the fine scale of 1 mm can be combined into a wide range of size classes. We define ecological recruitment as abalone 1 to 99mm in shell length. We caution that this size class is cryptic and that other methods used by CDFW are better for quantifying the numbers in this size range (such as ARMs and invasive transects). Recruitment to the fishery is defined as 100 to 177mm in shell length. Our transect data are suitable for capturing abalone in this adult size class. Finally, the fished size class is 178mm in shell length to the largest sizes and again are quantified during our emergent transect sampling.

Incorporating substrate, algal composition as well as associated species this sampling program is producing information designed to maintain an ecosystem-based focus. Invertebrates other than abalone and sea urchins such as sea stars, crabs, gumboot chitons, benthic fishes, and other macroscopic invertebrates are also enumerated along the transect. Algal cover is also recorded by type and percent cover. Algal cover is divided into functional categories based on algal height: canopy reaches the surface; subcanopy is 1-3m in height, foliose is 0.1-1.0m in height; turf is less than 0.1m (about the height of a grass lawn); encrusting algae such as crustose coralline algae is recorded; as well as a bare rock category. Total algal coverage can be more than 100% as algal communities can overlap each other. Substrate is also recorded. Substrate is categorized as rock reef (continuous rock forming a reef), boulder (>1m diameter and rock that cannot be moved by one person), cobble that can be moved, and sand (fine enough to insert fingers). Total substrate will add up to 100%. At 10m marks along the transect tape (0m, 10m, 20m and 30m) the diver estimates substrate composition and algal cover on both sides of the transect tape out to 1m (total area/sample point = 2 x 1 m). For example, if at the 20m mark on the transect the diver sees 50% canopy, 20% subcanopy, 20% foliose, 80% turf and 100% encrusting and 0% bare rock then this is recorded for algal cover while at the same 20m mark there might also be 100% reef on both sides of the tape. The depth, substrate and algal measures are recorded every 10m yielding 4 measures of algal cover, substrate and depth per 30 meter transect.

Scuba surveys are conducted by trained scientific research divers (AAUS certified) with northern California dive experience. New divers to the team undergo training and then are paired with experienced divers for their first year of the surveys. Scientific diver training takes place in the dive programs in northern California including the research dive class at UC Davis, Humboldt State and other survey programs. Once divers are trained, divers come to the invertebrate dive team for one-on-one diver training using the transect tapes and data sheets. Divers are trained to distinguish between the three species of abalone; red abalone *H. rufescens*, flat abalone, *H. walallensis* and pinto abalone, *H. kamtschatkana* and the two species of sea urchins; red sea urchins, *Strongylocentrotus franciscanus* and purple sea urchins, *S. purpuratus*, as well as associated species found in the subtidal study region. Divers are told to make sure to quantify the number of abalone and sea urchins along the transect as the first priority. The second priority task for more experienced divers are the measures and the substrate and algal composition. Ocean conditions may alter the number of transects completed at a site in a specific survey cycle. Ocean conditions with wave heights greater than approximately 2m (approx. 6 feet) are avoided as divers cannot safely work in these conditions. Dive conditions along the north coast are generally optimal from July-October. Dive conditions including wave height and surge dictate which months can be used for survey work on the north coast. Algal cover is not one of the factors determining suitable survey conditions as it might in other more benign regions in the south. Surveys are scheduled during these months with backup cruise dates used as needed.

Alternative Survey Designs

When designing the density surveys, we considered a number of options. In consultation with statisticians and other subtidal researchers, we concluded that stratified random placement of transects provides the best representation of the overall density at the site. On the other hand, fixed transects are useful for determining if density has changed at that transect over time. Fixed transects are not ideal for this application as they are time consuming to find after one or more years, and finding 36 transects would be unworkable. Plotless density estimators may be used (Engeman et al. 1994); however these are not as robust to non-random, contagious distributions which we find for red abalone. We have conducted and rejected nearest-neighbor-distance-based estimates for red abalone as a means to determine if densities have changed over time for our management application. However, we have found that nearest-neighbor distance and aggregation size estimates are useful for examining questions of reproductive success, especially for populations at low densities (Button 2008). These methods have also been used to examine commercial abalone diver fishing impacts on abalone aggregations (Dowling et al. 2004).

