Safe lead: Safer and innovative alternative to pelagic longline fishery

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The Problem

- Longline fishing is IMPLICATED
- Line sinking rate very IMPORTANT
- hook sink rate == less time for bird to find bait

BUT

- Fishermen dislike adding weight to their gear
Two main reasons for unwillingness to add weight

1. Crew safety
2. Economics of catch
How it works

- Monofilament is stretchy
- ‘Bite-offs’ frequent during hauling
- Traditional leaded swivels → bullets
Weighted swivels or safe leads?

- Safe Lead exploits stretchiness of mono
- Threaded onto mono, not tied/crimped
- Designed to ‘clamp’ onto unstretched mono
- Bite-off: mono recoils, but slips through SL
- Energy dissipates, as mono approaches normal thickness SL grips but does not fly back
Research objectives

To test the operational effectiveness of the safe leads both in terms of their likely improvement to:

1. Crew safety
2. Operational and
3. Economic practicality
Effort

. 14 trips, 93 experimental sets,
. Total hooks deployed = 43,870
. Sample unit = 30 consecutive hooks
. Sample size: TI (N=746) = 22,365 hooks and TII (N=717) = 21,505 hooks
. Total: 1462 sample units.
Crew Safety

Entanglements
SL = 14 (0.65/1000 hooks) < WS = 18 (0.8/1000 hooks)

Fly-backs
SL = (N=24) and WS = (N=15)

Category 3 (Over the side of the vessel)
SL = 0 % and WS = 7 (46.7 %)
No statistical significance: ($X^2 = 2.5, P > 0.05$).

Category 1 (slid off the line into the water)
SL >> WS (Poisson GLM model)
Statistically significant: ($X^2 = 29.6, P < 0.001$).

Category 2 (lower part of the vessel)
SL = 1 (0.04 %) and WS = 11 (73.3 %)
Crew safety

Rate of bite-offs
SL = 24 (61.5%) and WS = 15 (38.5%)
No significant difference: ($X^2 = 2.12, P > 0.05$)
Hook sink rate
Target species:
SL = 459 and WS = 484
$T_{941} = 0.22, P=0.83$

Sharks:
SL = 245 and WS = 266
$T_{509} = 0.37, P=0.72$
Target spp

Mean number of fish per sample unit

Big eye
Longfin
Yellow fin
Swordfish
Sharks

Mean number of fish per sample unit

- Small
- Medium
- Large

<table>
<thead>
<tr>
<th>Size</th>
<th>Mean</th>
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</thead>
<tbody>
<tr>
<td>Small</td>
<td>1.5</td>
</tr>
<tr>
<td>Medium</td>
<td>3.5</td>
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<tr>
<td>Large</td>
<td>4.5</td>
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</tbody>
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Velocity calculations

Mean Impact height (MIH)
SL = 1.59 ± 0.059 m  (N=55)
NB: Less than 2.4 m (=height above water of the line hauler/crew’s upper body)

Mean Velocity
SL = 109.4 ± 5.82 km/h
WS = 267.2 ± 18.5 km/h
60% of velocity reduction for SL compared to WS.
Poisson GLM Model: (P = 0.007)

Mean Kinetic energy (MKE)
SL = 27.7 ± 2.8 J
WS = 168.9 ± 23.6 J
83% of MKE reduction of SL compared to WS
Cost

- SL = USD $1 === traditional 60g Leaded swivel in RSA (=USD $1).
- Possible additional cost
- BUT, frequency of loss depends on position from the hook.
- Added crew safety provided by SL > any additional cost of replacement
Conclusion

• LW is an indispensable tool
• SL: - rapidly sink baited hooks,
  •  - crew safety and
  •  - competitive in price
• Seamless integration
Physical environment of seabirds foraging along the South African coastline

Objective:
To relate foraging areas of seabirds to oceanographic features.
Research Questions

1. Oceanographic features and foraging areas exploited by seabirds?
2. Oceanographic features and foraging patterns?
3. Physical properties define these oceanic features?
Methods

- At sea observation and satellite data
- Pathfinder and MODIS estimate
- MODIS and SEAWIFS
- TRMM SST
- AVISO
- Warm/Cold years
- SAM positive and negative years
Rationale

SA waters provide rich foraging areas
Special Apex-predators
Bird numbers!
Association with rich oceanic regions
Integration of oceanic environmental variability.
Impact of mismatches in food supply
Why this topic?

• Key indicators of healthy marine environment.
• Knowledge of oceanographic properties that dictate foraging patterns
• Fisheries management and seabird conservation
• Legacy
Preliminary Results

- Expected by the end of October 2012
- Submission date: end of 2013