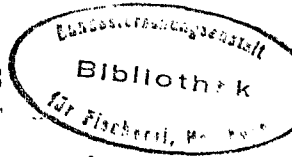


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International Council for
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Shellfish and
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LOBSTER (HOMARUS GAMMARUS (L.)) TAGGING TRIALS IN ENGLAND

by

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INTRODUCTION

As part of the expansion of the research studies on lobsters (Homarus gammarus (L.)) in England and Wales it is necessary to study growth rates, migrations, and natural and fishing mortality rates. The ICES Lobster (Homarus sp.) Working Group has drawn attention to the need to develop a tagging technique which allows recognition of individual lobsters and a tag which is retained after moulting (ICES C.M. 1975/K:38; see also ICES C.M. 1974/K:3).

Trials of two tags and a marking method, the sphyrion tag, the toggle tag and branding, were started in 1974, both in the laboratory and in the field. This report presents the results obtained so far and discusses future trials.

LABORATORY TRIALS

METHODS

Laboratory testing of three tagging methods was started in June 1974. Lobsters obtained from Selsey, Sussex were held individually in 50 l tanks containing approximately 25 l of sea water which was continuously aerated and slowly exchanged by a continual inflow of about 60 l/day. The lobsters were fed with live slipper limpets (Crepidula fornicata (L)) and live or frozen shrimp (Crangon crangon (L)) about twice a week. The aquaria were initially kept in an unheated tank-room at ambient air temperature, ranging from 12 to 21°C, but the ambient air temperature was maintained at 22°C from 25 January 1975 onwards.

Four lobsters were assigned to each of 4 groups of males and 4 groups of females - making a total of 32 lobsters. The lobsters in each group were selected to ensure that the groups had approximately the same mean size (70.1 to 72.4mm carapace length), with a minimum variance within a group.

One of four different treatments was randomly allotted to each of the 4 groups of males and to each of the 4 groups of females. The 4 treatments were:

1. Control. No tags, no branding.
2. Sphyrion tag (Figure 1a). This tag was developed by Scarratt and Elson (1965) for use on salmon and lobsters (Homarus americanus). It consists of an anchor of stainless steel wire, joined by a strand of monofilament polypropylene to a length of vinyl tubing, with a reference number printed on it. The anchor is inserted into the muscles between the carapace and the first abdominal segment, where the shell splits to allow the lobster to crawl out when moulting.
3. Toggle tag (Figure 1b). This tag was first used by Gundersen (1964) on the lobster Homarus gammarus. It consists of a flat rectangular stainless steel toggle attached by a double piece of nylon monofilament to an external flat rectangular plastic tag. Both the toggle and the external tag may be numbered. The toggle is inserted at the same place as the sphyrion anchor.
4. Branding (Figure 1c). A hot butane gas soldering iron was applied to the exoskeleton of the abdomen, and red marks made in a coded sequence. The underlying pigment was destroyed and left marks which were visible on the new shell. This technique was first used on the crayfish Astacus astacus Linne by Abrahamson (1965), and was used by Dybern (1965) and Gundersen (1973) on Homarus gammarus.

RESULTS

No deaths were recorded during the experiment.

Only 3 of the lobsters moulted before the tank room was heated, whilst 31 moulted between 25 January 1975, when the tank room was heated, and 28 June 1975.

Branding did not appear to be very successful. The brands were either so indistinct after moulting that it was not possible to determine the coded number, even on very close examination, or if the code could be read, the marks left on the new shell were not obvious and if used in the field were unlikely to attract the attention of fishermen.

All 8 sphyrion tags and 8 toggle tags were retained after moulting. After moulting one of the sphyrion anchors was only partly embedded in the muscle between the carapace and abdomen; two of the sphyrion anchors were visible at the scar around the entry point of the monofilament. The rest appeared to be well embedded. One of the toggles was visible near the surface of the musculature.

No second moults have yet occurred but the observations on the retention of the two tagging methods suggest that the toggle is more likely to be retained than the sphyrion anchor.

An analysis of the growth observations is given in Table 1 and in Table 2 the results of t-tests on the differences in moult increments and mean time to moult are listed. No significant differences ($P > 0.3$) were found between the mean percentage moult increments in carapace length of the controls, sphyrion tagged, toggle tagged or branded lobsters. There were no significant differences ($P > 0.4$) between the sexes within each treatment. There were no significant differences ($P > 0.1$) between the mean time to moult of 3 of the treatments. Comparisons with the toggle-tagged lobsters were omitted as these were not tagged until 70 days after the branding and sphyrion tagging.