Data Entry

The data are subject to quality control methods for entry into the Access database. Datasheets are examined by staff on the day of the surveys and divers are interviewed to clarify any discrepancies or issues of legibility on the datasheet. Data are entered by two people and then triple checked by a third independent data entry person. In addition, the means and outliers are examined and the data are plotted with density as a function of depth as a way of ensuring quality control. These density and depth values are double checked with the raw data sheets. Raw data entries are discussed and verified with divers at the end of the dive day on the dive boat.

Data Analyses

The ARMP gives little guidance as to how to conduct the data analyses for abalone management other than to define the triggers for management changes. The null Hypothesis (see above) is structured so that potential changes in density can be tested to determine if they are statistically significant changes to further inform management.

Analysis of variance is used to determine if the density of red abalone has changed significantly between the earliest and most recent survey time periods. The data are log transformed (Log (Density +1)) since these data are not normally distributed. Transformation is done prior to performing a two-factor ANOVA (Factor 1: Time Period; Factor 2: County). The results of this analysis provide insight on the change in density across time periods in the fishery overall as well as within a county. The two survey time periods compared were the early time period (2003-2007) and the recent time period (2009-2012). The two Counties compared are Sonoma and Mendocino County.

Power analyses were conducted to determine the number of transects and the power to detect changes in density (effect size). The alpha level (Type 1 error) was set at $p<0.05$ and the statistical power (Type II error) was set at Power $(1-\beta)>0.8$ as is commonly done in many studies of this type. In addition, power analyses with preliminary data were used to help design the sampling program initially (N size) as well as to determine the detectable effect size.

While there are many types of statistics and statistical software packages available, in this case, we used MatLab v R2013a for the AVOVA and the power analysis package PASS v 6.0.

Results

A wide range of sites (N=14) in both Sonoma and Mendocino Counties have been surveyed between 1999 and 2012 (Table 2). The goal has been to sample each index site every 4-6 years. Non-index sites are also sampled to compare with the fished index sites.

Comparing Baseline with 2003-2007

The ARMP baseline fishery density level was estimated from CDFW surveys conducted between 1999 and 2000 at 3 fished sites: Fort Ross, and Salt Point in Sonoma County and Van Damme in Mendocino County. These data were collected to establish a baseline for the drafting of the ARMP. The baseline of 0.66 ab/m^2 was based on the densities found at these three index sites across all depths at this time (ARMP section 7.1.2.1).

Dive surveys were conducted each year such that at the end of a 3-4 year period all eight abalone index sites in Sonoma and Mendocino County were surveyed. Comparing the densities during the earliest baseline (three index sites) time period 1999-2000 with the 2003-2007 time period (eight index sites) did not show any significant changes in mean red abalone density across all depths. The results from the 2003-2007 survey period average densities fishery-wide (Sonoma and Mendocino Co.) were not significantly lower than the previous surveys nor did they drop below the 0.5 ab/m^2 trigger therefore, no new management changes were recommended (Kashiwada and Taniguchi 2007). The mean abalone density across all depths at the eight index sites for the earlier 2003-2007 time period was 0.72 ab/m^2, slightly above the earlier baseline but not significantly different than the earlier baseline.

