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Tagging Experiments on Lobster (Homarus vulgaris L.) in Norway.

by

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Owing to the habit of growth by moulting, where all hard parts are lost, there are special problems in the use of external tags on crustacea.

The types of tag used on crustacea fall into two groups: 1) External tags that are lost during moulting. 2) Marks and tags that persist through the moult.

This experiment deals with tags belonging to the second group.

Simpson (1961) gives a brief review of tags that persist through the moult. For this purpose holes have been punched through different parts of the tail fan of lobsters, according to a code that gave the length of the lobster at the time of marking. Further a barbed plastic strip bearing numbers and instructions has been used on crustacea. This was inserted between the second and third abdominal segments, and to one side of the mid-dorsal line in order to miss the gut. On the same place a stainless steel wire carrying a numbered disc on one end and bent into a hook at the other end has been used.

A drawback of the punching method is the disappearing of the holes after repeated moults, furthermore the tags are not individual.

Barbed plastic strips have a tendency to work into the flesh and can be hidden under the shell after one or two moults. In addition, when this sort of tags are inserted on spots where no changes in the shell structure takes place during the moulting process, it is possible that the tags will follow the left off shells.

In a method originally devised by Van Engel, (Butler 1957) the described difficulties are overcome on crabs by fixing the tag to the underlying tissue with a stainless steel wire through two holes in the shell along the line of separation of the carapace during ecdysis. Butler (1957) used this method on Cancer magister, Mistakidis (1960) and Gundersen (1963) on Cancer pagurus.

Gundersen (1963) developed another method also with the intention to fix the tag to the underlying tissue. In this method a double tag is used, one applied internally, one externally. The internal tag is made of plastic or stainless steel, the dimensions are: length 14 mm, breadth 3 mm, thickness 0.5 mm. In addition to letter and number stamped on the tag, a small hole, 0.8 mm in diameter, has been pierced in the middle of the flat side. The external tag is made of plastic and has the same shape as the internal tag but is somewhat larger: 20 x 4 x 0.5 mm, and the hole has been made at the end of the flat side. A piece of nylon gut No. 30, a knot having been made at one end; is pulled through the hole in the internal tag, until it is stopped by the tag.

The external tag is then tied to the other end of the nylon gut (Fig. 1).

As this type of tags showed promising results on crabs, it was of interest to try them on lobster too. During the moulting process the lobster leave the shell between the carapace and the first abdominal segment, and sometimes also the carapace opens along the dorsal medial line. When the experiment started the following methods were used:

- 1) The norwegian suture tag for crabs, later named "Double crab tag". The tagging operation was carried out as follows: With an awl a small T- shaped hole, just big enough to let the small tag and the knot pass, was made on the medial line of carapace. By means of a specially made pump (Gundersen 1963) the small tag is inserted into the lobster with right hand, while the left hand holds the bigger tag (Fig. 2). By pulling carefully at the external tag when the internal tag has passed carapace and skin, the internal tag will slide backwards inside the body of the lobster until the hole in the tag is just opposite the hole in the carapace. In reality this is the same method as used in sleeve- buttoning (Fig. 3).
- 2) The same tag as in method 1. With a surgical knife a small slit was made in the soft skin between carapace and abdomen on the dorsal side and the tag was inserted in the same way as described in method 1 (Fig. 4).
- 3) An external crab tag was fixed to the lobster by nylon gut. The nylon gut was tread through the lobster from side to side in the soft part between carapace and abdomen by using a curved suture needle (Fig. 5).

The results of method 1 is shown in table 1. By this method the risk for the tag to penetrate the pericardial cavity is very high. In two cases this seemed to be the cause of death.

During the moulting process it was obvious that the carapace did not open along the medial dorsal line. In some cases therefore the "old" carapace was picked up by the external tag and the lobster was not able to leave the shell. Sometimes the lobster came out halfway but was strangled because the old carapace pressed on both sides of the new carapace.

During 1962-63 method 2, the internal tag of plastic, was tried on eighteen lobsters (Table 2). Of these two lobsters died eight days after the tagging operation. A closer examination showed that the tags in this cases had penetrated the pericardial cavity. Three died by an accident eight months later when the supply of water failed. These animals had moulted once and were in good condition. During 1964 one died one and a half month after the second moult and one ten days after the third moult. In this cases it was impossible to find the reason. The internal tag was perfectly coalesced with the flesh and the wound caused by the tagging operation was healed. Of the rest all have been moulting twice after tagging and one three times.

