Black Abalone Translocations at Dangermond Preserve
Monitoring Summary
February 2025

Translocations and Monitoring at Government Point

Phase 1

On March 19, 2023, we translocated 104 abalone from a donor site on Santa Cruz Island (Fraser Cove, 34.060477, -119.924457) to the restoration site at Government Point (34.443211, -120.456039) on The Nature Conservancy's Dangermond Preserve. These abalone were outplanted to five translocation plots at the West Block which encompasses about 160m of shoreline (Figure 1). Eight additional, rehabilitated abalone were outplanted into these plots on April 14, 2023.

Phase 2

On October 30, 2023, we translocated 134 abalone from a donor site on Santa Cruz Island (Blue Gum Cove, 34.056227, -119.910108) to the restoration site at Government Point (34.443211, -120.456039) on The Nature Conservancy's Dangermond Preserve. The abalone were outplanted to five translocation plots at the East Block, which encompasses about 150m of shoreline (Figure 1).

In total, 246 black abalone were translocated from donor sites on Santa Cruz Island to the restoration site at Government Point.

Figure 1. Restoration site set-up showing the West Block and East Block at Government Point and the location of the translocation (blue) and control (red) plots. Abalone were translocated into the translocation plots.

Following each phase, we conducted monitoring of abalone at the recipient site. We monitored the abalone the day following translocation, two weeks post-translocation, and then about

monthly through August 2024. We currently are conducting monitoring quarterly and monitored the abalone in October 2024 and February 2025 (February 2025 data are not included here).

We monitored the abalone by sampling the translocation and control plots (five of each in each block) and searching extensive and consistent areas outside of the plots to account for abalone that have moved out of the plots. We counted the number of abalone found by location, sized the abalone, recorded any tag information, and determined if the abalone was a confirmed transplant, a resident, or an unknown:

- Transplant – confirmed, tag present.
- Resident – larger than >130mm and/or documented prior to translocation
- Unknown – no tag, 60-130mm, and not a known resident

In addition to regular monitoring of the abalone at Government Point, we have conducted extensive surveys for recruits and juvenile abalone and conducted a sitewide population survey.

Monitoring Results

Counts for the West Block from March 2023 to October 2024 are shown in Figure 2. Counts for the East Block from October 2023 to October 2024 are shown in Figure 3. These data show that the number of resident abalone has been fairly stable over time. Immediately after the translocations there was a decline in the total number of transplanted abalone. Confirmed transplants continued to decline as tags were lost, but the number of unknown abalone increased, suggesting that many of the unknown abalone were actually transplants. Following an initial decline, total numbers have been fairly stable. The most recent count of the West Block found a total of 85 abalone (4 transplants, 12 residents, and 69 unknowns), compared to 119 abalone counted following the translocation on March 19, 2023. The most recent count of the East Block found a total of 98 abalone (16 transplants, 13 residents, and 69 unknowns), compared to 151 abalone counted following the translocation on October 30, 2023. Some of the initial decline in abalone counts can be accounted for by movement of the abalone beyond the plots and monitoring areas - see Sitewide Population Survey below.

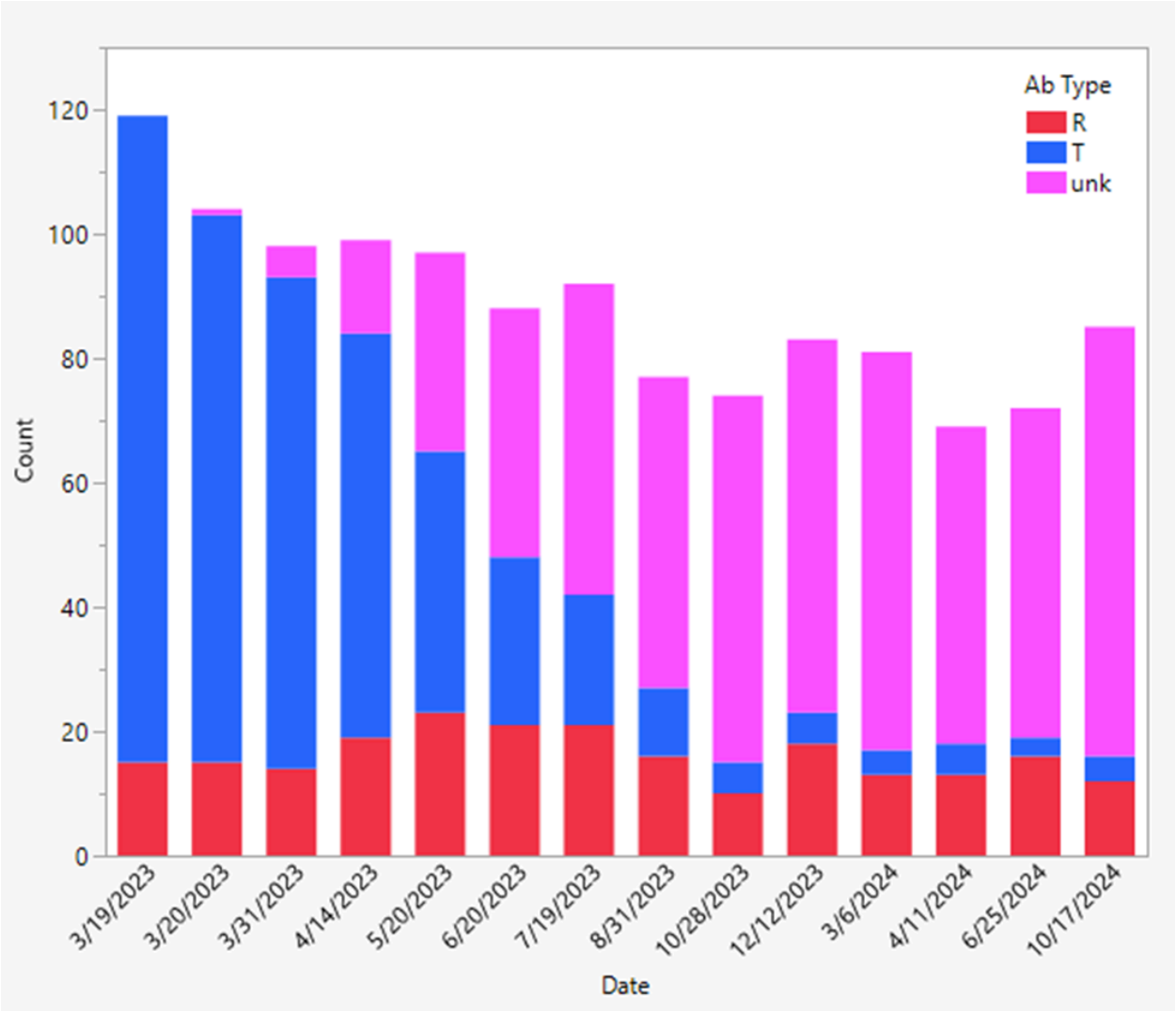

Figure 2. Monitoring counts at the West Block by abalone type. Red = Resident, Blue = Transplant, Pink = Unknown.

