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Mortality Associated with Tagging in the Sea Scallop, *Placopecten magellanicus* (Gmelin)

by

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Abstract

Mortality associated with tagging dredge-caught sea scallops as determined by their subsequent survival in the laboratory was determined to be 3% over 78 days, corresponding to an instantaneous mortality coefficient of 0.143.

Résumé

La mortalité liée au marquage des pétoncles géants capturés à la drague, déterminée par leur survie en laboratoire, a été de 3 % sur une période de 78 jours, ce qui correspond à un coefficient de mortalité instantanée de 0,143.

Introduction

While tagging of scallops has been conducted on a more or less routine basis, few studies have been undertaken to determine associated mortality. Posgay (1963) conducted large-scale tagging of sea scallops on Georges Bank in 1957 and 1958. On the basis of the condition of scallops returned he hypothesized that tagging mortality was "low". As part of ongoing population studies of sea scallops on St. Pierre Bank a tagging program was begun in the spring of 1984. The exercise provided us the opportunity of estimating tagging mortality in the species.

Materials and Methods

Scallops were procured with a 12 ft offshore New Bedford dredge. Using short tows (5-10 min) animals were dredged up from an area relatively free of rocks in 40-42 m. Scallops appearing in good condition were sorted out from trash and immediately placed in running sea water. Physically damaged shells and those in which the hinge mechanism had become visibly impaired were discarded. Only those deemed satisfactory were used in the tagging exercise. Tagging scallops is a simple procedure (Posgay 1963). A hole is drilled through the wing of the upper (left) valve adjacent to the byssal notch using a hand drill with a 1/6 inch drill bit. A numbered Peterson disc was then applied and secured in position by means of a 0.39 mm nickel wire. The loose end was tucked under the disc and held taut on the upper valve (Fig. 1). To improve visibility a 4-5 inch brightly-coloured vinyl streamer was attached to one half (1500) of the total number tagged (3000). Tagged animals were then immediately returned to recovery tanks where they remained for a further 6-12 hr. Just prior to release each tagged scallop was reexamined individually before commencement of measurements for shell heights and other documentation. Numbers of tagged scallops released at any station were proportional to their relative spatial abundance as determined during a survey seven months prior to the tagging exercise. Controls consisted of dredge-caught scallops as follows:

100 untreated (Control A)
101 holes drilled but not tagged (Control B).

Control animals were transported back to the laboratory in running sea water. To minimize thermal shock an attempt was made to preadjust the experimental holding tank to the temperature prevaling at source.

A similar set up was established using only diver-procured scallops. These were collected at a near-shore location (10 m) in Placentia Bay, Newfoundland and transported to holding tanks in the laboratory within 10 hr. All experimental animals were tagged the following day and maintained in running sea water at the Northwest Atlantic Fisheries Centre (St. John's, Newfoundland). Observations were made for 78 and 105 days for the dredge and diver-caught scallops, respectively. A continuous temperature record was maintained separately for each group of animals for the full duration of the study.

Results

Shell-height distributions of scallops used in the study are summarized in Table 1. There were no significant differences between the means of controls and experimental animals of both dredge and diver-caught scallops ($F = 0.99 < F_{2,298,0.01} = 4.69$ and $F = 0.59 < F_{2,137,0.01} = 4.76$ respectively).

Diver-procured scallops were collected from a source temperature of 0.8°C and transferred within 6 hr into holding tanks at 1.7°C. Similarly dredge-caught specimens taken from 2.7°C were held in recovery tanks at 5°C onboard the vessel and subsequently transferred into precooled experimental tanks at 5°C. Transportation to the laboratory took approximately 26 hr. Temperature fluctuations in the experimental tanks were minimal (Fig. 2). Inspite of a doubling in temperature at the outset there was only one immediate death amongst the dredge-caught scallops. This occurred on the third day with no further mortalities until 26 and 28 days. Similarly there were only two deaths in the intact controls each occurring on day 25 and day 57. Three out of 101 drilled controls died, each on days 13, 14 and 50 into the experiment (Table 2). There were no significant differences between the mean sizes of those dying compared with survivors (Table 3). Total survival irrespective of treatment was 97.3%.

Similarly there was only one death in the experimental (tagged) group from the diver-procured scallops. This occurred on day 3. Two controls (untreated) also died three and 66 days into the experiment. All drilled scallops from this category survived for the full duration (105 days). Total survival was 97.8% (Table 2). Again deaths were not size specific (Table 3).

There was no obvious relationship between temperature and time of death (Fig. 2).