Comparing 2003-2007 with the most recent time period 2009-2012

During the most recent time period, in the 2009-2012 survey cycle, the density of red abalone dropped significantly ($p<0.001$) in the fishery overall by 36%. The average density was 0.47 ab/m^2, below the management trigger of 0.5 ab/m^2 (Fig. 2). The decline in red abalone density was driven by the decline in the Sonoma County portion of the fishery where the HAB event occurred. In Sonoma County, the average abalone density at the four sites declined by 60% from 0.79 ab/m^2 to 0.31 ab/m^2 ($P<0.001$). There was no significant decline between the time periods in Mendocino County, with average densities near 0.6 ab/m^2 at the four sites in both time periods (Fig. 3). Densities and confidence intervals by site and survey year are shown in Table 3. The decline in the fishery overall triggered a recommendation to the Fish and Game Commission (FGC) to reduce take in the fishery, with a particular focus on Sonoma County take reductions (for more information see FGC web site).

Power Analysis

The results of the power analysis indicates that, for the fishery as a whole, there was sufficient power to detect a 36% decrease in the density of abalone between the two time periods from mean1 (early 2003-2007) = 0.72 abalone/m^2 compared with mean2 (recent 2009-2012) = 0.47 ab/m^2. There was a sample size of N1 (early) = 287 transects in the early time period compared with a sample size of N2 (recent) = 308 for the most recent time period. Given the standard deviations of the mean density of the early and more recent time periods, the power was determined to be 0.99 (>0.8). We estimate that with 36 transects per site, and 8 sites there is sufficient power to detect effect sizes greater than 15%. Even with a doubling of sampling effort to 576 transects the power to detect changes would only increase to approx 10% effect size which is not a big improvement for the large increase in sampling effort.

An analysis of changes in density at the County level reveals that there is enough power to detect a significant 60% decrease in the density of abalone in the index sites in Sonoma County, but no significant change in the density of abalone in the Mendocino County sites. Given an effect size of this magnitude (change of 60%) the power was sufficient to detect this large decline despite fewer transects at the county level (N=146 transects in each time period for Sonoma Co.) compared to the fishery overall with nearly double the number of transects (Fig. 3). This sampling effort was sufficient to detect changes in density of approx. 25%.

Discussion

Based on the results of the surveys, the overall density (fishery-wide across index sites) fell 36% between the earlier (2003-2007) and the most recent (2009-2012) time periods (Fig. 2, Table 3). Further analyses revealed that there is sufficient statistical power to detect changes of this magnitude (>15%) in density (or effect sizes). Conducting an analysis at the County level, we found that the density decline in the fishery was driven by the decline in Sonoma County. Density in Sonoma County declined by 60% between the two time periods but was not significantly different in Mendocino County between the time periods. The most recent time period for the Sonoma County survey data was 2012 which followed the August 2011 HAB event (Rogers-Bennett et al. 2012).

Our survey methods have been used in a published paper on abalone density in Biological Conservation. In this paper these methods were used to detect large declines in abalone density inside areas opened to fishing in northern California. The site was private lands called the Stornetta Ranch and is now part of the North Central Coast MPAs called Sea Lion Cove. Prior to the opening of this site to fishing in 2004, our surveys indicated that this site had high red abalone densities. After just 3 years of public access and associated fishing pressure, red abalone catch fell and density was significantly reduced in the subtidal zone by 65%. This decline was due to a combination of legal and illegal fishing (Rogers-Bennett et al. 2013).

In conclusion, the results of our density estimation methods are informative for red abalone management. This density estimation methodology is designed to be sensitive to changes in density >15%. The use of fished sites as indicators of fishery status is designed to function as an extra precautionary approach by examining sites which are likely to respond to fishing pressure first.

Alternative Assessment Methods

Alternative assessment methods, such as biomass and abundance estimation, have been considered. These methods would be based on estimating the biomass of all the abalone in the fishery at high, medium, and low use sites. These methods are subject to assumptions regarding the total area of the sites and habitat quality and result in high levels of uncertainty in the resulting biomass estimate. In the past, we have investigated estimating total abundance at the site level and concluded that the error bars on those estimates, given the patchy distribution of abalone and the imprecision of site area calculations, are so wide that this method is not useful for our purposes of detecting changes in abundance over time. Similarly, we are not using a harvest control rule such as constant fishing mortality rate (F) applied to an estimate of total abundance (or biomass) in this work. In contrast, the goal of the surveys employed by CDFW is to detect changes in density *relative* to previous estimates at key index sites.

