

## **Influence of Blue-Dyed Bait on Catch Rates of Seabirds and Tuna Species in the Experimental Operations of the Japanese Southern Bluefin Tuna Longline.**

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### 日本のミナミマグロ調査操業において青色餌が 海鳥偶発捕獲と魚類釣獲率に及ぼす影響

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#### **Abstract**

The effect of blue-dyed bait and Tori-pole streamer for the reduction of incidental catch of seabirds by the Japanese Southern Bluefin Tuna longline fishery was examined off South Africa in 2003. The influence of the blue-dyed bait on the catch rates of three tuna species, southern bluefin tuna, bigeye tuna and albacore, was also examined. High efficacy of blue-dyed bait in avoiding seabirds was reaffirmed. On average, blue-dyed bait reduced the catch rates of seabirds down to 25% of the control. The effect of blue-dyed bait was further reinforced if it was coupled with Tori-pole streamer. In addition, catch rates of tuna species with the blue-dyed bait were not significantly changed as compared to those of non-dyed bait

#### **要旨**

ミナミマグロ延縄漁業における海鳥類の偶発的な捕獲を削減するために、2003年に漁具の餌を青色に染色させた青色餌とトリポールを用いて海鳥類の偶発的捕獲の回避効果を検討した。また、青色餌の使用がミナミマグロ、メバチ、ピンナガのまぐろ類3種の釣獲率に影響を与えるかどうかの試験も行った。その結果、青色餌は海鳥の偶発捕獲削減に大きな効果を持つことが再確認された。青色餌は海鳥類の偶発的捕獲を平均で75%削減することが明らかとなった。また、青色餌とトリポールを組み合わせることで、海鳥類の偶発的捕獲をほとんどなくすことができた。さらに、まぐろ類については、青色餌を使用してもまぐろ類の釣獲率に悪影響を及ぼさないことが明らかとなった。

## **Introduction**

Incidental catch of seabirds in tuna longline fishery occurs mostly during line setting. It is possible to achieve a significant reduction of incidental catch of seabirds by adopting appropriate mitigation measures during line setting. An experiment using blue-dyed bait was conducted in the Hawaiian swordfish fishery showing the effectiveness for the reduction of incidental catch of seabirds (Baird 2001, Boggs 2001). Results of the Japanese longline survey in the Southern Ocean off South Africa in 2001 and 2002 revealed that the blue-dyed bait was highly effective in reducing the incidental catch of seabirds and that it did not affect the catch rates of tuna compared to non-dyed bait, with a few exceptions in terms of the catch rates of southern bluefin tuna (Minami and Kiyota 2004). In this paper, we examined again the impact of blue-dyed bait and Tori-pole streamers on the reduction of incidental catch of seabirds as well as the side effect of blue-dyed bait on catch rates of target fish species in an experimental fishing operations conducted off South Africa in 2003.

## **Materials and Methods**

The survey was conducted by a chartered commercial fishing vessel, the Fukuryu-maru No.21 from 20 October 2003 to 7 January 2004 off Cape Town in the Southern Ocean. The number of experimental operations was 51. A total of 2,000 hooks were used in one operation, of which 900 hooks were used for the comparison of blue-dyed and non-dyed baits. The experimental section of 900 hooks were divided into three subsections (300 hooks each); non-dyed baits were used in the first and last subsections, and blue-dyed baits were used in the middle subsection. Squid, sardine and mackerel scad were used as bait during the survey.

## **Results and Discussion**

### 1) Effect of mitigation measures on reduction of incidental catch of seabirds

Two, zero, and thirty-four sea birds were caught incidentally in the experimental subsections with blue-dyed bait, with blue-dyed bait and Tori-pole, and without both mitigation measures, respectively. On average, the blue-dyed bait reduced the catch rate of seabirds down to 25% of the control. The seabird avoidance effect of blue-dyed bait was enhanced when it was coupled with a Tori-pole streamer (Fig. 1).

The result shows that the use of the blue-dyed bait was very effective in reducing incidental catch of seabirds, and that the catch rate was reduced down to almost zero when blue-dyed bait was coupled with Tori-pole.

