

SUPPLEMENTARY INFORMATION

Section S1. Variation in density strata across sampling periods

Observed population densities varied over time in all density strata due to the dynamic nature of the system, the patchiness of wild sea scallop beds, and the presence of fishing activity in both areas over the course of the study. Density strata remained distinct during the study, with mean population densities increasing from the low-density stratum to the medium-density stratum to the high-density stratum in both areas (Fig. S1).

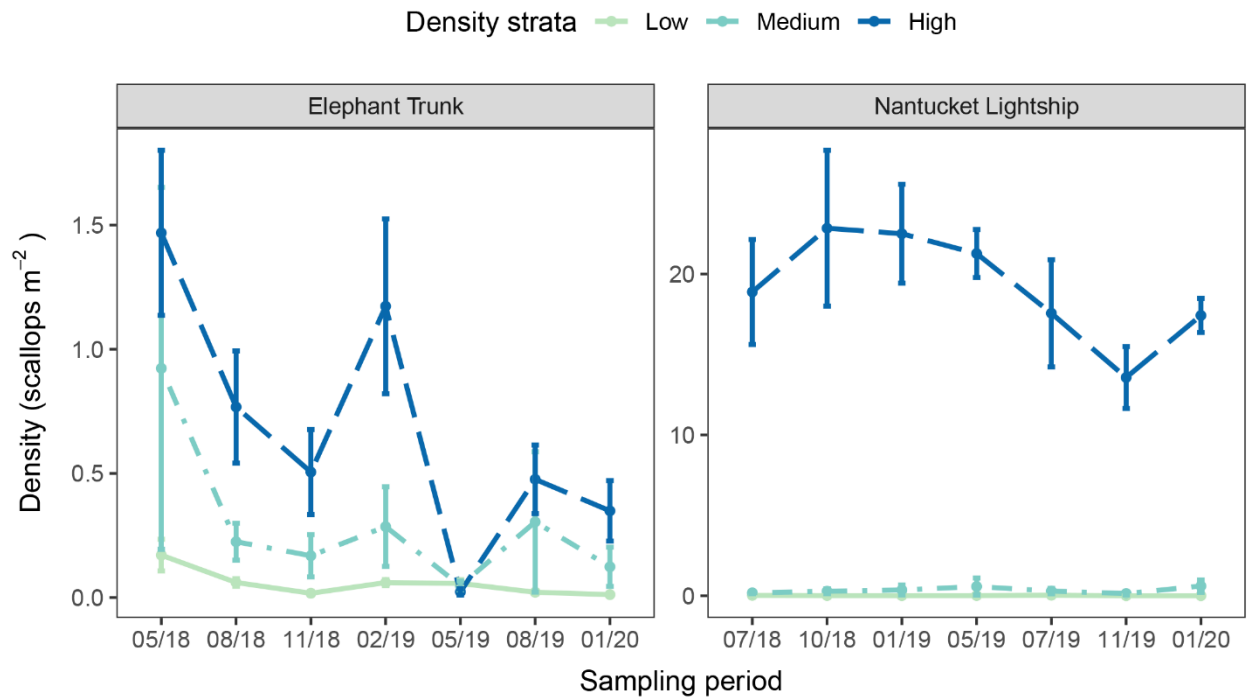


Fig. S1. Mean observed population density (sea scallops m^{-2}) across study areas, density strata, and sampling periods. Error bars represent standard error

Section S2. Examples of sea scallop reproductive stages

Example images of male and female sea scallop reproductive stages are provided for reference. Stage names match those used during at-sea reproductive stage assignment through gross examination.