FIELD TRIALS

A small field trial using branding and the sphyrion tag was carried out off Selsey Bill, Sussex in June 1974. A total of 299 lobsters, each with a sphyrion tag and brand marks, was released a few miles off Selsey. Fishermen were asked to bring ashore any tagged or branded lobsters caught and these were then held alive in storage tanks at Selsey until laboratory staff could examine them. The market value plus a reward of 50 pence was paid for each marked lobster and information on its time and place of recapture.

Over half (52%) of the 299 lobsters released were recaptured in 1974. Most were re-released and some were subsequently recaptured, a few up to five times. Observations on the brands indicated that they tended to fade and some perforated the exoskeleton. The sphyrion tag appeared to remain well anchored in the lobsters which had not moulted. Unfortunately, only 9 lobsters were recaptured having moulted; all of which retained the sphyrion tags but the brands on the new shell had faded. It is unlikely that lobsters which had lost their sphyrion tags during moulting would have been recognised by fishermen from the branding marks.

DISCUSSION

The small-scale laboratory testing of the three marking methods (sphyrion, toggle and branding) suggests that none of the methods affects the growth of Homarus gammarus.

The persistence after moulting of branding was not sufficient for fishermen to recognise the presence of the marks. Non-quantitative observations on the position of the internal anchor after moulting suggested

that the larger and smoother stainless steel toggle tag was more effectively retained beneath the musculature than the sphyrion anchor. There was some suggestion that the small sphyrion anchor with its sharp edges at the cut ends of the wire gradually worked its way to the surface of the muscles just beneath the soft membrane between the carapace and first abdominal segment. An anchor in this position was most likely to be cast off with the old shell at moulting. Gundersen (1973) found that the recapture rate of toggle tagged lobsters was higher than sphyrion tagged lobsters, thus indicating a higher tag loss rate for sphyrion tags. As a result of experience gained from the earlier experiments, current trials are being made of a modified tag. A total of 203 lobsters were double tagged and released off Selsey, Sussex, during May 1975. Each lobster was branded and tagged with a modified toggle tag (Figure 1d). This consisted of the 14 x 3 x 0.5mm stainless steel internal toggle attached by approximately 25mm of braided terylene thread to a 25mm long length of numbered vinyl tubing, as used on the sphyrion tag. This design it is believed combines the apparently superior persistence of the internal toggle with the neater and smaller external vinyl tubing of the sphyrion. This tubing offers less resistance than the larger rectangular external toggle when being pulled through the membrane between the carapace and first abdominal segment during moulting. To aid the insertion of the toggle and cause the minimum of internal damage it is intended to reduce the length of the toggle from 14 to 10mm and to make it of plastic material (Figure 1e). Further laboratory and field trials of this tag design are in progress.

SUMMARY

Trials of the sphyrion tag, branding and the toggle tag were commenced in 1974, both in the laboratory and the field. Laboratory testing of the three methods suggested that none of the methods affected the growth of Honarus gammarus. No mortalities were recorded from the 24 lobsters marked, or from the 8 controls. Brand marks left on the new exoskeleton after moulting were unlikely to attract the attention of fishermen. All the sphyrion and toggle tags were retained after moulting. There was some evidence that the smaller sphyrion anchor could work to the surface and may be cast with the old shell at subsequent moults. From a field trial of 299 branded and sphyrion tagged lobsters over half were recaptured but only 9 lobsters had moulted. All had retained the sphyrion tag but the brands on the new shell had faded. Lobsters which had lost the sphyrion tag during moulting

were unlikely to be recognized by fishermen from the branding marks. A tag has been constructed which combines the apparently greater persistence of the internal toggle with the neater and smaller external vinyl tubing of the sphyron. It is intended to reduce the size of the toggle and make it in plastic to aid the insertion of the toggle and so cause minimal internal damage. A total of 203 lobsters using the modified toggle tag have been released during May 1975. Further laboratory and field trials are in progress or planned.

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	<u>Mean premoult carapace length (mm ± S.D.)</u>	<u>Mean % increment (% ± S.D.)</u>	<u>Mean time to moult (days ± S.D.)</u>
<u>Males</u>			
Control	71.5 ± 5.4	9.9 ± 1.4	234 ± 98
Sphyrion	72.3 ± 3.9	8.8 ± 2.5	204 ± 41
Toggle	71.1 ± 2.2	9.7 ± 2.0	(150 ± 49*)
Brand	72.4 ± 5.8	8.5 ± 2.0	223 ± 21
<u>Females</u>			
Control	71.0 ± 4.7	9.6 ± 2.4	261 ± 46
Sphyrion	70.7 ± 2.3	9.3 ± 1.0	275 ± 28
Toggle	71.5 ± 2.8	10.2 ± 1.5	(213 ± 17*)
Brand	70.1 ± 4.9	9.5 ± 0.4	228 ± 103

* Toggle tags applied 70 days after other methods.