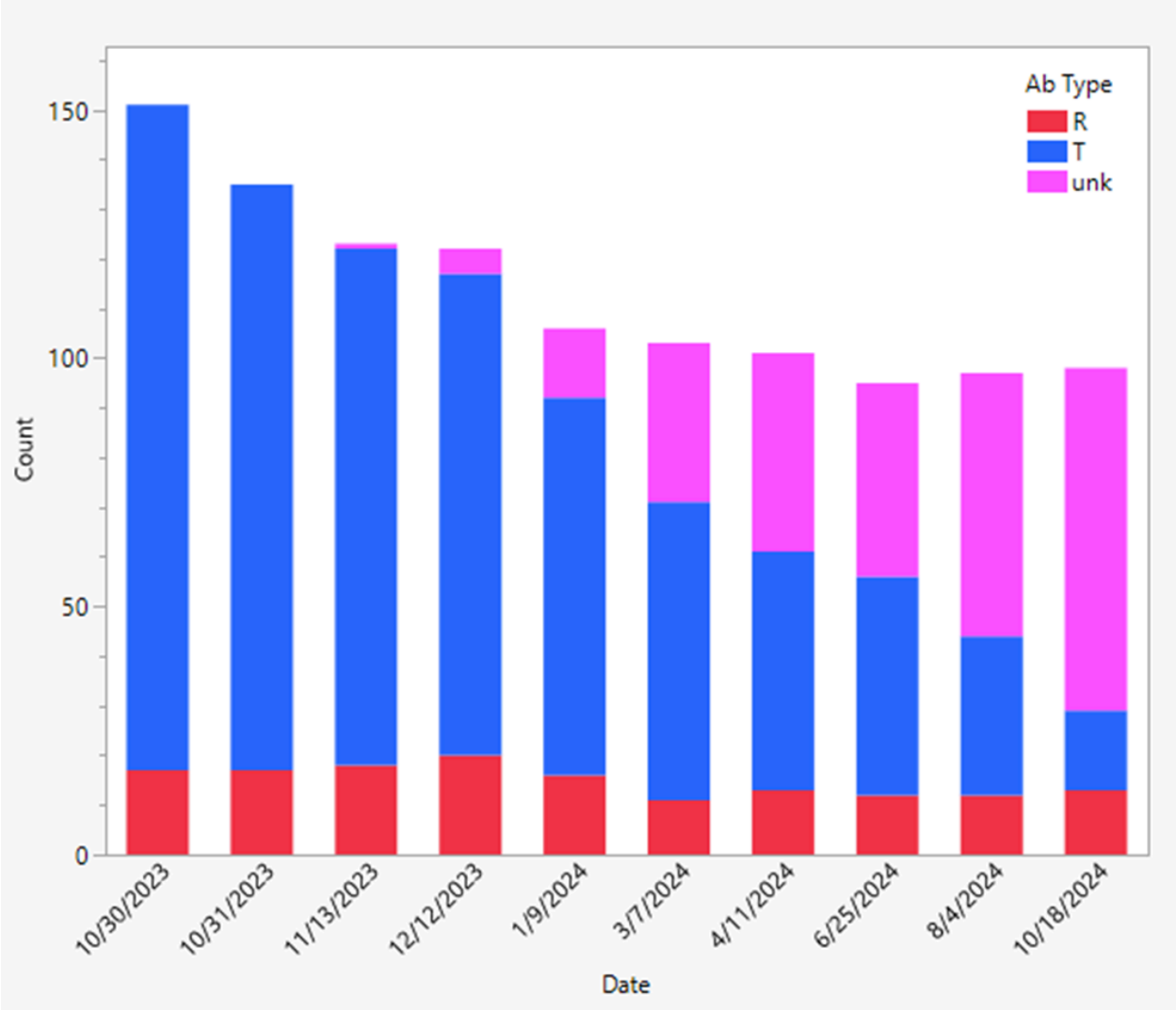

Figure 3. Monitoring counts at the East Block by abalone type. Red = Resident, Blue = Transplant, Pink = Unknown.

Counts by location are shown in Figure 4 for the West Block and Figure 5 for the East Block. These data show that immediately following the translocations, many abalone moved out of the translocation plots and into the control plots or habitat outside of the plots. After a precipitous decline in the number of abalone in the translocation plots, counts within the plots have stabilized.

