

Black Abalone Collection and Translocation Report

For take of black abalone authorized under Permit 26606

January 2024

Collection Donor Sites and Dates

Black abalone were collected from Blue Gum Cove on Santa Cruz Island (34.056227, -119.910108) on October 27, 2023. A pre-collection survey of the site was conducted on October 27, 2023.

Collection Participants

Nate Fletcher (UCSC) - collector

Karah Ammann (UCSC) - collector

Maya George (UCSC) - data collection

John Steinbeck (UCSC) - collector, data collection

Walter Heady (TNC) - data collection

Avrey Parsons-field (UCSB) - collector, data collection

Pre-Collection Survey Results

We conducted a pre-collection survey at one 195m² section of rocky intertidal reef at the north side of Blue Gum Cove (Figure 1) to ensure collections met collection criteria (see below). During the survey, we subsampled the survey area by counting black abalone within 12, stratified random 1m² quadrats (Table 1). We then characterized habitat quality (% good, moderate, and poor habitat) within each quadrat and for the entire survey area. Mean densities (by habitat quality) from the quadrats were used to extrapolate counts to the entire survey area, from which we estimated the population size and habitat based densities for the site (Table 2).

Collection Criteria:

- Maintain a density greater than the expected density for that site based on the habitat. This metric is consistent with the Habitat-based Density Recovery Criterion described in the Final Recovery Plan for Black Abalone (NMFS 2020).
- Maintain a minimum density of at least two black abalone per m² for good to moderate habitat. This minimum density is based on previous work that suggests that recruitment of juvenile black abalone can be compromised when adult density falls below one per square meter.
- Maintain the proportion of abalone within reproductive clusters. These “clusters” of black abalone are likely to contain a mixture of females and males in close proximity to one another (required for successful fertilization). Defined as groups of three or more abalone within one meter of one another.
- Collect no more than 10% of the black abalone from any one donor site. We expect that for most sites, this means we will not collect more than 50-60 abalone per site.
- Avoid areas where long-term monitoring or historic abalone surveys have been done.



Figure 1. Pre-collection survey area (blue polygon) at Fraser Cove on Santa Cruz Island.

Table 1. Results of quadat surveys with habitat quality (proportion good, moderate, and poor) and habitat-based counts and densities. Mean habitat-based densities were used to extrapolate counts to the entire site (Table 2). SCFC= Santa Cruz Island, Fraser Cove.

Site	Quad	Area (m2)	Hab Good	Hab Mod	Qual Poor	Count Good	Count Mod	Count Poor	Density Good	Density Mod	Density Poor
SCBG	1	1	0.03	0.3	0.67	10	20	0	333.33	66.67	0.00
SCBG	2	1	0.01	0.15	0.84	1	8	0	100.00	53.33	0.00
SCBG	3	1	0	0.2	0.8	0	2	1	0.00	10.00	1.25
SCBG	4	1	0.03	0.57	0.4	26	15	0	866.67	26.32	0.00
SCBG	5	1	0.01	0.35	0.64	5	60	29	500.00	171.43	45.31
SCBG	6	1	0.02	0.68	0.3	8	55	0	400.00	80.88	0.00
SCBG	7	1	0.04	0.36	0.6	21	31	0	525.00	86.11	0.00
SCBG	8	1	0.03	0.42	0.55	8	16	1	266.67	38.10	1.82
SCBG	9	1	0.03	0.4	0.57	7	31	14	233.33	77.50	24.56
SCBG	10	1	0.01	0.39	0.6	0	84	60	0.00	215.38	100.00
SCBG	11	1	0.02	0.4	0.58	2	17	1	100.00	42.50	1.72
SCBG	12	1	0.01	0.24	0.75	3	32	14	300.00	133.33	18.67
SCBG	MEAN	1	0.02	0.37	0.61	7.6	30.97	10	302.08	83.46	16.11

Table 2. Site wide population and density estimates extrapolated from quadrats (Table 1).

Length (m)	Width (m)	Area (m ²)	Hab Area (m ²)	Hab Good	Hab Mod	Hab Poor	Est. Density Good	Est. Density Mod	Est. Density Poor	Est. Count Good	Est. Count Mod	Est. Count Poor	Est. Total Count
13	15	195	185	.02	0.38	0.6	302.08	83.46	16.11	1119	5875	1791	8785

Results from the pre-collection surveys showed that abalone at Blue Gum Cove are highly abundant. We estimate the population within the survey area to be 8785 abalone with habitat-based densities well above expected densities (Expected density based on mean densities observed in populations unimpacted by withering syndrome; $G = 1.58$, $M = 0.27$, $P = 0.0049$). Abalone abundance and density beyond the survey area were also noted to be very high. Based on these results we determined that we could collect our target of 135 abalone from the site while meeting all collection criteria.