## 2) The catch rates of target fish species by blue-dyed bait

The catch rates of three tuna species, southern bluefin tuna, bigeye tuna and albacore, with the blue-dyed bait were not significantly different from those with non-dyed bait (Fig. 2). Minami and Kiyota (2001) reported that the catch rates of tunas and tuna like species for blue-dyed and non-dyed baits were not significantly different in the western Pacific and the eastern tropical Pacific. It was suggested that the use of the blue-dyed bait has little effect on the catch rates of target species.

## Conclusion

The high efficacy of blue-dyed bait in reducing the incidental catch of seabirds was reaffirmed. Blue-dyed bait had little effect on the catch rates of target fish. Another advantage of blue-dyed bait is that it doesn't require modification of fishing operations and that it makes little trouble with fishing gear. Time and labor of bait dying and/or its economic cost seems the only problem of the blue-dyed bait. In order to introduce this method to commercial fishery, it will be necessary to improve the practicality and economic efficiency of the preparation of blue-dyed bait.

### 【はじめに】

まぐろ延縄漁業における海鳥類の偶発的な捕獲は、魚類の混獲とは異なり、海鳥類が投縄直後の餌を海面付近で摂餌するために発生する。そのため、投縄時に海鳥類の摂餌行動に適した回避法を行えば、彼らの偶発捕獲を減らすことが可能となる。ハワイのメカジキ延縄漁業において青色に染色した餌を用いたところ、海鳥類の偶発的な捕獲が減少したことが報告されている(Baird 2001, Boggs 2001)。日本では、2001年、2002年にミナミマグロ漁場である南アフリカ沖において延縄試験操業を実施し、青色餌が海鳥類の偶発捕獲に効果があることと、2002年のミナミマグロの釣獲率が減少したことを除いて青色餌は漁獲対象種に影響を及ぼさないことが明らかとなっている(Minami and Kiyota 2004)。本報告では、2003年に南アフリカ沖において青色餌およびトリポールによる海鳥類の偶発捕獲の回避効果について更なる検討を行った。また、青色餌の使用が漁獲対象魚種の釣獲率に影響

響を与えるかどうかの試験も行った。

### 【材料と方法】

2003年10月20日～2004年1月7日に第21福龍丸を用船し、南アフリカ沖においてミナミマグロ延縄操業調査を実施した。操業回数は51回である。調査方法については、1操業当たり2,000鈎数を使用し、そのうち投縄後半部分の900鈎数を実験区として用いて青色餌と非着色餌を比較した。実験区を300鈎ごとのサブセクションに分け、最初と最後のサブセクションでは無着色の通常餌を用い、中間のサブセクションに青色餌を用いた。この配置により、まぐろ類の釣獲率に対する浸積時間が打ち消されるようになっている。使用した餌は、イカ、イワシおよびムロアジであり、通常餌と青色餌では同じ餌種および配置で調査を行った。

### 【結果と考察】

#### 1) 海鳥類の偶発的捕獲の回避効果

青色餌を用いた操業では2羽、青色餌とトリポールを組み合わせると0羽、混獲回避措置を用いなければ34羽の海鳥が捕獲された。青色餌を用いた場合の海鳥類の偶発捕獲率は、何も回避処置をしない場合に比べて75%の削減効果があった(図1)。さらに、青色餌とトリポールを組み合わせた場合では、海鳥類の偶発的捕獲率が0であった(図1)。青色餌の海鳥回避効果が高く、トリポールと組み合わせると海鳥類の偶発捕獲をほとんどゼロに削減できることが明らかになった。

#### 2) 漁獲対象魚種の釣獲率

青色餌を用いたまぐろ類の釣獲率に関しては、通常の餌と比べ差は認められなかった(図2)。また、北西部太平洋や東部太平洋熱帯域における青色餌を使用した延縄調査においても、まぐろ類の釣獲率に悪影響はなかった(Minami and Kiyota 2001)。青色餌の使用は漁獲対象魚種の釣獲率を落さないことが明らかとなった。

### 【まとめ】

餌を青くする方法は、海鳥類の偶発的な捕獲の回避に高い効果を持つことが確認された。また、魚の釣獲率に悪影響を及ぼさないことも明らかになった。青色餌は操業パターンを変更する必要がなく、漁具とのトラブルもないことが利点である。しかし、餌を染色するための作業と時間、もしくは経済的なコストがかかることが欠点である。青色餌を普及さ