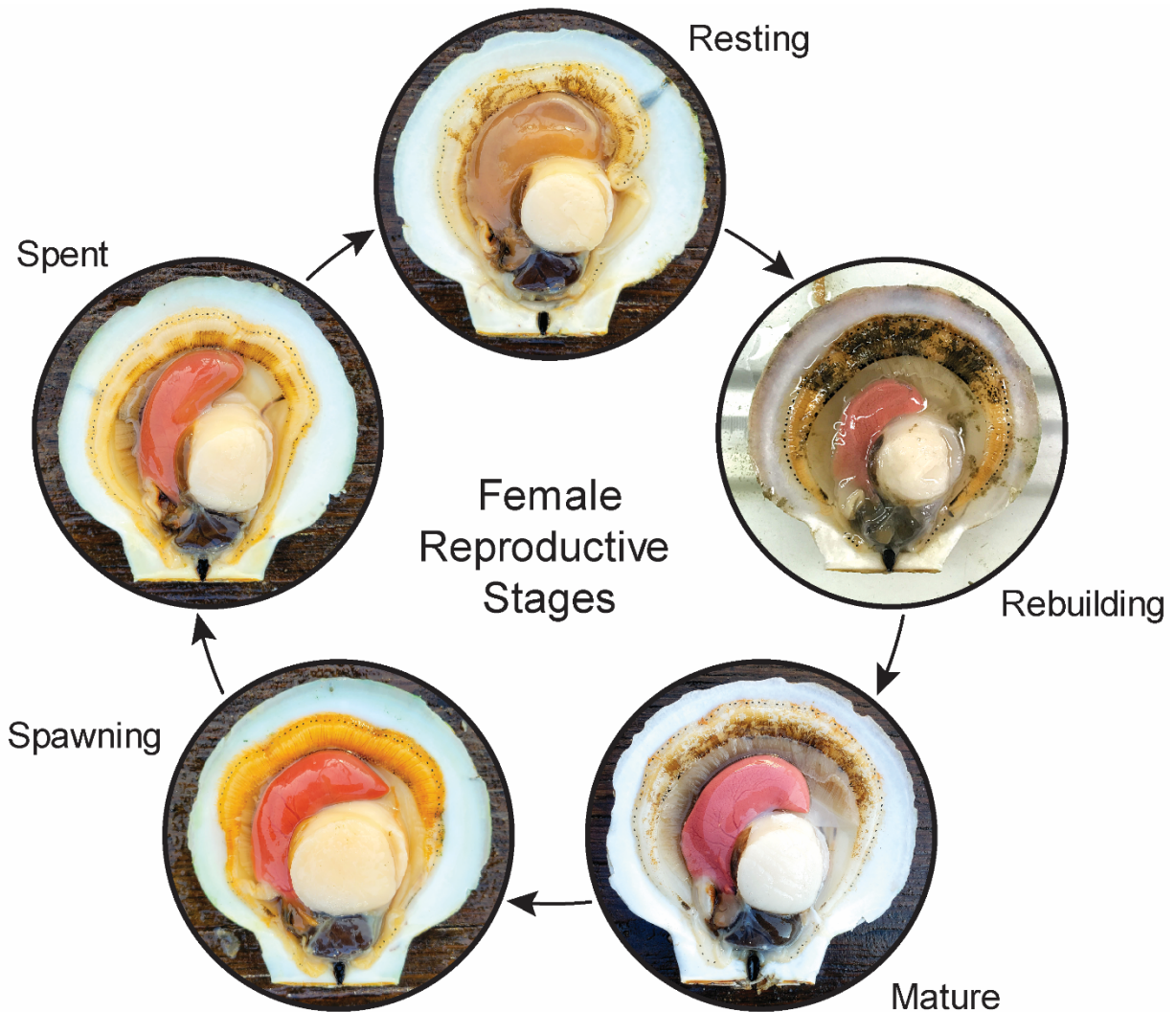


Fig. S2. Examples of female sea scallop reproductive stages assigned at sea through gross examination