Collection Plots

We designated the entire pre-collection survey area as the collection plot. The plot was marked with marine epoxy and photographed in order for it to be relocated for future monitoring. Plot counts and densities are shown in Table 2. All abalone in the plot were found within reproductive clusters (RC, >3 abalone/m²).

Results of Collection Activities

We collected 134 black abalone from the donor site (Blue Gum Cove). Collections were made from the one collection plot. All abalone were collected from moderate and poor habitat (36.6% and 63.4%, respectively). Following collections, density in good to moderate habitat was maintained well above 2/m², densities remained well above expected densities, and all abalone remained in reproductive clusters (Table 3). We collected an estimated 1.53% of the population at the site.

Table 3. Plot counts and densities following collections.

Length (m)	Width (m)	Area (m ²)	Hab Area (m ²)	Hab Good	Hab Mod	Hab Poor	Est. Density Good	Est. Density Mod	Est. Density Poor	Est. Count Good	Est. Count Mod	Est. Count Poor	Est. Total Count
13	15	195	185	.02	0.38	0.6	302.08	82.87	15.37	1119	5826	1706	8651

Summary of Collected Abalone

The 134 collected abalone ranged in size from 63-142mm (Figure 2).

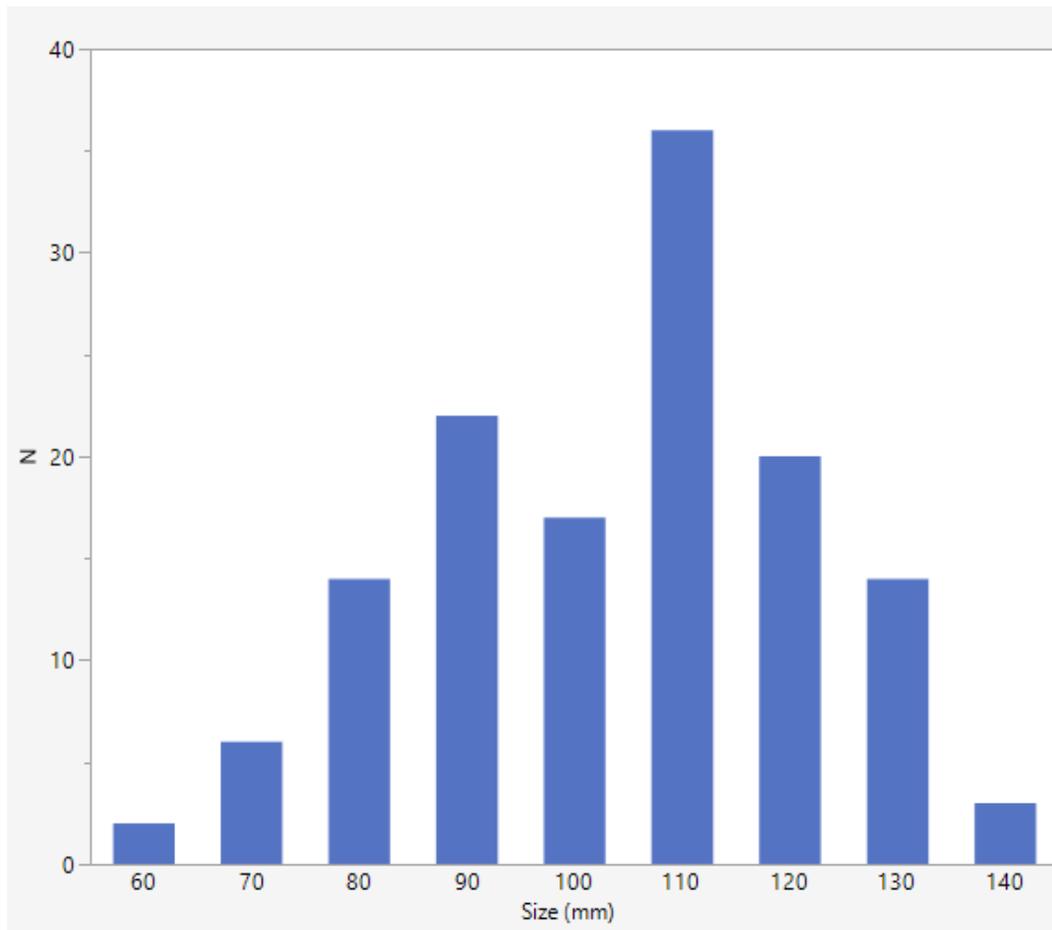


Figure 2. Size distribution (sizes binned to nearest 10mm) of collected black abalone from Blue Gum Cove on Santa Cruz Island.

