Bycatch Mitigation FACT-SHEET 10 (Updated September 2014)

Practical information on seabird bycatch mitigation measures

Pelagic Longline: Blue-dyed bait (squid)

Blue-dyed bait is a measure under development and, while there are some promising results, there is some uncertainty about its long-term effectiveness at reducing seabird bycatch and the practicality of widespread application. Current evidence suggests that blue-dyed squid is effective but dyed fish bait is not.

Why dye bait blue?

In the 1970s, fishermen experimented with dyed bait as a means of improving their target fish catch. More recently, experiments have been directed towards using blue-dyed bait to reduce seabird bycatch in pelagic longline fisheries.

In theory, dyeing bait blue reduces the contrast between the bait and the surrounding seawater making it more difficult for foraging seabirds to detect. Alternative theories suggest that seabirds are simply less interested in blue-dyed bait compared with undyed controls.

Effectiveness at reducing seabird bycatch

The effectiveness of blue-dyed bait at reducing seabird bycatch has varied considerably between different trials. Some trials have shown reductions in contacts between albatrosses and bait of over 90%, outperforming other mitigation measures (Boggs, 2001; Kiyota *et al*., 2007) while others indicate that blue-dyed bait used alone was less effective than other mitigation measures under investigation, including side-setting and setting chutes (Gilman *et al*., 2003).

Cocking *et al*. (2008) highlight the importance of bait type, blue-dyed fish was far less effective than squid at reducing seabird attack. Blue-dyed squid shows promise as an effective mitigation measure whereas blue-dyed fish appears less promising.

Several factors have been identified that could influence the effectiveness of blue-dyed bait;

- Fishermen perceive that several environmental factors (weather, light, sea colour) and operational factors (how bait is deployed) influence the behaviour of seabirds towards dyed bait.
- Competition and seasonal food requirements of foraging birds are likely to influence their response to blue-dyed bait.
- In the long-term, birds may become habituated to blue-dyed bait.

Generally, there appears to be potential to reduce seabird mortality but long-term trials are needed to understand the complex relationships between seabird behaviour, bait colour, environment and operational factors.

Recommendations for deployment

The dyeing process requires bait to be fully thawed before they can take up sufficient dye. Food colouring, such as Virginia Dare FD C Blue No. 1 or E133, is commonly used. In Brazil, a company that specialises in food colouring, Mix Industria, has developed a dye to specifically to colour fishing bait. Depending on the concentration of the dye and the desired colour, bait is soaked from 20 minutes to four hours. Comparison with a colour card determines when the desired colour has been achieved. Bait is often refrozen after dyeing and used in a semi-frozen state to improve bait retention on hooks.

Figure 1. From the air, blue-dyed squid merge with the surrounding water.

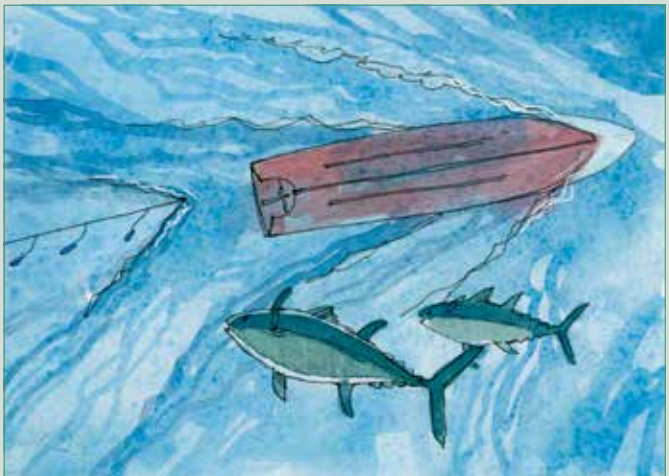

Figure 2. From below, dyed bait remains visible to target fish species.

Bait type

The type of bait used, squid or fish, can affect the up-take of dye and the birds' response. Squid take on the colouring far more effectively than fish. Fish easily lose dyed scales and there is considerable contrast between the dorsal and ventral surfaces of fish. Additionally, once thawed fish are more easily lost from hooks.

Other benefits

Target catch rates

The first experiments with dyed bait were designed to improve the catch of target fish species. It is unclear whether this is due to the reduction in bait loss to foraging seabirds or due to bait being more attractive to fish in the water column. Further trials are needed in order to quantify these subtle differences in catch.

Potential problems and solutions

Operational limitations

Several factors can make this measure inconvenient for fishermen.

- Bait needs to be fully thawed before it will take up sufficient dye. Thawed bait, particularly fish, is less likely to remain on the hook and thawing requires considerable preparation time.
- Dyeing bait at-sea can be a messy business: hands, clothes and the boat become coated in blue dye.
- In Hawaii, it is estimated that it costs US$14 to dye each longline set, which equates to about US$ 8 per 1,000 hooks.
- Additionally, the use of dyed of bait at-sea is very difficult to enforce.

Many of these issues would be resolved if pre-dyed bait were commercially available. Until such time, blue-dyed bait is unlikely to be widely used by fishermen.

Combinations of measures

At present, the practical issues of dyeing bait at-sea and the inconsistent results of experimental trials suggest that blue-dyed bait is not an appropriate primary mitigation measure. Blue-dyed bait has greater potential when limited to squid bait and used in combination with other mitigation measures including:

- ***Streamer lines*** (Fact-sheets 7a and 7b)
- ***Side-setting*** (Fact-sheet 9)
- ***Night-setting*** (Fact-sheet 5).

Further research

More trials are needed to evaluate the effects of blue-dyed squid on seabird bycatch and target fish catch. Fishermen are encouraged to voluntarily use dyed squid bait if they consider this will improve their catch.

Long-term studies are underway in Brazil preliminary results are promising and suggest reduced seabird bycatch with no effect on fish catch. Similar trials are required elsewhere to determine the effectiveness of blue-dyed squid in preventing bycatch in other seabird assemblages.

Compliance and implementation

The current practice of dyeing bait on board vessels at sea requires observer presence or video surveillance to monitor implementation. Assessment of implementation in the absence of on-board observers or video surveillance requires baits be dyed on land and monitored through port inspection of all bait on vessels prior to departure on fishing trips.

References

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CONTACTS

Rory Crawford , Senior Policy Officer, BirdLife International Marine Programme, The Royal Society for the Protection of Birds, The Lodge, Sandy, Bedfordshire, SG19 2DL, UK. Email: rory.crawford@rspb.org.uk BirdLife UK Reg. Charity No. 1042125

ACAP Secretariat, Agreement on the Conservation of Albatrosses and Petrels, 27 Salamanca Square, Battery Point, Hobart, TAS 7004, Australia. Email: secretariat@acap.aq