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Special Report

The data for this report was collected from 23 June through 1 July 2006 on a Mooloolaba longline freezer vessel. The new moon was 25 June so little or no visible moon throughout. A total of nine shots on nine consecutive days were set. 17,500 hooks were deployed. Bait included frozen squid and frozen pilchard. A variety of size, type and colour of glow sticks were deployed on 1,415 of the 17,500 hooks set. The enclosed data includes a breakdown of each species of fish landed plus additional information on reject and losses to shark and whales. Target species was Albacore (*Thunnus alalunga*). Other desired catch included BigEye (*Thunnus obesus*) and Yellowfin (*Thunnus albacares*). Other valuable by-catch was recorded as well.

The efficacy of glow sticks when used with squid and frozen pilchard was also tested. Enclosed is a spreadsheet for each shot showing the breakdown of each species caught as well as rejects. The data shows the odds expressed in percentages for catching targeted fish on hooks with and without glow sticks.

Page one shows a summary of all nine shots followed by pie charts detailing the catch. Of the 17,500 hooks set, 1,415 included glow sticks and 16,085 hooks were set without glow sticks. The odds of catching an Albacore, BigEye or Yellowfin on any of the 16,085 hooks without glow sticks was 5.6% (meaning that 5.6% of the 16,085 hooks caught a marketable Albacore, Yellowfin or BigEye). The odds of catching an Albacore, BigEye or Yellowfin on any of the 1,415 hooks with a glow stick increased to 10.2% (10.2% of the 1,415 hooks caught a marketable Albacore, Yellowfin or BigEye). This is a significant improvement in the catch of targeted species. It was discovered that there was little or no benefit to using squid instead of pilchard with a glow stick. The resulting increase of catch with a glow stick was equal to or greater with pilchard when compared to a glow stick used with squid. Therefore the more economical bait can be used when shooting with glow sticks instead of unlighted hooks. It was also suggested from previous experience by the captain and mate, that hooks adjacent to glow sticks had an increase in catch of target species. This hypothesis was tested and verified over all nine shots. Of the hooks *with or adjacent to a glow stick*, the odds of catching an Albacore was 36.5% (even if we subtract the 5.6% random catch rate for an unlighted hook from this figure, we arrive at a 30.9% chance of catching an Albacore, BigEye or Yellowfin on any hook with or adjacent to a glow stick).

The data was even more conclusive with BigEye. Fully 48.1% of all BigEye were caught on a hook with pilchard and glow stick (compares to a 0.2% chance of catching a BigEye on an unlit hook). If you include hooks adjacent to glow sticks, 18 of 27 (66.7%) of BigEye were caught as a result of using glow sticks. Likewise, 14.3% of all Yellowfin were caught directly on hooks with glow sticks, while 71.4% of all Yellowfin were caught on hooks with or adjacent to a glow stick (compares to a 0.2% chance of catching a BigEye on an unlit hook).

The fishing depth was between 160 – 275 meters. Before this trial, the Mooloolaba fishermen targeting Albacore used almost no glow sticks. The reasons for no glow sticks with Albacore were four-fold:

1. They set their lines in the early morning and began hauling about sundown so the bait was in the water mostly during daylight hours.
2. They fished much deeper and thought the glow stick would fail at this depth due to the pressure.
3. They used different bait (pilchard or sardine) that was MUCH cheaper than squid and therefore thought the additional expense of glow stick was not economical.
4. The fishermen use MANY MORE hooks much closer together. Therefore the time to bait a hook and add a glow stick is reduced from 12 seconds to less than 4 seconds. The fishermen believed that there was not enough time to put the glow stick on the hook.

Here is what we discovered in response to those four concerns:

1. Although the bait is in the water mostly during daylight hours, at these deeper depths, there is very little background light and many target species still have a photo kinetic affect with glow sticks. In addition, the first three sections are in the water for up to 16-18 hours (first section shot is the last section hauled and often the hauling was not completed until almost midnight so the first three to four sections are in the water for significant nighttime hours). Many of the BigEye and Yellowfin were caught on glow sticks in these sections and most of them came up live. Also, the ONLY live albacore caught on the first three sections were caught on glow sticks. In general, albacore caught during the day on unlit hooks came up dead and were frozen. The live albacore caught on glow sticks during the final two days were bagged and kept fresh in brine to fetch a much higher price than the frozen cannery price.
2. Although the polypropylene glow sticks never failed from pressure, they are more expensive and the fishermen do not like the clip-on top because it scratches the soft branch line. Although the PET Gloweez glow stick would crush at the most extreme depths, the glowing fluid did NOT completely leak out and every single glow stick came up glowing 100%. At 160-200 meters fewer than 1% crushed. At 200-250 meters up to 5% crushed (meaning 95% did NOT crush) and even the ones that did crush still came up with glowing liquid inside. From 250-350 meters up to 40% would crush. No fishing was done beyond 350 meters during this test.
3. We experimented with squid (which costs more than \$1.00 USD per bait) and pilchard which costs about \$0.07 cents USD per bait. The Albacore were equally likely to bite a squid or pilchard so there was no reason to use the expensive bait to catch an Albacore. But of the three target fish (Albacore, BigEye, and Yellowfin) the most valuable fish are BigEye and Yellowfin. Both BigEye and Yellowfin are MUCH more likely to be caught on a pilchard *with* a glow stick than on squid with or without glow stick. And even Albacore has a significant increase with pilchard and glow stick. Therefore there is no economical incentive to use the more expensive bait, however there IS GREAT ADVANTAGE to use a glow stick with pilchard or squid.
4. The timing is very difficult. The hooks fly out so fast there is barely time to add the bait and no time left to add the glow stick. However they developed a system to crack the glow stick and add it to the

