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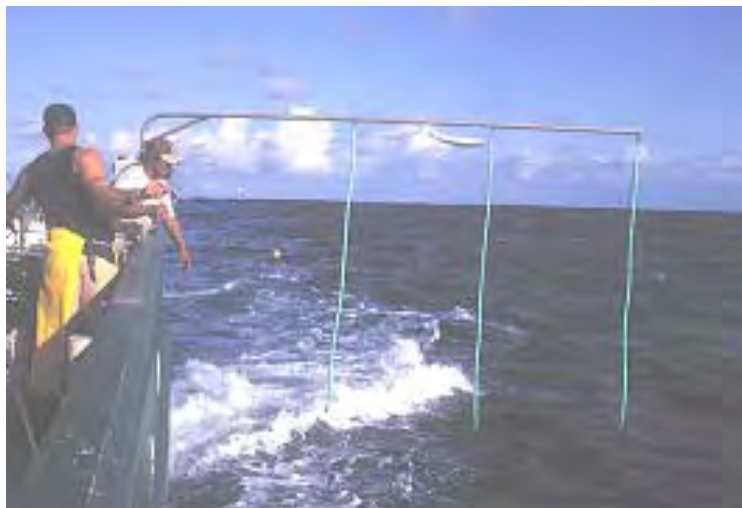
# Technical Assistance for Hawaii Pelagic Longline Vessels to Change Deck Design and Fishing Practices to Side Set

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## 1. INTRODUCTION AND SUMMARY

This report presents results of a project of converting vessels in the Hawaii pelagic longline tuna and swordfish fleet to set from the side instead of the conventional position at the stern to reduce seabird bycatch and provide operational benefits. The success of the technical assistance program was due to its timing with the completion of a research experiment, voluntary change to side setting by a portion of the fleet, and a proposed regulatory amendment. Within three months following a successful trial of side setting in the Hawaii longline fleet, which demonstrated side setting's effectiveness as a bird avoidance method and commercial viability, ten percent of the fleet voluntarily changed to side setting. This provided further evidence of the potential for side setting to be broadly adopted and assist the Hawaii longline fleet to minimize seabird mortality. This provided the impetus for the Hawaii Longline Association, U.S. NOAA Fisheries, Western Pacific Regional Fishery Management Council, and Blue Ocean Institute to collaborate to institute a technical assistance program for additional vessels in the Hawaii fleet to change to side set. The initiation of the assistance program coincided with a proposed amendment to government regulations on avoiding seabird bycatch to allow Hawaii longline vessels to side set in lieu of currently required seabird avoidance methods.

Mortality in longline fisheries is the most critical global threat to most albatross and large petrel species. Developing and mainstreaming the use of seabird avoidance methods that not only have the capacity to minimize bird interactions, but are also practical and provide crew with incentives to employ them effectively, is necessary to resolve this problem.

Incidental bycatch of Laysan (*Phoebastria immutabilis*) and Black-footed (*P. nigripes*) Albatrosses by Hawaii pelagic longline tuna and swordfish fisheries, and the risk of bycatch of the U.S. listed endangered Short-tailed Albatross (*P. albatrus*) are conservation and management concerns. Research and commercial demonstrations conducted from 2002-2003 assessed the effectiveness of three methods at avoiding incidental seabird capture and commercial viability in Hawaii pelagic longline fisheries. A seabird avoidance method called side-setting had the lowest mean seabird contact and capture rates of all treatments tested. Side setting reduces the incidence of seabird captures to close to zero, reducing bird captures by nearly 100% in longline tuna gear and over 87% in longline swordfish gear compared to controls. Side setting is a means by which setting longline gear is done from the side of the vessel rather than the conventional position at the stern (Fig. 1). When setting from the side crew set baited hooks close to the side of the vessel hull where seabirds, such as albatrosses, are unable or unwilling to pursue them. Ideally, when side setting with proper line weighting, by the time the stern passes, the hook has sunk beyond the reach of seabirds.

Because side-setting promises to also provide large operational benefits for longline vessels, broad industry uptake and voluntary compliance is realistic. Evidence of this is that over fifteen percent of the fleet converted to side set at their own instigation before managers formally considered including this strategy in regulations. The potential exists for this to be the first seabird bycatch problem in a longline fleet to be reliably and permanently solved, entailing minimal expenditure for compliance. A significant contributing factor to this success is that already vessels in this fleet traditionally use branch lines that achieve a rapid bait sink rate: Branch lines are adequately weighted, with a lead swivel of between 45 g and 60 g placed within 0.5 m of the hook, achieving an average sink rate of about 1 s/m. Side setting is a seabird avoidance method that simply becomes an operational norm entailing no additional effort or diligence by operators.

Side setting provides large operational benefits, especially for vessels with an aft wheelhouse and main work deck forward of this. Instead of having two separate work areas as is necessary when line setting is carried out from the vessel stern, side setting permits a vessel to have a single work area. Side setting provides significantly more deck room on all vessels, even those with a forward wheelhouse. Side setting also allows for better supervision of fishing operations by the vessel captain on the bridge, providing safety and efficiency advantages. Other advantages reported already include preference by the crew to set off the side versus the stern, less bait lost and line tangles because side set gear does not contact the turbulent stern water as has traditionally been the case, and bird interactions almost never occur. Additionally, this method is a very attractive option by comparison to the regulatory alternatives available for the Hawaii fleet. Many of the Hawaii vessels characterized by forward wheelhouses and aft deck space can still take advantage of the change to side setting by now occupying the redundant aft most deck space with mainline spools and float storage compartments.

At the time of preparing this report and conducting the technical assistance project, fishery managers were in the process of amending regulations to allow Hawaii longline tuna and swordfish vessels to employ side setting as an alternative to currently required seabird avoidance methods, which includes a requirement to dye bait blue. Here again, side setting may provide substantial economic benefits as the process of dyeing fish bait, which requires thawing the bait, is thought to be extremely detrimental to bait retention on hooks. The amended regulations are expected to come into effect in early 2006.

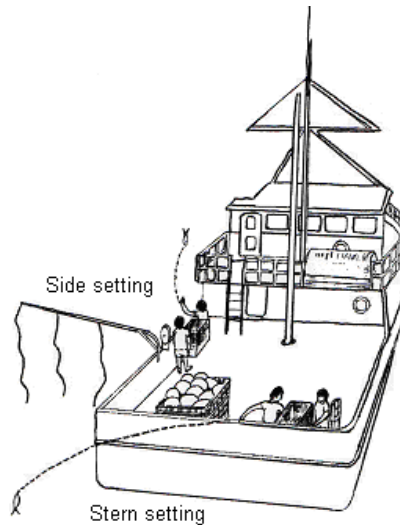


Fig. 1. Illustration showing a port side setting position with bird curtain and position of conventional stern setting.

Developing the side setting method and proving its worth in the Hawaii longline fleet has the potential to provide longline fishing worldwide with an incentive for adoption, as there are no reasons why this method cannot be employed by all longline fleets.

We provided technical support to the Hawaii pelagic longline fleet to facilitate efficient, cost-effective, and optimum conversions as well as advice on how to optimize side setting performance. Dockside technical assistance was provided to convert 28 vessel deck designs to side set and fabricate and install a bird curtain, which further enhances the security against seabird interaction during side setting. Of these vessels, eight target swordfish exclusively or part of the year. Hawaii longline swordfish vessels have had a higher seabird capture rate than Hawaii longline tuna vessels, in part, due to the location of fishing grounds and differences in fishing gear and methods.

Deck changes involved identifying a position for gear deployment from the side on individual vessels as all vessels in the Hawaii fleet are somewhat different, through considering how to maximize operational benefits and effectiveness at avoiding seabird capture, and fabricating and installing a bird curtain. Considerations included selecting locations for main line shooter, hydraulic lines, mainline spools, buoy racks, and the new route for mainline travel off the spool through the shooter. Advice was also provided to captains and crew on setting from the new position, including timing for clipping branch lines to the main line, and practices for baited hook throwing. The importance of this cannot be overstated as incorrect branch line deployment and timing is potentially very dangerous, perhaps more so if done incorrectly when side setting. Section 3 provides information on two types of line shooter mountings both to accommodate the need to safeguard the shooter from damage in its side



mounted position. Section 3 also provides details on the design and specifications for the two types of bird curtains installed.

Each vessel participating in the project received \$1000 towards covering costs for the deck conversion, and received a free bird curtain. Total cost for materials for a bird curtain and for welding services for mounting is about \$200.

In addition, for all vessels converted and including about 15 others that had previously converted, we documented aspects of each vessel, its fishing equipment, and line setting characteristics that are considered relevant for subsequent performance evaluation and the rectifying of any problems that may emerge.

Following each vessel's first fishing trip after initial conversion to side setting, the opinion of the captain and crew was sought on the change and details of any problems that they encountered. Table 2 summarizes this information. Of the 28 vessels converted, six had completed one or more fishing trips after conversion at the time of writing this report. Of these, none of the vessels encountered any substantial operational problems or had a negative attitude to side setting.

### **Recommended Next Steps for Side Setting in the Hawaii Longline Fleet**

- **Incentives Program:** Extend the duration of the technical assistance incentives program to capitalize on the current momentum and willing participation by the Hawaii longline industry to assist with all remaining vessels in the fleet that wish to switch to side set.
- **Observer Data Collection Protocols:** Ensure observer data protocols include the collect of information to assess possible causes for differences in bird avoidance effectiveness of side setting vessels. This includes adopting a consistent and replicable method to observe average albatross abundance during entire sets, practices of crew setting baited hooks (where are the baited hooks thrown, how far forward is their setting position), vessel setting speed, propeller direction, and gear weighting configuration. Because many vessels employ a variety of weighing configurations throughout their branch lines, this necessitates that observers collect information on each occasion a seabird is captured. This will enable scientists to assess each side-setting vessel to identify design and operational differences, and determine if there is a correlation between vessels having relatively low seabird bycatch rates normalized for albatross abundance and specific fishing gear, vessel design, or fishing methods. Similar data are required also for non side-setting vessels, including the position of the line shooter in relation to the stern and starboard corners.

- **Side Setting Lessons Learned:** Continue to document lessons learned by vessels in the Hawaii fleet that have switched to side set to maximize the efficacy of side setting deck designs and fishing methods at reducing seabird bycatch and maximize operational benefits. Document subsequent modifications made to the vessel designs and fishing practices to improve side setting performance and bird avoidance efficacy.
- **Trends in Side vs. Stern Setting:** Assess the durability of conversions with time: is there a trend for vessels that switched to side setting to switch back to stern setting, or do vessels that try side setting tend to stick with the new setting position?
- **Comparison of Bird Bycatch Avoidance Efficacy:** Compare seabird bycatch rates, normalized for albatross abundance, of vessels in the Hawaii fleet that are side-setting versus employing other methods to avoid seabird capture. This can be conducted through analysis of the onboard observer database.
- **Bird Curtain:** Assess the extent that use of a bird curtain contributes to the performance of side setting to reduce seabird bycatch.
- **Export Lessons Learned:** Broadly disseminate to other longline fleets the benefits learned in the Hawaii fleet of the seabird avoidance and operational benefits of side setting.

## 2. VESSEL CONVERSION

Table 1 summarizes the vessel deck layout and gear designs before and after conversion to side setting.

Table 1. Summary of vessel deck layout and gear designs before and after conversion to side setting.

|   | Vessel  |                         |                        |                         |                        |                        |
|---|---|-------------------------|------------------------|-------------------------|------------------------|------------------------|
|   | Finback   | Kilauea                 | Marine Star            | Miss Jane               | Seaspray               | Pacific Sun            |
| <b>Owner</b>                                      | Vessel Management Associates (contact: Sean Martin)                   | Michael Ostendorp       | John Myking            | Gary Hundrin            | Richard Hansen         | Frank and Sylvia James |
| <b>Captain</b>                                    | Neemia Teuteu   | New captain being hired | Nathan Nakagawa        | New captain being hired | Richard Hansen         | Peter Webster          |
| <b>Vessel and Gear Descriptions</b>               |   |                         |                        |                         |                        |                        |
| <b>Target spp.</b>                                | Tuna  | Tuna and swordfish      | Tuna                   | Tuna                    | Tuna                   | Tuna                   |
| <b>Length (m)</b>                                 | 19.52   | 23.8                    | 20.74                  | 25.62                   | 16.8                   | 20.74                  |
| <b>Beam (m)</b>                                   | 4.47  | 5.5                     | 6.2                    | 6.71                    | 4.9                    | 5.8                    |
| <b>Draft (m)</b>                                  | 2.75  | 3.66                    | 3.66                   | 3.23                    | 2.1                    | 2.75                   |
| <b>Work deck height above water (m)</b>           | 0.64  | 1.27                    | 1.45                   | 0.95                    | 0.56                   | 0.90                   |
| <b>Wheelhouse location</b>                        | Forward   | Forward                 | Forward                | Forward                 | Forward                | Forward                |
| <b>Propeller direction</b>                        | Right hand (clockwise)  | Right hand (clockwise)  | Right hand (clockwise) | Right hand (clockwise)  | Right hand (clockwise) | Right hand (clockwise) |
| <b>Length center of prop to water surface (m)</b> | 1.83  | 2.44                    | Not known              | Not known               | 1.5                    | 1.22                   |
| <b>Hook size and type</b>                         | Japan tuna 3.6 with ring  | Japan tuna 3.6          | Japan tuna 3.6         | Japan tuna 3.6          | 8/0 J                  | Japan tuna 3.6         |
| <b>Total branch line length (m)</b>               | 9.4-9.5   | 23.35                   | 14.72                  | 12.81                   | 11.84                  | 12.81                  |
| <b>Leader length (mm)</b>                         | 400 – 500   | 350                     | 460                    | 460                     | 300                    | 610                    |
| <b>Leader material</b>                            | Wire  | Wire                    | wire                   | wire                    | wire                   | wire                   |
| <b>Clip size and type</b>                         | 145 mm length, 148 wire diameter, 1/8" nose diameter, 8/0 swivel size | 145 mm 148-1/8" x 8/0   | 145 mm 148-1/8" x 8/0  | 145 mm 148-1/8" x 8/0   | 145 mm 148-1/8" x 8/0  | 145 mm 148-1/8" x 8/0  |