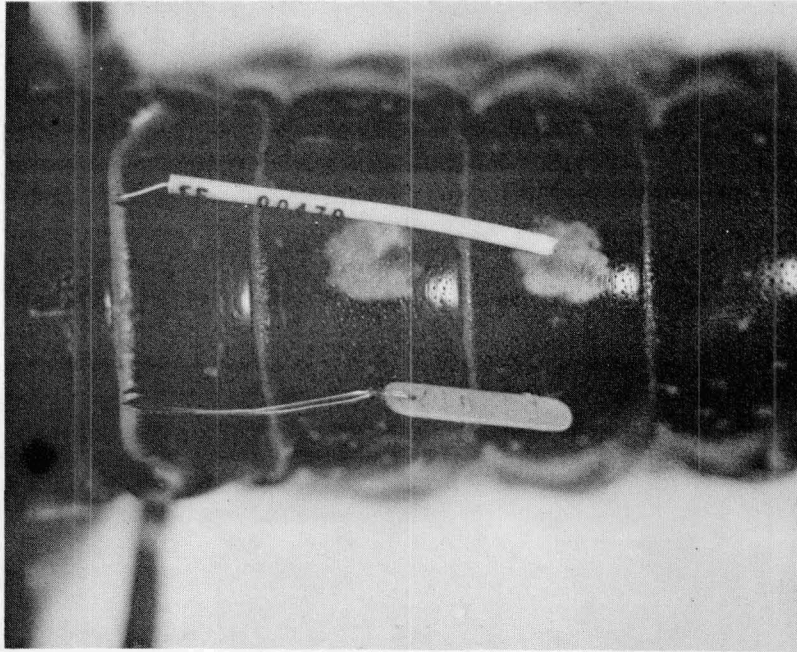
Table 1. The effects of the sphyrion tag, toggle tag, and branding on the moult increment and timing of the moulting of Honarus gammarus

<u>Methods Compared</u>	<u>Mean % Moulth increment</u>				<u>Mean time to moult</u>			
	<u>Male</u>		<u>Female</u>		<u>Male</u>		<u>Female</u>	
	<u>t</u>	<u>p</u>	<u>t</u>	<u>p</u>	<u>t</u>	<u>p</u>	<u>t</u>	<u>p</u>
Control/sphyrion	0.77	0.5	0.21	0.9	0.56	0.6	0.53	0.7
Control/toggle	0.16	0.9	0.46	0.7	*		*	
Control/brand	1.16	0.3	0.02	>0.9	0.22	0.9	0.58	0.6
Sphyrion/toggle	0.56	0.6	1.05	0.4	*		*	
Sphyrion/brand	0.19	0.9	0.48	0.7	0.81	0.5	0.88	0.4
Toggle/brand	0.85	0.5	0.88	0.5	*		*	

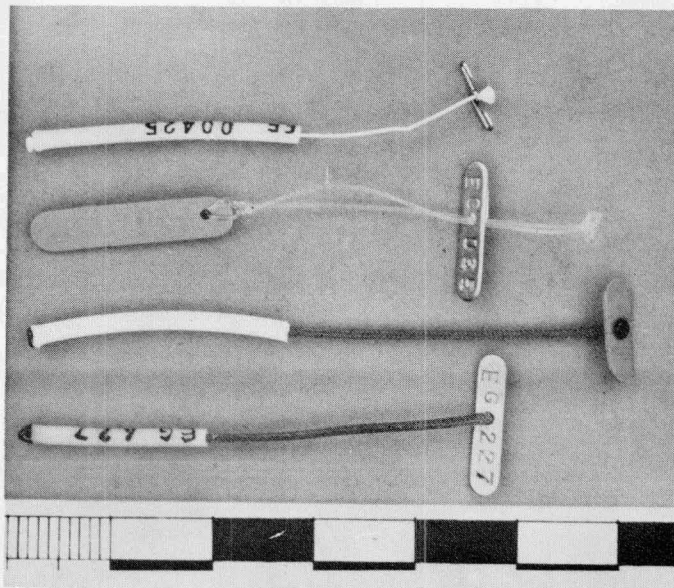
*Comparison not possible as toggle tags applied 70 days after other methods

Table 2. Significance of differences between the mean % moult increment and the mean time to moult of various pairs of tagging methods (t-test).

Figure 1. Lobster Tagging Methods.



- (a) Sphyrion tag (upper) inserted between carapace and first abdominal segment.
- (b) Toggle tag (lower)
- (c) Branding marks on second and third abdominal segments.



Top to bottom: sphyrion tag, toggle tag, proposed lobster tag(e), and modified toggle(d) as used in May 1975.

(Scale: mm and cm)