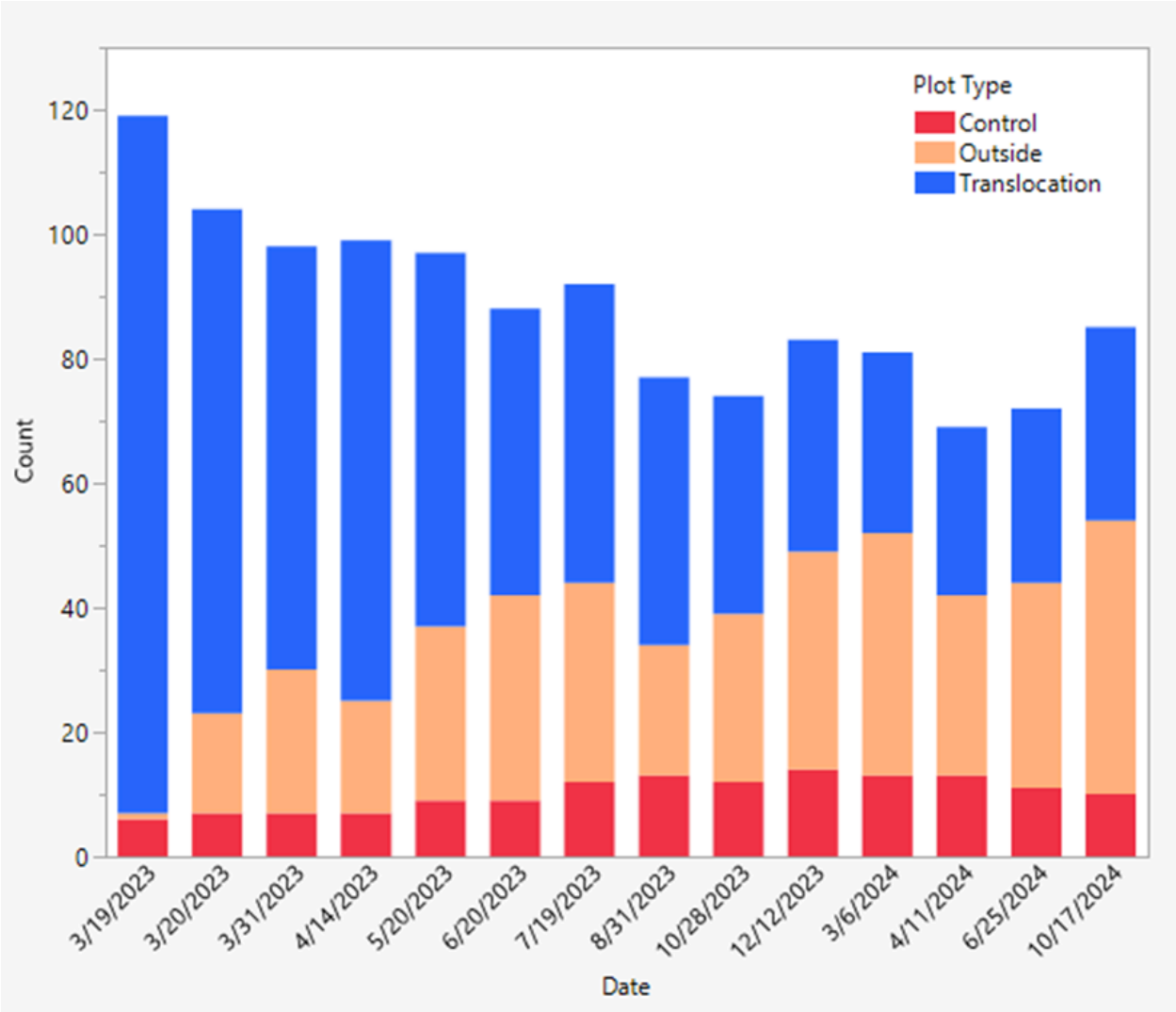

Figure 4. Monitoring counts at the West Block by abalone location. Blue = in translocation plots, Red = in control plots, Peach = outside the plots.

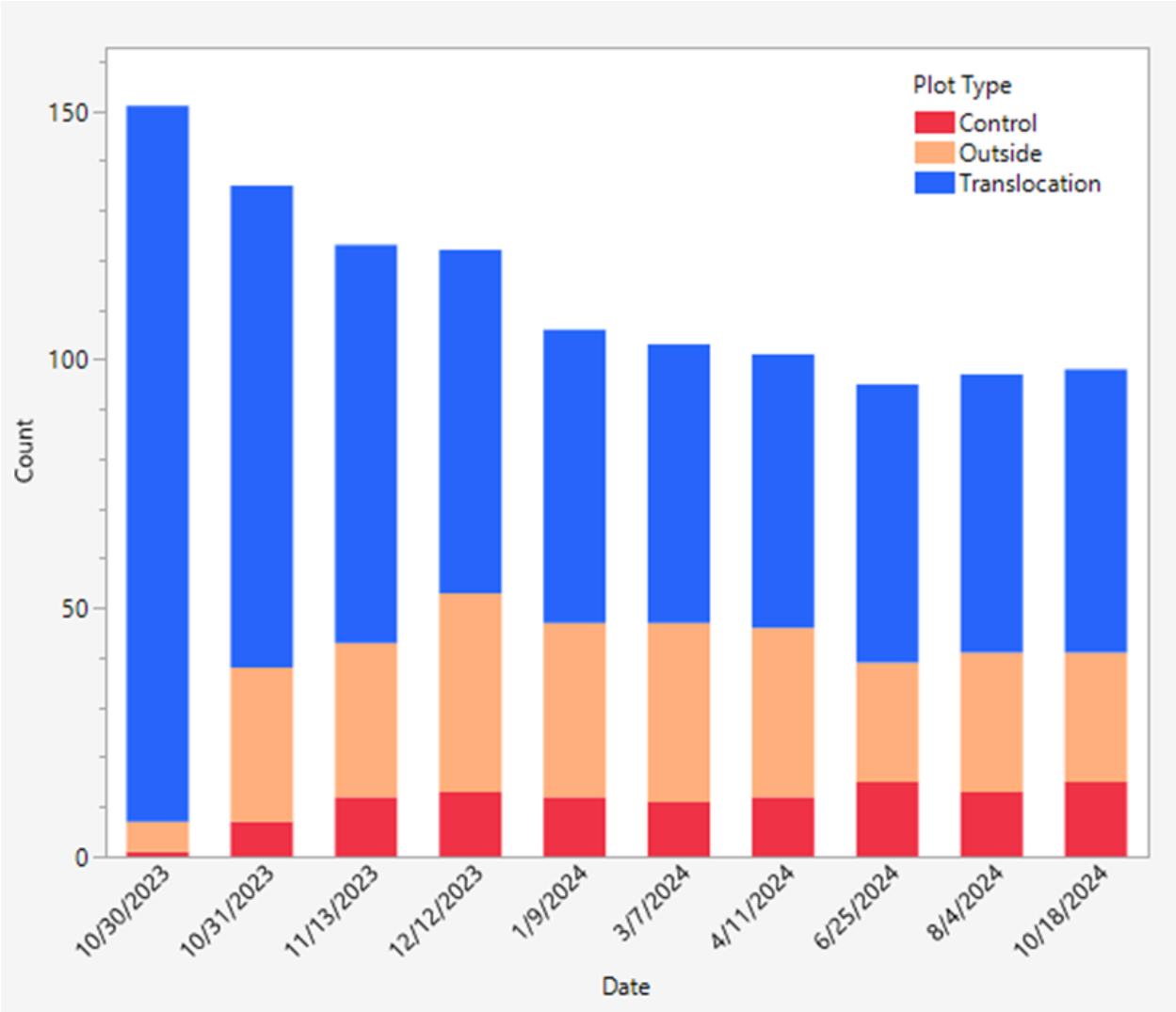

Figure 5. Monitoring counts at the East Block by abalone location. Blue = in translocation plots, Red = in control plots, Peach = outside the plots.