line still in the snude bin BEFORE the branch line is clipped to the mainline. Using this new method, it is possible to place one glow stick for every 3-4 hooks without delays or tangles.

Here are the final conclusions:

1. During this trip, 9 days were fished. 17,500 hooks were set in total (2000 per day for 8 days and 1500 for one day).
2. Of these 17,500 hooks set, only 1,415 had glow sticks. 16,085 stick had no glow stick.
3. The chance of catching an Albacore, Yellowfin or BigEye one of the 16,085 hooks without glow stick was 5.6%
4. The chance of catching an Albacore, Yellowfin or BigEye one of the 1,415 hooks with glow stick was 10.2% (almost double the random catch rate for an unlit hook).
5. Glow sticks also increased the chance catching a fish on an unlit hook adjacent to a glow stick.
6. The chance of catching an Albacore, Yellowfin or BigEye one of the 1,415 hooks **WITH OR ADJACENT** to a glow stick was 26.1%. Even if we subtract the random unlit hook catch of 5.6% from this figure, you still get greater than 20.5% chance of catching a money fish on or adjacent to a glow stick (almost FOUR TIMES the random-hook catch rate of an unlit hook).
7. The glow stick was affective on Albacore, but it was MOST affective on the more valuable species.
8. The random chance of catching Albacore on an unlit hook was 5.3%. With a glow stick the chance was 13.9%.
9. The random chance of catching a BigEye on an unlit hook with pilchard was 0.2%. With a glow stick the chance was 48.1%.
10. The random chance of catching a Yellowfin on an unlit hook with pilchard was 0.1%. With a glow stick the chance was 14.3%.
11. If you include hooks adjacent to glow sticks, the odds of catching a BigEye **ON OR ADJACENT** to a glow stick is 66% (compared to 0.2% with no glow stick) and the odds of catching a Yellowfin ON OR ADJACENT to a glow stick is 71% (compared to 0.1% with no glow stick). Because these are the most important and most profitable fish, one single additional BigEye or Yellowfin can more than pay for all glow sticks used in a shot.
12. In every case the chance of catching a money fish on a hook with glow stick was more than double the random unlit hook average.
13. Glow sticks increased the catch of Albacore significantly but increased the catch of BigEye and Yellowfin far MORE drastically than anything else.
14. The addition of a glow stick did NOT increase the catch of unwanted species such as lancer or puffer fish or shark, but it did increase the catch of rudderfish (which is sellable but not highly profitable).

Attached is a summary spreadsheet and graph showing the results of all nine shots and pie charts for the species spread. It is to be noted that the skipper and mate for this particular trip were specifically targeting Albacore and freezing them every night. BigEye and Yellowfin were never targeted but VERY welcome when caught. Because the fish caught on glow sticks normally came up live and healthy (i.e. were presumed to have been caught during the period between sundown and when the line was finally pulled) they were gutted, gilled, bagged and kept fresh in brine rather than frozen so the price per fish was greatly enhanced.

During this experiment, glow sticks were set on only 8% of hooks (in order to gather data about random efficacy of glow sticks) however the current recommendation and now the standard procedure for longline Albacore boats on the east coast is to use glow sticks on 20-35% of all hooks for maximum economic return. This will increase the number of Albacore overall, and maximize the number of live Albacore if desired. This will also catch many more BigEye and Yellowfin than would otherwise have been caught. Other than Rudderfish (which can be sold however are not specifically targeted) adding glow sticks will not increase unwanted by catch.