|   |                                    |  |                                     |   |   |  |
|---|------------------------------------|--|-------------------------------------|---|---|--|
| <b>Vessel speed when setting (kts)</b>                        | 7                                  | 6  | 6.7                                 | 6.0 – 6.2   | 5.5   | 6  |
| <b>Line shooter speed (if one is used) (kts)</b>              | Not known                          | Not known                                  | Not known                           | 9.7 – 10  | Not known   | Not known  |
| <b>Distance between branch lines (m)</b>                      | 27                                 | 36.6                                       | 27.5                                | 36.4  | 28  | Not known  |
| <b>Hook timer interval (s)</b>                                | 6                                  | 6  | 6                                   | 6.2 – 7   | 8   | 6  |
| <b>Swivel weight (if used) (g)</b>                            | 45                                 | 60   | 60                                  | 45 (80%),<br>60 (20%)   | 45  | 60   |
| <b>Pre-Conversion Information</b>                             |                                    |  |                                     |   |   |  |
| <b>Line shooter position (if one is used) (m)</b>             | 1.32 m from starboard stern corner | Stern center (2.4 m from the vessel sides) | Stern center                        | Stern center 2.8 m from vessel sides  | Stern center  | 2 m from starboard, 3 m from port  |
| <b>Post-Conversion Information</b>                            |                                    |  |                                     |   |   |  |
| <b>Setting position</b>                                       | Port                               | Port                                       | Port                                | Port  | Port  | Port   |
| <b>Reason(s) for selection of side setting position</b>       | Weather wall constraint at 4.4 m   | Fitted redesigned work area to cabin       | Convenient for existing deck layout | Only position possible, between the setting shack and the wheelhouse (cabin). | Most convenient, and forward most possible due to space to cabin. | Haul from the starboard side, weather wall prevents from setting further forward |
| <b>Distance main line shooter to stern (m)</b>                | 2.7                                | 4.3  | 4.6                                 | 7.0   | 3.3   | 3.35   |
| <b>Distance bird curtain mount to stern (m)</b>               | 1.7                                | 2.75                                       | 1.4                                 | 5.45  | 0.45  | 1.75   |
| <b>Bird curtain height above water surface at bulwark (m)</b> | 1.75                               | 4.2  | 3.24                                | 3.55  | 2.65  | 1.8  |
| <b>Bird curtain height above water surface at outer end</b>   | 2.0                                | 4.2  | 3.55                                | 3.70  | 3.25  | 2.8  |

|  |      |      |      |      |      |       |
|--|------|------|------|------|------|-------|
| Distance from stern of crew throwing baited hooks (m)  | 4.4  | 6.4  | 6.6  | 9.1  | 5.3  | 5.15  |
| Estimated distance from stern baited hooks are thrown (assumes crew throws the baited hook 7 m forward) (m)  | 11.4 | 13.4 | 13.6 | 16.1 | 12.3 | 12.15 |
| Estimated depth of baited hooks at stern (based on setting speed, sink rate of gear, and location of crew throwing baited hooks from stern) (m) <sup>a</sup> | 3.8  | 5.7  | 5.2  | 6.2  | 5.3  | 5.2   |

<sup>a</sup> When a 45 g swivel is used, the baited hook sink rate is assumed to be 1.2 m/s, which is the baited hook sink rate of a branch line containing a 45 g swivel at 300 mm from a Japan tuna 3.6 hook. When a 60 g swivel is used, the baited hook sink rate is assumed to be 1.3 m/s, which is the baited hook sink rate of a branch line containing a 60 g swivel at 300 mm from a Japan tuna 3.6 hook. The baited hook sink rate uses the lightest swivel weight contained in the gear when more than one type of swivel weight is used in a vessel's gear.

Table 1, continued.

|                                     | Vessel             |                    |                       |            |                    |                     |
|-------------------------------------|--------------------|--------------------|-----------------------|------------|--------------------|---------------------|
|                                     | Victoria           | Jessica            | Susan K               | Kukus      | Hawaii Power       | Lady Christine II   |
| Owner                               | Sukil Kim          | Alan Duong         | Howard and Shin Kyung | Andy Hwang | Steven Ho          | Christine and Kevin |
| Captain                             | Sukil Kim          | Bo Tang            | Shin Kyung            | Andy Hwang | Steven Ho          | Kevin               |
| <b>Vessel and Gear Descriptions</b> |                    |                    |                       |            |                    |                     |
| Target spp.                         | Tuna and swordfish | Tuna and swordfish | Tuna                  | Tuna       | Tuna and swordfish | Tuna and swordfish  |
| Length (m)                          | 23.79              | 28.9               | 23.8                  | 18.91      | 22.57              | 28.98               |

|   |                        |   |                        |                        |  |  |
|---|------------------------|---|------------------------|------------------------|--|--|
| <b>Beam (m)</b>                                   | 6.71                   | 7.6   | 7.3                    | 5.15                   | 6.71   | 7.63   |
| <b>Draft (m)</b>                                  | 2.98                   |   | 3.05                   | 2.75                   | 2.89   | 3.66   |
| <b>Work deck height above water (m)</b>           | 0.89                   | 1.25  | 0.95                   | 0.45                   | 1.1  | 1.5  |
| <b>Wheelhouse location</b>                        | Forward                | Forward   | Forward                | Forward                | Forward  | Forward  |
| <b>Propeller direction</b>                        | Right hand (clockwise) | Twin screw – both turn towards vessel center                    | Right hand (clockwise) | Right hand (clockwise) | Right hand (clockwise)   | Twin screw – both turn away from vessel center |
| <b>Length center of prop to water surface (m)</b> | Not known              | Not known   | Not known              | Not known              | Not known  | Not known                                      |
| <b>Hook size and type</b>                         | Japan tuna 3.6         | Japan tuna 3.6  | Japan tuna 3.6         | Japan tuna 3.6         | 50% Japan tuna 3.6, 50% 18/0 circle hook (part of a government experiment) | Japan tuna 3.6                                 |
| <b>Total branch line length (m)</b>               | 14.3                   | 14.65   | 14.64                  | 14.6                   | 12.96  | 12.81  |
| <b>Leader length (mm)</b>                         | 300                    | 450   | 400                    | 400                    | 400  | 460  |
| <b>Leader material</b>                            | Wire                   | Wire  | Wire                   | Wire                   | Wire   | Wire   |
| <b>Clip size and type</b>                         | 145 mm 148-1/8" x 8/0  | 145 mm 148-1/8" x 8/0   | 145 mm 148-1/8" x 8/0  | 145 mm 148-1/8" x 8/0  | 145 mm 148-1/8" x 8/0  | 145 mm 148-1/8" x 8/0                          |
| <b>Vessel speed when setting (kts)</b>            | 7                      | Not known yet (just departed for its first trip to target tuna) | 7                      | 7                      | 7  | 7  |
| <b>Line shooter speed (if one is used) (kts)</b>  | Not known              | NA  | Not known              | Not known              | Not known  | Not known                                      |
| <b>Distance between branch lines (m)</b>          | 35                     |   | 23.8                   | 38.4                   | 36   | 36   |
| <b>Hook timer interval (s)</b>                    | 8                      |   | 8                      | 8                      | 7  | 7  |

|   |   |                    |   |   |   |  |
|---|---|--------------------|---|---|---|--|
| <b>Swivel weight (if used) (g)</b>                            | 45  | 45                 | 50% 45 g,<br>50% 60 g   | 50% 45 g,<br>50% 60 g                         | 25% 45,<br>75% 80   | 45   |
| <b>Pre-Conversion Information</b>                             |   |                    |   |   |   |  |
| <b>Line shooter position (if one is used) (m)</b>             | 4 m from starboard, 2 m from port                       | NA                 | 3.6 m from starboard, 2.25 m from port                        | 3 m from starboard, 1.9 m from port           | 1.85 m from starboard, 3.7 m from port  | No shooter   |
| <b>Post-Conversion Information</b>                            |   |                    |   |   |   |  |
| <b>Setting position</b>                                       | Port  | Starboard          | Port  | Port  | Port  | Port   |
| <b>Reason(s) for selection of side setting position</b>       | Forward most position and convenient for mainline route | Twin screw concern | Haul on the starboard side, convenient to existing hydraulics | Haul on starboard side, most appropriate site | Convenience related to the position of hydraulic lines and close to stern (but bait throwing position is another 2.4 m forward) | Concerned about tangling in twin screw propellers if located further forward |
| <b>Distance main line shooter to stern</b>                    | 5.45  | 3.2                | 5.1   | 2.65  | 1.2   | 1.05   |
| <b>Distance bird curtain mount to stern (m)</b>               | 2.9   | 1.4                | 4.0   | 0.3   | 0.2   | 0.05   |
| <b>Bird curtain height above water surface at bulwark (m)</b> | 1.7   | 5.3                | 2.5   | 2.5   | 3.6   | 5.1  |
| <b>Bird curtain height above water surface at outer end</b>   | 2.5   | 6                  | 2.6   | 3   | 3.8   | 5.1  |
| <b>Distance from stern of crew throwing baited hooks (m)</b>  | 7.45  | 5.2                | 7.2   | 4.65  | 3.6   | 3.05   |

|  |       |      |      |       |      |       |
|--|-------|------|------|-------|------|-------|
| <b>Estimated distance from stern baited hooks are thrown (assumes crew throws the baited hook 7 m forward) (m)</b>   | 14.45 | 12.2 | 14.2 | 11.65 | 10.6 | 10.05 |
| <b>Estimated depth of baited hooks at stern (based on setting speed, sink rate of gear, and location of crew throwing baited hooks from stern) (m)<sup>a</sup></b> | 4.8   | 4.7  | 4.7  | 3.9   | 3.5  | 3.4   |

<sup>a</sup> When a 45 g swivel is used, the baited hook sink rate is assumed to be 1.2 m/s, which is the baited hook sink rate of a branch line containing a 45 g swivel at 300 mm from a Japan tuna 3.6 hook. When a 60 g swivel is used, the baited hook sink rate is assumed to be 1.3 m/s, which is the baited hook sink rate of a branch line containing a 60 g swivel at 300 mm from a Japan tuna 3.6 hook. The baited hook sink rate uses the lightest swivel weight contained in the gear when more than one type of swivel weight is used in a vessel's gear.

Table 1, continued.

|                                     | <b>Vessel</b>      |                   |   |               |                 |                    |
|-------------------------------------|--------------------|-------------------|---|---------------|-----------------|--------------------|
|                                     | <b>Grace</b>       | <b>Isabella T</b> | <b>Mariah</b>                                       | <b>Hokuao</b> | <b>Jennifer</b> | <b>Katherine Y</b> |
| <b>Owner</b>                        | Kim Sang           | Joseph Ramalho    | Vessel Management Associates (contact: Sean Martin) | Jonak Paik    | Kil Cho Moon    | Katherine Song     |
| <b>Captain</b>                      | Kim Sang           | Matthew Case      | Sione Keli  | Kim Hikjin    | Kil Cho Moon    | Weou Chel Yi       |
| <b>Vessel and Gear Descriptions</b> |                    |                   |   |               |                 |                    |
| <b>Target spp.</b>                  | Tuna and swordfish | Tuna              | Tuna  | Tuna          | Tuna            | Tuna               |
| <b>Length (m)</b>                   | 21.7               | 18.3              | 22.9  | 22            | 14.95           | 15.2               |
| <b>Beam (m)</b>                     | 6.7                | 5.2               | 7.3   | 7.0           | 5.49            | 8.49               |
| <b>Draft (m)</b>                    | 3.05               | 3.81              | 3.0   | 2.14          | 2.44            | 2.6                |
| <b>Work deck height</b>             | 0.85               | 0.97              | 1.05  | 900           | 600             | 760                |



|   |  |  |  |  |  |  |
|---|--|--|--|--|--|--|
| <b>above water (m)</b>                              |  |  |  |  |  |  |
| <b>Wheelhouse location</b>                          | Forward  | Forward                                    | Forward  | Forward                                      | Forward                                    | Forward  |
| <b>Propeller direction</b>                          | Twin screw -<br>- both turn<br>towards<br>vessel<br>center | Right hand<br>(clockwise)                  | Not known  | Right hand<br>(clockwise)                    | Right hand<br>(clockwise)                  | Right hand<br>(clockwise)                                |
| <b>Length center of prop to water surface (m)</b>   | Not known  | 3.1  | Not known  | Not known                                    | Not known                                  | Not known  |
| <b>Hook size and type</b>                           | Japan tuna<br>3.6  | 15/0 circle                                | 15/0 circle<br>(but might<br>change to<br>Japan tuna<br>3.6) | Japan<br>tuna 3.6                            | Japan<br>tuna 3.6                          | Japan tuna<br>3.6  |
| <b>Total branch line length (m)</b>                 | 16.5   | 12.8                                       | 11.2   | 14.6   | 12.81                                      | 13.0 (first<br>meter from<br>clip is chord,<br>not mono) |
| <b>Leader length (mm)</b>                           | 500  | 500  | 460  | 400  | 430  | 380  |
| <b>Leader material</b>                              | wire   | Nylon                                      | Wire   | wire   | wire                                       | wire   |
| <b>Clip size and type</b>                           | 145 mm<br>148-1/8" x<br>8/0                                | 145 mm<br>148-1/8" x<br>8/0                | 145 mm<br>148-1/8" x<br>8/0                                  | 145 mm<br>148-1/8" x<br>8/0                  | 145 mm<br>148-1/8" x<br>8/0                | 145 mm<br>148-1/8" x<br>8/0                              |
| <b>Vessel speed when setting (kts)</b>              | 7  | 6  | 7  | 7  | 7  | 7  |
| <b>Line shooter speed (if one is used) (kts)</b>    | Not known  | Not known                                  | Not known  | Not known                                    | Not known                                  | Not known  |
| <b>Distance between branch lines (m)</b>            | 37   | 16.5                                       | 18.3   | Not known                                    | Not known                                  | Not known  |
| <b>Hook timer interval (s)</b>                      | 9  | 7  | 7  | 7  | 8  | 7 to 8   |
| <b>Swivel weight (if used) (g)</b>                  | 45   | 45 and 47                                  | 45   | 45   | 45   | 45   |
| <b>Pre-Conversion Information</b>                   |  |  |  |  |  |  |
| <b>Line shooter position m (if one is used) (m)</b> | 2.2 from<br>port, 3.9<br>from<br>starboard                 | 0.5 from<br>starboard,<br>4.1 from<br>port | 2.14 from<br>starboard,<br>4.15 from<br>port                 | 2.55 from<br>port 4.05,<br>from<br>starboard | 1.4 from<br>starboard,<br>2.1 from<br>port | Stern<br>center, 2.5<br>from each<br>side                |

| <b>Post-Conversion Information</b>   |  |                                  |   |  |   |                              |
|--|--|----------------------------------|---|--|---|------------------------------|
| <b>Setting position</b>  | Port   | Port                             | Port  | Port   | Port  | Port                         |
| <b>Reason(s) for selection of side setting position</b>  | Suitable for line set alignment and work space | Starboard haul, optimal position | Avoid starboard hauling area, locations of weather wall and setting shack | Avoid starboard hauling area, optimum location | Avoid starboard hauling area, optimal location in terms of distance forward | Avoid starboard hauling area |
| <b>Distance main line shooter to stern</b>   | 3.65   | 7.5                              | 6.0   | 5.6  | 4.5   | 5.0                          |
| <b>Distance bird curtain mount to stern (m)</b>  | 1.2  | 5.45                             | 4.1   | 4.23   | 2.5   | 1.95                         |
| <b>Bird curtain height above water surface at bulwark (m)</b>  | 2.73   | 2.57                             | 2.8   | 2.7  | 2.25  | 3.05                         |
| <b>Bird curtain height above water surface at outer end</b>  | 3.05   | 3.57                             | 3   | 3.1  | 3.0   | 3.8                          |
| <b>Distance from stern of crew throwing baited hooks (m)</b>   | 5.65   | 9.5                              | 8   | 7.6  | 6.5   | 7                            |
| <b>Estimated distance from stern baited hooks are thrown (assumes crew throws the baited hook 7 m forward) (m)</b> | 12.65  | 16.5                             | 15  | 14.6   | 13.5  | 14                           |

|  |     |     |     |     |     |     |
|--|-----|-----|-----|-----|-----|-----|
| <b>Estimated depth of baited hooks at stern (based on setting speed, sink rate of gear, and location of crew throwing baited hooks from stern) (m)<sup>a</sup></b> | 4.2 | 6.4 | 5.0 | 4.9 | 4.5 | 4.7 |
|--|-----|-----|-----|-----|-----|-----|

<sup>a</sup> When a 45 g swivel is used, the baited hook sink rate is assumed to be 1.2 m/s, which is the baited hook sink rate of a branch line containing a 45 g swivel at 300 mm from a Japan tuna 3.6 hook. When a 60 g swivel is used, the baited hook sink rate is assumed to be 1.3 m/s, which is the baited hook sink rate of a branch line containing a 60 g swivel at 300 mm from a Japan tuna 3.6 hook. The baited hook sink rate uses the lightest swivel weight contained in the gear when more than one type of swivel weight is used in a vessel's gear.