The same method but the internal tag of stainless steel was tried on thirtyfour lobsters during 1963 (Table 3). Of this quantity two died five days after tagging. Here too, the tag had penetrated the pericardial cavity. Two died after the first moult when the supply of water failed. One died two days after the first moult probably because of rough handling just after moulting, and one died just after the second moult. In this case the cause of death is unknown.

One of these animals shed the tag during second and one during the third moult.

Most of this quantity has moulted twice, more than one third three times and finally one four times.

Method 3 (Table 4) was tried on eight lobsters in January 1962. This method seems to be the most lenient to the lobster. All of them have moulted twice and are in good condition. Three have shed the tag because the knot has broken.

All left off shells from moulting lobsters observed in these experiments demonstrate that the lobster comes out through a split in the soft skin which connects carapace and abdomen. On this skin it seems to be a transverse suture closer to carapace than abdomen. After moulting a narrow border of soft skin is connected with carapace, a somewhat broader border with abdomen on the left off shell.

According to the way of leaving the shell during moulting method 1. is unfit for use.

Method 2 has given more promising results. Mortality caused by the tagging operation has been about 7%, and occurred within a week after tagging. To exclude tagging mortality in a field experiment tagged lobsters may be kept in captivity for a week or fortnight. During that time a seriously wounded animal will die. It is just possible that the internal tag placed to one side of the mid-dorsal line, in order to miss the gut or the dorsal abdominal artery, would be more lenient to the lobster.

Shedding of tags have not occurred during the first moult but once in the second and the third. In these cases it was obvious that the tag had been inserted through the soft skin connected with abdomen. During moulting the external tag was picked up by this skin, being tough enough to pull the internal tag out of the tissue. It is possible that inserting of the internal tag through a split in the suture on the soft skin will prevent shedding of this kind.

A closer examination of the internal tag in animals killed by accidents or died in other ways after one or more moults, shows that the tags are capsulated in the flesh.

Tagging after method 3 seems to do the animal no harm at all. On the other hand this method is more time-consuming.

In tagging for field experiments it is important that the tag itself and the way it is fixed give small chances for the animal to be caught by the tag which might hook on stones, seaweed or other overhang.

To prevent this in method 3 the nylon ring which fixes the tag must be hidden under carapace. This will complicate the tagging operation but another fixing method will perhaps give satisfactory results.

SUMMARY

Three methods for using individual tags which persist through the moult on lobster are described.

One of these methods has given promising results.

References

- Butler, T. H. 1957 The tagging of the commercial crab in the Queen Charlotte Islands region. Prog. Rep. Pacific Coast St., No. 109, p. 16.
- Gundersen, K. R. 1963 Tagging Experiments on Cancer pagurus in Norwegian Waters. Ann. Biol. 18 (1961) : 206 - 8.
- Mistakidis, M. N. 1960 Movements of the edible crab (Cancer pagurus) in English waters. ICES, Doc. No. 88, Shellfish Committee.
- Simpson, A. C. 1963 Marking Crabs and Lobsters for Mortality and Growth Studies. Special Publication No. 4. Int. Comm. Northw. Atlant. Fish.

TABLE I

Method 1: "Double crab tag" in the medial line of the carapace.

Internal tag of plastic.

Date of tagging	No.	Sex	Total length in cm	Date of moulting	Total moulting length	Date of Total	Total length	Remarks
15/10-61	1402	♀	26.0	24/10-63	27.3			External tag removed 24/10-63.
31/10-61	1408	♀	36.0	19/ 9-63	36.4	24/7-64	36.7	Died 10/9-64. Reason unknown.
" "	1409	♀	24.5	24/ 3-63	27.0	2/3-64	28.4	External tag removed 2/3-64.
22/11-61	1403	♀	22.0	4/ 7-63	24.4			Killed 15/7-63 by a "comrade".
15/ 1-62	398	♂	21.1					Died 4/4-62. The tag in the heart.
" "	399	♀	21.0	22/ 6-63	23.5			Strangled by the "old" carapace.
" "	400	♂	21.4					Died 26/3-62. The tag in the heart.
" "	403	♀	21.5					Died 22/4-63 during transport.
" "	404	♀	21.7	28/ 6-63	23.0			Died 20/12-63. Reason unknown.