From the above figures it is obvious that the use of lightsticks proved highly advantageous. In using our 4" PET patented soft Gloweez lightstick for the field study we found that between 2% and 5% of sticks had cracked outer cases at between 200-250 metres. From 250-300 metres about 40% of sticks had cracked cases at between but in all cases all lightsticks continued to glow and emit considerable light despite some minor leaking. Because our sticks are non caustic, non toxic, non flammable, EPA approved, and the ONLY sticks in Asia Pacific to have gained ISO9002 QA Certification we believe this standard stick will well serve the needs of fishermen deep setting for tuna up to 250 meters. However, following this research and assuming that operators will want to experiment with fishing at deeper depths, we have since developed a DEEP-water version of the same basic design that is able to operate at depths up to 400 metres. The stick is produced in the same factory, from the same material using the same chemicals and incorporating the same patented one-piece loop-on head. The only difference is a set of pressure ridges that prevent the intense pressure from flattening the tube and causing it to crack at the greater depths. The new DEEP-water stick was been lab tested to 400 meters (fewer than 5% cracked) and field tested to 990 metres testing at 100-metre intervals. Because of the additional plastic required to manufacture the DEEP-water light stick and the cost of new injection moulds, the stick costs 2-cents (USD) more to produce. It is now available since December 2006 in Pink, Blue, Green and Yellow.

Shot	Day	Hooks Shot	Number Sections 250 Hooks/Section	Number Gloweez Deployed	Albacore	BigEye	Yellow Fin	Skip Jack	Rudder	Mahi Mahi	Striped Marlin	Sword	Wahoo	Moon Fish	Total Caught	Total Keep	Total Reject	Lost to Whales
Shot 1	Fri 23 June	2,000	8	160	47	1	0	4	4	0	0	0	0	0	80	56	24	0
Shot 2	Sat 24 June	2,000	8	160	111	7	0	7	5	1	0	1	0	0	163	132	31	0
Shot 3	Sun 25 June	2,000	8	160	91	6	1	3	2	0	0	1	0	0	104	62	42	83
Shot 4	Mon 26 June	1,500	6	150	58	1	1	0	11	1	2	0	0	1	106	75	31	0
Shot 5	Tue 27 June	2,000	8	135	124	1	0	1	7	0	0	0	1	0	163	134	29	0
Shot 6	Wed 28 June	2,000	8	234	158	5	1	1	5	0	0	0	0	1	193	171	22	0
Shot 7	Thur 29 June	2,000	8	252	108	2	2	10	4	0	0	0	0	1	172	127	45	27
Shot 8	Fri 30 June	2,000	8	81	89	1	0	5	6	0	0	0	0	0	144	101	43	4
Shot 9	Sat 01 July	2,000	8	83	150	3	9	5	6	0	0	0	0	0	234	173	61	0
TOTALS for Trip		17,500		1,415	936	27	14	36	50	2	2	2	1	3	1,359	1,031	328	114

Percent Hooks with Gloweez

8.09%

Cost at 22 cents AUD

\$311

Total Gloweez Catch

169

130

13

2

2

19

1

1

1

0

0

Adjacent to Stick

235

212

5

8

5

4

0

0

1

0

Catch + Adjacent

404

342

18

10

7

23

1

1

2

0

0

% Catch + Adjacent

28.6%

36.5%

66.7%

71.4%

19.4%

46.0%

100.0%

Raw Hook Average

Odds of Catch

5.3%

0.2%

0.1%

0.2%

0.3%

0.0%

Raw Gloweez Average

Odds of Catch

11.9%

13.9%

48.1%

14.3%

5.6%

38.0%

50.0%

Odds of Catch (with Adjacent)

28.6%

36.5%

66.7%

71.4%

19.4%

46.0%

100.0%

Odds of Catch on Random Gloweez

14.3%

7.1%

14.3%

Odds of Adjacent on Random Gloweez

14.3%

14.3%

Hooks without Glow 16,085 Chance of catching Albacore or BigEye or Yellowfin on any one of these 16,085 hooks: **5.6%**

Gloweez Hooks 1,415 Chance of catching Albacore, BigEye or Yellowfin **on one of these 1,415** Gloweez hooks: **10.2%**

Gloweez Hooks 1,415 Chance of catching Albacore, BigEye or Yellowfin **on or adjacent** to any Gloweez hook: **26.1%**

20.6% **(If you deduct random chance of 5.6% you still get a 20% catch rate for adjacent hooks)**

Total Hooks 17,500 Overall chance of catching any money fish on any hook (ignoring rejects) **5.9%**