Table 1, continued.

|   | <b>Vessel</b>  |                      |                |                    |                         |                     |
|---|----------------|----------------------|----------------|--------------------|-------------------------|---------------------|
|   | <b>Jane</b>    | <b>Seven Star II</b> | <b>Robin</b>   | <b>Crystal</b>     | <b>Miss Lisa</b>        | <b>Heola</b>        |
| <b>Owner</b>                                      | Yoo Hui Choi   | Kwang Tae Lee        | Chong Hwan Kim | Kevin Van          | Stephen Coates          | Jonak Paik          |
| <b>Captain</b>                                    | Seong Gu Choi  | Kwang Tae Lee        | Mr. Kim        |                    | Stephen Coates          | Tom Kim             |
| <b>Vessel and Gear Descriptions</b>               |                |                      |                |                    |                         |                     |
| <b>Target spp.</b>                                | Tuna           | Tuna                 | Tuna           | Swordfish and tuna | Tuna and swordfish      | Tuna                |
| <b>Length (m)</b>                                 | 20.4           | 20.4                 | 14.64          | 24                 | 25                      | 17.1                |
| <b>Beam (m)</b>                                   | 4.52           | 5.79                 | 4.75           |                    | 6.7                     | 4.88                |
| <b>Draft (m)</b>                                  | 2.44           | 4.5                  | 2.44           |                    | 2.75                    | 2.14                |
| <b>Work deck height above water (m)</b>           | 0.75           | 1.21                 | 0.20           |                    | 1.10                    | 0.35                |
| <b>Wheelhouse location</b>                        | Forward        | Forward              | Forward        | Forward            | Forward                 | Forward             |
| <b>Propeller direction</b>                        | Not known      | Not known            | Clockwise      | Not known          | Clockwise               | Clockwise           |
| <b>Length center of prop to water surface (m)</b> | Not known      | Not known            | Not known      | Not known          | 1.37                    | Not known           |
| <b>Hook size and type</b>                         | Japan tuna 3.6 | Japan tuna 3.6       | Japan tuna 3.6 | 18/0 circle        | 50% Japan tuna 3.6, 50% | 50% Japan tuna 3.6, |

|   |                                |                                       |                               |  |  |   |
|---|--------------------------------|---------------------------------------|-------------------------------|--|--|---|
|   |                                |                                       | (changing to 16/0 circle)     |  | 18/0 circle (participating in government commercial demonstration) | 50% 14/0 circle hook  |
| <b>Total branch line length (m)</b>                 | 18.3                           | Not known                             | 14.64                         | Not known  | 12.8   | 14.6  |
| <b>Leader length (mm)</b>                           | 230                            | 381                                   | 300                           | NA   | 230  | 400   |
| <b>Leader material</b>                              | Wire                           | Wire                                  | Wire                          | Mono   | Wire   | Wire  |
| <b>Clip size and type</b>                           | 145 mm 148-1/8" x 8/0          | 145 mm 148-1/8" x 8/0                 | 145 mm 148-1/8" x 8/0         | 145 mm 148-1/8" x 8/0                                    | 145 mm 148-1/8" x 8/0  | 145 mm 148-1/8" x 8/0                                       |
| <b>Vessel speed when setting (kts)</b>              | 7                              | 7                                     | 7                             | 7  | 7  | 7   |
| <b>Line shooter speed (if one is used) (kts)</b>    | Not known                      | Not known                             | Not known                     | Not known (may not be using a shooter any more)          | 9-11   | Not known   |
| <b>Distance between branch lines (m)</b>            | 40.26                          | Not known                             | 21                            | 145 mm 148-1/8" x 8/0                                    | Not known  | Not known   |
| <b>Hook timer interval (s)</b>                      | 8                              | 8                                     | 8                             | 5  | 5.5  | 7   |
| <b>Swivel weight (if used) (g)</b>                  | 45                             | 60                                    | 60                            | 80% 60, 20% 80   | 56 (egg leads, not swivels)  | 80% 45 20% 60   |
| <b>Pre-Conversion Information</b>                   |                                |                                       |                               |  |  |   |
| <b>Line shooter position m (if one is used) (m)</b> | 1.55 to port 2.45 to starboard | Stern center, 2.64 m from each corner | 1.4 to port, 2.8 to starboard | NA   | Center of stern, 3.1 from port, 3.1 from starboard                 | Starboard stern corner, 0.42 from starboard, 3.75 from port |
| <b>Post-Conversion Information</b>                  |                                |                                       |                               |  |  |   |
| <b>Setting position</b>                             | Port                           | Port                                  | Port                          | Port when targeting tuna, stern when targeting swordfish | Starboard  | Port  |

|  |   |   |  |   |   |  |
|--|---|---|--|---|---|--|
| <b>Reason(s) for selection of side setting position</b>  | Avoid starboard hauling position, is as far forward as possible | Avoid starboard hauling position, is as far forward as possible | Avoid starboard hauling position. Temporary for cost and convenience, plans to change entire deck design in 1 year when will improve the side setting position | Owner selected, selected position close to the stern, not optimal for avoiding seabirds | Avoid port hauling position. Appropriate distance forward as close to existing weather wall | Avoid starboard hauling position, ideal position given deck layout |
| <b>Distance main line shooter to stern</b>   | 3.2   | 3.7   | 1.95   | 2.0 when side setting   | 4.3   | 4.6  |
| <b>Distance bird curtain mount to stern (m)</b>  | 0.9   | 1.18  | 1.45   | NA (did not mount one)  | 3.3   | 1.65   |
| <b>Bird curtain height above water surface at bulwark (m)</b>  | 2.9   | Not known   | 1.8  | NA (did not mount one)  | Not yet known   | 2.25   |
| <b>Bird curtain height above water surface at outer end</b>  | 3.3   | Not known   | 2.6  | NA (did not mount one)  | Not yet known   | 2.65   |
| <b>Distance from stern of crew throwing baited hooks (m)</b>   | 5.2   | 5.4   | 3.95   | 7.0   | 6.3   | 6.3  |
| <b>Estimated distance from stern baited hooks are thrown (assumes crew throws the baited hook 7 m forward) (m)</b> | 12.2  | 12.4  | 10.95  | 14  | 13.3  | 13.3   |

|  |     |     |     |   |     |     |
|--|-----|-----|-----|---|-----|-----|
| <b>Estimated depth of baited hooks at stern (based on setting speed, sink rate of gear, and location of crew throwing baited hooks from stern) (m)<sup>a</sup></b> | 4.1 | 4.5 | 4.0 | 3.5 when side setting, 0 when stern setting | 4.4 | 4.4 |
|--|-----|-----|-----|---|-----|-----|

<sup>a</sup> When a 45 g swivel is used, the baited hook sink rate is assumed to be 1.2 m/s, which is the baited hook sink rate of a branch line containing a 45 g swivel at 300 mm from a Japan tuna 3.6 hook. When a 60 g swivel is used, the baited hook sink rate is assumed to be 1.3 m/s, which is the baited hook sink rate of a branch line containing a 60 g swivel at 300 mm from a Japan tuna 3.6 hook. The baited hook sink rate uses the lightest swivel weight contained in the gear when more than one type of swivel weight is used in a vessel's gear.

Table 1, continued.

|   | <b>Vessel</b>   |                         |                            |              |
|---|---|-------------------------|----------------------------|--------------|
|   | <b>Sea Falcon</b>                                       | <b>Princess Jasmine</b> | <b>Princess Jasmine II</b> | <b>Lihau</b> |
| <b>Owner</b>                                      | Not known (leased)                                      | Min Dang                | Min Dang                   | Jonak Paik   |
| <b>Captain</b>                                    | Phil Westbrook  | Not known               | Not known                  | Jaere Joung  |
| <b>Vessel and Gear Descriptions</b>               |   |                         |                            |              |
| <b>Target spp.</b>                                | Tuna  | Swordfish               | Swordfish                  | Tuna         |
| <b>Length (m)</b>                                 | 27.5  |                         |                            | 18.91        |
| <b>Beam (m)</b>                                   | 6.2   |                         |                            | 5.49         |
| <b>Draft (m)</b>                                  | 1.8   |                         |                            | 2.75         |
| <b>Work deck height above water (m)</b>           | 1.0   | Not known               | Not known                  | 0.67         |
| <b>Wheelhouse location</b>                        | Forward   | Forward                 | Forward                    | Aft          |
| <b>Propeller direction</b>                        | Port counterclockwise, starboard clockwise (twin screw) | Not known               | Not known                  | Clockwise    |
| <b>Length center of prop to water surface (m)</b> | 1.22  | Not known               | Not known                  | Not known    |

|   |  |   |   |   |
|---|--|---|---|---|
| <b>Hook size and type</b>                               | Japan tuna 3.6                                       | 18/0 circle   | 18/0 circle   | 50% Japan tuna 3.6 and 50% 14/0 circle hook                         |
| <b>Total branch line length (m)</b>                     | 13.0   | Not known   | Not known   | 14.6  |
| <b>Leader length (mm)</b>                               | 460 (wire) and 1000 (mono) – phasing out the mono    | Not known   | Not known   | 450   |
| <b>Leader material</b>                                  | Mix of wire and mono                                 | Not known   | Not known   | Wire  |
| <b>Clip size and type</b>                               | 85% 145 mm 148-1/8" x 8/0 and 15% with 60 g swivel   | Not known   | Not known   | 145 mm 148-1/8" x 8/0   |
| <b>Vessel speed when setting (kts)</b>                  | 6  | Not known   | Not known   | 7   |
| <b>Line shooter speed (if one is used) (kts)</b>        | 7.5  | Not known   | Not known   | Not known   |
| <b>Distance between branch lines (m)</b>                | 23.2   | Not known   | Not known   | 20  |
| <b>Hook timer interval (s)</b>                          | 6  | Not known   | Not known   | 7   |
| <b>Swivel weight (if used) (g)</b>                      | Mix of 45 and 60 (predominantly 45s)                 | Not known   | Not known   | 45  |
| <b>Pre-Conversion Information</b>                       |  |   |   |   |
| <b>Line shooter position m (if one is used) (m)</b>     | 2.65 to starboard, 3.75 to port                      |   |   | 0.442 from starboard, 3.75 from port                                |
| <b>Post-Conversion Information</b>                      |  |   |   |   |
| <b>Setting position</b>                                 | Port   | Starboard   | Starboard   | Port  |
| <b>Reason(s) for selection of side setting position</b> | Deck is cluttered aft (tank), mainline reel foreward | Avoid weather wall further forward, haul on the port side | Avoid weather wall further forward, haul on the port side | Avoid starboard hauling position, and most forward optimal position |

|  |   |               |               |       |
|--|---|---------------|---------------|-------|
| <b>Distance main line shooter to stern</b>   | 9.5   | 2.2           | 2.2           | 11.25 |
| <b>Distance bird curtain mount to stern (m)</b>  | Not yet installed at time of writing report | Not yet known | Not yet known | 4.6   |
| <b>Bird curtain height above water surface at bulwark (m)</b>  | Not yet known                               | Not yet known | Not yet known | 3.5   |
| <b>Bird curtain height above water surface at outer end</b>  | Not yet known                               | Not yet known | Not yet known | 4.1   |
| <b>Distance from stern of crew throwing baited hooks (m)</b>   | 11.5  | 8             | 8             | 13.25 |
| <b>Estimated distance from stern baited hooks are thrown (assumes crew throws the baited hook 7 m forward) (m)</b>   | 18.5  | 15            | 15            | 20.25 |
| <b>Estimated depth of baited hooks at stern (based on setting speed, sink rate of gear, and location of crew throwing baited hooks from stern) (m)<sup>a</sup></b> | 7.3   | Not yet known | Not yet known | 6.8   |

<sup>a</sup> When a 45 g swivel is used, the baited hook sink rate is assumed to be 1.2 m/s, which is the baited hook sink rate of a branch line containing a 45 g swivel at 300 mm from a Japan tuna 3.6 hook. When a 60 g swivel is used, the baited hook sink rate is assumed to be 1.3 m/s, which is the baited hook sink rate of a branch line containing a 60 g swivel at 300 mm from a Japan tuna 3.6 hook.



The baited hook sink rate uses the lightest swivel weight contained in the gear when more than one type of swivel weight is used in a vessel's gear.