TABLE II

Method 2. "Double crab tag" in the soft skin between carapace and abdomen.

Internal tag of plastic.

Date of tagging	No.	Sex	Total length in cm	Date of moulting	Total length	Date of moulting	Total length	Date of moulting	Total length	Remarks
29/6-62	618	♀	23.0	13/6-63	24.7	20/ 3-64	25.5			
- "	385	♂	21.0	12/7-63	23.1	17/ 2-64	25.9			
15/3-63	2751	♂	20.0	2/7-63	22.7	5/ 2-64	24.3			
- "	2754	♂	20.0	2/7-63	22.9	21/ 4-64	25.4			
- "	2755	♀	19.5	31/7-63	21.4	22/ 2-64	23.0			
- "	2757	♂	20.7	18/6-63	23.5	26/ 1-64	26.4			
- "	2758	♂	20.0	9/8-63	22.4	20/ 3-64	23.2			
- "	2762	♂	20.5	25/6-63	22.6	11/ 1-64	24.7			
- "	2763	♀	19.0	6/7-63	21.5	28/ 1-64	24.0	24/5-64	26.5	
- "	2764	♀	21.5	22/8-63	23.7	18/ 4-64	26.5			
- "	2766	♂	22.5	30/6-63	24.7	25/ 4-64	27.2			
- "	2752	♂	20.0							} Died 23/3-63. The tag in the heart.
- "	2753	♂	18.5							
- "	2756	♂	18.5	1/7-63	20.5	23/12-63	22.0	17/7-64		} Died 27/7-64.
- "	2765	♀	23.0	26/6-63	24.7	10/ 2-64	25.5			} Reason unknown.
- "	2759	♂	20.2	12/7-63	21.6					
- "	2760	♀	20.0	8/6-63	22.5					} Died 14/11-63. Supply of water failed.
- "	2761	♀	20.2	30/8-63	22.2					

TABLE III

Method 2: "Double crab tag" in the soft skin between carapace and abdomen.

Internal tag of stainless steel.

Date of tagging	No.	Sex	Total length in cm	Date of moulting	Total length	Date of moulting	Total length	Date of moulting	Total length
18/5-63	761	♂	19.6	12/ 7-63	22.5	20/ 1-64	24.0	28/8-64	26.8
"	763	♂	18.2	4/ 9-63	20.0	2/ 3-64	22.0	2/9-64	24.5
"	764	♂	19.2	23/ 8-63	21.6	23/ 3-64	23.1		
"	765	♂	19.8	8/ 8-63	21.4	18/ 4-64	23.5		
"	767	♀	19.3	21/10-63	20.8	24/ 5-64	22.2		
"	768	♂	20.9	16/ 7-63	22.6	17/ 2-64	24.0	2/9-64	26.0
"	769	♂	17.4	1/ 8-63	19.3	20/ 1-64	21.1	14/8-64	23.3
"	770	♂	19.2	3/10-63	20.5	10/ 3-64	22.5		
"	771	♂	20.6	26/10-63	22.0	3/ 8-64	24.5		
"	772	♂	19.7	16/ 8-63	21.8	28/ 2-64	23.3	18/9-64	25.5
"	774	♀	20.0	30/ 7-63	21.8	2/ 3-64	23.4		
"	776	♂	18.2	1/ 8-63	21.0	29/ 2-64	23.0		
"	777	♀	20.3	16/ 1-64	21.5				
"	778	♀	19.7	5/10-63	21.5	3/ 5-64	24.3		
"	781	♀	20.5	8/ 7-63	22.4	9/ 4-64	24.2	10/9-64	26.3
"	782	♀	18.5	10/ 7-63	20.9	3/1-64	22.4	14/5-64	24.3
"	783	♂	20.2	24/ 7-63	22.1	10/ 3-64	24.4	12/9-64	26.7
"	784	♀	18.9	12/10-63	21.0	11/ 5-64	23.5		
"	785	♀	19.3	10/ 8-63	21.0	14/ 2-64	22.9	17/8-64	24.5
"	757	♂	20.4	28/ 9-63	22.6				
"	760	♂	20.3	7/10-63	22.2				
"	759	♀	18.9						
"	780	♂	18.5						
"	773	♀	20.2	11/ 7-63	22.0				
"	775	♀	20.5	18/ 7-63	23.2	12/ 3-64			

Shed the tag by third moult.