Mean density of abalone within the translocation plots has stabilized at ~3.5 abalone/m^2 for the West Block (Figure 6) and at ~5 abalone/m^2 for the East Block (Figure 7). These densities are greater than our target density of >2 abalone/m^2 . Densities by plot are shown in Figure 8 for the West Block and Figure 9 for the East Block.

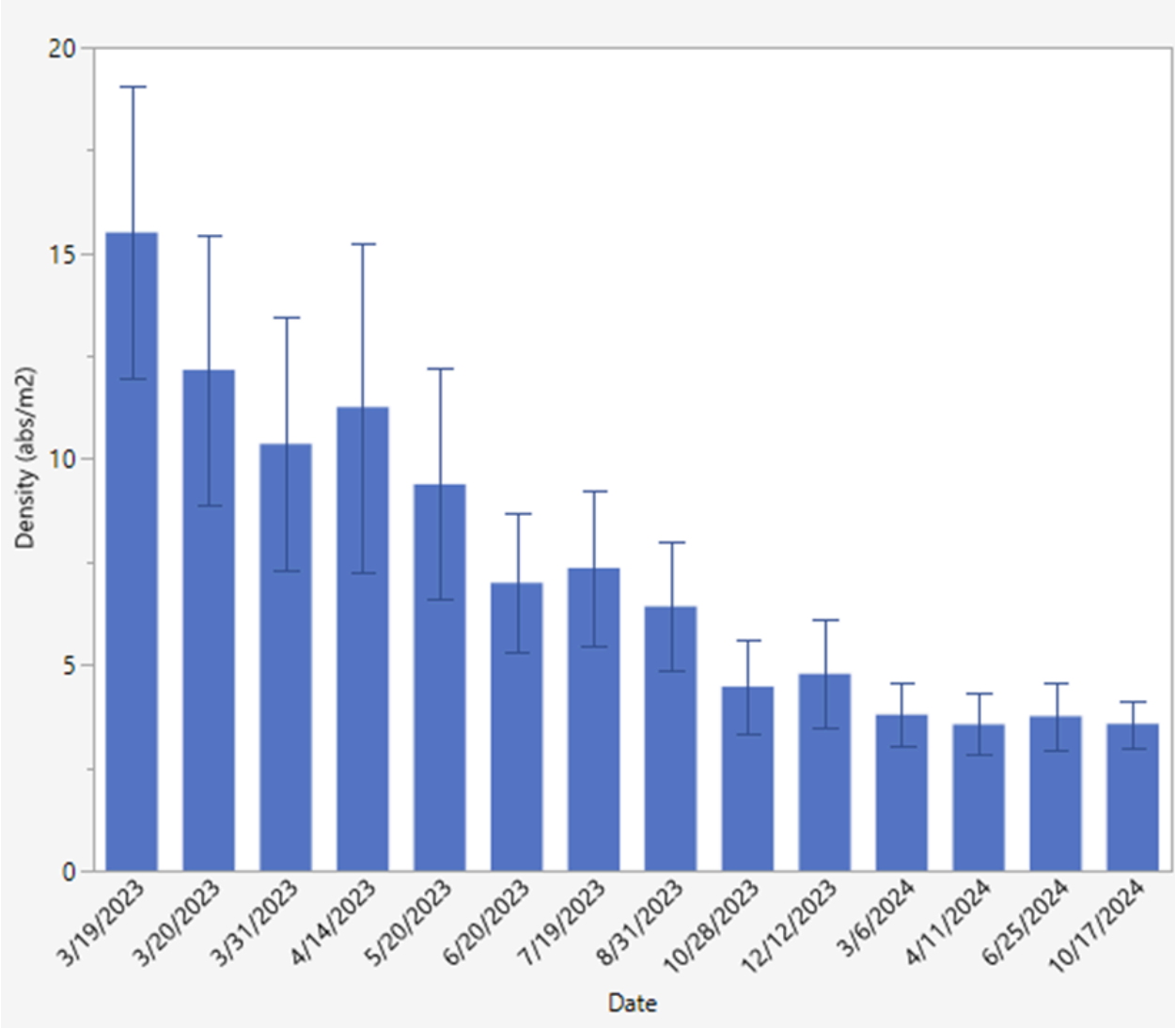

Figure 6. Mean abalone density overtime in the translocation plots at the West Block.