Egg-per-recruit methods are also used to manage invertebrate fisheries. In the southern California abalone fisheries, the abalone size limit was thought to ensure sufficient reproduction prior to recruitment to the fishery. Since the size at first reproduction is known to be smaller than the legal minimum size this was thought to ensure sustainable fishing but the abalone fishery was not sustainable and was closed in 1997 (Karpov et al. 2000, Rogers-Bennett et al. 2002). Egg-per-recruit modeling studies however suggests that even though 48% of the egg production was maintained by the commercial size limit (Tegner et al. 1989) this was not enough to ensure sustainability of the abalone fishery in southern California (Rogers-Bennett and Leaf 2006, Leaf et al. 2008). This example illustrates the importance of having on the ground density estimates (dive surveys) as a safeguard to ensure density is being maintained by the existing traditional management measures such as size and bag limits.

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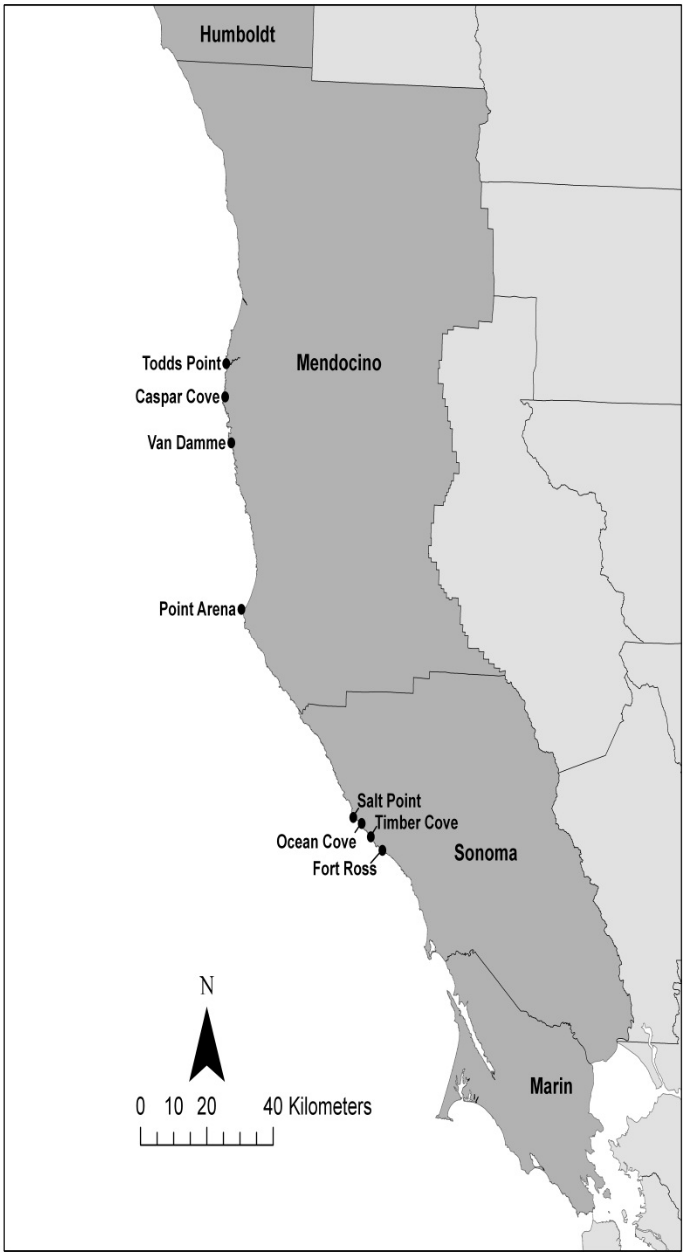

Fig. 1. Abalone dive survey index sites in northern California.