Table 2. Summary of captain and crew debriefing of any problems encountered with side setting following each vessel's first fishing trip after initial conversion to side setting.

| <b>Vessel</b>     | <b>Problem encountered</b>  | <b>Strategy to remedy the problem</b>   |
|-------------------|---|---|
| Finback           | None  | NA  |
| Kilauea           | Branch line timing  | Correct timing  |
| Marine Star       | None  | NA  |
| Miss Jane         | Branch line timing  | Correct timing  |
| Pacific Sun       | None  | NA  |
| Lady Christine II | Crew exposed to sun   | Employ crew not accustomed to setting from a setting shack or install a new setting shack at the new side setting position.   |
| Crystal           | Owner decided not to install provided bird curtain because he perceives it is a safety hazard to crew in rough seas, the vessel does not side set when targeting swordfish, but side sets from a far forward position when targeting tuna | Have owner discuss with other captains and owners, in particular, with other Vietnamese owners and operators, who have experience successfully side setting with a bird curtain when targeting swordfish. |

## 2.1. F/V Finback

### **Summary of side setting information for evaluation of bird avoidance**

**performance:** Baited hooks are estimated to be 3.8 m deep when the vessel stern passes, the bait throwing position is 4.4 m from the port corner, baited hooks are thrown approximately 11.4 m forward from the stern, and a bird curtain is mounted 1.7 m from stern and 1.0 m from shooter. This is one of the smaller vessels in the fleet.

### **Summary of pros and cons of side setting conversion related to**

**operational benefits:** Moving the buoy rack and mainline spool provided a substantial increase in available deck space, particularly for fish handling and processing. Tote stowage is now more convenient. Centering the spool on the deck has corrected a substantial port-side list, which had required the crew to stow bait and fuel to counteract the spool being on the port-side. A disadvantage of the new setting position is the spool no longer being under the covered work deck, where it was protected from ultraviolet deterioration, but the vessel owners were not concerned about this. Also, while the repositioned buoy rack is now out of the main work area, it is less conveniently located for stowing the buoys during hauling.

**Reason(s) for change to side setting:** To meet regulatory requirements and operational benefits

### **Summary of Changes**

Purchase supplies for bird curtain and welding service

Cut and fit bird curtain stand to bulwarks

Main line shooter stand fabricated and attached

Purchase and install hydraulic pipes and fittings

Spool cut from previous position and welded in new position

Buoy rack cut off and weld in new position

Main line shooter cut and welded in new position

Purchased and installed two main line pulley blocks

Stainless pipe stand fabricated and installed into bulwark for

main line pulley block

Rust proofed and re-painted areas that were welded and grinded

Labor 20 hours

**Total estimated cost:** \$1200\*

\* The vessel owners conducted deck improvements unrelated to side setting at the same time, making estimating the costs for the conversion difficult.

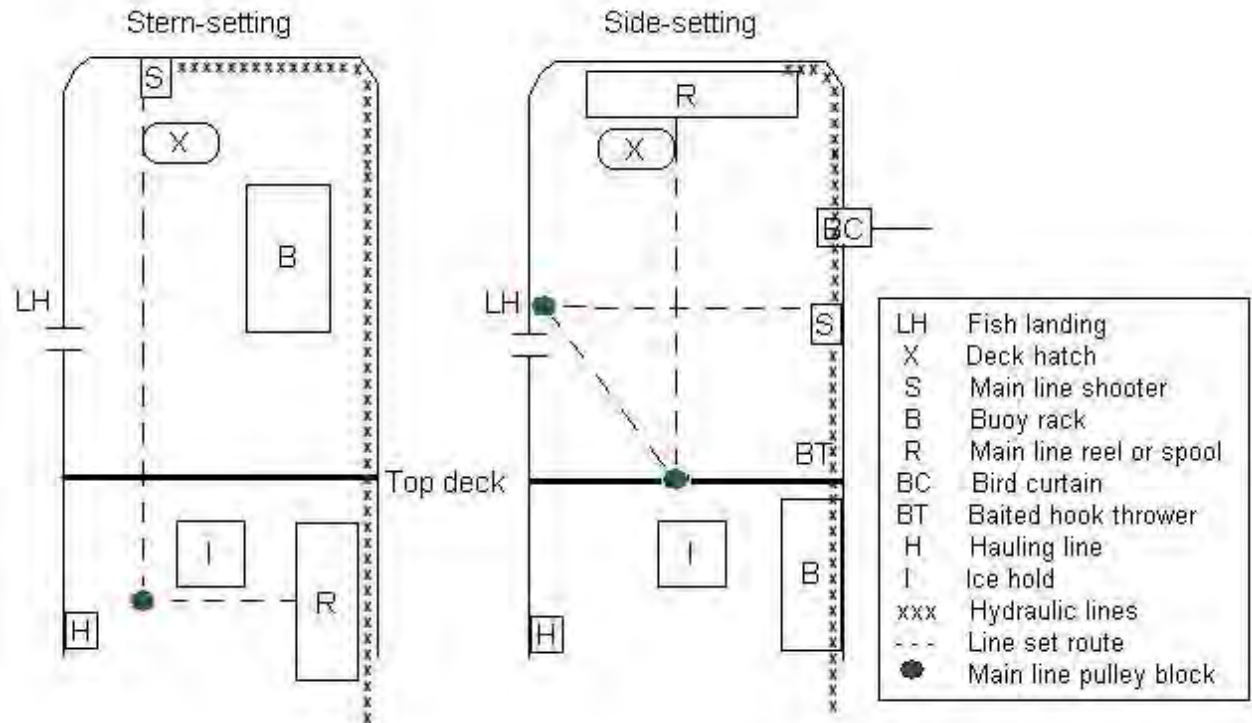


Fig. 2. Illustration of plan view of F/V Finback deck layout before and after conversion from stern to side-setting.



Fig. 3. F/V Finback with stern-setting deck layout.



Fig. 4. Two “endless chains” used on the F/V Finback to slide the spool along the deck from the portside to the stern.



Fig. 5. F/V Finback with side-setting deck layout.

## 2.2. F/V Kilauea

### **Summary of side setting information for evaluation of bird avoidance**

**performance:** Baited hooks are estimated to be 5.7 m deep when the vessel stern passes, the bait throwing position is 6.4 m from the port corner, baited hooks are thrown approximately 13.4 m forward from the stern, and a telescopic bird curtain is mounted on the setting shack roof 2.75 m from the stern and 1.3 m from the shooter.

### **Summary of pros and cons of side setting conversion related to**

**operational benefits:** This vessel was undertaking substantial changes in addition to the side set conversion, much of which improved operational features. Specific to side setting, the aft deck setting shack was transformed into a dual compartment for housing the mainline spool aft and the buoy rack forward. This has placed the mainline spool out of the way in a safer location than before, and no longer necessitates the practice, deemed dangerous by the owner, of buoy retrieval from the buoy storage rack on the roof of the setting shack. Less distance and easier route for moving totes.

**Reason(s) for change to side setting:** Remodeling the vessel anyway, interested in trying something new and perhaps more efficient

### **Summary of Changes**

Purchase supplies for bird curtain and welding service

Cut and fit bird curtain stand to bulwarks

Purchase and install hydraulic pipes and fittings

Spool cut from previous position and welded in new position

Buoy rack weld in new position

Main line shooter stand fabricated and attached

Main line shooter cut and welded in new position

Purchased and installed two main line pulley blocks

Rust proofed and re-painted areas that were welded and grinded



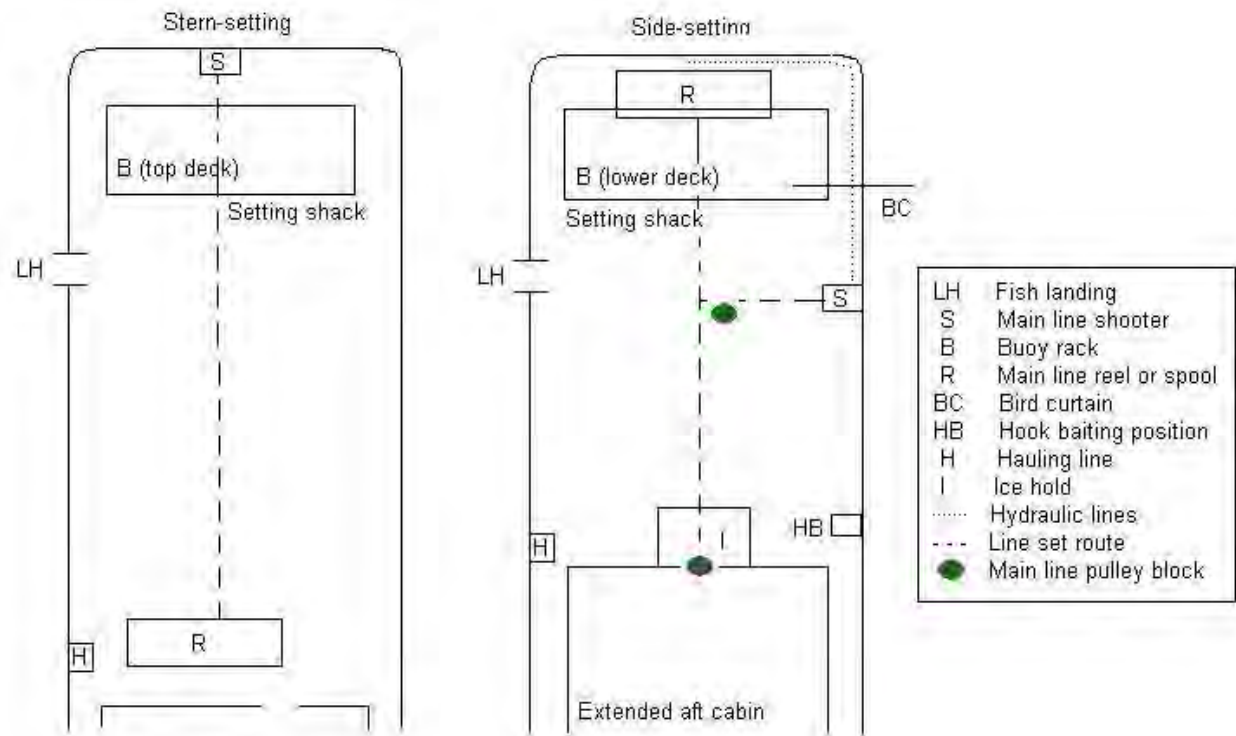


Fig. 6. Illustration of plan view of F/V Kilauea deck layout before and after conversion from stern to side-setting.



### 2.3. F/V Marine Star

#### Summary of side setting information for evaluation of bird avoidance performance:

Baited hooks are estimated to be 5.2 m deep when the vessel stern passes, the bait throwing position is 6.6 m from the port corner, baited hooks are thrown approximately 13.6 m forward from the stern, and a bird curtain is mounted 1.4 m from stern and 3.1 m from the shooter.

#### Summary of pros and cons of side setting conversion related to operational benefits:

The conversion entailed only moving the main line shooter and installing a bird curtain. Setting from the mid-ship position provides substantial operational benefits.

**Reason(s) for change to side setting:** Recommended by others in the fleet to provide operational benefits. The owner of this vessel also owns and is captain of another vessel, Maree M, which already had converted to side setting and was found to be operating successfully.

#### Summary of Changes

- Purchase materials, fabricate bird curtain
- Cut and fit bird curtain stand to buoy rack frame
- Purchase and install hydraulic pipes and fittings
- Fabricate and install swivel base for mainline shooter
- Main line shooter cut and welded in new position
- Purchased and installed one mainline pulley block
- Rust proofed and re-painted areas that were welded and grinded
- Labor 10 hours

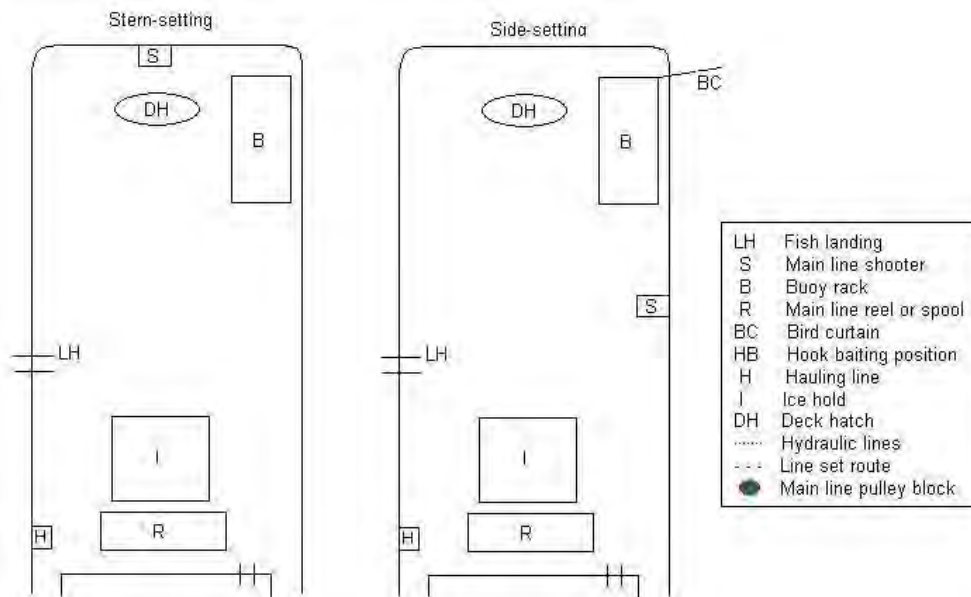


Fig. 7. Illustration of plan view of F/V Marine Star deck layout before and after conversion from stern to side-setting.



Fig. 8. Work begins on the F/V Marine Star to move the main line shooter from the stern mount.

## 2.4. F/V Miss Jane

### Summary of side setting information for evaluation of bird avoidance performance:

Baited hooks are estimated to be 6.2 m deep when the vessel stern passes, the bait throwing position is 9.1 m from the port corner, baited hooks are thrown approximately 16.1 m forward from the stern, and a bird curtain is mounted 5.45 m from the stern and 1.55 m from the shooter.

### Summary of pros and cons of side setting conversion related to operational benefits:

Previously an awkward procedure shifting totes through to the stern set position. Now, with the vast setting shack as free space, this area will be better used as a general work area or to partly accommodate a freezer unit.