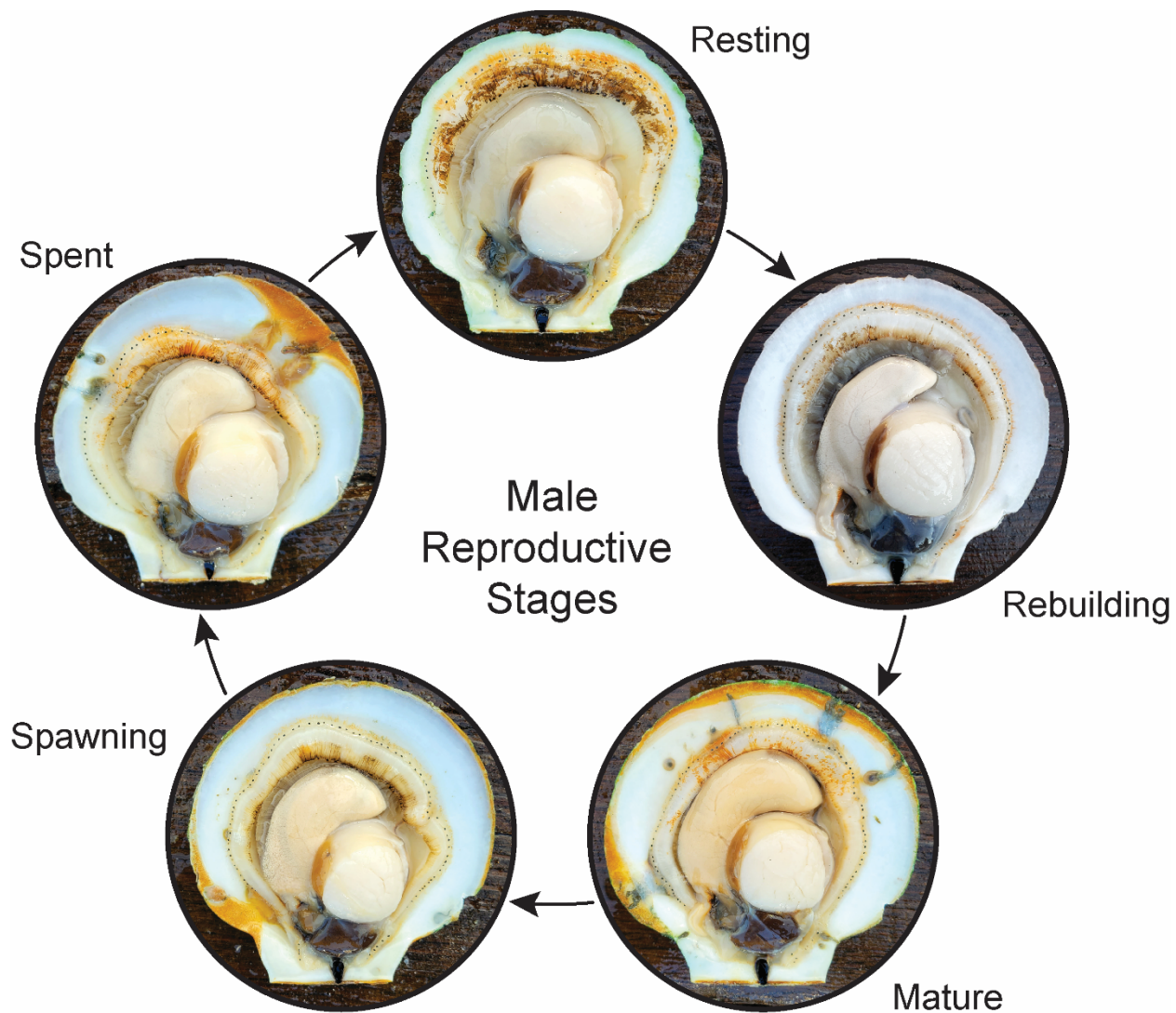


Fig. S3. Examples of male sea scallop reproductive stages assigned at sea through gross examination

