

A survey of escape mechanisms and ring placements on commercial crab pots fished during the  
1997 Bering Sea snow crab, *Chionoecetes opilio*, season

By

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## TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES .....	i
LIST OF FIGURES .....	i
LIST OF APPENDICES .....	i
INTRODUCTION.....	1
METHODS.....	1
RESULTS AND DISCUSSION.....	2
LITERATURE CITED.....	3
TABLE.....	4
FIGURES .....	7
APPENDIX .....	8

## LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. Frequency of escape mechanism type (mesh versus rings) observed in pots registered for the 1997 Bering Sea snow crab season. Percent frequencies are for within data set.....	4
2. Frequency of ring placements in the 110 pots that were observed opportunistically from 87 vessels registered for the 1997 Bering Sea snow crab season. "N/A" indicates "relative height in door or rear" tunnel is not applicable. Percent frequencies are relative to the 108 pots in data set that were fitted with rings.....	5
3. Frequency of ring placements in 9,987 pots as determined from interviews with 50 vessels registered for the 1997 Bering Sea snow crab season. "N/A" indicates "relative height in door or rear" tunnel in not applicable. Percent frequencies are relative to the 9,632 pots in data set that were fitted with rings.....	6

## LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. Sample data form used during the 1997 c. opilio ring placement survey .....	7

## LIST OF APPENDICES

<u>Appendix</u>	<u>Page</u>
A. The 1996 Board of Fish regulation (5AAC 35.525) that requires escape mechanisms be placed in lawful crab gear used for registration area J during the Bering Sea Tanner crab fishery .....	9
B. Number of different ring arrangements observed during the 1997 C. opilio ring placement survey.....	10

## INTRODUCTION

Only males of a minimum carapace width (CW) may be harvested in the Bering Sea commercial Tanner crab, *Chionoecetes bairdi*, and snow crab, *C. opilio*, fisheries (ADFG 1996). Minimum legal size for Tanner crabs and snow crabs is 5.5 inches (140 mm) CW and 3.1 inches (79 mm) CW, respectively. Whereas incidental catch of female and undersized male snow crabs has been generally low relative to the catch of legal-sized males in the snow crab fishery, in the Tanner crab fishery the catch of undersized male Tanner crabs typically exceeds that of legal-sized males (Beers 1991, 1992; Tracy 1994, 1995a, 1995b; Boyle et al. 1996). Likewise, high bycatch rates of mated female Tanner crabs can also occur in the Tanner crab fishery. Regulations require that incidentally captured female and undersized male Tanner and snow crabs be immediately returned to the sea (ADFG 1996). The full effects on the survivorship of the discarded bycatch crabs remains unknown, but handling-induced lethal and sublethal effects that can lower long term fishery yields have been documented in other crab species (Kruse 1993).

Due to concerns over the unknown effects of crab bycatch, the Alaska Board of Fisheries (BOF) in March 1996 adopted new shellfish regulations (5AAC 35.525) requiring either escape 'rings' or escape mesh in all pots fished in Westward Region (Area J) Tanner and snow crab fisheries (ADF&G 1996; Appendix 1). The BOF action was intended to reduce bycatch of females and undersized males in the Tanner crab fishery and to preclude any future trend of increased bycatch in the snow crab fishery. Although the new escape mechanism regulations specify minimum dimensions for and quantities of escape mesh and escape rings, they still allow some latitude in implementation. Fishers have the option of employing either escape mesh or escape rings. Additionally, a wide variety of options exist for the actual placement on the pot of the escape mechanism employed. Most notable here are the options for placement of the escape rings. The regulations stipulate only that "no less than four circular escape rings" of a minimum diameter be "installed on the vertical plane".

The choice of escape mechanisms, (either mesh or rings) and the location of the escape rings on crab pots will likely influence the effectiveness of the new regulations in allowing incidentally captured females and undersized males to escape. In this regard, ADF&G has completed the field portion of a study with National Marine Fisheries Service comparing the effectiveness of escape mesh versus escape rings and of escape rings located high on a vertical panel versus located low on the panel (Donaldson and Byersdorfer 1997). Data presented summarizes how participants in the 1997 Bering Sea snow crab fishery chose to implement the new escape mechanism regulations.

## METHODS

Prior to the 15 January opening of the 1997 Bering Sea snow crab fishery, ADF&G tank inspectors were given ring placement survey forms (Figure 1) to collect information on escape mechanisms used (mesh vs rings) when boarding vessels in Dutch Harbor, Akutan, Pribilofs and King Cove. Ring placement was obtained from 137 of the 228 vessels that registered for the 1997 snow crab fishery.