Discussion

It is apparent that tagging itself did not appear to have a deleterious effect on subsequent survival in both dredge- and diver-procured scallops. The marginally higher mortality in dredge-caught scallops may be ascribed to factors other than tagging, especially mode of capture and handling prior to tagging. Invisible damage, particularly at the hinge line, could affect survival. In the short term such scallops may be more easily engaged by predators such as starfish. Since all experimental (tagged) scallops in this study were held in a predator-free environment, it is possible that mortality associated with this moribundity is underestimated. Dredge-caught scallops frequently suffer various degrees of mantle retraction, the severity of which may affect medium to long-term survival.

Temperature fluctuations were within the order of magnitude expected at source and therefore unlikely to have caused the observed deaths.

It is concluded that tagging sea scallops as described in this paper causes minimal mortality in this species. In terms of annualized instantaneous rates, mortality amongst experimental animals (0.143) was somewhat higher than the 1984 instantaneous rate computed for this area (0.101; Naidu and Cahill, unpublished data) from percent occurrence of cluckers in the population (Dickie 1955). This is not surprising in view of the minimal damage to living tissue in applying the tag. Scallop deaths are more likely related to mode of capture and handling than tagging *per se*. This is further supported by the observation that 92% (61 out of 66) recaptures during the ensuing six months had visible repair to the hole drilled for securing the tag.

References

Dickie, L. M. 1955. Fluctuations in abundance of the giant scallop, *Placoptera magellanicus* (Amelin), in the Digby area of the Bay of Fundy. *J. Fish. Res. Board Can.* 12: 797-857.

Posgay, J. A. 1963. Tagging as a technique in population studies of the sea scallop. ICNAF Special Pub. No. 4: 268-271.

Table 1. Shell-height distributions of dredge- and diver-procured scallops. Percentages are parenthesized.

Shell height (mm)	Dredge-caught						Diver-caught					
	Tagged		Intact		Drilled only		Tagged		Intact		Drilled only	
	#	Percent	#	Percent	#	Percent	#	Percent	#	Percent	#	Percent
60-64												
65-69												
70-74			1	(1.0)								
75-79					1	(1.0)			1	(2.0)	2	(5.0)
80-84	2	(2.0)			2	(2.0)			3	(6.0)	1	(2.5)
85-89	3	(3.0)	1	(1.0)	1	(1.0)	8	(16.0)	3	(6.0)	11	(27.5)
90-94	13	(13.0)	12	(12.0)	13	(12.9)	9	(18.0)	11	(22.0)	5	(12.5)
95-99	23	(23.0)	19	(19.0)	30	(29.7)	5	(10.0)	8	(16.0)	8	(20.0)
100-104	27	(27.0)	32	(32.0)	27	(26.7)	9	(18.0)	7	(14.0)	1	(2.5)
105-109	14	(14.0)	21	(21.0)	13	(12.9)	4	(8.0)	1	(2.0)	1	(2.5)
110-114	12	(12.0)	8	(8.0)	8	(7.9)	4	(8.0)	6	(12.0)	2	(5.0)
115-119	5	(5.0)	2	(2.0)	4	(4.0)	3	(6.0)	6	(12.0)	2	(5.0)
120-124	0		3	(3.0)	0		4	(8.0)	2	(4.0)	1	(2.5)
125-129	0		1	(1.0)	1	(1.0)	1	(2.0)	0		2	(5.0)
130-134	1	(1.0)	0		1	(1.0)	3	(6.0)	0		2	(5.0)
135-139	0		0		0		0		2	(4.0)	2	(5.0)
N =	100		100		101		50		50		40	
Mean shell height (mm ± S.D.)	102.0 ± 8.36		102.4 ± 7.85		100.8 ± 8.44		103.2 ± 13.16		102.0 ± 13.40		99.9 ± 16.96	

Table 2. Summary of numbers used, deaths and survival times (days).

Category	Initial Nos.	No. deaths (shell heights mm)	Length of survival (days)	Percent survival
A. Dredge-caught:				
Experimental (tagged)	100	3 (98.0; 114.0; 95.8)	3; 26; 28	97
Control A (intact)	100	2 (103.7; 93.3)	25; 57	98
Control B (drilled only)	101	3 (97.0; 93.5; 101.3)	13; 14; 50	97
B. Diver-caught:				
Experimental (tagged)	50	1 (97)	7	98
Control A (intact)	50	2 (118; 84)	3; 66	96
Control B (drilled only)	40	0 (-)	-	100

Table 3. Size comparisons of survivors versus those dying for experimental and control animals.