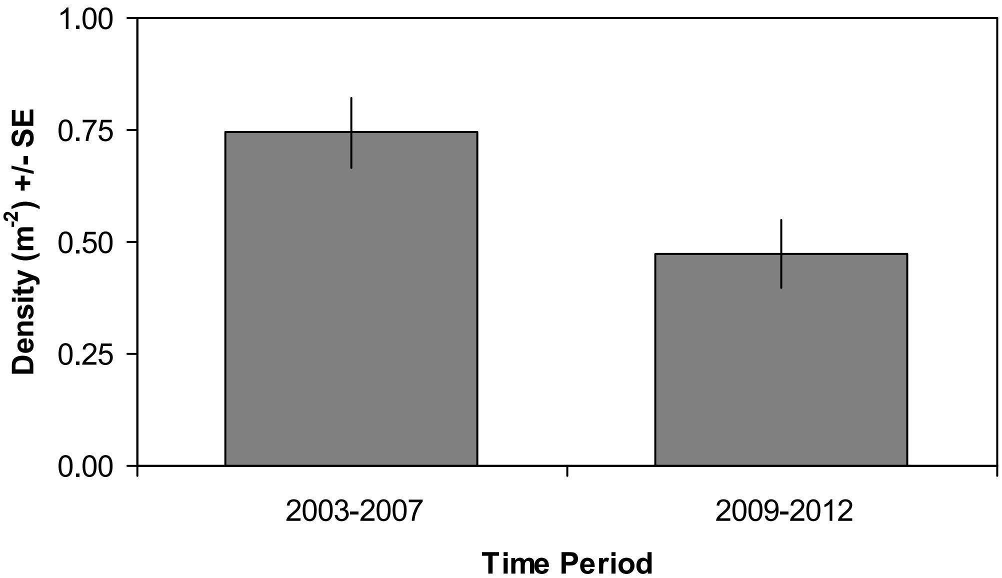

Fig. 2. Average density of red abalone at all eight index sites in Sonoma and Mendocino County in the earlier time (2003-2007) with N=287 transects and the most recent time period (2009-2012) with N=308 transects.