Prior to conducting this survey, it was assumed that escape mechanisms were installed uniformly on all pots registered for a single vessel. Accordingly, tank inspectors were instructed to record the escape mechanism used and the placement of rings from only a single pot for each vessel. It was noticed during tank inspections, however, that ring placement varied among the pots registered for a single vessel. Tank inspectors interviewed the crew or captain of 50 vessels to determine the number of pots with a particular escape mechanism configuration on the vessel. The observations on and interviews from those 50 vessels provided information on 9,987 pots. Data from these 50 vessels are referred to as the “interview” data in the Results and Discussion.

Detailed interviews were not performed on the remaining 87 vessels from which data was obtained. Descriptions of 110 pots were recorded from those 87 vessels, but the full array of escape mechanism configurations on the 87 vessels and the relative proportions of such configurations remains unknown without interviews. Data from the 87 vessels that were not accompanied by interviews are referred to as the “opportunistic” sample data in the Results and Discussion.

For summarization of ring placement data, pots were first classified as to the side of the pot on which rings were placed: the door panel; the rear panel; both the door and rear panels; or, the tunnels. Pots with rings placed in the door or rear panel were further categorized by the location of the rings in the panel: high; middle; low; or, both high and low.

## **RESULTS AND DISCUSSION**

The opportunistic and interview data sets from the preseason survey of pots provide similar inferences on the use of escape mechanism results during the 1997 Bering Sea snow crab fishery. Both data sets indicate that only a small minority (2-4%) of the pots fished during the 1997 snow crab fishery were fitted with escape mesh to fulfill the new escape mechanism regulations (Table 1). Forty different arrangements for placement of rings were identified among the surveyed pots that were fitted with escape rings (Appendix 2). Close to two-thirds of pots fitted with rings had the rings placed only in the rear panel, approximately one-third of the pots had rings placed only in the door and few pots were observed with rings placed in the tunnel (Tables 2 and 3). Escape rings were placed high on the door or rear panel in roughly half of all surveyed pots fitted with escape rings; less than half had escape rings placed in the lower portion of the door or rear panel.

The three inch rings installed on pots for the 1997 snow crab fishery were typically affixed with electrical “zip-ties” inside of the five inch rings that had been earlier installed for the 1997 Bering Sea Tanner crab season. Hence, these findings reported here on escape mechanisms used and on ring placement also have general applicability to the Bering Sea Tanner crab fishery.

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Table 1. Frequency of escape mechanism type (mesh versus rings) observed in pots registered for the 1997 Bering Sea snow crab season. Percent frequencies are for within data set.

Data set	Number of pots (Number of vessels)	Pots with escape mesh (Percent)	Pots with escape rings (Percent)
Opportunistic	110 (87)	2 (2%)	108 (98%)
Interview	9,987 (50)	355 (4%)	9,632 (96%)

Table 2. Frequency of ring placements in the 110 pots that were observed opportunistically from 87 vessels registered for the 1997 Bering Sea snow crab season. "N/A" indicates "relative height in door or rear tunnel" is not applicable. Percent frequencies are relative to the 108 pots in data set that were fitted with rings.

Side of pot	Relative height in door or rear panel					Total (Percent)
	High (Percent)	Middle (Percent)	Low (Percent)	High and low (Percent)	N/A (Percent)	
Door	17 (16%)	2 (2%)	6 (6%)	1 (1%)	0 (0%)	26 (24%)
Rear Panel	31 (29%)	6 (6%)	17 (16%)	21 (19%)	0 (0%)	75 (69%)
Door and rear panel	2 (2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (2%)
Tunnel	N/A	N/A	N/A	N/A	5 (5%)	5 (5%)
Total	50 (46%)	8 (7%)	23 (21%)	22 (20%)	5 (5%)	108 (100%)

Table 3. Frequency of ring placements in 9,987 pots as determined from interviews with 50 vessels registered for the 1997 Bering Sea snow crab season. “N/A” indicates “relative height in door or rear tunnel” is not applicable. Percent frequencies are relative to the 9,632 pots in data set that were fitted with rings.