**Reason(s) for change to side setting:** Reduce seabird capture, contribute to the sustainability of the industry

### Summary of Changes

- Purchase materials, fabricate bird curtain
- Cut and fit bird curtain stand to side of setting shack
- Purchase and install hydraulic pipes and fittings
- Fabricate and install swiveling shooter base
- Weld new shooter to bulwark
- Rust proofed and re-painted areas that were welded and grinded
- Labor 20 hours

Estimated cost: \$2,109.00

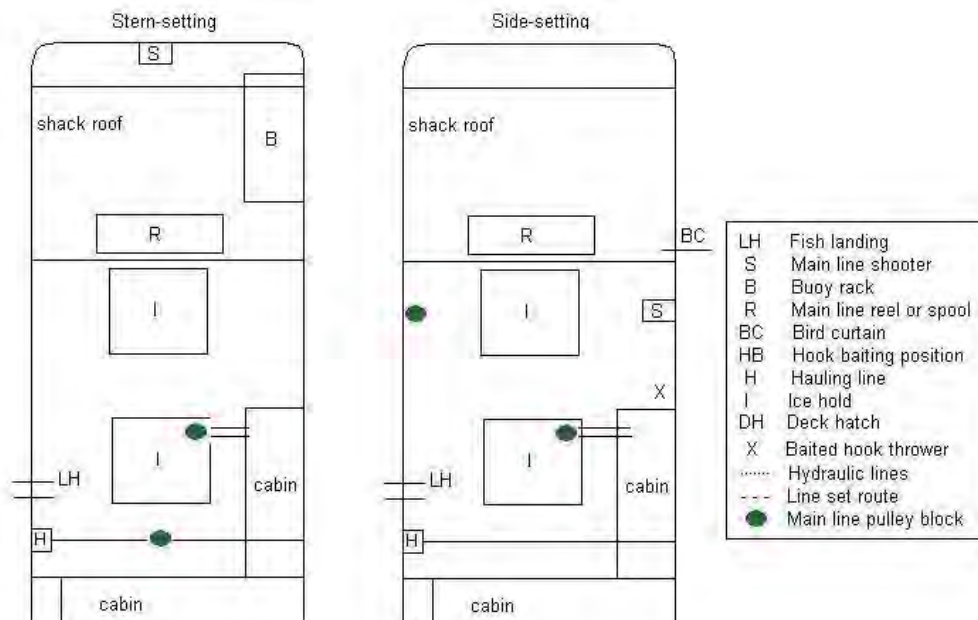


Fig. 9. Illustration of plan view of F/V Miss Jane deck layout before and after conversion from stern to side-setting.



Fig. 10. Stern of the F/V Miss Jane.



Fig. 11. Mid ship of the F/V Miss Jane.

## 2.5. F/V Seaspray

### **Summary of side setting information for evaluation of bird avoidance**

**performance:** Baited hooks are estimated to be 5.3 m deep when the vessel stern passes, the bait throwing position is 5.3 m from the port corner, baited hooks are thrown approximately 12.3 m forward from the stern, and a bird curtain is mounted 0.45 m from the stern and 2.9 m from the shooter.

### **Summary of pros and cons of side setting conversion related to**

**operational benefits:** The repositioning of the main line spool 0.5 m aft and shifting the buoy rack towards the stern has substantially increased the area of the work deck between the spool and ice hatch. Mainline spool is therefore at a safer working distance. Buoy rack is more conveniently positioned now for ease of access during setting and hauling. Radio beacons and light poles more conveniently situated. Totes are now easily moved between work stations.

**Reason(s) for change to side setting:** To meet anticipated regulatory changes while taking advantage of the assistance program

### **Summary of Changes**

Purchase materials, fabricate bird curtain

Cut and fit bird curtain stand

Purchase and install hydraulic pipes, oil, and fittings

Spool cut from previous position and welded in new position

Attach new safety rail

Buoy rack cut off and weld in new position

Main line shooter stand fabricated and attached

Main line shooter cut and welded in new position

New main line pulley block installed on mainline spool guard

Rust proofed and re-painted areas that were welded and grinded

Labor 30 hours

Total estimated cost: \$1683.05



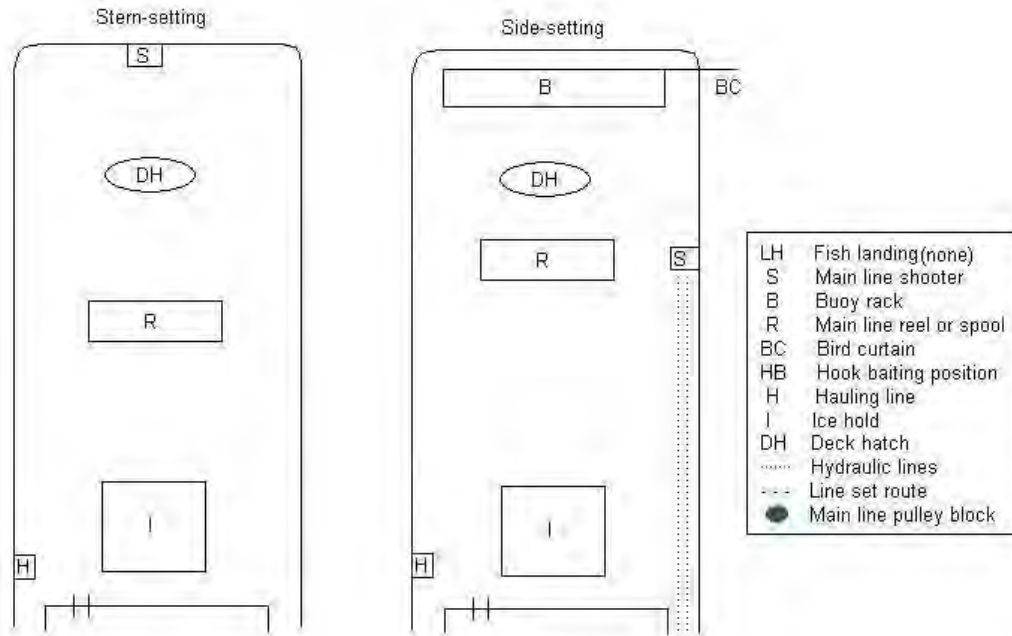


Fig. 12. Illustration of plan view of F/V Seaspray deck layout before and after conversion from stern to side-setting.



Fig. 13. F/V Sea Spray with stern setting deck layout.



Fig. 14. Bird curtain deployed on the F/V Seaspray with converted deck.



Fig. 15. Bird curtain stowed on the F/V Seaspray.



## 2.6. F/V Pacific Sun

**Summary of side setting information for evaluation of bird avoidance performance:** Baited hooks are estimated to be 5.2 m deep when the vessel stern passes, the bait throwing position is 5.15 m from the port corner, baited hooks are thrown approximately 12.15 m forward from the stern, and a bird curtain is mounted 1.75 m from the stern and 1.6 m from the shooter.

**Summary of pros and cons of side setting conversion related to operational benefits:** Main line spool at aft end and buoy rack immediately forward of the reel has created a much more efficient work space for both setting and hauling. The side set position has taken advantage of the existing shelter roof giving crew a more comfortable work station for setting.

**Reason(s) for change to side setting:** Opportune time as owners were altering deck layout at the time.

### Summary of Changes

- Purchase materials, fabricate bird curtain
- Cut and fit bird curtain stand to bulwarks
- Purchase and install hydraulic pipes and fittings
- Spool cut from previous position and welded in new position
- Buoy rack replaced and re-positioned
- Main line shooter stand fabricated and attached
- Main line shooter cut and welded in new position
- Purchased and installed two main line pulley blocks
- Rust proofed and re-painted areas that were welded and grinded
- Labor 20 hours

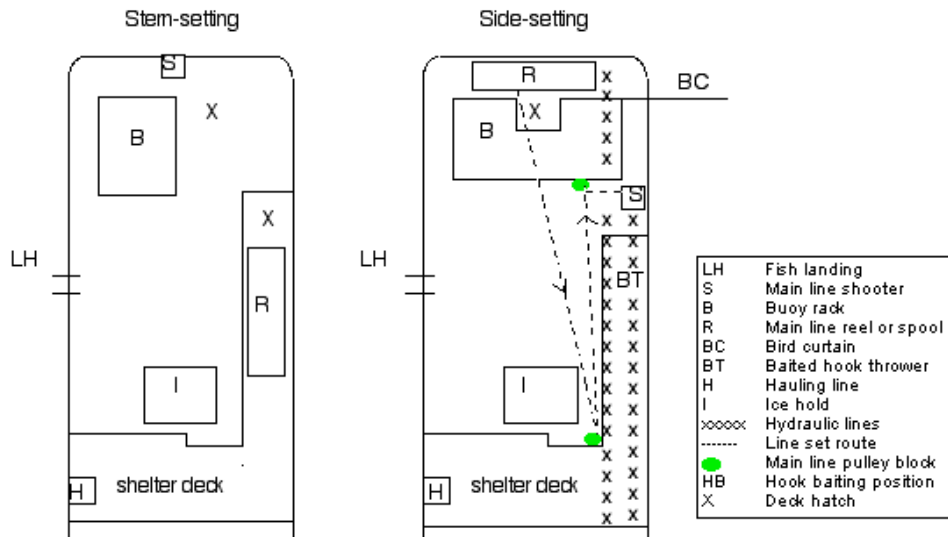


Fig. 16. Illustration of plan view of F/V Pacific Sun deck layout before and after conversion from stern to side-setting.



Fig. 17. F/V Pacific Sun with stern setting deck design.



Fig. 18. F/V Pacific Sun deck design for side setting from the port side with bird curtain in deployed position. Low, wide buoy rack in front of the spool is conveniently located for hauling and setting.

## 2.7. F/V Victoria

### Summary of side setting information for evaluation of bird avoidance performance:

Baited hooks are estimated to be 4.8 m deep when the vessel stern passes, the bait throwing position is 7.45 m from the port stern corner, baited hooks are thrown approximately 14.45 m forward from the stern, and a bird curtain is mounted 2.9 m from the stern and 2.6 m from the shooter.

### Summary of pros and cons of side setting conversion related to operational benefits:

Distance totes have to be moved has been reduced, otherwise there has been no additional substantial operational benefits.

**Reason(s) for change to side setting:** Vessel owner understood the operational benefits, and appreciated the assistance program.

### Summary of Changes

Purchase materials, fabricate bird curtain

Cut and fit bird curtain stand to bulwark

Spool cut from previous position and welded in new position

Main line shooter stand fabricated and attached

Main line shooter cut and welded in new position (the shooter stand is 15 " long so that the side-mounted shooter does not protrude over the port gunawl)

Fabricate and attach two new tote tie-down eyes at the port positions

Rust proofed and re-painted areas that were welded and grinded

Labor 20 hours

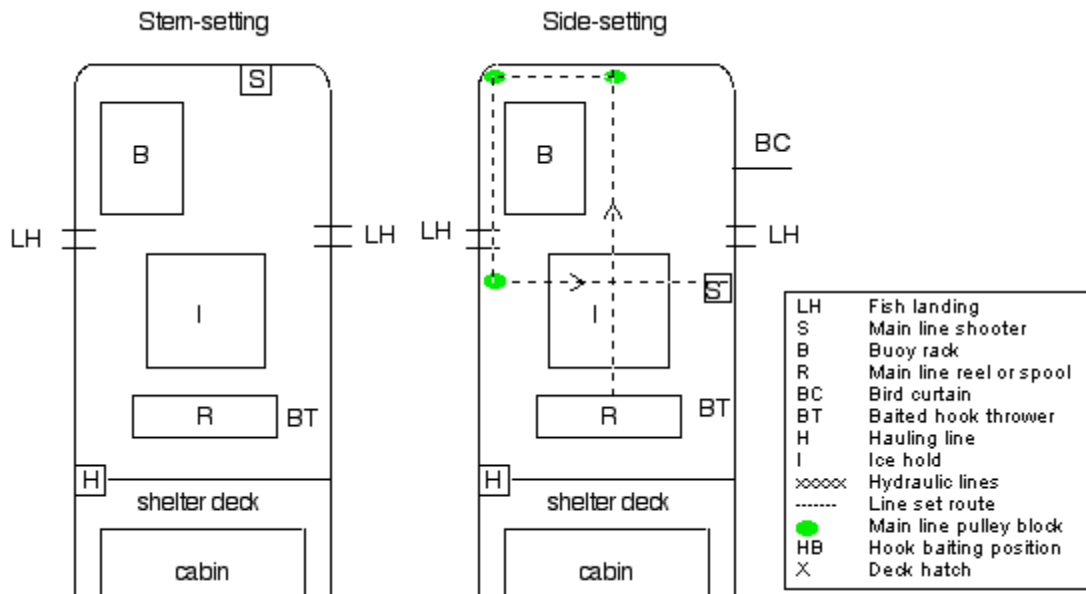


Fig. 19. Illustration of plan view of F/V Victoria deck layout before and after conversion from stern to side-setting.



Fig. 20. F/V Victoria with stern-setting deck layout.

## 2.8. F/V Jessica

### **Summary of side setting information for evaluation of bird avoidance**

**performance:** Baited hooks are estimated to be 4.7 m deep when the vessel stern passes, the bait throwing position is 5.2 m from the starboard corner, baited hooks are thrown approximately 12.2 m forward from the stern, and a bird curtain is mounted 1.4 m from the stern and 1.8 m from the shooter.

### **Summary of pros and cons of side setting conversion related to**

**operational benefits:** The side setting position could have been twice the distance forward from the stern than the vessel owner selected, but he was concerned that problems of gear being tangled in the props would have occurred due to the twin propellers located close to the stern and not far away from the vessel sides if he set further forward, which would have provided more time for the gear to drift sideways under the vessel in certain conditions. The vessel has a substantial setting shack so obvious disadvantage from losing this for setting. It is now safer for the crew to not be setting from within the setting shack where they cannot be easily observed by the captain.

**Reason(s) for change to side setting:** To gain operational benefits and anticipated compliance with regulations for seabird avoidance.

### **Summary of Changes**

- Purchase materials, fabricate bird curtain
- Cut and fit bird curtain stand to bulwarks
- Purchase and install hydraulic pipes and fittings
- Spool cut from previous position and welded in new position
- Buoy rack cut off and weld in new position
- Main line shooter stand fabricated and attached
- Main line shooter cut and welded in new position
- Purchased and installed two main line pulley blocks
- Stainless pipe stand fabricated and installed into bulwark for  
main line pulley block
- Rust proofed and re-painted areas that were welded and grinded
- Labor 20 hours

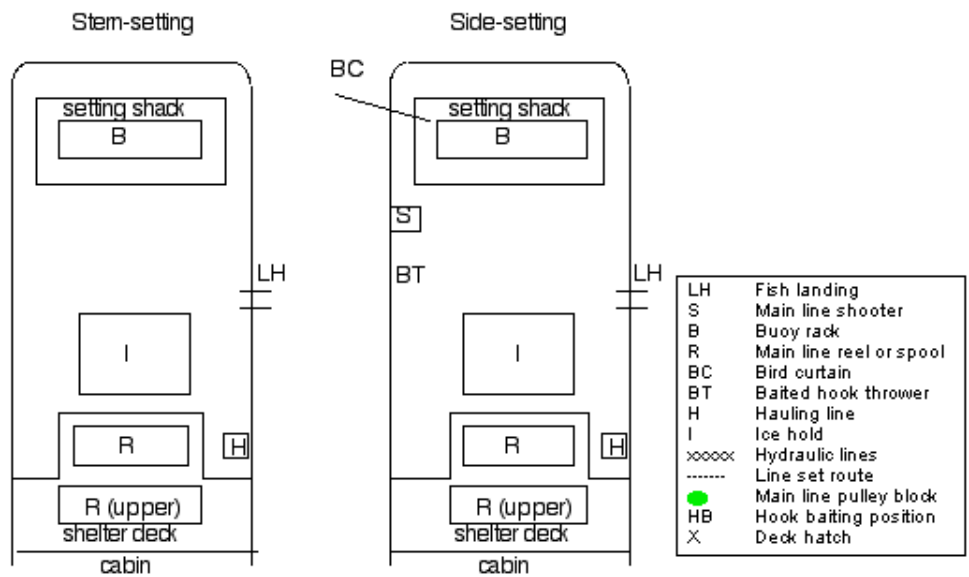


Fig. 21. Illustration of plan view of F/V Jessica deck layout before and after conversion from stern to side-setting.