	Survivors		Deaths		t-tests
A. Dredge-caught:					
Tagged	N = 97	$\bar{X}$ = 101.98 ± 8.36mm	N = 3	$\bar{X}$ = 102.60 ± 9.93mm	$t = 0.13 < t_{.025,98} = 1.99$
Control A	N = 98	$\bar{X}$ = 102.50 ± 7.87mm	N = 2	$\bar{X}$ = 98.5 ± 7.35mm	$t = 0.71 < t_{.025,98} = 1.99$
Control B	N = 98	$\bar{X}$ = 100.86 ± 8.53mm	N = 3	$\bar{X}$ = 97.27 ± 3.91mm	$t = 0.72 < t_{.025,99} = 1.99$
B. Diver-caught:					
Tagged	N = 49	$\bar{X}$ = 103.35 ± 13.26	N = 1	$\bar{X}$ = 97	
Control A	N = 48	$\bar{X}$ = 102.04 ± 13.22	N = 2	$\bar{X}$ = 101.00 ± 24.04	$t = 0.11 < t_{.025,48} = 2.01$
Control B	N = 40	$\bar{X}$ = 99.90 ± 16.96			

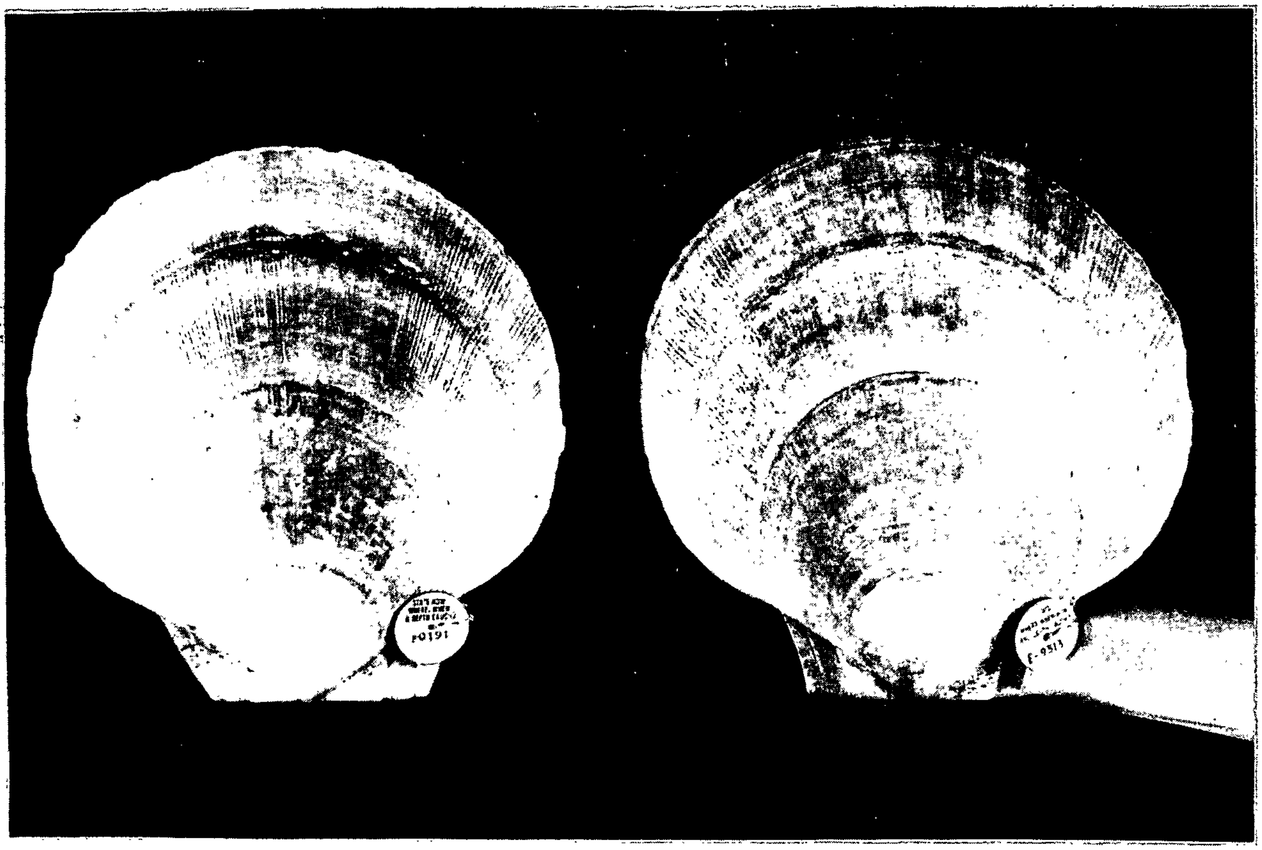

Fig. 1. Sea scallops tagged with Peterson discs (with and without streamer).