Died 14/11-63, Supply of water failed.

Died 23/ 5-63, The tag in the heart.

Died 13/ 7-63, Rough handling after moulting.

Died 13/ 3-64, Reason unknown.

TABLE III (continued).

Method 2: "Double crab tag" in the soft skin between carapace and abdomen.

Internal tag of stainless steel.

Date of tagging	No.	Sex	Total length in cm	Date of moulting	Total length moulting	Date of moulting	Total length moulting	Date of moulting	Total length moulting
17/7-63	4951	♀	23.5	26/ 7-63	25.5	31/ 3-64	27.5		
" "	4952	♀	23.9	7/10-63	24.7	3/ 4-64	27.2		
" "	4953	♀	19.8	19/ 9-63	21.8	22/ 3-64	23.7		
" "	4954	♂	17.5	30/ 9-63	20.0	5/ 3-64	22.2	3/8-64	25.2
" "	4956	♀	14.0	22/ 9-63	15.2	10/12-63	16.3	12/4-64	17.8
								21/9-64	19.3
1 27/8-63	4958	♀	21.8	24/ 1-64	22.5	17/ 5-64	24.1		
" "	4959	♀	22.4	7/ 9-63	23.0	20/ 2-64	24.0		
" "	4960	♂	21.8	16/10-63	23.0	22/ 6-64	25.2		

Shed the tag by second moult.

TABLE IV

Method 3: External crab^(tag) fixed by nylon gut through the soft skin between carapace and abdomen.

Date of tagging	No.	Sex	Total length in cm	Date of moulting	Total length	Date of moulting	Total length
15/1-62	1404	♀	24.5	23/ 6-63	26.4	10/3-64	28.4
- " -	1405	♂	21.4	5/ 7-63	23.4	20/2-64	25.2
- " -	1406	♀	25.0	31/ 8-63	27.0	8/3-64	29.5
- " -	1411	♀	29.4	1/ 9-63	30.5	18/3-64	31.7
- " -	1412	♂	22.0	10/ 6-63	24.6	20/1-64	27.1
- " -	1413	♀	22.5	11/ 6-63	25.0	15/3-64	27.2
- " -	1414	♀	23.5	29/10-62	25.4	22/2-64	26.5
- " -	1415	♂	21.2	24/ 6-63	23.6	8/2-64	25.5

Knot broken.

Knot broken.

Shed the tag last moult. Knot broken.

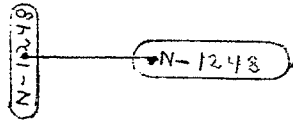


Figure 1. The double crab tag.

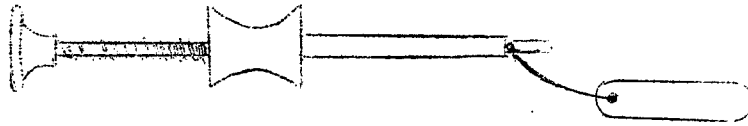


Figure 2. The tagging pump loaded with the internal tag.