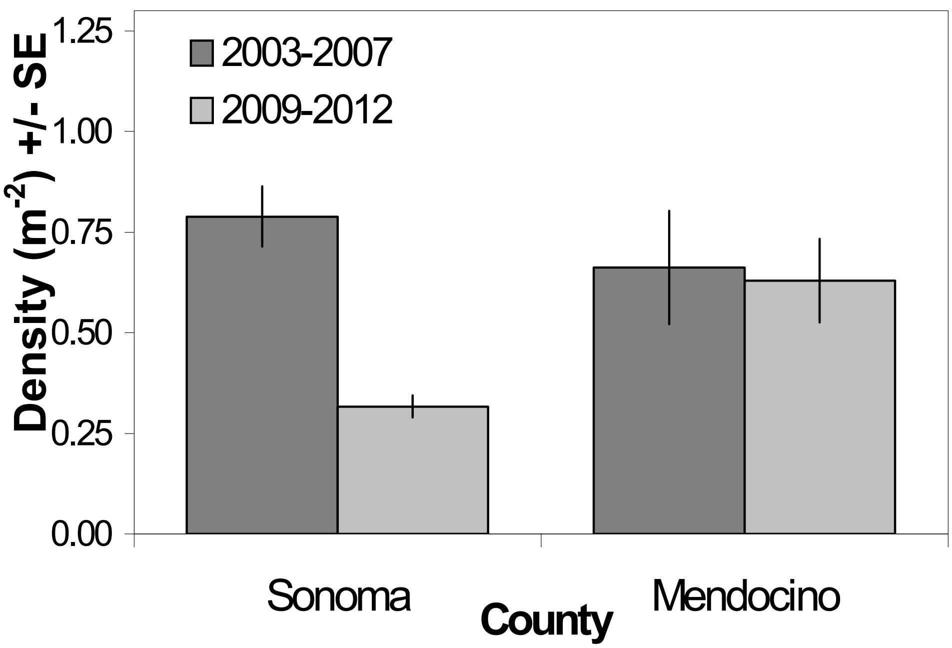

Fig. 3. The average density of red abalone in Sonoma (four sites) declined over time while there was no significant difference in the densities in Mendocino County (four sites) in the earlier time (2003-2007) and the most recent time period (2009-2012). In Sonoma County, the sample sizes were equal in the earlier (N=146 transects) and most recent time periods (N=146 transects). In Mendocino County, sampling effort was slightly greater in the most recent time period (N=162 transects) compared with the earlier time period (N=141 transects).

Table 1. Northern California abalone index site sizes as length of coastline and subtidal area estimates from 0 to 18m depth contour.

Site	Miles	Km	Area**(Ha)
Fort Ross	1.94	3.12	171.4
Timber Cove	1.98	3.19	145.1
Ocean Cove*	1.79	2.87	76.2
Salt Point	1.79	2.87	97.2
Arena Cove	1.62	2.61	183.1
Van Damme	1.51	2.43	111.2
Caspar	1.48	2.38	135.0
Todds Pt	1.60	2.58	167.7

- *Steep changes in depth reduce site area
- ** Area estimates do not incorporate topography or rugosity (surface height) information.

Table 2. List of index and non-index sites surveyed for red abalone in the subtidal and the years the surveys took place. The sites are listed from the south to the north with an * indicating the eight index sites.

Site	County	Year Surveyed
Bodega Marine Reserve	Sonoma	1999
Fort Ross*	Sonoma	1999, 2006, 2009, 2012
Timber Cove*	Sonoma	2006, 2009, 2012
Ocean Cove*	Sonoma	2007, 2010, 2012
Salt Point*	Sonoma	2000, 2005, 2008, 2012
Fisk Mill Cove	Sonoma	2009-10
Stewart's Point	Sonoma	2012
Sea Ranch	Sonoma	2012
Stornetta Ranch	Mendocino	2004, 2007, 2010
Point Arena*	Mendocino	2003, 2007, 2010
Van Damme*	Mendocino	1999, 2003, 2007, 2010, 2013
Point Cabrillo State Marine Reserve	Mendocino	1999, 2003, 2013
Caspar Cove*	Mendocino	2005-06, 2008, 2011
Todd's Point*	Mendocino	2006, 2009-10, 2013

Table 3. Average densities, 95% confidence intervals, and number of transects (*n*) for each index site during three time periods – Earliest (2003-2007), Mid (2007-2010), and Most Recent (2009-2012). Sites are listed from south to north.

	Earliest		Mid		Most Recent	
Site	Average ± 95%c.i.	*n*	Average ± 95%c.i.	*n*	Average ± 95%c.i.	*n*
Fort Ross	**0.572** ± 0.180	37	0.411 ± 0.107	35	**0.248** ± 0.088	37
Timber Cove	**0.811** ± 0.160	37	0.430 ± 0.137	35	**0.368** ± 0.151	36
Ocean Cove	**0.863** ± 0.240	36	0.622 ± 0.202	36	**0.327** ± 0.113	32
Salt Point	**0.907** ± 0.326	36	0.374 ± 0.127	43	**0.314** ± 0.117	41
Point Arena	**0.571** ± 0.157	38	0.663 ± 0.225	36	**0.812** ± 0.219	40
Van Damme	**1.074** ± 0.286	34	0.623 ± 0.268	38	**0.797** ± 0.314	36
Caspar Cove	**0.576** ± 0.295	35	0.435 ± 0.163	49	**0.393** ± 0.125	55
Todd's Point	**0.428** ± 0.182	34	--	--	**0.514** ± 0.205	31
ALL	**0.725** ± 0.154	287	--	--	**0.472** ± 0.153	308