Agreement on the Conservation of Albatrosses and Petrels

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ACAP Guidelines to measure the sink rates of baited hooks in pelagic longline fisheries using Time-Depth Recorders

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SUMMARY

ACAP's Seabird Bycatch Working Group (SBWG) regularly reviews and updates ACAP's Best Practice Advice for seabird mitigation for industrial fishing gear types including pelagic longlines. ACAP recommends the simultaneous use of three best-practice measures—branch line weighting, night setting, and bird scaring lines—as the most effective approach to reduce seabird bycatch. Alternatively, an assessed hook-shielding device or an underwater bait-setting device can be used as a standalone mitigation option. SBWG12 reviewed the minimum standards for branch line weighting and defined a sink-rate criterion for best-practice branch line weighting. To implement this sink-rate criterion it is necessary to establish ACAP Guidelines to measure the sink rates of baited hooks in pelagic longline fisheries. This document provides a step-by-step protocol for conducting these measurements using time-depth recorders, ensuring that data collected are accurate and comparable.

RECOMMENDATIONS

That SBWG:

1. Review the proposed ACAP Guidelines to measure the sink rates of baited hooks in pelagic longline fisheries using Time-Depth Recorders.
2. Recommend that the Advisory Committee endorse the Guidelines.
3. Recommend that the Advisory Committee encourages advocacy of the Guidelines to strengthen seabird mitigation measures in relevant Regional Fisheries Management Organisations.

Directrices del ACAP para medir las tasas de hundimiento de los anzuelos cebados en las pesquerías de palangre pelágico utilizando registradores de tiempo y profundidad

RESUMEN

El Grupo de Trabajo sobre Captura Secundaria de Aves Marinas (GdTCS) del ACAP revisa y actualiza periódicamente las recomendaciones de mejores prácticas del ACAP para la mitigación de aves marinas para tipos de artes de pesca industrial, incluidos los palangres pelágicos. El ACAP recomienda el uso simultáneo de tres medidas de mejores prácticas (el lastrado de brazoladas, el calado nocturno y las líneas espantapájaros) como el enfoque más efectivo para reducir la captura secundaria de aves marinas. También se puede utilizar un dispositivo de protección de anzuelos evaluado o un dispositivo de calado de cebos subacuático como opción de mitigación independiente. La GdTCS12 revisó los estándares mínimos para el lastrado de brazoladas y definió un criterio de tasa de hundimiento para el lastrado de brazoladas de mejores prácticas. Para implementar este criterio de tasa de hundimiento, es necesario establecer las directrices del ACAP para medir las tasas de hundimiento de los anzuelos cebados en las pesquerías de palangre pelágico. Este documento proporciona un protocolo paso a paso para realizar estas mediciones utilizando registradores de tiempo y profundidad, lo que garantiza la precisión y la comparabilidad de los datos recopilados.

RECOMENDACIONES

Que el GdTCS:

1. Revise las directrices del ACAP propuestas para medir las tasas de hundimiento de los anzuelos cebados en las pesquerías de palangre pelágico utilizando registradores de tiempo y profundidad.
2. Recomiende que el Comité Asesor apruebe las directrices.
3. Recomiende que el Comité Asesor fomente la defensa de las Directrices para fortalecer las medidas de mitigación de aves marinas en las Organizaciones Regionales de Ordenación Pesquera pertinentes.

Directives de l'ACAP pour mesurer les taux d'immersion des hameçons appâtés dans les pêcheries à la palangre pélagique à l'aide d'enregistreurs temps–profondeur

RÉSUMÉ

Le Groupe de travail sur les captures accessoires d'oiseaux marins (SBWG) de l'ACAP examine régulièrement et met à jour les conseils de meilleures pratiques de l'ACAP pour l'atténuation des captures accessoires d'oiseaux marins pour les types d'engins de pêche industrielle, y compris les palangres pélagiques. L'ACAP recommande l'utilisation simultanée de trois mesures de meilleures pratiques — le lestage des avançons, la mise à l'eau nocturne et les lignes d'effarouchement des oiseaux — comme l'approche la plus efficace pour réduire les captures accessoires d'oiseaux marins. À titre d'alternative, un dispositif de protection des hameçons évalué ou un dispositif de mise à l'eau sous-marine des appâts peut être utilisé comme option d'atténuation autonome. Le SBWG12 a examiné les normes minimales pour le lestage des avançons et a défini un critère de taux d'immersion pour le lestage des avançons selon les meilleures pratiques. Pour mettre en œuvre ce critère de taux d'immersion, il est nécessaire d'établir des directives de l'ACAP pour mesurer les taux d'immersion des hameçons appâtés dans les pêcheries à la palangre pélagique. Ce document fournit un protocole étape par étape pour effectuer ces mesures à l'aide d'enregistreurs temps–profondeur, garantissant que les données collectées sont précises et comparables.