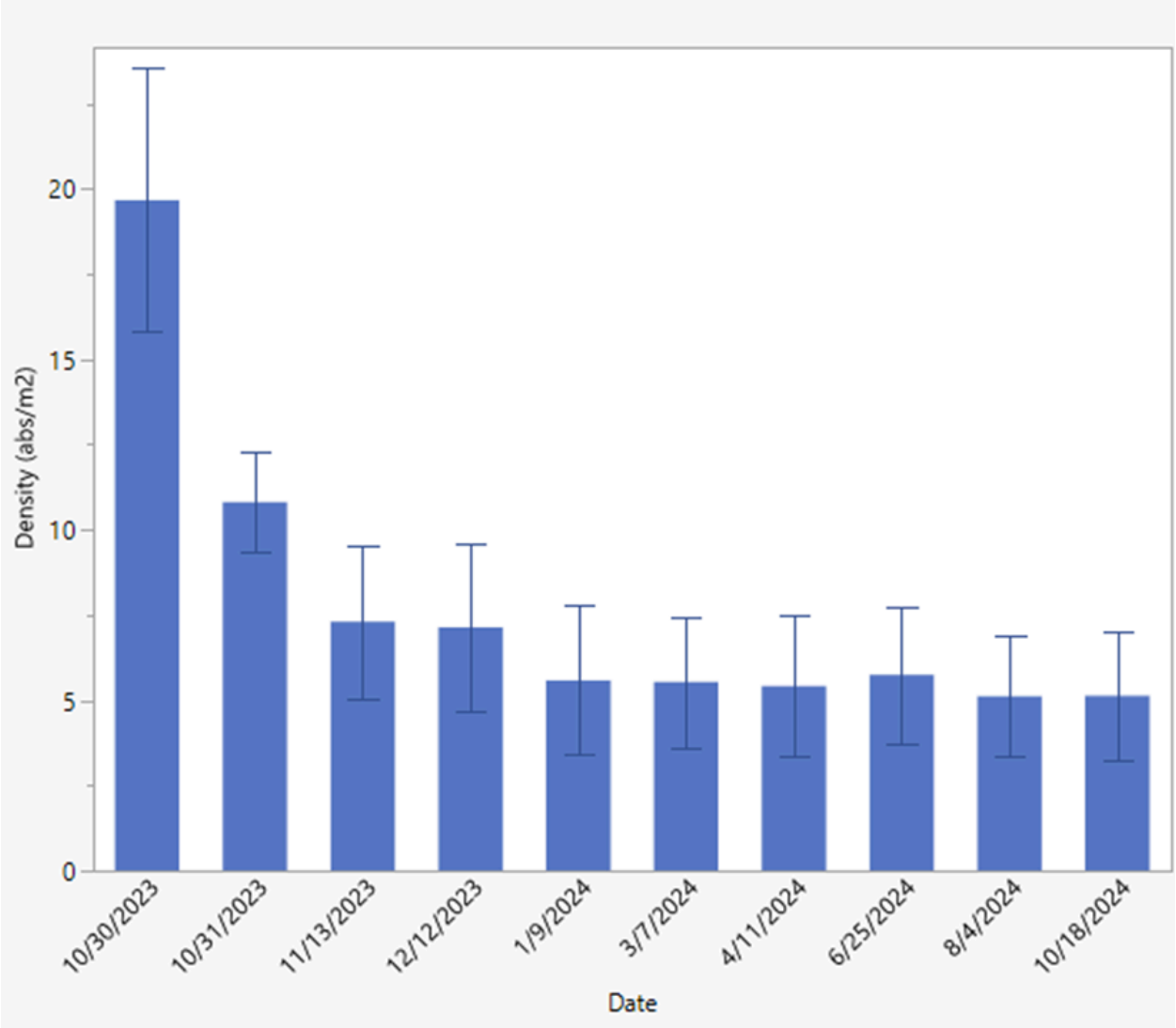

Figure 7. Mean abalone density overtime in the translocation plots at the East Block.

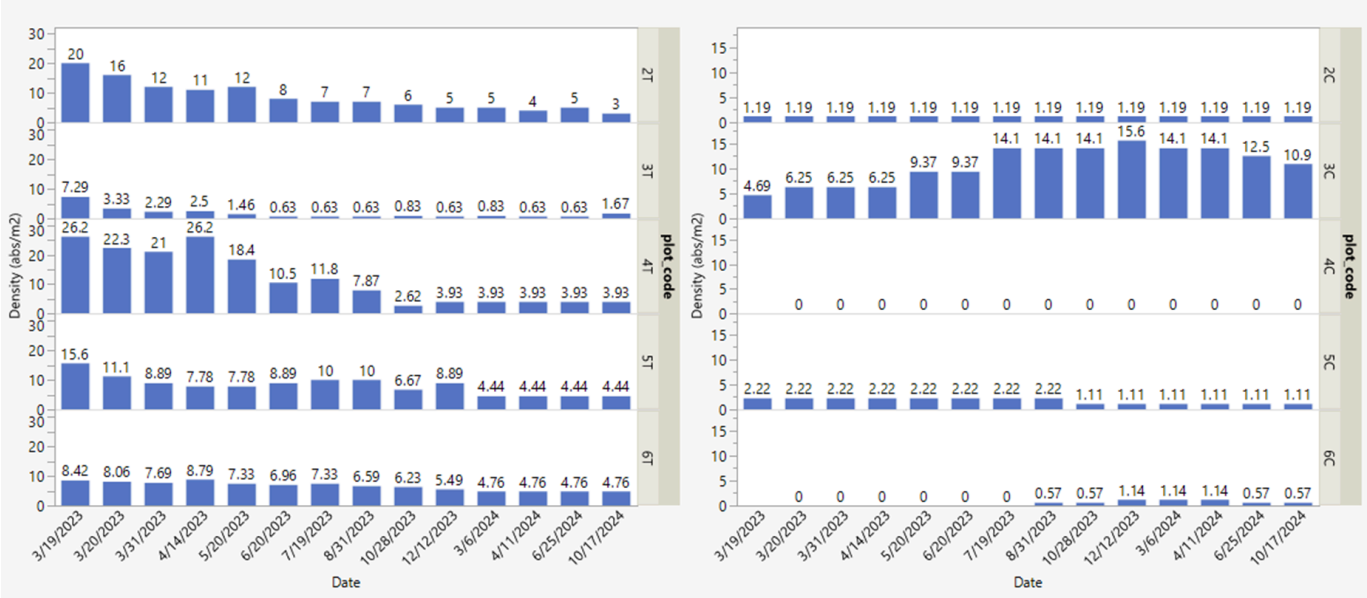

Figure 8. Plot densities overtime at the West Block. Translocation plots on the left, control plots on the right.