## 2.9. F/V Susan K

### Summary of side setting information for evaluation of bird avoidance performance:

Baited hooks are estimated to be 4.7 m deep when the vessel stern passes, the bait throwing position is 7.2 m from the port corner, baited hooks are thrown approximately 14.2 m forward from the stern, and a bird curtain is mounted 4.0 m from the stern and 1.1 m from the shooter.

### Summary of pros and cons of side setting conversion related to operational benefits:

Distance totes have to be moved has been reduced, otherwise there has been no additional substantial operational benefits.

**Reason(s) for change to side setting:** Vessel owner and captain hopes that side setting will provide operational benefits.

### Summary of Changes

Purchase materials, fabricate bird curtain

Cut and fit bird curtain stand to bulwarks

Purchase and install hydraulic pipes and fittings

Main line shooter stand fabricated and attached

Main line shooter cut and welded in new position

Installed two main line pulley blocks

Rust proofed and re-painted areas that were welded and grinded

Labor 20 hours

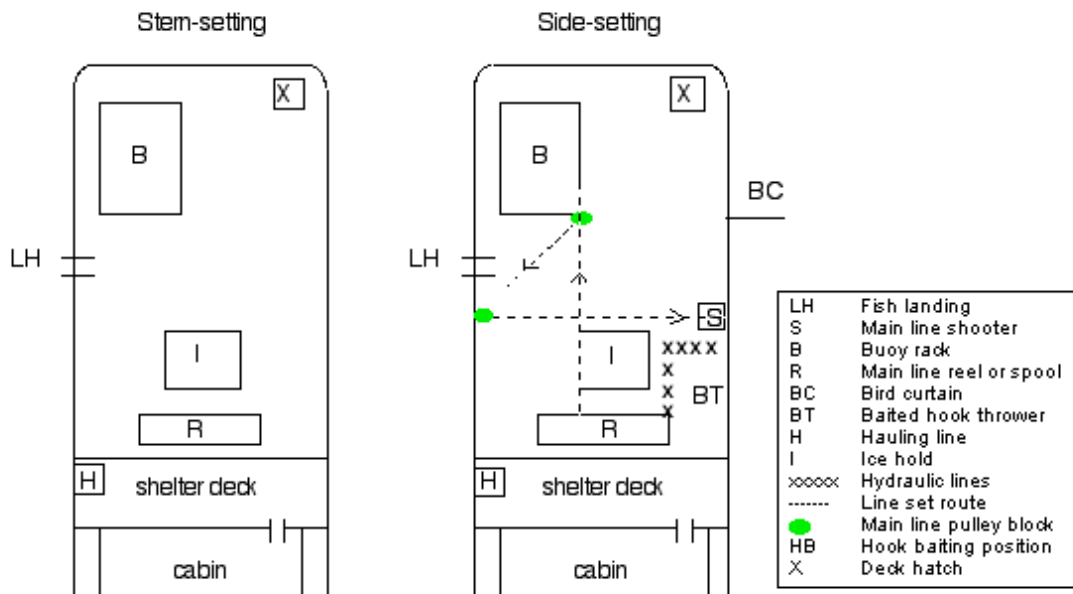


Fig. 22. Illustration of plan view of F/V Susan K deck layout before and after conversion from stern to side-setting.





Fig. 23. Deck layout of the F/V Susan K after moving the main line shooter from the stern to the port side.

## 2.10. F/V Kukus

**Summary of side setting information for evaluation of bird avoidance performance:** Baited hooks are estimated to be 3.9 m deep when the vessel stern passes, the bait throwing position is 4.65 m from the port corner, baited hooks are thrown approximately 11.65 m forward from the stern, and a bird curtain is mounted 0.3 m from the stern and 2.25 m from the shooter.

**Summary of pros and cons of side setting conversion related to operational benefits:** Distance totes have to be moved has been reduced, otherwise there has been no additional substantial operational benefits.

**Reason(s) for change to side setting:**

### Summary of Changes

Purchase materials, fabricate bird curtain  
 Cut and fit bird curtain stand to bulwarks  
 Purchase and install hydraulic pipes and fittings  
 Main line shooter stand fabricated and attached  
 Main line shooter cut and welded in new position  
 Installed one main line pulley block  
 Rust proofed and re-painted areas that were welded and grinded  
 Labor 20 hours

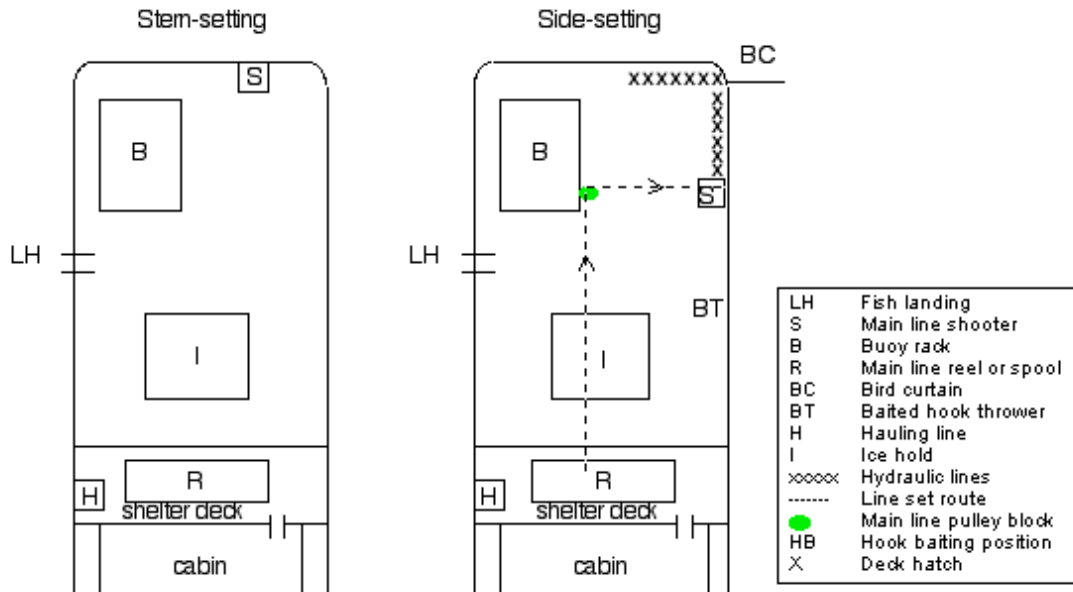


Fig. 24. Illustration of plan view of F/V Kukus deck layout before and after conversion from stern to side-setting.



Fig. 25. Main line shooter mount being installed on the port side of the F/V Kukus.



Fig. 26. New main line shooter fixed-mount (not swivel type) installed on the port side on the F/V Kukus along with a bird curtain.

## 2.11. F/V Hawaii Power

**Summary of side setting information for evaluation of bird avoidance performance:** Baited hooks are estimated to be 3.5 m deep when the vessel stern passes, the bait throwing position is 3.6 m from the port corner, baited hooks are thrown approximately 10.6 m forward from the stern, and a bird curtain is mounted 0.2 m from the stern and 1.0 m from the shooter.

**Summary of pros and cons of side setting conversion related to operational benefits:** The captain/owner selected to position the main line shooter a minimum distance 1m forward from the stern in order to be able to hook up the shooter with hydraulic hoses from the stern, allowing for the shooter to be removed and stowed in the setting shack. Because large timber totes are used on this vessel, the baiting position is far forward from the shooter position.

**Reason(s) for change to side setting:** Potentially beneficial for fishing practices when targeting tuna, but not believed to be beneficial when targeting swordfish.

### **Summary of Changes**

Purchase materials, fabricate bird curtain  
Cut and fit bird curtain to setting shack roof  
Purchase and install hydraulic pipes and fittings  
Fit shooter swivel base  
Purchased and installed two main line pulley blocks  
Stainless pipe stand fabricated and installed into bulwark for  
main line pulley block  
Rust proofed and re-painted areas that were welded and grinded  
Labor 20 hours



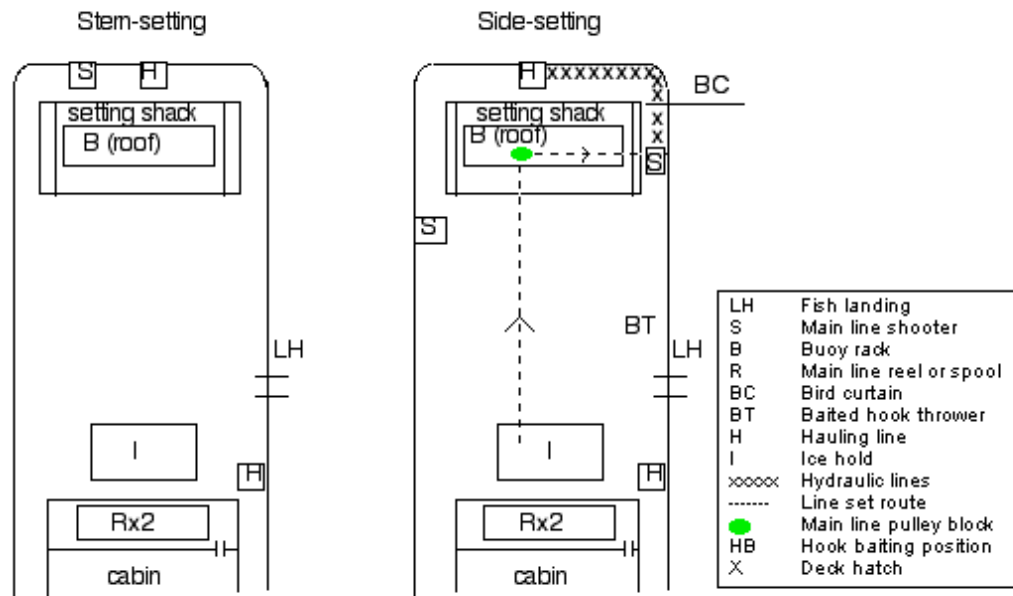


Fig. 27. Illustration of plan view of F/V Hawaii Power deck layout before and after conversion from stern to side-setting.



Fig. 28. Stern mounted line shooter on the F/V Hawaii Power before changes to side set.

## 2.12. F/V Lady Christine II

**Summary of side setting information for evaluation of bird avoidance performance:** Baited hooks are estimated to be 3.4 m deep when the vessel stern passes, the bait throwing position is 3.05 m from the port corner, baited hooks are thrown approximately 10.05 m forward from the stern, and a bird curtain is mounted 0.05 m from the stern and 1 m from the shooter.

**Summary of pros and cons of side setting conversion related to operational benefits:** The vessel owner and captain is concerned about the proximity of the relatively large twin screw propellers to the sides of the vessel, making him reluctant to locate the main line shooter further forward, where there is more space and a better route for the main line. The shooter was therefore located at the minimum distance forward from the stern (1 m). A mounting plate was fixed at a slight forward angle to allow the main line to clear the aft port corner of the setting shack from a block fixed to the mid-stern cap rail. The captain did not want to pass the line through a hole cut in the side of the shack because he considered this to be dangerous, although this would have been a more efficient design.

**Reason(s) for change to side setting:** To take advantage of the incentives program. This will be the vessels first time targeting tuna.

### **Summary of Changes**

- Purchase materials, fabricate bird curtain
- Cut and fit bird curtain to setting shack
- Purchase and install hydraulic pipes and fittings
- Fitted fixed-base-type shooter stand
- Installed two main line pulley blocks
- Rust proofed and re-painted areas that were welded and grinded
- Labor 20 hours

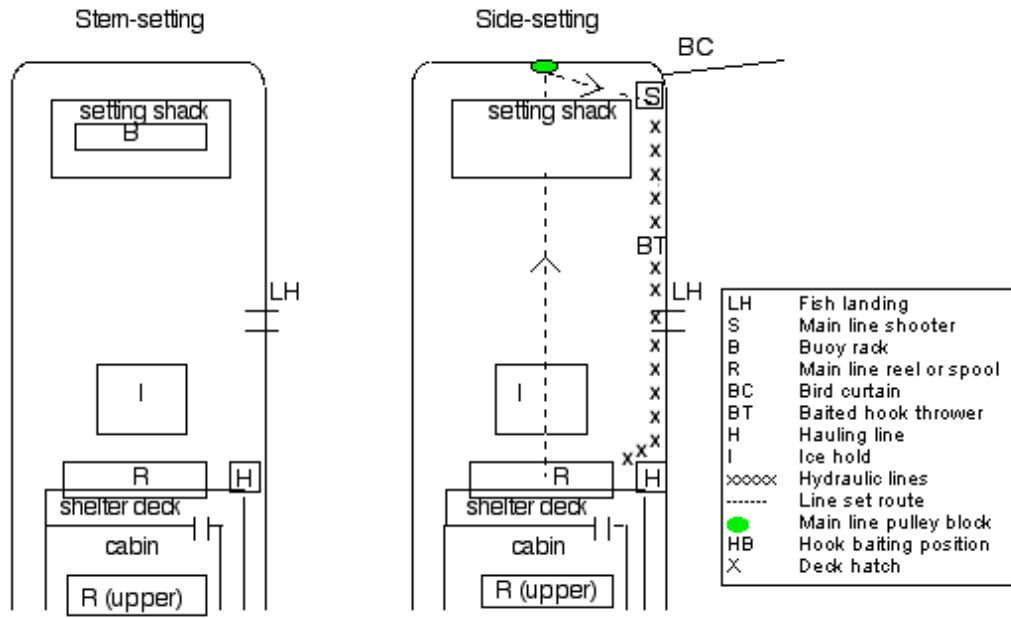


Fig. 29. Illustration of plan view of F/V Lady Christine II deck layout before and after conversion from stern to side-setting.