Collected abalone were placed in individual mesh bags on top of a piece of thin plastic for them to attach to. They were transported from shore to boat (the vessel *Circle Take*) in soft sided coolers. Once onboard, the abalone were placed in large hard-sided coolers containing newspaper wrapped ice packs and damp towels for transport to the mainland (Ventura Harbor). Abalone were driven from Ventura Harbor to UC Santa Barbara where they were temporarily held. Total transport time was 6 hours.

Abalone were held in a 5' diameter, free-flowing, seawater tank at UC Santa Barbara. Abalone were kept in individual mesh bags during holding. Abalone were held at this facility for a total of 60 hours.

On October 29, 2023 the abalone were processed for outplanting. Processing consisted of sizing and weighing, tagging, photographing, collecting tissue samples for genetic analyses, and

collecting fecal samples for disease analysis. Abalone were tagged with two small, numbered Floy tags adhered to the shell with Corafix. Floy tags were placed at the anterior and posterior ends of the shell. Two small blobs of colored two- part epoxy were also placed on the sides of the shell. Injuries were also assessed during processing (see summary of injuries). Quickly and efficiently processing the abalone was a collaborative effort involving UCSC, UCSB, CDFW, NOAA/NMFS, Tenera, and The Nature Conservancy.

Summary of Injuries and Mortalities

We assessed injuries during processing and determined that 36% of the collected abalone had no injury (category 0), 49% had mild injury (category 1), and 16% had moderate injury (category 2) (Figure 3). No abalone were considered severely injured (category 3) and no abalone were held for injury recovery.

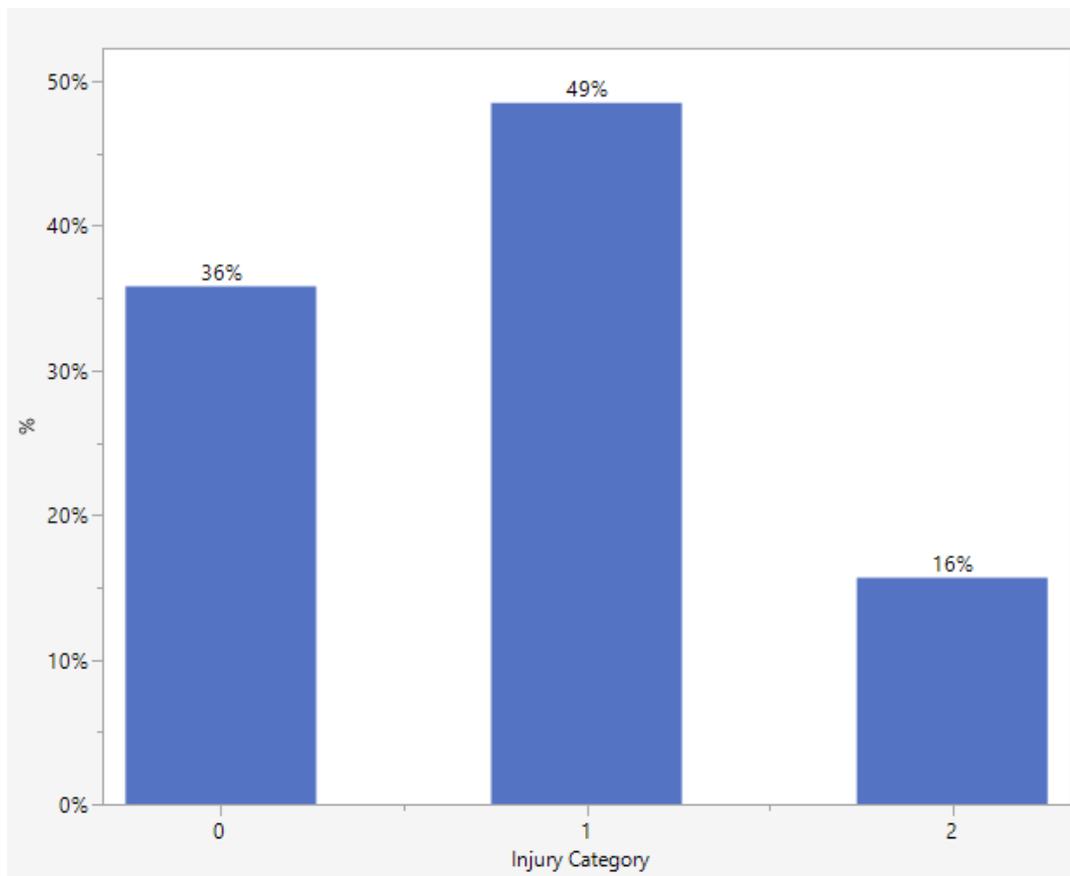


Figure 3. Results of injury assessment showing the % of abalone by injury category: 0 = no injury observed, 1 = mild injury (superficial abrasions, blistering, or single cuts <1cm deep), 2 = moderate injury (multiple cuts <1cm deep or single cuts 1-2cm deep), 3 = severe injury (multiple cuts 1-2cm deep or single cut >2cm deep).