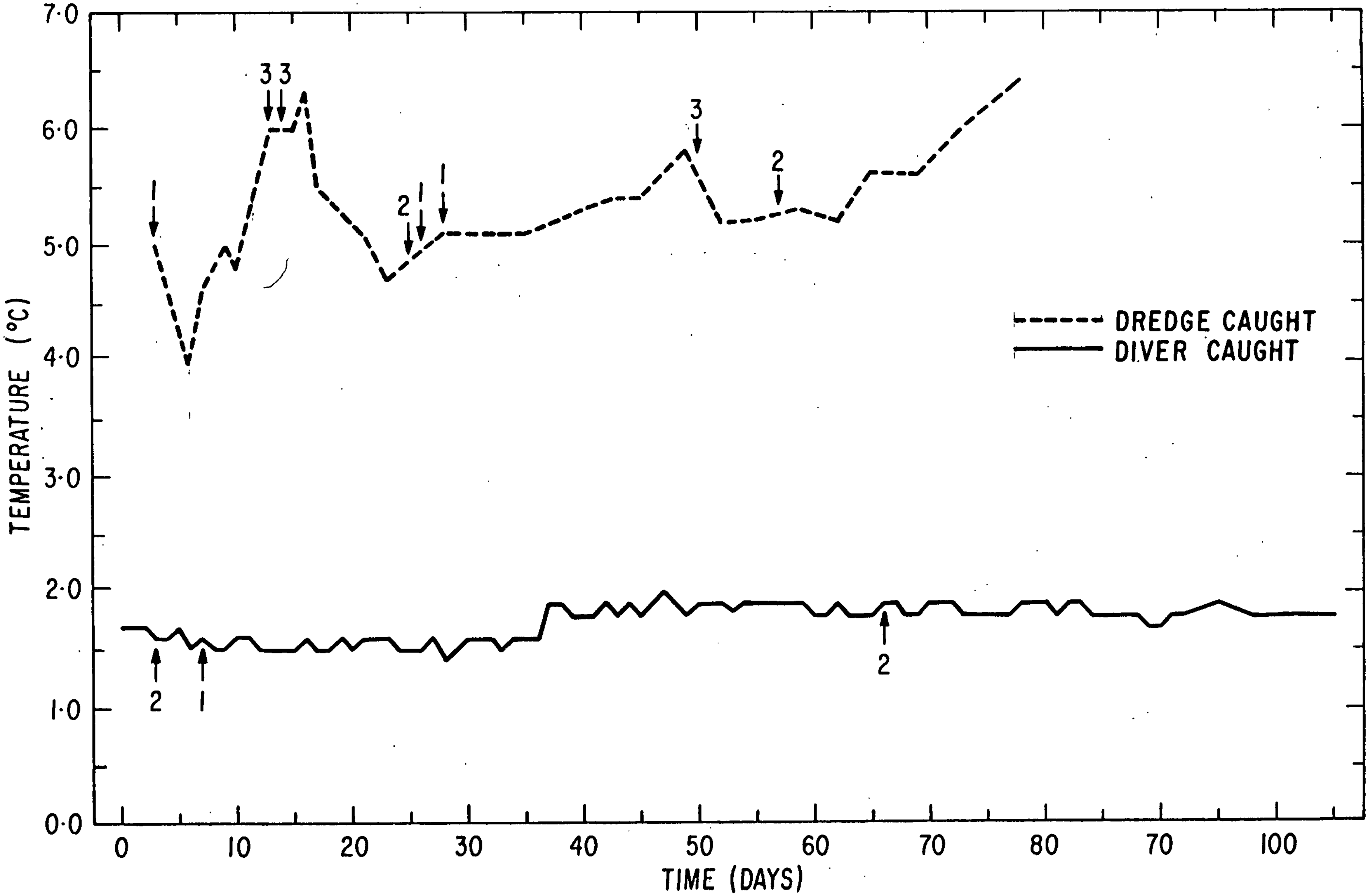

Fig. 2. Temperature in experimental tanks. Arrows indicate time and type of mortality. (1 = tagged; 2 = Control A; 3 = Control B, see Table 2).