## 2.13. F/V Grace

### Summary of side setting information for evaluation of bird avoidance performance:

Baited hooks are estimated to be 4.2 m deep when the vessel stern passes, the bait throwing position is 5.65 m from the port corner, baited hooks are thrown approximately 12.65 m forward from the stern, and a bird curtain is mounted 2.4 m from the stern and 1.2 m from the shooter.

### Summary of pros and cons of side setting conversion related to operational benefits:

A simple change in location of the main line shooter and main line routing has increased efficiency in reducing gear storage space and reduced the distance that gear needs to be moved.

**Reason(s) for change to side setting:** Preferred to blue-dyed bait and tori line, which are to be the alternative seabird avoidance method per a current government proposed final regulatory amendment.

### Summary of Changes

Purchase materials, fabricate bird curtain

Cut and fit bird curtain stand to bulwarks

Purchase and install hydraulic pipes and fittings

Main line shooter stand fabricated and attached

Main line shooter cut and welded in new position

Installed two main line pulley blocks

Rust proofed and re-painted areas that were welded and grinded

Labor 20 hours

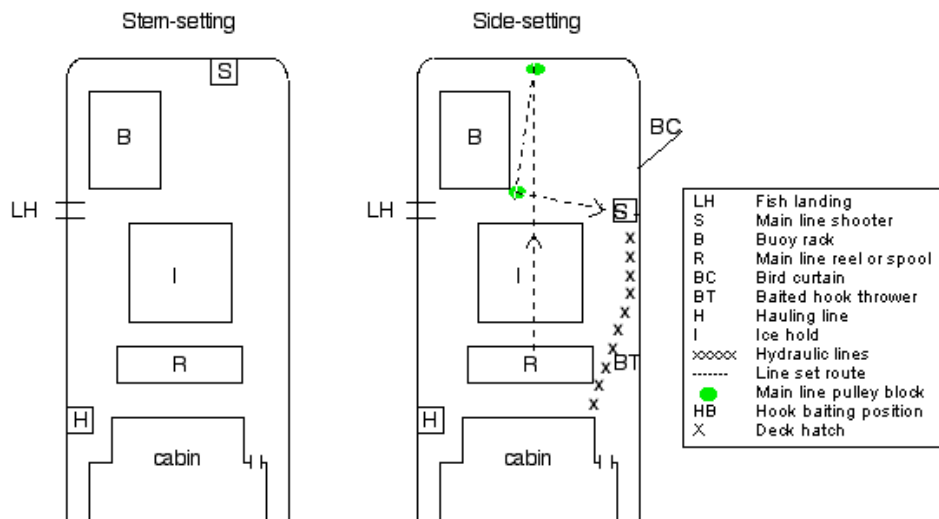


Fig. 30. Illustration of plan view of F/V Grace deck layout before and after conversion from stern to side-setting.

## 2.14. F/V Isabella T

### **Summary of side setting information for evaluation of bird avoidance**

**performance:** Baited hooks are estimated to be 6.4 m deep when the vessel stern passes, the bait throwing position is 9.5 m from the port corner, baited hooks are thrown approximately 16.5 m forward from the stern, and a bird curtain is mounted 5.45 m from the stern and 2.15 m from the shooter.

### **Summary of pros and cons of side setting conversion related to**

**operational benefits:** Movement of the main line spool to the new stern position created a significant space savings on an already limited deck area.

**Reason(s) for change to side setting:** The owner is interested in deck space savings from the switch to the new deck setting position, and is interested to improve bird avoidance.

### **Summary of Changes**

Purchase materials, fabricate bird curtain

Cut and fit bird curtain stand to bulwarks

Purchase and install hydraulic pipes and fittings

Spool cut from previous position, moved with a crane, and welded in new position

Buoy rack cut off and weld in new position

Main line shooter stand fabricated and attached

Main line shooter cut and welded in new position

Purchased and installed three main line pulley blocks

Rust proofed and re-painted areas that were welded and grinded

Labor 20 hours

Total estimated cost: \$4,364.02

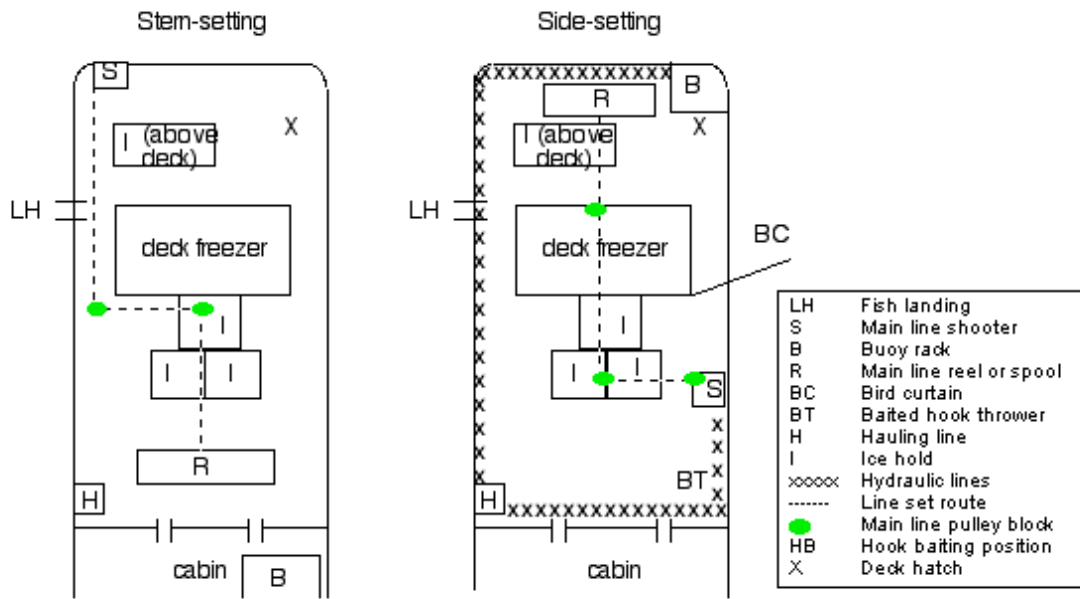


Fig. 31. Illustration of plan view of F/V Isabella T deck layout before and after conversion from stern to side-setting.



Fig. 32. F/V Isabella T before deck design changes, with the main line shooter located on the stern near the starboard side.



Fig. 33. Location of the main line spool on the F/V Isabella T prior to deck design changes to set from the side.



Fig. 34. Movement of the main line spool to its new position at the stern on the F/V Isabella T.



Fig. 35. F/V Isabella T deck space opened-up after movement of the main line spool to the stern.



## 2.15. F/V Mariah

### Summary of side setting information for evaluation of bird avoidance performance:

Baited hooks are estimated to be 5.0 m deep when the vessel stern passes, the bait throwing position is 8 m from the port corner, baited hooks are thrown approximately 15 m forward from the stern, and a bird curtain is mounted 4.1 m from the stern and 1.9 m from the shooter.

### Summary of pros and cons of side setting conversion related to operational benefits:

Distance totes have to be moved has been reduced, otherwise there has been no additional substantial operational benefits. The captain can now see the setting operation, increasing safety. The setting shack can now be better utilized.

**Reason(s) for change to side setting:** To participate in incentives program and anticipating change in regulations.

### Summary of Changes

Purchase materials, fabricate bird curtain

Cut and fit bird curtain stand to setting shack

Main line shooter stand fabricated and attached

Purchase and install hydraulic pipes and fittings

Main line shooter cut and attached in new position

Rust proofed and re-painted areas that were welded and grinded

Labor 20 hours

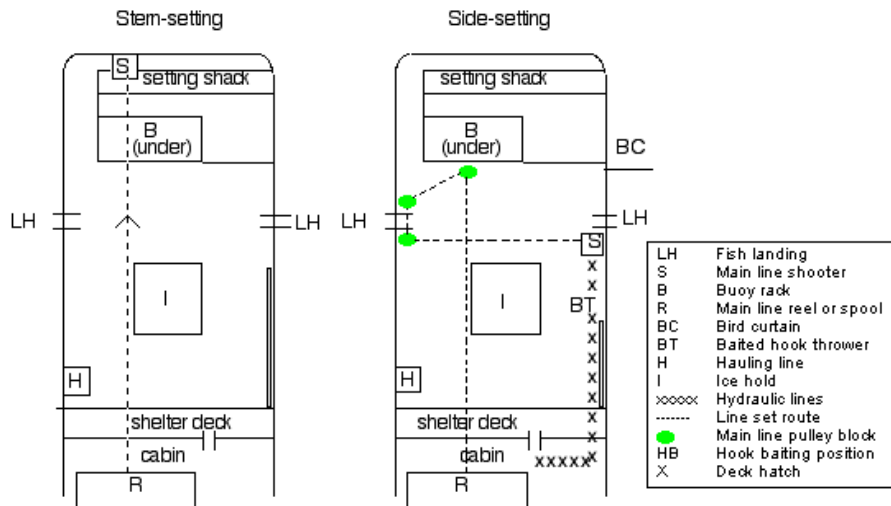


Fig. 36. Illustration of plan view of F/V Mariah deck layout before and after conversion from stern to side-setting.

## 2.16. F/V Hokuao

### Summary of side setting information for evaluation of bird avoidance performance:

Baited hooks are estimated to be 4.9 m deep when the vessel stern passes, the bait throwing position is 7.6 m from the port corner, baited hooks are thrown approximately 14.6 m forward from the stern, and a bird curtain is mounted 4.23 m from the stern and 1.35 m from the shooter.

### Summary of pros and cons of side setting conversion related to operational benefits:

Distance totes have to be moved has been reduced, otherwise there has been no additional substantial operational benefits. The captain can now see the setting operation, increasing safety.

**Reason(s) for change to side setting:** To take advantage of operational benefits and the incentives program, and in anticipation of regulatory amendment.

### Summary of Changes

Purchase materials, fabricate bird curtain

Cut and fit bird curtain stand to setting shack

Main line shooter stand fabricated and attached

Purchase and install hydraulic pipes and fittings

Main line shooter cut and attached in new position

Rust proofed and re-painted areas that were welded and grinded

Replaced handrail on all sides of the deck, not as a requirement for side setting conversion

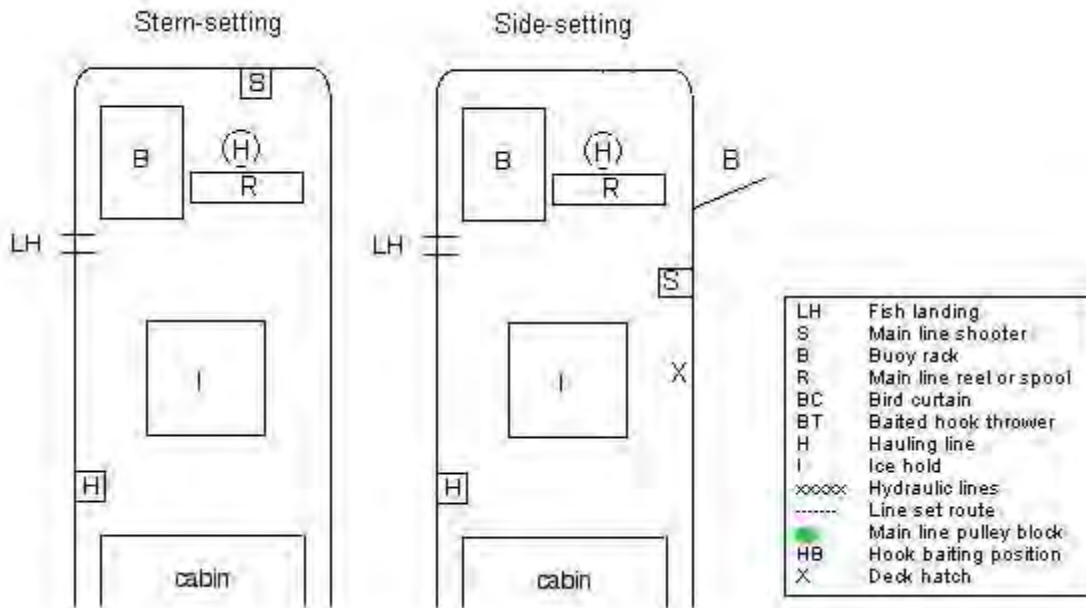


Fig. 37. Illustration of plan view of F/V Hokuao deck layout before and after conversion from stern to side-setting.



Fig. 38. F/V/ Hokuao with the main line shooter in the original stern position.



## 2.17. F/V Jennifer

### Summary of side setting information for evaluation of bird avoidance performance:

Baited hooks are estimated to be 4.5 m deep when the vessel stern passes, the bait throwing position is 6.5 m from the port corner, baited hooks are thrown approximately 13.5 m forward from the stern, and a bird curtain is mounted 2.1 m from the stern and 2.5 m from the shooter.

### Summary of pros and cons of side setting conversion related to operational benefits:

Distance totes have to be moved has been reduced, otherwise there has been no additional substantial operational benefits. The captain can now see the setting operation, increasing safety.

**Reason(s) for change to side setting:** To take advantage of the side setting technical assistance program and optimistic about operational benefits.

### Summary of Changes

Purchase materials, fabricate bird curtain

Cut and fit bird curtain stand to bulwark

Main line shooter stand fabricated and attached

Purchase and install hydraulic pipes and fittings

Main line shooter cut and attached in new position

Rust proofed and re-painted areas that were welded and grinded

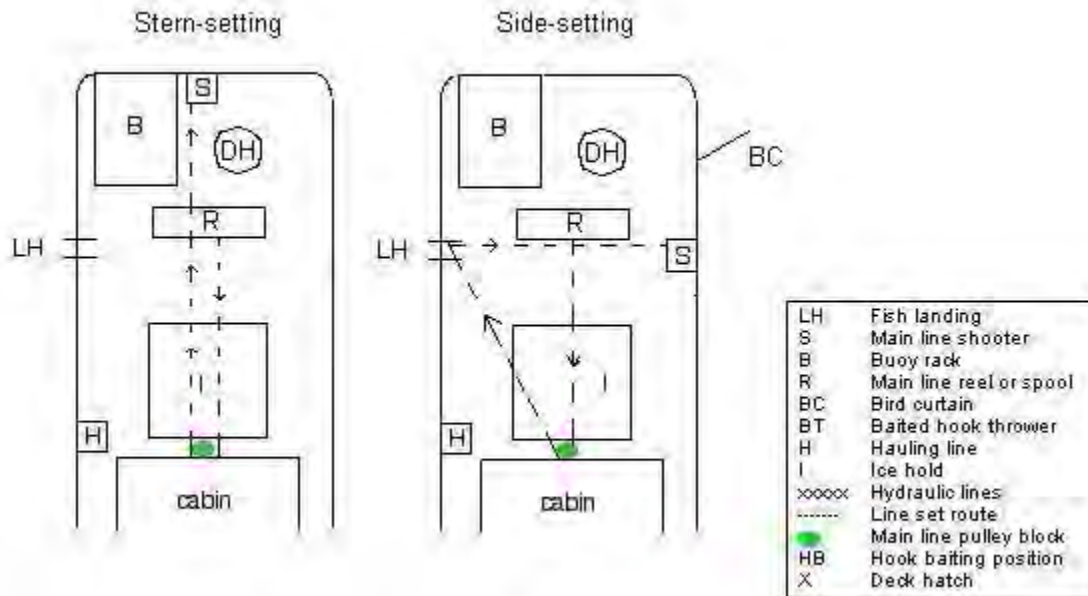


Fig. 39. Illustration of plan view of F/V Jennifer deck layout before and after conversion from stern to side-setting.