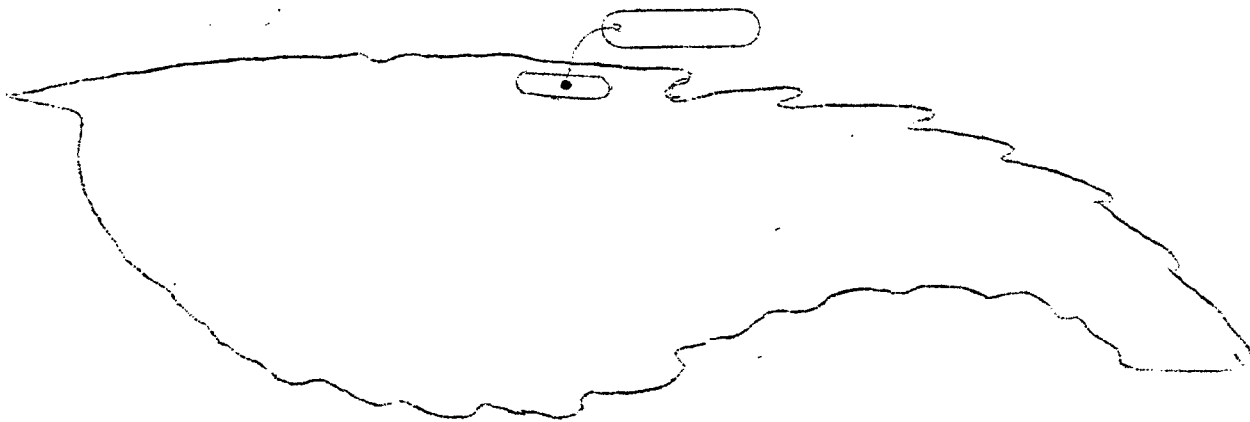


Figure 3. Method 1. The tag inserted through the medial dorsal line on carapace.

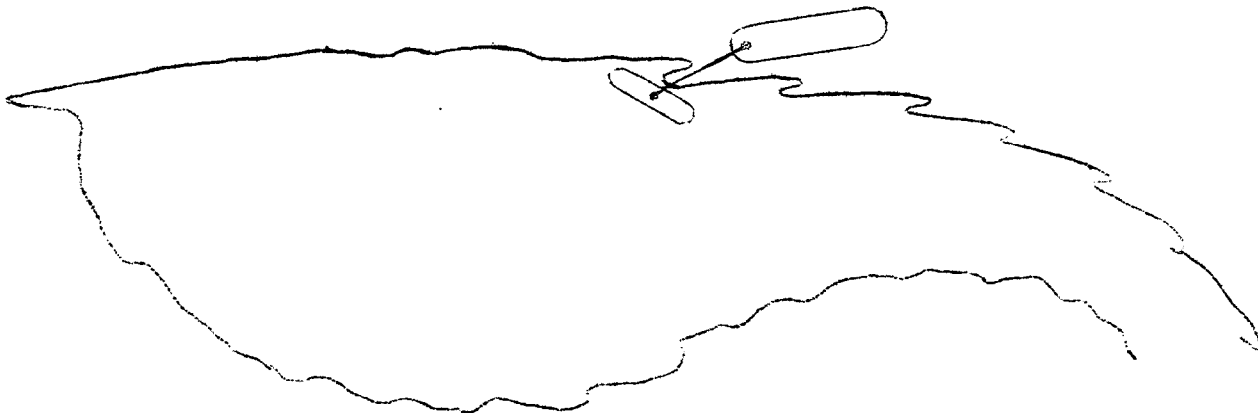


Figure 4. Method 2. The tag inserted through the soft skin between carapace and abdomen.

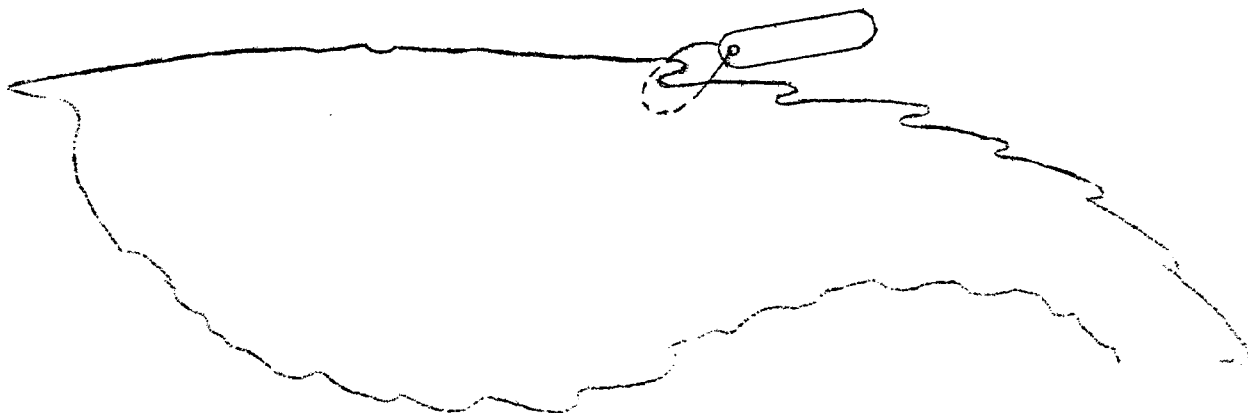


Figure 5. Method 3. The tag is fixed by nylon gut through the soft skin between carapace and abdomen.