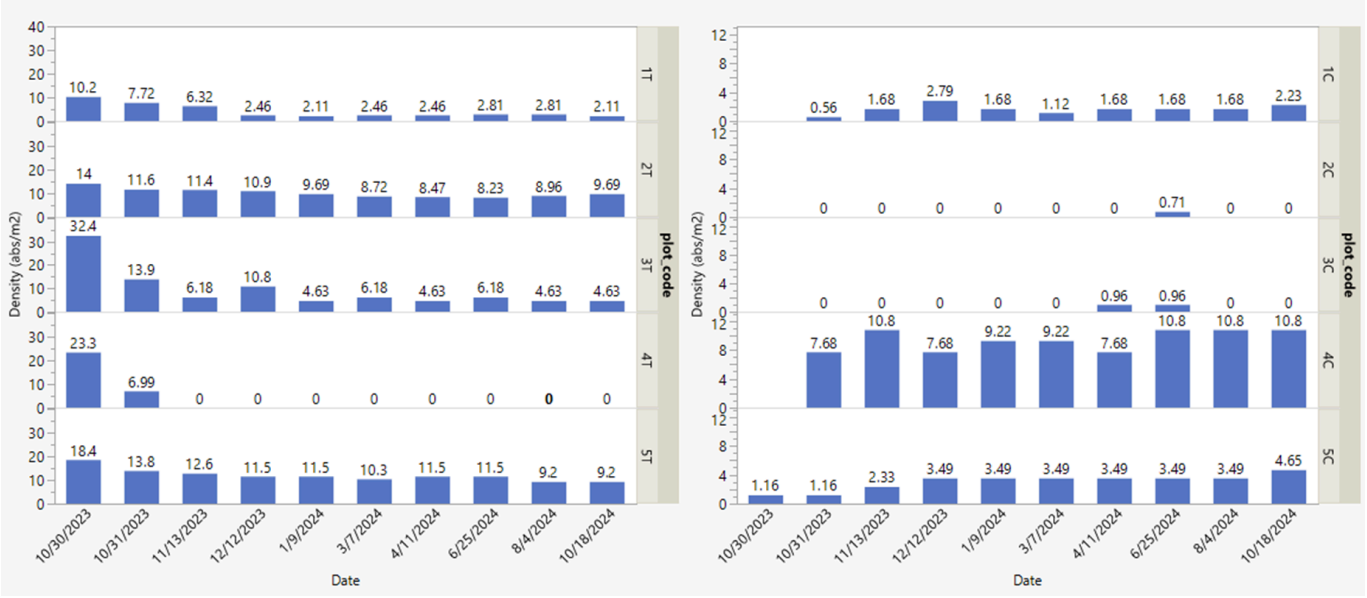

Figure 9. Plot densities overtime at the East Block. Translocation plots on the left, control plots on the right.

Sitewide Population Survey

We conducted an extensive population and habitat survey of the site in February 2022, using the UCSC/MARINe Black Abalone Population and Habitat Assessment Survey (AHA) protocol, to assess the black abalone population size at Government Point prior to the translocations. We repeated this survey in March 2024, one year after Phase 1 and six months after Phase 2. Repeating this survey allowed us to determine the sitewide population size and habitat-based density of black abalone pre- and post-translocations. This also allowed us to account for any abalone that have moved beyond the plots and areas regularly monitored. We extensively surveyed five segments (totalling 408m of shoreline and 11,719m^2 of intertidal habitat) at Government Point, from the upcoast end of the West Block through the downcoast end of the East Block (Figure 10). In the 2022 survey we counted 54 abalone; in 2024 we counted 252 abalone. Assuming all of the additional 198 abalone were from the translocations, this suggests that 80% of the 246 translocated abalone were accounted for. The sitewide density of abalone in Good Habitat increased from 0.2 abalone/m^2 in 2022 to 0.76 abalone/m^2 in 2024 (Figure 11). No recruits were found during these surveys.

Figure 10. Abalone Population and Habitat Assessment Survey segments (red polygons) at Government Point. These areas were surveyed in 2022 (pre-translocation) and 2024 (post-translocation).