Side of pot	Relative height in door or rear panel					Total (Percent)
	High (Percent)	Middle (Percent)	Low (Percent)	High and low (Percent)	N/A (Percent)	
Door	1,235 (13%)	188 (2%)	1,060 (11%)	365 (4%)	0 (0%)	2,848 (30%)
Rear Panel	3,726 (39%)	396 (4%)	979 (10%)	1,085 (11%)	0 (0%)	6,186 (64%)
Door and rear panel	263 (3%)	0 (0%)	330 (3%)	0 (0%)	0 (0%)	593 (6%)
Tunnel	N/A	N/A	N/A	N/A	5 (0%)	5 (0%)
Total	5,224 (54%)	584 (6%)	2,369 (25%)	1,450 (15%)	5(0%)	9,632 (100%)

1997 opilio season ring placement survey

Recorder/date \_\_\_\_\_

Vessel name \_\_\_\_\_

Vessel ADFG number \_\_\_\_\_

**Instructions.**

Draw in approximate location of 5" and 3.75" rings into the illustrations on the other side of this page (Please note that the "Right" and "Left" tunnels in the illustrations are arbitrary). Record on the illustrations or in the Comments any other additional information that would help clarify the position of the rings; e.g., approximate distance of ring to top or bottom or side of pot and approximate distance between rings. Any other necessary comments or clarifying information can be entered in the comments section below. If the pots on this vessel are using escape mesh instead of rings, record that fact in the Comments section below.

**Comments:**

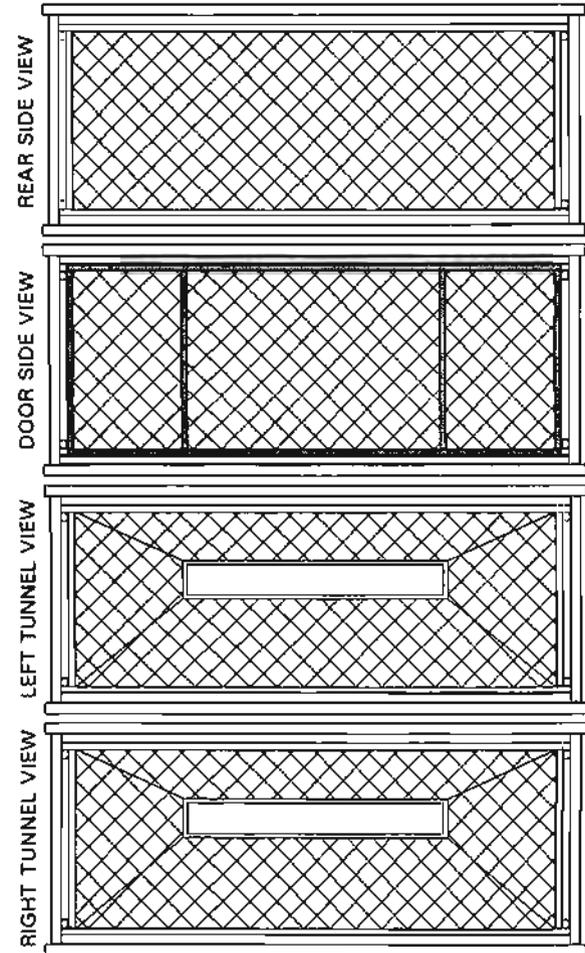


Figure 1. Sample data form used during the 1997 C.opilio ring placement survey.

## APPENDIX

Appendix A. The 1996 Board of Fish regulation ( 5AAC 35.525.) that requires escape mechanisms be placed in lawful crab gear used for registration area J during the Bering Sea Tanner crab fishery.

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**5AAC 35.525 LAWFUL GEAR FOR REGISTRATION AREA J.** (a) Tanner crab may be taken only with Tanner crab pots. Tanner crab taken by other means must be returned to the water without further harm.

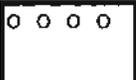
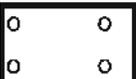
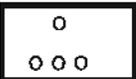
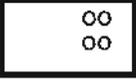
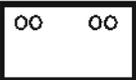
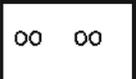
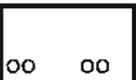
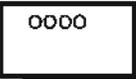
(b) The following Tanner crab pot requirements are in effect in Registration Area J:

(1) pots used to take *Chionoecetes bairdi* Tanner crab must have at least one-third of one vertical surface of the pot composed of not less than seven and one-quarter inch stretched mesh webbing or have no less than four circular escape rings of no less than five inches inside diameter installed on the vertical plane to permit escapement of undersized *C.bairdi* Tanner crab; and

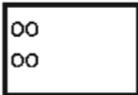
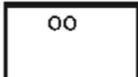
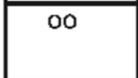
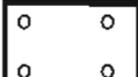
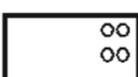
(2) pots used to take *Chionoecetes opilio* Tanner crab must have at least one-third of one vertical surface of the pot composed of not less than five inch stretched mesh webbing or have no less than four circular escape rings of no less than three and three-quarters inches inside diameter installed on the vertical plane to permit escapement of undersized *C.opilio* Tanner crab; and