Section S3. Sea scallop shell heights and tissue weights across sampling periods

Table S1. Mean, standard error (SE), and range of shell height (mm) and adductor muscle, gonad, and viscera weight (g) by sampling periods and density strata in the Nantucket Lightship. Mean population densities were 0.02, 0.30, and 0.69 sea scallops m⁻² in the Elephant Trunk low, medium, and high-density strata, respectively

Sampling period	Density strata	Shell height (mm)			Adductor muscle weight (g)			Gonad weight (g)			Viscera weight (g)		
		Mean	SE	Range	Mean	SE	Range	Mean	SE	Range	Mean	SE	Range
07/18	Low	124	0.90	65–157	37.3	0.89	3.9–76.3	12.8	0.53	0.8–56.2	53.2	1.11	5.0–101.3
	Medium	115	0.65	87–138	27.9	0.58	8.2–53.8	8.8	0.34	1.6–42.6	41.8	0.73	16.7–74.8
	High	82	0.67	55–105	7.5	0.22	1.4–18.1	1.5	0.09	0.1–12.6	14	0.35	4.0–27.6
10/18	Low	122	0.90	73–148	26.8	0.67	5.6–51.4	5.8	0.25	0.7–20.6	47.3	1.10	9.6–93.3
	Medium	108	0.85	79–136	18.2	0.51	6.1–39.2	3.8	0.15	0.6–11.2	34.6	0.89	13.5–80.6
	High	88	0.80	65–124	8.0	0.33	2.4–28.5	1.3	0.07	0.1–6.3	17.8	0.62	6.5–58.4
01/19	Low	132	1.29	81–157	37.2	0.96	10.1–62.4	10.0	0.33	1.2–20.9	65.1	1.53	16.0–108.7
	Medium	109	0.89	74–142	18.2	0.53	3.1–43.9	4.0	0.16	0.5–14.2	36.6	0.93	9.2–85.1
	High	83	0.53	61–106	5.7	0.15	1.5–15.4	1.0	0.03	0.3–2.5	14.4	0.29	5.8–28.9
05/19	Low	123	1.17	87–152	40.9	1.16	9.0–78.6	13.8	0.46	3.3–41.1	56.8	1.54	15.4–102.0
	Medium	107	0.97	75–142	25.8	0.84	5.6–72.8	7.7	0.26	1.5–19.9	37.6	1.07	11.4–92.2
	High	87	0.60	69–110	10.1	0.24	2.8–20.4	2.2	0.09	0.3–8.8	17.4	0.36	8.0–32.8
07/19	Low	134	1.02	69–171	47.9	1.14	4.6–92.2	22.8	0.80	1.9–58.7	55.5	1.48	5.1–114.4
	Medium	108	0.82	77–144	25.0	0.66	7.8–50.1	9.8	0.39	1.4–45.7	28.5	0.81	7.8–64.0
	High	91	0.61	69–115	11.6	0.31	2.4–26.2	3.2	0.12	0.3–9.1	13.5	0.43	1.6–37.3
11/19	Low	134	1.41	70–161	31.9	1.02	4.0–62.8	10.2	0.47	0.9–39.0	48	1.70	5.2–139.4
	Medium	114	1.20	78–157	19.6	0.74	2.7–54.5	7.0	0.39	0.2–29.9	29.9	1.27	4.4–149
	High	91	0.69	64–127	8.7	0.28	1.6–29.2	1.7	0.09	0.1–9.3	17.1	0.48	4.0–44.2
01/20	Low	128	1.60	86–153	32.9	1.01	6.5–49.0	10.2	0.45	1.8–25.3	57.8	1.75	16.2–97.8
	Medium	109	0.96	83–147	21.6	0.59	8.2–48.7	6.1	0.20	1.7–15.7	39.5	1.05	12.5–103.6
	High	89	0.56	67–111	8.7	0.23	2.5–20.6	2.2	0.08	0.4–6.8	19.3	0.39	8.7–43.8