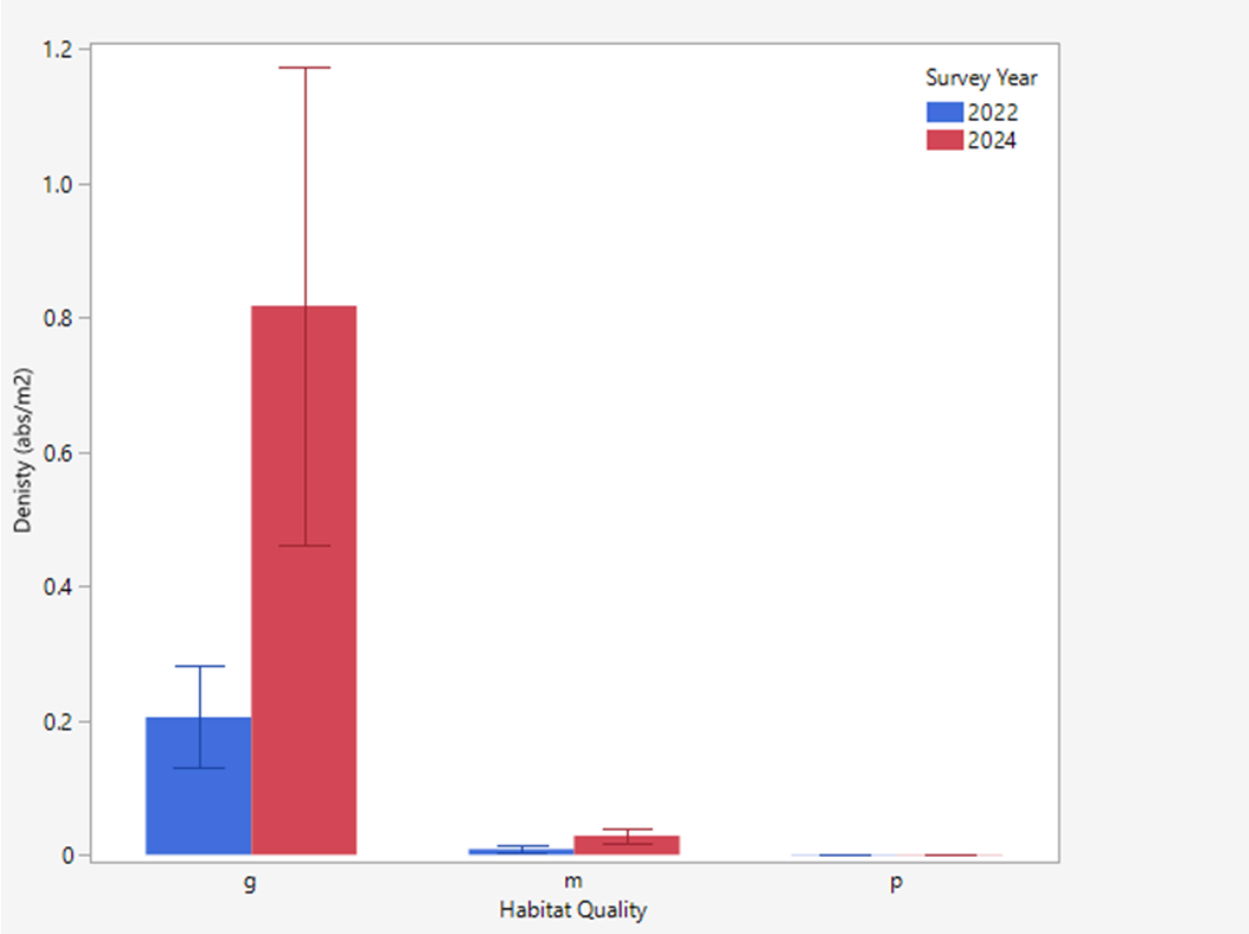

Figure 11. Habitat-based density of black abalone at Government Point in 2022 (blue) and 2024 (red).

Recruitment Surveys

We conducted extensive surveys of the West Block and East Block for abalone recruits and juveniles in March 2024, October 2024, and February 2025. In February 2025, three juvenile abalone were found around the edge of a large pool at the West Block (Figure 12). Sizes were 25mm, 30mm, and 35mm. Two of the juveniles were swabbed for genetics and parentage analysis.

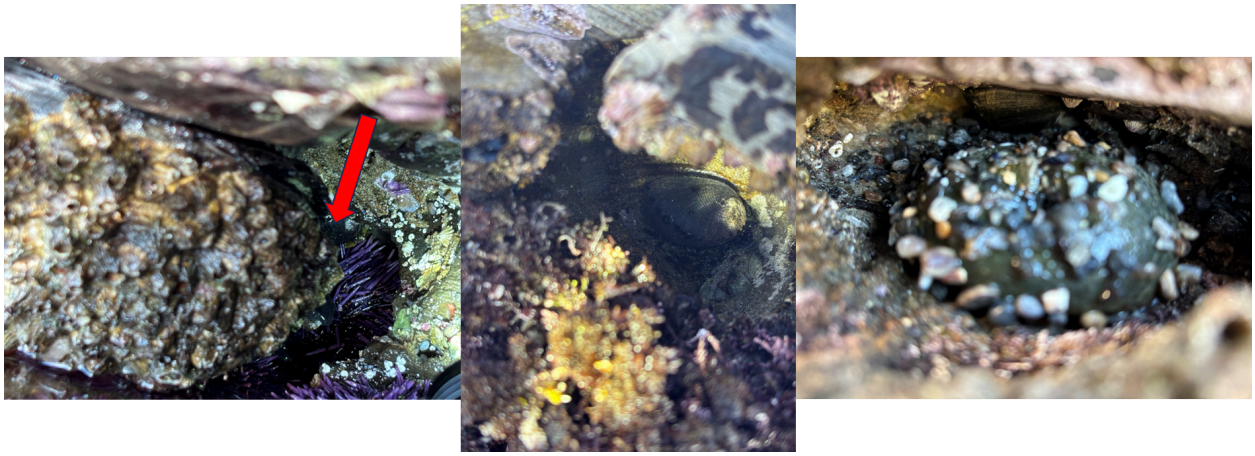

Figure 12. Juvenile black abalone found at the West Block, Government Point on February 10, 2025.

Monitoring of Donor Sites

Phase 1 - Fraser Cove

During Phase 1, black abalone were collected from three collection plots at Fraser Cove on Santa Cruz Island. We conducted a pre-collection survey of the site to ensure collections met collection criteria. During the survey, we subsampled the survey area by counting black abalone within four, randomly placed swaths (Table 1). We then characterized habitat quality (% good, moderate, and poor habitat) within each swath and for the entire survey area. Mean densities (by habitat quality) from the swaths 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 3). Results from the pre-collection surveys showed that abalone at Fraser Cove are highly abundant. We estimate the population to be 9991 abalone with habitat-based densities well above expected densities.

We then established three smaller collection plots with high abundance of black abalone where abalone were collected. Prior to collection, we counted and sized all abalone, characterized the habitat, and estimated habitat-based density within each of the collection plots (Table 4). Immediately after the collections, we determined the resulting counts and densities within each of the plots (Table 5).

In July 2023, four months post-collection, we resurveyed the site using the same methods described above, to determine if there were any effects of collection on black abalone counts and densities at the site. The results of the sitewide population survey indicate that there were negligible effects of collections and that overall numbers and densities were similar post-collection and remained very high. We estimated the population size post-collection to be 9760 abalone, or 2.3% less than the pre-collection population size (Table 3). We also sampled the three collection plots and found that total numbers in the plots increased from 960 pre-collection to 1179 post-collection, suggesting that there were no effects from collections on abalone within the plots (Table 6).

Table 1. Results of pre-collection (March 2023) swath surveys at Fraser Cove 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).

Swath	Length (m)	Width (m)	Area (m2)	Hab Good	Hab Mod	Qual Poor	Count Good	Count Mod	Count Poor	Density Good	Density Mod	Density Poor
1.1	10	38	380	0.01	0.2	0.79	94	164	25	24.74	2.16	0.08
1.2	10	15	150	0.01	0.15	0.84	40	106	5	26.67	4.71	0.04
1.3	5	12	60	0.01	0.13	0.86	57	139	84	95.00	17.82	1.63
1.4	10	11	110	0.01	0.1	0.89	76	176	34	69.09	16.00	0.35

Table 2. Results of post-collection (July 2024) swath surveys at Fraser Cove 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 3).

Swath	Length (m)	Width (m)	Area (m2)	Hab Good	Hab Mod	Qual Poor	Count Good	Count Mod	Count Poor	Density Good	Density Mod	Density Poor
1.1	10	38	380	0.01	0.2	0.79	119	174	10	31.32	2.29	0.03
1.2	10	15	150	0.01	0.15	0.84	120	103	7	80.00	4.58	0.06
1.3	5	12	60	0.01	0.13	0.86	55	147	50	91.67	18.85	0.97
1.4	10	11	110	0.01	0.1	0.89	36	169	33	32.73	15.36	0.34

Table 3. Site wide population and density estimates pre- and post-collection extrapolated from swaths (Tables 1 and 2).

