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EXAMINATION OF TORI-POLE CONFIGURATION IN MIDDLE-SIZED LONGLINE VESSELS

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Abstract

We examined the performance, practicality and effectiveness of tori-poles to explore the configuration suited to middle-sized Japanese longline vessels in the western North Pacific. Experiments on 2 types of poles, 3 types of bird lines and 3 classified lengths were conducted by a commercial longline vessel. Among 3 types of line, 2 heavy line types are characteristically strong type by wind whereas they appear to turn down aerial coverage of bird line. The behavior rates of catching the bait under long bird line were lower than that under short line. Although line length of tori-pole depends heavily on the situation in size of vessel and oceanic condition, use of bird line for as long as possible in consideration of safety and handling might be best practice to exert maximum effectiveness. To conclude from our preliminary examination of tori-poles, the appropriate tori-pole configuration for middle-sized longline vessels were the following specifications: approximately 100m of bird line length (approximately three times the total length of vessel), untwisted and lightweight bird line material, lightweight streamer such as polypropylene band.

Introduction

Japan developed the National Plan of Action to reduce incidental take of seabirds in longline fisheries (NPOA-seabirds) to mitigate seabird interactions for sustainable coexistence of fishery and seabirds. In the North Pacific north of latitude 20 degrees north, the Japan's NPOA-seabirds requests fishermen to implement at least one measure from the following: tori-poles (bird-scaring lines); night setting; line weighting; bait casting machines; and fully-thawed baits. Among these mitigation measures, tori-poles were invented voluntarily by longline fishers and are known as one of the cost-effective mitigation measures for reducing incidental catch of seabirds (Brothers 1991). Japanese fishers have modified and improved tori-poles voluntarily and have developed various kinds of poles and bird lines according to vessel size, gear configuration, and weather condition. Shiode et al. (2001) and Yokota et al. (2007) analyzed data from Japanese scientific observes in the high-sea southern bulefin tuna fishery, and showed that bird line length, horizontal alignment of bird line, and pole height were important parameters for optimizing the effectiveness of tori-poles in reducing incidental catch of seabirds. In the Third Regular Session of WCPFC, tori-pole specification for large-sized longline vessels (>= 24 m in total length) was discussed. The provisional specification of tori-poles of WCPFC is not necessarily compatible with

Japanese longline vessels, because optimum configuration of tori-pole may vary with vessel size and weather condition from the practical perspective. In this paper, we introduce the results of a preliminary experiment in which we deployed tori-poles with various configurations on a middle-sized commercial longline vessel and examined the performance, practicality and effectiveness of tori-poles to explore the configuration of tori-poles suited to middle-sized vessels.

Materials and Methods

A commercial longline vessel, Kaisei-maru (total length 30.22m, 149 GT) was used in the experiments conducted in the western North Pacific from 4 May to 3 June 2007. Different types of poles, bird lines, and streamers listed below were used in the experiment:

i) Pole

Bamboo pole (total length approximately 8m)

Glass fiber pole (total length 7.8m)

ii) Bird line and streamer material (see appendix 1 for more information)

Type A (WCPFC type):	Nylon code line, nylon code and urethane tube streamers, two-forked
Type B:	Nylon multi-mono filament line, polypropylene (PP) band streamer
Type C (heavy type):	Polyester multi-filament line, polypropylene (PP) band streamer

iii) Bird line length

50m, 100m, and 150m

Line material of Type B is lighter than those of Type A and Type C: the heavy line of Type C was designed to minimize deflection by wind compared with that of Type B. Two-forked streamers of Type A are longer and heavier than polypropylene band streamers of Type B and C.

Different combinations of poles, bird lines and streamers, and line lengths were tested during line setting of 20 fishing operations. Each combination of tori-pole was tested once or more depending on the oceanic conditions. The following information was recorded during the tori-pole experiments:

1) Status of tori-pole

2-1) Deflection of the pole by tension)

2-2) Aerial coverage of line, Deflection of line by wind)

2-3) Movement of streamer, Deflection by wind

2) Handling

We also recorded feeding behavior of albatrosses as an indicator of seabird avoidance effect:

3) Status of seabirds

3-1) Maximum number of albatross observed (approximately 200m in range around stern during line setting)

3-2) Number of landing on the water and catching the bait (Frequency of albatross behavior per one bird and one minute)

Results and Discussion

Summary of performance, practicality and effectiveness of poles and bird lines is shown Table 1. In the bird line materials, line of Type A and C are characteristically strong type by wind whereas their heavy lines, especially Type C, appear to turn down aerial coverage of bird line. Type B has wide aerial coverage due to lightweight bird line. Untwisted line of Type A is easy to care for handling on its set and retrieval. In the streamer materials, light streamer such as polypropylene band seems to make more threat against seabirds compared with nylon code and urethane tube streamer. There was no difference in performance, practicality and effectiveness between both pole materials, glass fiber and bamboo. The behavior rates of catching the bait by albatrosses under bird line Type A and B with 100m of line length are lower than that under both line type with 50m (Table 1). Yokota et al. (2007) showed that the effectiveness of tori-pole in reducing incidental catch of albatross increased with longer bird line. These results suggest that the longer bird line might have the higher effects for avoiding incidental catch of seabirds. In the practicality of bird line, movement of long bird line might be stabilized by tension of long part of line in water. However, the longer bird line should have the higher probability of entanglement with fishing gear and difficulty in handling. Although line length of tori-pole depends heavily on the situation in size of vessel and oceanic condition, use of bird line for as long as possible in consideration of safety and handling might be best practice to exert maximum effectiveness.