RECOMMANDATIONS

Que le SBWG :

1. Examine les directives de l'ACAP proposées pour mesurer les taux d'immersion des hameçons appâtés dans les pêcheries à la palangre pélagique à l'aide d'enregistreurs temps–profondeur.
2. Recommande que le Comité consultatif approuve les directives.
3. Recommande que le Comité consultatif encourage la promotion des directives pour renforcer les mesures d'atténuation des captures accessoires d'oiseaux marins dans les organisations régionales de gestion des pêches concernées.

1. ACAP GUIDELINES TO MEASURE THE SINK RATES OF BAITED HOOKS IN PELAGIC LONGLINE FISHERIES USING TIME-DEPTH RECORDERS

1.1. Introduction

The incidental capture of seabirds in pelagic longline fisheries is a global concern, particularly for threatened albatrosses and petrels. Addressing this issue was a central motivation for establishing the Agreement on the Conservation of Albatrosses and Petrels (ACAP), which aims to secure a favourable conservation status for these species.

ACAP's Seabird Bycatch Working Group (SBWG) regularly reviews and updates ACAP's best practice mitigation advice for industrial fishing gear types, including pelagic and demersal longline and trawl gears. ACAP's review process considers safety, practicality, and fishery-specific characteristics when evaluating mitigation measures and developing best-practice guidance. For pelagic longline fisheries, ACAP recommends the simultaneous use of three best-practice measures—branch line weighting, night setting, and bird scaring lines—as the most effective approach to reduce seabird bycatch. Alternatively, an assessed hook-shielding device or an underwater bait-setting device can be used as a standalone mitigation option (ACAP 2024).

1.2. Branch line weighting

Branch lines should be weighted to sink the baited hooks rapidly out of the diving range of feeding seabirds. Studies show that placing more weight closer to the hooks makes them sink faster and consistently, and reduces seabird attacks on baits, as well as seabird mortalities (ACAP 2024).

SBWG12 reviewed the minimum standards for branch line weighting, defined a sink rate criterion for best practice branch line weighting, and provided further clarification on the use of weight attached to or integrated into the hook, as well as on weighting materials.

Best practice branch line weighting should achieve an average sink rate of 0.5 m/s to 5 m depth. The following configurations have been demonstrated, under controlled conditions and with metal materials, to meet this standard:

a) 40 g or greater attached within 0.5 m of the hook; or
b) 60 g or greater attached within 1 m of the hook; or
c) 80 g or greater attached within 2 m of the hook.

When weight is attached to the branch line, or integrated into the hook, a minimum added weight of 50 g is sufficient to achieve a sink rate of 0.5 m/s to 5 m depth. Branch line weighting is integral to the fishing gear and, compared to bird-scaring lines and night setting, has the advantage of being more consistently implemented, thereby facilitating compliance and port monitoring. It is recommended to avoid using lead when it may be ingested (e.g. attached to or integrated into the hook). Using lighting devices or other fishing accessories as weights is not recommended unless they meet the sink rate criterion.

With the inclusion of a defined sink-rate criterion for best-practice branch line weighting, it became necessary to establish guidelines on how to measure the sink rates of baited hooks. This document provides a step-by-step protocol for conducting these measurements using time-depth recorders (TDRs), ensuring that data collected are accurate and comparable.

1.3. Scope and intended users

The protocol is intended for use by scientific observers and researchers in a variety of contexts, including on research vessels or commercial fishing vessels operating under normal fishing conditions or under charter for research purposes.

1.4. Time-depth recorders

The TDRs must be small, lightweight (ideally less than 3 grams in seawater), robust, easy to set up and download at sea and not appreciably affect sink rates. Various manufacturers produce TDRs that meet these criteria, including, but not limited to the following manufacturers:

- Cefas Technology (https://cefastechnology.co.uk/products/data-storage-tags/g5)
- Star-Oddi (https://www.star-oddi.com/products/archival-tags)
- Lotek https://www.lotek.com/products/lat1000-series/

Due to a range of factors, the sink rates of pelagic longlines can vary significantly. Studies should aim to complete at least 10 replicates of *each weighting regime* in a sampling session. This can be achieved by deploying 10 TDR branch lines in *a single set* of the longline. The exercise can be repeated over multiple sets (days) if larger sample sizes are required or if between-set variation – due to changing sea states or other factors – is an important part of the research plan.