せるためには，こうした点を改善し実用性を高める必要がある。

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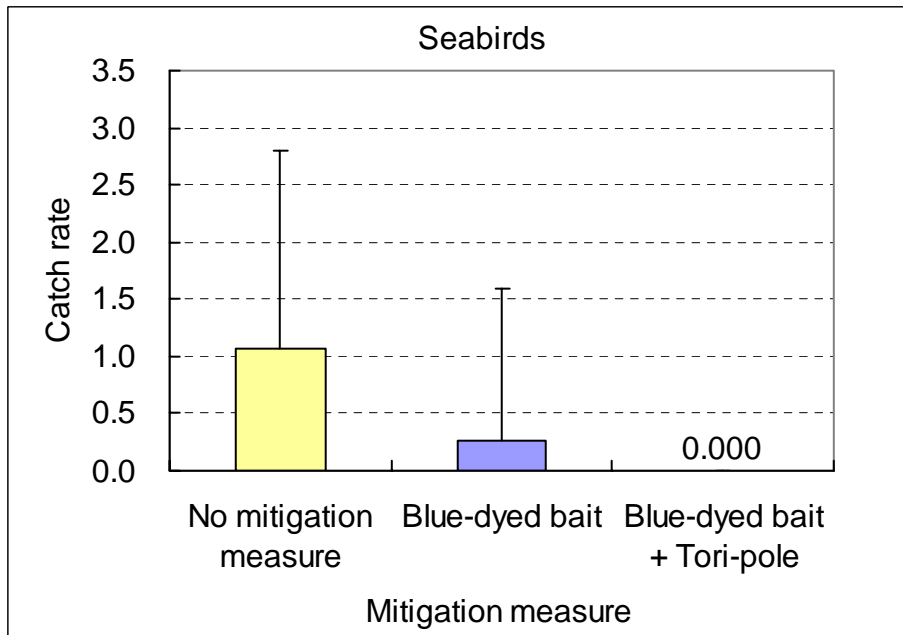


Fig. 1. Catch rates (number of catch/1,000 hooks) of seabirds using no mitigation measure, blue-dyed bait, or blue-dyed bait and Tori-pole in experimental longline operations off South Africa in 2003.

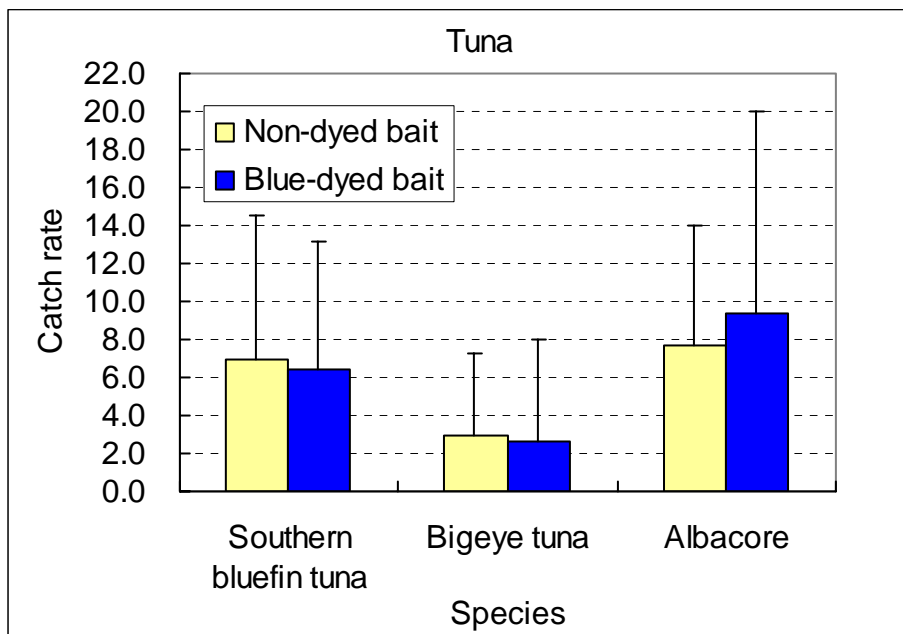


Fig. 2. Comparison of catch rates (number of catch/1,000 hooks) of tuna between blue-dyed bait and non-dyed bait in experimental longline operations off South Africa in 2003.