Survey	Length (m)	Width (m)	Area (m2)	Hab Good	Hab Mod	Hab Poor	Est. Abundance	Est. Count Good	Est. Count Mod	Est. Count Poor	Est. Density Good	Est. Density Mod	Est. Density Poor
Pre	176	19	3344	0.01	0.2	0.79	**9991**	1802	6803	1386	53.87	10.17	0.52
Post	176	19	3344	0.01	0.2	0.79	**9760**	1971	6868	921	58.93	10.27	0.35

Table 4. Results from pre-collection plot surveys with habitat quality (proportion good, moderate, and poor), habitat-based counts and densities, and total count.

Plot	Length (m)	Width (m)	Area (m2)	Hab Good	Hab Mod	Hab Poor	Total Count	Count Good	Count Mod	Count Poor	Density Good	Density Mod	Density Poor
C1	6	12	66	0.01	0.40	0.59	619	206	343	70	312.12	12.99	1.80
C2	7	7	42	0.01	0.15	0.84	194	43	109	42	101.78	17.20	1.18
C3	5	5	23	0.01	0.12	0.87	261	29	167	65	128.89	61.85	3.32

Table 5. Plot counts and densities following collections.

Plot	Length (m)	Width (m)	Area (m2)	Hab Good	Hab Mod	Hab Poor	Total Count	Count Good	Count Mod	Count Poor	Density Good	Density Mod	Density Poor
C1	6	12	66	0.01	0.40	0.59	568	206	309	53	312.12	11.70	1.36
C2	7	7	42	0.01	0.15	0.84	156	43	81	32	101.78	12.78	0.90
C3	5	5	23	0.01	0.12	0.87	236	29	155	52	128.89	57.41	2.66

Table 6. Plot counts and densities following collections.

Plot	Length (m)	Width (m)	Area (m2)	Hab Good	Hab Mod	Hab Poor	Total Count	Count Good	Count Mod	Count Poor	Density Good	Density Mod	Density Poor
C1	6	12	66	0.01	0.40	0.59	776	335	380	61	507.58	14.39	1.57
C2	7	7	42	0.01	0.15	0.84	175	37	107	31	87.57	16.88	0.87
C3	5	5	23	0.01	0.12	0.87	228	42	140	46	186.67	51.85	2.35

Phase 2 - Blue Gum Cove

During Phase 2, black abalone were collected from one collection plot at Blue Gum Cove on Santa Cruz Island. We conducted a pre-collection survey at one 195m^2 section of rocky intertidal reef at the north side of Blue Gum Cove to ensure collections met collection criteria. During the survey, we subsampled the survey area by counting black abalone within 12 stratified random 1m^2 quadrats (Table 7). 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 9). 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. Immediately after the collections, we determined the resulting counts and densities within the plot (Table 9).

Table 7. Results of pre-collection quadat surveys at Blue Gum Cove (October 2023) 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 9).

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***

In April 2024, six months post-collection, we resurveyed the collection plot, using the same method as we used for the pre-collection survey, to determine if there were any effects of collection on black abalone counts and densities at the site. The results indicate that there were negligible effects of collections and that overall numbers and densities were similar post-collection and remained very high. Estimated numbers in the plot increased from 8785 pre-collection to 11102 post-collection, potentially from movement of abalone from adjacent intertidal and subtidal habitat. (Tables 8 and 9).

Table 8. Results of post-collection quadat surveys at Blue Gum Cove (April 2024) 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 9).

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	0.03	0.97	0	3	1	0.00	100.00	1.03
SCBG	2	1	0.02	0.2	0.78	22	31	3	1,100.00	155.00	3.85
SCBG	3	1	0.02	0.29	0.69	12	75	31	600.00	258.62	44.93
SCBG	4	1	0.01	0.25	0.74	5	9	0	500.00	36.00	0.00
SCBG	5	1	0.02	0.2	0.78	19	49	6	950.00	245.00	7.69
SCBG	6	1	0.11	0.2	0.69	12	21	0	109.09	105.00	0.00
SCBG	7	1	0.02	0.12	0.86	10	4	0	500.00	33.33	0.00
SCBG	8	1	0.01	0.09	0.9	2	23	0	200.00	255.56	0.00
SCBG	9	1	0.02	0.2	0.78	14	54	19	700.00	270.00	24.36
SCBG	10	1	0	0.1	0.9	0	2	0	0.00	20.00	0.00
SCBG	11	1	0.06	0.15	0.79	7	5	0	116.67	33.33	0.00
SCBG	12	1	0	0.1	0.9	0	0	0	0.00	0.00	0.00
SCBG	**MEAN**	***1***	***0.02***	***0.16***	***0.82***	***8.5***	***23***	***5***	***397.98***	***125.99***	***6.82***

Table 9. Plot population and density estimates extrapolated from quadrats (Table 7 and 8).

Survey	Area (m2)	Hab Area (m2)	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
Pre Oct 2023	195	185	.02	0.38	0.6	302.08	83.46	16.11	1119	5875	1791	**8785**
Post Oct 2023	195	185	.02	0.38	0.6	302.08	82.87	15.37	1119	5826	1706	**8651**
Post April 2024	195	185	.02	0.38	0.6	397.98	125.99	6.82	1475	8869	758	**11102**

At both donor sites, the following collection criteria were met:

- We maintained a density greater than the expected density for that site based on the habitat (Good = 1.58, Mod = 0.27, Porr = 0.0049). This metric is consistent with the Habitat-based Density Recovery Criterion described in the Final Recovery Plan for Black Abalone (NMFS 2020). Densities remained well above expected density.
- We maintained a minimum density of at least two black abalone per m^2 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. Density in good and moderate habitat was well above $2/m^2$

- We maintained 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. At both sites almost all abalone were found in reproductive clusters as abalone density was very high. When collecting, we avoided collecting abalone that would reduce the proportion of reproductive clusters.
- We collected < 10% of the black abalone from any one donor site. At Fraser Cove we collected 1.14% of the estimated population. At Blue Gum Cove, we collected 1.53% of the estimated population.
- We avoided areas where long-term monitoring or historic abalone surveys have been done.