The precise estimation of baited hook sink rates relies on strict adherence to the following procedures and practices.

1.5. Determining depth offsets at the sea surface

All TDRs exhibit errors in depth readings at the sea surface, known as ‘zero offsets' by TDR manufacturers. These offsets usually fall within the range +0.5 m to -0.5 m. Clearly, zero must be zero, meaning that the depth at the sea surface must always read 0 m.

To measure sink rates accurately, particularly at the surface (e.g. 0-2 metres) where baits are most visible and where small errors can lead to erroneous interpretations, the zero offsets need to be determined for each TDR, and the TDR data corrected during the data analysis to account for the offset. To determine the offsets, simply turn the TDRs on (as described below) and maintain them at the sea surface for about 20 seconds, which equates to 20 records at a one-second sampling rate. This procedure should be performed in calm seawater before leaving port, ensuring that the water temperature is stable. As zero offset refers to a depth of 0 m, the TDRs must be held at the sea surface during this procedure. Document the calculated zero offsets for each TDR for later reference.

1.6. Setting up procedure (at sea)

Equip yourself with a digital wristwatch that displays the time at one-second intervals. Synchronise the time on your wristwatch with the time on your computer. This synchronised time will be programmed into the TDRs when they are connected to the computer, ensuring that your watch, computer, and TDRs all operate on the exact same time. This synchronisation allows water entry times to be accurately recorded.

Program the devices to record depth at 0.5 m increments and time at one-second intervals. Program them to turn on at a convenient time *before* the scheduled deployment time. You can choose to have them switch off *after* reaching estimated fishing depth, or let them run for all,

or part of, the soak period. The latter option, however, comes at the expense of lifetime battery longevity.

1.7. Attaching the TDRs

The TDRs can be attached to the branch lines using multiple cable ties or an equivalent method. If cable ties are used, tighten them with a tensioning device like that shown in the **ANNEX**. To ensure that the TDRs sink at the same rate as the baited hooks, and to reduce the likelihood of shark bite-offs, TDRs should be attached within 30 cm from the hooks. Finally, wrap the TDRs in waterproof tape (such as electrical tape) and label each one (using a waterproof felt-tipped pen) with a unique number that corresponds to your deployment schedule.

As a practical aid during hauling, consider marking the snap of each TDR branch line with coloured tape and the corresponding TDR number, to help the crew identify and separate these lines promptly and avoid accidental impacts that may damage the device.

1.8. Deploying the TDR branch lines

Instruct the crew to deploy the TDR branch lines in accordance with their normal practice concerning the bait landing distance behind the vessel and its position relative to the vessel's wake. This means either over the centre line of the propeller, in the vessel's wake on either side, or outboard of the wake zone on either side. *Consistency in the branch line deployment method is essential.*

Use your digital wristwatch to record the exact time to the nearest second *when baited hooks land in the water.* This record is crucial, as it serves as the starting point for calculating sink times and rates to target depths. Inferring water entry times from the time-depth files when downloaded is not as precise as time-synchronised visual observations made during the set.

1.9. Downloading the files

When the longline is hauled, retrieve the TDRs, rinse them in fresh water, and download the CSV files from each TDR into separate spreadsheets. The downloaded data will be presented in columns for date, sampling time and depth in the water column, as shown in **Table 1** below. Locate the water entry time and highlight it in the data. Retain about 15 rows of TDR records before the water entry time so others can assess the extent of the TDR offsets *prior* to the time of water entry. Delete all data rows before these 15 rows. Add a new column (“number of seconds” or simply “seconds”) beside the depth column, with the first entry (0 sec) corresponding to the time of water entry and fill down as shown in the table.

Copy the raw values collected by the TDRs, which are listed in the “Depth” column of **Table 1**. Paste them into a separate column titled “Corrected depth”. Using the scores in the “Corrected depth” column, write a formula in Excel to adjust the raw scores based on the offset from your still water determinations for each TDR mentioned above.

Importantly, the depth offsets derived in still water should be the same or very close to the offsets shown in the downloaded data before water entry (0.5 m, as shown in **Table 1**). *If discrepancies occur, prioritise the offsets obtained from your still water tests. Apply the formula to correct the raw depth scores collected by the TDRs.*

Add your name, the date, the vessel name, the TDR number and any other relevant information to the rows of the spreadsheet immediately above the data rows.