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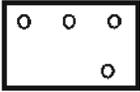
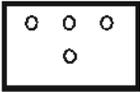
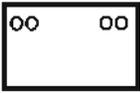
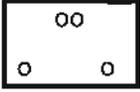
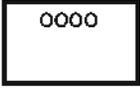
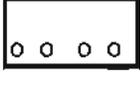
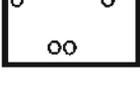
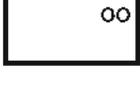
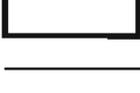
Appendix B. Number of different ring arrangements observed during the 1997 *C. opilio* ring placement survey.

		RANDOM * SAMPLE (N=87 boats)	VESSEL ** INTERVIEW (N=50 boats)
	Door side- 4 rings upper middle	1	0
	Door side- 4 rings evenly spaced-upper	6	861
	Door side- 4 rings in each corner	1	240
	Door side- 4 rings left	0	100
	Door side- 3 rings lower evenly spaced/1 ring upper middle	0	25
	Door side- 4 rings upper right	1	50
	Door side- 2 rings in each upper corner	6	324
	Door side- 2 rings in middle left and right side	2	188
	Door side- 2 rings in each lower corner	2	390
	Door side- 4 rings evenly spaced bottom	4	306
	Door side- 4 rings in upper middle	1	0

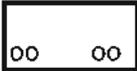
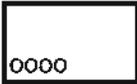
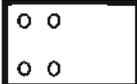
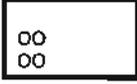
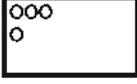
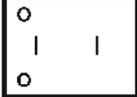
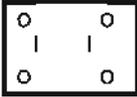
-Continued-

		RANDOM * SAMPLE (N=87 boats)	VESSEL ** INTERVIEW (N=50 boats)
	Door side- 4 rings evenly spaced middle	0	364
	Door side- 4 rings upper left side	2	0
	Door side- 2 rings high middle	2	20
	Rear panel- 2 rings high middle		
 	door Door side- 1 ring in each bottom corner rear Rear panel- 1 ring in each bottom corner	0	180
 	door Door side- 1 ring in each upper corner rear Rear panel- 1 ring in each upper corner	0	243
 	door Door side- 1 ring lower middle, 1 ring lower right rear Rear panel- 1 ring lower middle, 1 ring lower right	0	150
	Rear panel- 1 ring in each corner	2	170
	Rear panel- 4 rings evenly spaced upper	21	2,631
	Rear panel- 4 rings right upper half	1	121

-Continued-

		RANDOM * SAMPLE (N=87 boats)	VESSEL ** INTERVIEW (N=50 boats)
	Rear panel-3 rings evenly spaced upper, 1 lower right corner	1	0
	Rear panel-3 rings upper, 1 ring middle lower	0	150
	Rear panel- 2 rings in each upper corner	3	774
	Rear panel- 2 rings upper middle, 2 rings lower corners	1	155
	Rear panel- 4 rings evenly spaced middle	6	396
	Rear panel- 4 rings top middle	1	0
	Rear panel-4 rings evenly spaced bottom	9	780
	Rear panel-1 ring in each upper corner, 2 rings lower middle	1	0
	Rear panel- 4 rings upper right corner in a square	1	0
	Rear panel- 4 rings upper left corner in a square	3	0
	Rear panel- 4 rings upper left corner	1	0

-Continued-

		RANDOM * SAMPLE (N=87 boats)	VESSEL ** INTERVIEW (N=50 boats)
	Rear panel- 2 rings in each lower bottom corner	3	199
	Rear panel- 4 rings bottom left	4	0
	Rear panel-4 rings on left side	6	610
	Rear panel-4 rings left side bottom	1	0
	Rear panel-3 rings upper left, 1 lower	10	200
	Left tunnel- 1 ring in each upper corner	1	5
	Right tunnel- 1 ring in each upper corner		
	Right tunnel-2 rings on right side	2	0
	Left tunnel- 2 rings on left side		
	Left tunnel- 1 ring in each corner	1	0

-Continued-

	RANDOM * SAMPLE (N=87 boats)	VESSEL ** INTERVIEW (N=50 boats)
MESH NO	2	355
RINGS		
TOTAL POTS	109	9987

\* Random sample pots=one pot was randomly sampled, this may represent all the pots on the boat, many pots or just the one pot that was seen.

\*\*Interview= one or more pots were observed and the captain or crew was interviewed to find out the number of pots with the particular observed ring arrangement.

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