The Japanese fishermen have developed and used tori-poles with effectiveness in reducing incidental catch of seabirds in large and middle-sized longline vessels. To conclude from our preliminary examination of tori-poles, the appropriate tori-poles for middle-sized vessels are the following specifications from viewpoint of performance, practicality and effectiveness of tori-poles: approximately 100m of bird line length (approximately three times the total length of vessel), untwisted and lightweight bird line material, lightweight streamer such as polypropylene band, anything material of pole (e.g. glass fiber, bamboo).

Mitigation measures should be effective for reducing incidental mortality of seabirds and be acceptable to a variety of longline vessels. In developing and modifying tori-poles, both scientific data from experimental survey and empirical information form fishers are indispensable. We are continuing to develop and test tori-poles on better configurations for the reduction of seabird interactions with longline fisheries.

References

Brothers, N. 1991. Albatross mortality and associated bait loss in the Japanese longline fishery in the Southern Ocean. Biological Conservation 55: 255-268.

Shiode, D., Kiyota, M., Takeuchi, Y. 2001. Evaluation of efficiency of Tori-pole on incidental takes of albatross from observer data of Japanese southern bluefin tuna longline fishery. CCSBT-ERS/0111/60. 8pp.

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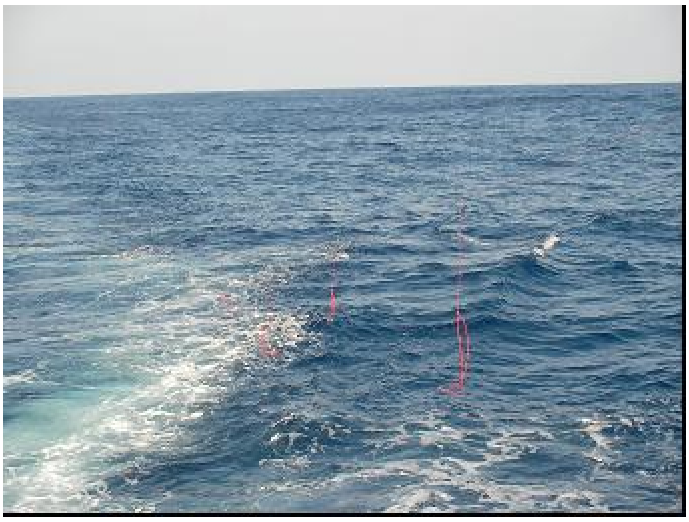
Table 1. Performance, practicality and effectiveness of tori-poles related to line and pole types and length of line.

Line type	Length of line (m)	Pole type	Status of pole	Status of line		Status of streamer		Maximum number of observed albatrosses during line setting	Albatross behavior rate*		Assessment
			Deflection by tension	Aerial coverage/ line length	Deflection by wind	Movement	Deflection by wind		Landing on the water	Catching bait	
Type A	50	Glass fiber	small	middle	no	small	no	2	0.122	0.033	Easy handling (retrieval) Arial coverage is slightly narrow compared to type B and C. Seabirds cannot approach around stern.
		Bamboo	small	middle	no	small	no	16	0.343	0.131	
	100	Glass fiber	no	narrow	no	small	no	1	0.000	0.000	
		Glass fiber	no	middle	no	small	no	32	0.130	0.031	
		Glass fiber	no	middle	no	small	no	22	0.374	0.062	
		Glass fiber	no	middle	small	small	no	20	0.370	0.050	
		Glass fiber	no	middle	no	small	no	0			
		Glass fiber	no	middle	small	small	small				
		Bamboo	no	middle	no	small	no	9	0.311	0.025	
	150	Glass fiber	no	narrow	no	small	no	0			
Type B	50	Glass fiber	no	wide	small	small	small	1	0.333	0.117	Difficutlty in handling (retrieval of twisted line) This line is effective in reducing seabird interactions. Weak by wind Wide arial coverage
		Glass fiber	no	wide	small	small	small	2			
		Glass fiber	no	wide	small	small	small	4			
		Bamboo	small	wide	large	large	large				
	100	Glass fiber	no	middle	no	small	small	3	0.050	0.033	
		Bamboo	no	middle	large	large	large	30	0.220	0.013	
	150	Glass fiber	small	middle	no	small	small	0			
Type C	50	Glass fiber	no	middle	no	small	no	4	0.171	0.008	Difficutlty in handling (retrieval of twisted and weighted line) This line seems to be effective in reducing seabird interactions.
		Bamboo	large	wide	no	small	small	13	0.203	0.033	
	100	Glass fiber	large	middle	no	small	no	0			

*: Frequency of albatross behavior per one bird and one minute

Attachment1: Tori-pole configuration

Type A:
Line material: Nylon code (3.0mm in diameter; 6.7g/m)
Streamer material: Nylon code and urethane tube, and Nylon code (two-forked streamer; 50cm in length per one streamer)
Streamer position: Seven streamers fixed at intervals of five meters



Type B:
Line material: Nylon multi- mono filament (#30×8: #30 is 0.903mm in diameter, 10.5g/m)
Streamer material: Polypropylene (PP) band (two-forked streamer; 1m in length and 15mm in wide per one streamer)
Streamer position: Intervals of 100cm until 50m of line

Type C:
Line material: Polyester multi-filament (6.6mm in diameter, 26.3g/m)

Streamer material: Polypropylene (PP) band (same streamer as Type B)
Streamer position: Intervals of 100cm until 50m of line