1.10. Data presentation

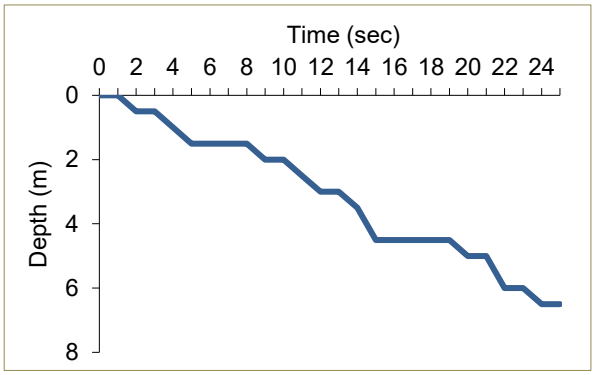
Present the data in **Table 1** below for each individual TDR in your report. Include the time taken to reach both 2 m and 5 m depths, along with the associated sink rates. Also include a graph of the sink profile to a depth of 5 m, as illustrated. Finally, along with the individual records, your report should present the average values (with 95% confidence limits) for the results shown in the table for all TDRs deployed in a sampling session. The report should also include a description of how the zero offset was calculated.

Table 1. Example of how the data and results are to be presented for each TDR, showing the observed water entry time, a column (third from the left) of the elapsed time since water entry, the depth data from the TDR and the corrected depths based on individual TDR zero offsets.

Date	Time (sec)	Number of seconds	Depth (m)	Corrected depth (m)
19/03/2015	10:37:36		0.5	
19/03/2015	10:37:37		0.5	
19/03/2015	10:37:38		0.5	
19/03/2015	10:37:39		0.5	
19/03/2015	10:37:40		0.5	
19/03/2015	10:37:41		1	
19/03/2015	10:37:42		0.5	
19/03/2015	10:37:43	**0**	0.5	**0**
19/03/2015	10:37:44	**1**	0	0
19/03/2015	10:37:45	**2**	1	0.5
19/03/2015	10:37:46	**3**	1	1
19/03/2015	10:37:47	**4**	1.5	1
19/03/2015	10:37:48	**5**	2	1.5
19/03/2015	10:37:49	**6**	2	1.5
19/03/2015	10:37:50	**7**	2	1.5
19/03/2015	10:37:51	**8**	2	1.5
19/03/2015	10:37:52	**9**	2.5	2
19/03/2015	10:37:53	**10**	2.5	2
19/03/2015	10:37:54	**11**	3	2.5
19/03/2015	10:37:55	**12**	3.5	3
19/03/2015	10:37:56	**13**	3.5	3
19/03/2015	10:37:57	**14**	4	3.5
19/03/2015	10:37:58	**15**	5	4.5
19/03/2015	10:37:59	**16**	5	4.5
19/03/2015	10:38:00	**17**	5	4.5
19/03/2015	10:38:01	**18**	5	4.5
19/03/2015	10:38:02	**19**	5	4.5
19/03/2015	10:38:03	**20**	5.5	5
19/03/2015	10:38:04	**21**	5.5	5
19/03/2015	10:38:05	**22**	6.5	6
19/03/2015	10:38:06	**23**	6.5	6
19/03/2015	10:38:07	**24**	7	6.5

Water entry time here

RESULTS	
Depth range (m)	**0-2**
Time (sec)	8
Rate (m/sec)	0.25



1.11. Supporting information

To ensure your recordings are interpreted correctly, include the following details for each completed round of TDR deployments.

1. Name and location of fishery.
2. Vessel name and length.
3. Vessel setting speed.
4. Vessel setting direction in relation to the direction of the current.
5. Sea state.
6. Branch line length, construction material (e.g. 1.8 mm monofilament) and length.
7. Hook type, size (e.g. 15/0 circle hook) and weight.
8. Bait (species, size / weight, frozen / defrosted).
9. Use of lightsticks / electric lights / hook-shielding devices, and location in the branch line.
10. Mainline configuration – surface set tight configuration or with slack astern to create a catena between the floats (e.g., with the use of a line shooter).
11. Line weighting regime – weight type (leaded swivel, sliding lead, leaded hook), amount of added weight additional to the mass of the hook, and distance from the hook.
12. Bait landing position astern – over the centre line of the propeller, edge of the wake on either side of the vessel or outboard of the wake zone on either side.

ANNEX 1.

The cable tie gun provided via the link below is shown for illustrative purposes only. Any comparable brand can be used.

https://www.auselectronicsdirect.com.au/professional-cable-tie-gun?gad_source=1&gad_campaignid=20367523594&gbraid=0AAAADVlwLB0ugis-fpdOVc7FI4VfhAq-&gclid=CjwKCAjw7fzDBhA7EiwAOqJkhzSb03anpR4mT-IAuSOjqcUKGfYT8S_6Hv7f03thSPf9WS_T6jxEaxoCye0QAvD_BwE