Table S2. Mean, standard error (SE), and range of shell height (mm) and adductor muscle, gonad, and viscera weight (g) by sampling periods and density strata in the Elephant Trunk. Mean population densities were 0.02, 0.35, and 19.21 sea scallops m⁻² in the Nantucket Lightship low, medium, and high-density strata, respectively

Sampling period	Density strata	Shell height (mm)			Adductor muscle weight (g)			Gonad weight (g)			Viscera weight (g)		
		Mean	SE	Range	Mean	SE	Range	Mean	SE	Range	Mean	SE	Range
05/18	Low	116	1.09	71–148	34.4	0.84	8.9–63.0	8.9	0.32	1.5–22.8	51.5	1.29	11.3–90.2
	Medium	110	1.02	77–153	26.7	0.63	8.9–59.0	7.3	0.24	1.6–17.9	43.0	1.18	11.9–95.1
	High	108	0.73	87–142	25.9	0.49	12.4–47.9	6.9	0.19	1.6–16.5	41.7	0.96	21.7–95.1
08/18	Low	109	1.07	69–146	28.3	0.88	4.8–63.5	8.7	0.36	1.2–25.8	36.4	1.04	10.5–76.2
	Medium	115	0.81	73–152	32.0	0.69	7.1–58.0	8.6	0.31	1.1–35.1	42.4	0.92	10.3–87.0
	High	112	0.67	86–142	26.1	0.50	11.6–49.9	5.6	0.16	1.4–12.0	37.7	0.81	17.7–80.8
11/18	Low	114	1.27	88–152	24.1	0.78	8.3–45.8	8.5	0.52	1.1–37.3	37.4	1.18	11.0–79.7
	Medium	119	0.89	80–161	25.1	0.52	7.3–49.5	9.2	0.41	0.8–49.5	39.9	0.87	9.5–92.7
	High	111	0.74	71–140	21.9	0.48	5.7–46.1	5.7	0.21	0.5–19.9	36.5	0.73	9.3–74.3
02/19	Low	112	1.13	74–154	24.8	0.69	6.3–49.5	13.2	0.55	1.3–49.5	38.9	1.07	10.7–96.0
	Medium	113	0.96	78–153	25.5	0.67	8.1–66.7	11.3	0.37	1.7–32.8	41.2	0.99	13.4–104.0
	High	113	0.75	75–144	25.6	0.55	7.2–52.7	10.6	0.3	1.8–28.7	43.6	0.80	12.9–89.5
05/19	Low	117	0.81	48–148	36.6	0.71	4.3–66.2	8.9	0.32	0.3–45.0	39.5	0.98	2.8–106.0
	Medium	124	0.99	78–153	34.0	0.94	3.7–63.2	11.0	0.52	1.3–38.9	42.8	1.12	11.0–88.0
	High	123	0.94	83–159	33.5	0.71	7.1–66.5	10.6	0.42	0.6–32.2	41.3	0.98	8.3–88.7
08/19	Low	118	1.08	79–147	34.9	0.94	8.7–61.5	8.2	0.34	0.5–21.4	40.5	1.12	10.1–74.5
	Medium	122	1.12	85–153	36.9	0.99	9.3–72.7	9.9	0.44	1.0–33.2	46.7	1.33	14.0–111.4
	High	119	0.80	85–150	32.2	0.69	9.1–56.5	9.5	0.37	0.9–29.4	41.9	0.87	14.0–79.5
01/20	Low	115	1.21	84–155	22.2	0.76	7.3–52.3	6.9	0.34	0.9–19.8	32.6	1.09	10.7–97.3
	Medium	119	0.92	85–148	23.6	0.54	8.7–47.9	7.0	0.22	1.2–17.3	44.3	0.98	14.0–78.6
	High	120	0.64	91–144	23.3	0.43	8.5–43.5	6.9	0.16	2.2–16.3	45.4	0.76	23.3–76.6