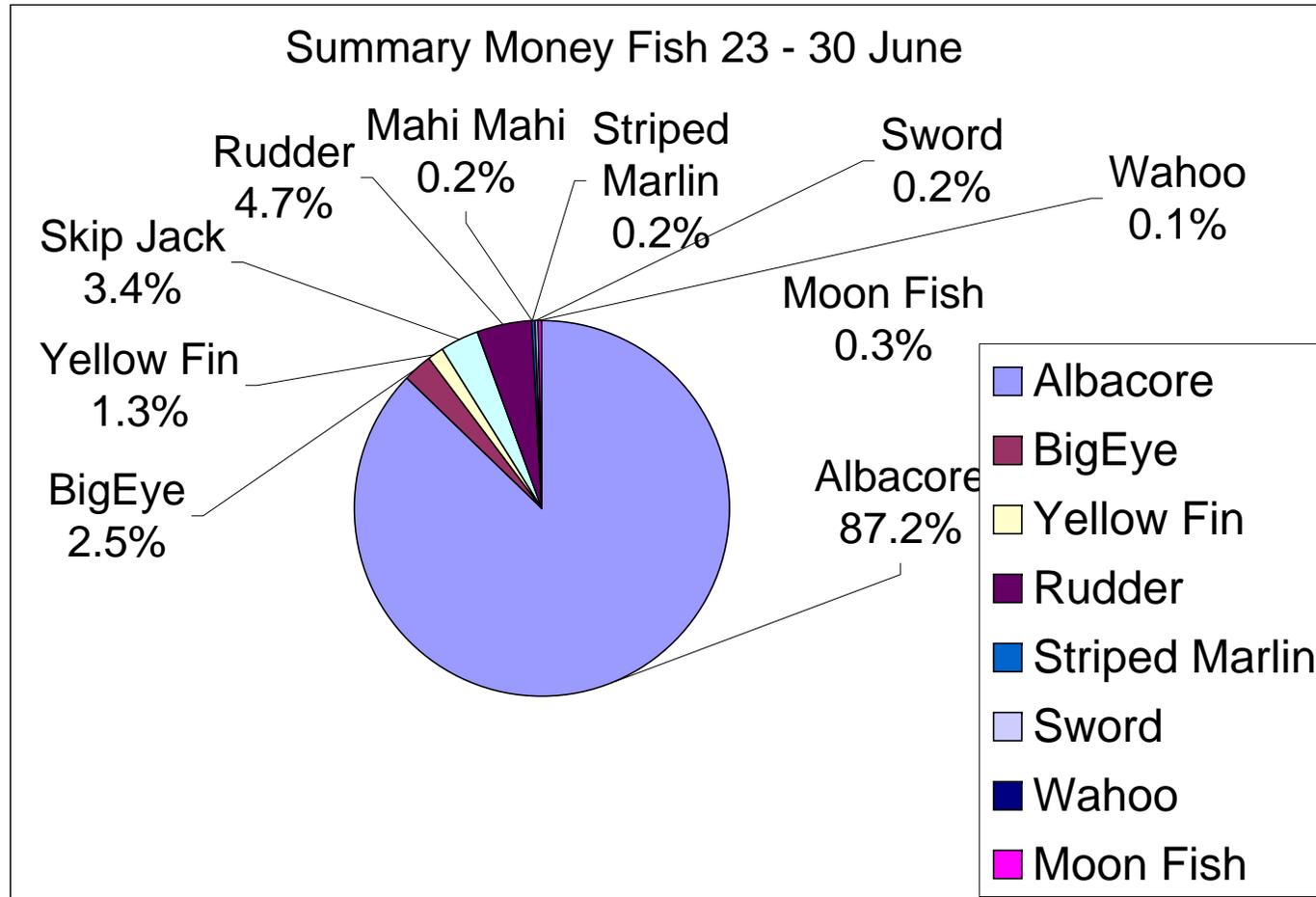
Overall chance of catching any fish on any hook (including rejects) **7.8%**

Random Hooks Catch

Random Gloweez Hooks stats: 24 9 Chance of catching any Money fish on any one of these 24 hooks: 37.5%

Note: Two hooks were chosen at random in each of 12 sections in shots 8 and 9. Of these 24 hooks with glow sticks, 9 caught fish (including the one and only live Big Eye in Shot 8). This is 5 times the raw hook average. These are catches ON the hook and ignore adjacent catches. If looking at adjacent hooks to these random 24, then an additional 8 adjacent catches were made for a total of 17 out of 24 random glow sticks.

Hooks Shot	Albacore	BigEye	Yellow Fin	Skip Jack	Rudder	Mahi Mahi	Striped Marlin	Sword	Wahoo	Moon Fish	Total Reject
17,500	936	27	14	36	50	2	2	2	1	3	328
Percent of Hooks	5.35%	0.15%	0.08%	0.21%	0.29%	0.01%	0.01%	0.01%	0.01%	0.02%	
Percent of Catch	68.87%	1.99%	1.03%	2.65%	3.68%	0.15%	0.15%	0.15%	0.07%	0.22%	



Summary of Hooks 23 - 30 June