There was one confirmed mortality during the collections. Following the translocations, there has been one confirmed mortality at the restoration site (Table 4).

Table 4. Summary of confirmed mortalities.

Date	Location	Abalone ID	Abalone Size (mm)	Location of Tissue Samples	Notes on Mortality
10/27/2023	Blue Gum Cove, SCI	N/A	110	N/A - animal left of site	Shell detached from foot muscle during collection.
12/12/2023	Government Point (East Block, Plot 2T)	555	110	UC Santa Cruz	Found detached and dead in Plot 2T with ~50% of foot mussel remaining. No injury had been observed during collection and injury assessment. Frozen whole.

Recipient Site and Translocation Date

On October 30, 2023, we transported 134 abalone from UC Santa Barbara to the restoration site at Government Point (34.443211, -120.456039) on The Nature Conservancy's Dangermond Preserve. The abalone were outplanted to the East Block, which encompasses about 130m of shoreline. Total time between collection and outplanting was about 63 hours.

Translocation Participants

Nate Fletcher (UCSC) - outplanted abalone
 Maya George (UCSC) - outplanted abalone
 Karah Ammann (UCSC) - outplanted abalone
 Avrey Parsons-Field (UCSB) - outplanted abalone
 Ian Taniguchi (CDFW) - outplanted abalone
 Walter Heady (TNC) - data recorder/outplanted abalone
 John Steinbeck (Tenere) - data recorder/outplanted abalone
 Susan Wang (NMFS) - data recorder/outplanted abalone
 Melissa Neuman (NMFS) - data recorder/outplanted abalone
 James Stilley (CDFW) - data recorder/outplanted abalone
 Allyson Bailey (CDFW) - data recorder/outplanted abalone
 Keighley Lane (CINMS) - data recorder/outplanted abalone
 Grace Kumaishi (CINMS) - data recorder/outplanted abalone
 Kimberly Jackson (BBCI) - data recorder

Summary of Translocations

Abalone were outplanted into five translocation plots at the East Block at Government Point (see Table 5). These plots had been previously marked and cleared of fouling organisms. Within translocation and control plots at the site, there were 11 resident abalone prior to outplanting. All resident abalone except for one were observed during monitoring to date.

Post-translocation Monitoring

We conducted monitoring of the translocated abalone at Government Point the day following outplanting, two weeks following outplanting, and then monthly in December 2023 and January 2024. Monthly monitoring will continue through March, at which time monitoring frequency will be reevaluated. In addition, we plan to monitor the collection plot at Blue Gum Cove in early 2024.

Monitoring results are shown in Table 5. These results show the number of black abalone translocated into each of the five Translocation Plots (T plots), the number of Resident black abalone within each plot at the time of translocations, the number of Translocated abalone found within each plot during monitoring, the number of Resident black abalone found within each plot during monitoring (these were sized and documented at the time of translocations), and the number of Translocated abalone found outside of plots during site-wide searches. For monitoring on Jan 9, 2024, results also include the number of Unknown abalone found. These are abalone that have lost their tags and aren't confirmed translocated abalone but have features including size and shell erosion patterns that match those of translocated abalone and weren't previously identified as Resident abalone.

Table 5. Translocation monitoring results through January 2024 by plot and date (T = translocation plot, C = control plot, Outside = outside of plot, found during site wide search). Unknowns found during Jan 9, 2023 are abalone that have lost their tags but have features (size, shell erosion) of translocated abalone and weren't previously identified as Residents.

Oct 30, 2023			Oct. 31, 2023		Nov. 13, 2023		Dec. 12, 2023		Jan. 9, 2024		
Plot	# Abalone Outplanted	# Resident Abalone	# Resighted	# Residents	# Resighted	# Residents	# Resighted	# Residents	# Resighted	# Residents	# Unknown
1T	28	1	21	1	17	1	6	1	5	1	0
2T	51	7	41	7	40	7	37	7	27	7	6
3T	21	0	9	0	4	0	7	0	3	0	0
4T	20	0	6	0	0	0	0	0	0	0	0
5T	14	2	10	2	9	2	8	2	8	2	0
1C	0	0	1	0	3	0	5	0	3	0	0
2C	0	0	0	0	0	0	0	0	.	0	0
3C	0	0	0	0	0	0	0	0	.	0	0
4C	0	0	5	0	7	0	5	0	5	0	1
5C	0	1	0	1	1	1	3	1	2	1	1
Outside	0	.	25	.	24	.	27	.	23	.	5
Total	134	11	118	11	105	11	98	11	76	11	13