Fig. 40. F/V Jennifer before main line shooter was relocated to the port side.

## 2.18. F/V Katherine Y

**Summary of side setting information for evaluation of bird avoidance performance:** Baited hooks are estimated to be 4.7 m deep when the vessel stern passes, the bait throwing position is 7.0 m from the port corner, baited hooks are thrown approximately 14.0 m forward from the stern, and a bird curtain is mounted 1.95 m from the stern and 2.95 m from the shooter.

**Summary of pros and cons of side setting conversion related to operational benefits:** Distance totes have to be moved has been reduced, otherwise there has been no additional substantial operational benefits. The captain can now see the setting operation, increasing safety.

**Reason(s) for change to side setting:** Uncertain, possibly only to take advantage of the technical assistance program.

### Summary of Changes

- Purchase materials, fabricate bird curtain
- Cut and fit bird curtain stand to bulwark
- Main line shooter stand fabricated and attached
- Purchase and install hydraulic pipes and fittings
- Main line shooter cut and attached in new position
- Rust proofed and re-painted areas that were welded and grinded

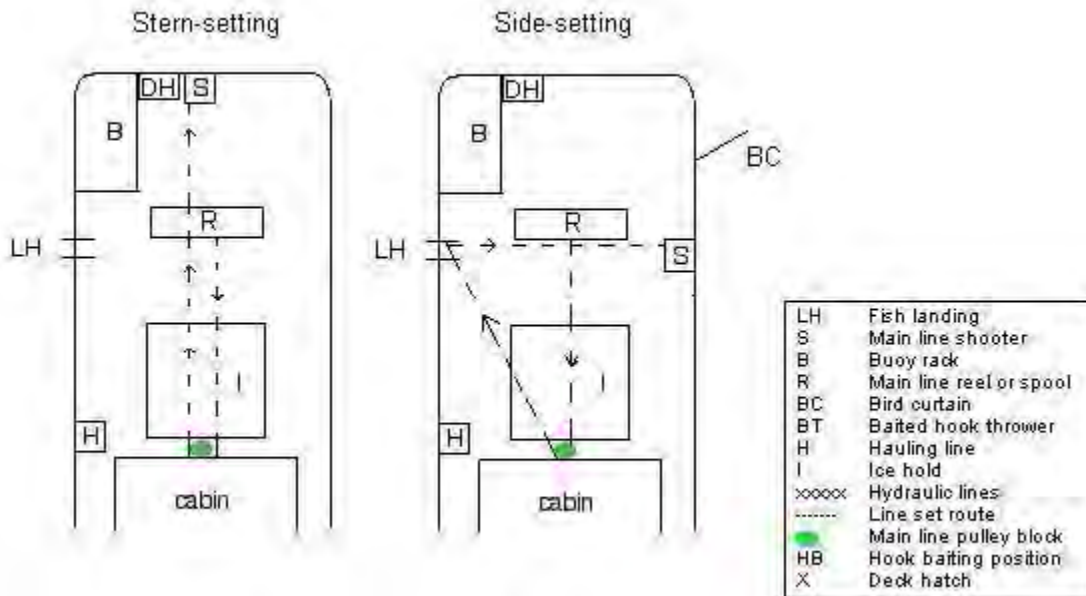


Fig. 41. Illustration of plan view of F/V Katherine Y deck layout before and after conversion from stern to side-setting.

## 2.19. F/V Jane

### Summary of side setting information for evaluation of bird avoidance performance:

Baited hooks are estimated to be 4.1 m deep when the vessel stern passes, the bait throwing position is 5.2 m from the port corner, baited hooks are thrown approximately 12.2 m forward from the stern, and a bird curtain is mounted 0.9 m from the stern and 2.3 m from the shooter.

### Summary of pros and cons of side setting conversion related to operational benefits:

Distance totes have to be moved has been reduced, otherwise there has been no additional substantial operational benefits. The captain can now see the setting operation, increasing safety.

**Reason(s) for change to side setting:** Take advantage of incentives program.

### Summary of Changes

Purchase materials, fabricate bird curtain

Cut and fit bird curtain stand to bulwark

Main line shooter stand fabricated and attached

Purchase and install hydraulic pipes and fittings

Main line shooter cut and attached in new position

Rust proofed and re-painted areas that were welded and grinded

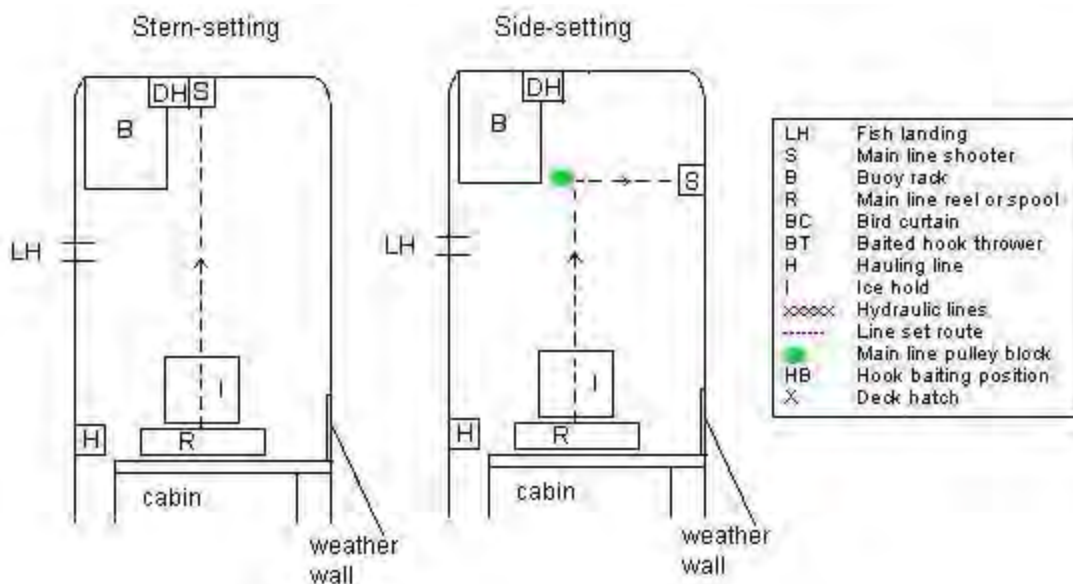


Fig. 42. Illustration of plan view of F/V Jane deck layout before and after conversion from stern to side-setting.

## 2.20. F/V Seven Star II (previously named F/V Seahawk)

**Summary of side setting information for evaluation of bird avoidance performance:** Baited hooks are estimated to be 4.5 m deep when the vessel stern passes, the bait throwing position is 5.4 m from the port corner, baited hooks are thrown approximately 12.4 m forward from the stern, and a bird curtain is mounted 1.18 m from the stern and 2.52 m from the shooter.

**Summary of pros and cons of side setting conversion related to operational benefits:** Distance totes have to be moved has been reduced, otherwise there has been no additional substantial operational benefits. The captain can now see the setting operation, increasing safety.

**Reason(s) for change to side setting:** To take advantage of operational benefits and the incentives program, and in anticipation of regulatory amendment.

### Summary of Changes

Purchase materials, fabricate bird curtain

Cut and fit bird curtain stand to bulwark

Main line shooter stand fabricated and attached

Purchase and install hydraulic pipes and fittings

Main line shooter cut and attached in new position

Rust proofed and re-painted areas that were welded and grinded

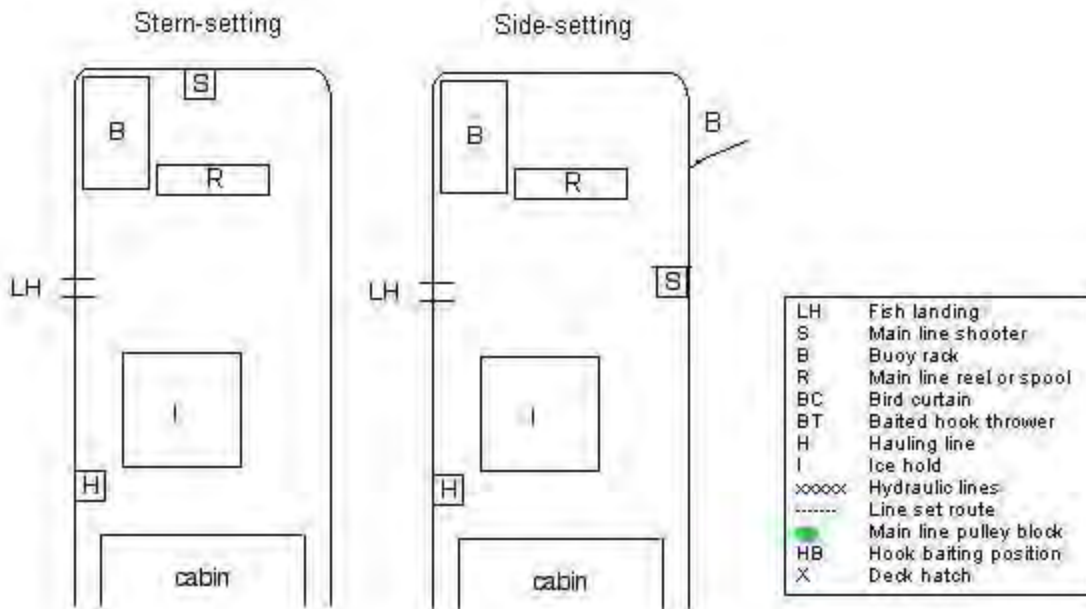


Fig. 43. Illustration of plan view of F/V Seven Star II deck layout before and after conversion from stern to side-setting.



Fig. 44. F/V Seven Star II with the main line shooter mounted in its previous position in the center of the stern and welder Phon Do with his hand positioned on the new main line shooter mount located on the port side.

## 2.21. F/V Robin

**Summary of side setting information for evaluation of bird avoidance performance:** Baited hooks are estimated to be 4.0 m deep when the vessel stern passes, the bait throwing position is 3.95 m from the port corner, baited hooks are thrown approximately 10.95 m forward from the stern, and a bird curtain is mounted 1.95 m from the stern and 0.5 m from the shooter.

**Summary of pros and cons of side setting conversion related to operational benefits:** The distance totes have to be moved is reduced, and the captain can now see the setting operation, increasing safety. Otherwise there has been no additional substantial operational benefits. The owner and captain decided to make only minor modifications of the deck design at this time to facilitate side setting from the port side, to avoid the starboard hauling position. In one year he plans to make major changes to the entire deck design, which will include moving the main line reel to the stern and fabricate a new buoy rack across the deck in front of the reel. This will require moving the existing deck hatch.

**Reason(s) for change to side setting:** Take advantage of the incentives program and believes that side setting will eventually be mandatory.

### **Summary of Changes**

Purchase materials, fabricate bird curtain

Cut and fit bird curtain stand to bulwark

Main line shooter stand fabricated and attached

Purchase and install hydraulic pipes and fittings

Main line shooter cut and attached in new position

Rust proofed and re-painted areas that were welded and grinded



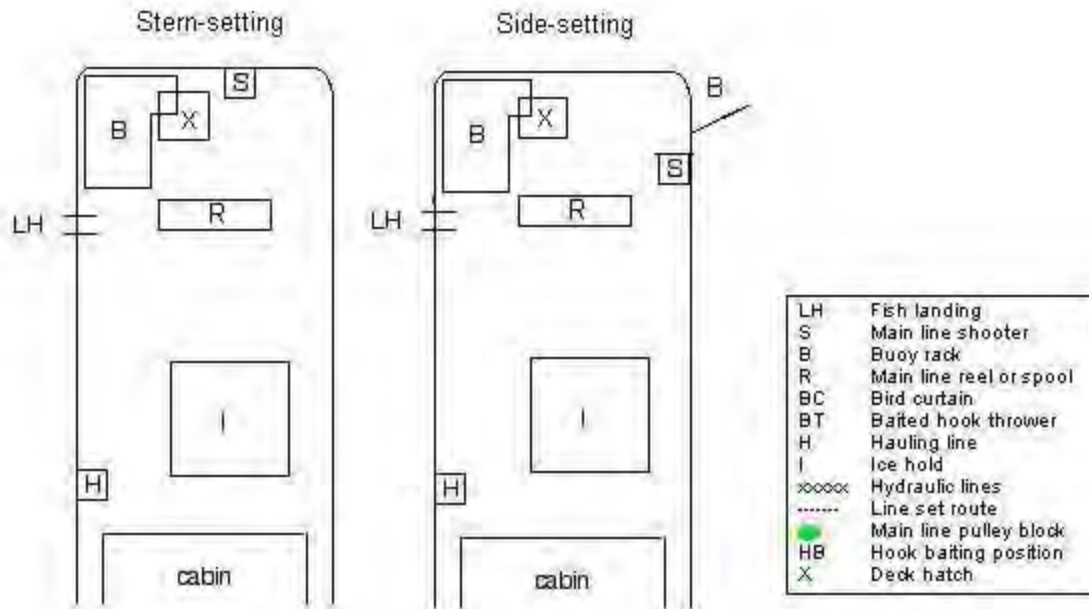


Fig. 45. Illustration of plan view of F/V Robin deck layout before and after conversion from stern to side-setting.



## 2.22. F/V Crystal

**Summary of side setting information for evaluation of bird avoidance performance:** Baited hooks are estimated to be 3.5 m deep when the vessel stern passes when the vessel is side setting, which the owner claims is employed when targeting tuna, and are 0.0 m deep when the vessel is stern setting when targeting tuna. When side setting, the bait throwing position is 7 m from the port corner, baited hooks are thrown approximately 14 m forward from the stern. The vessel owner decided not to install a bird curtain due to concerns that it would pose a safety hazard to crew during rough sea conditions.

**Summary of pros and cons of side setting conversion related to operational benefits:** The vessel does not side set when targeting swordfish. The port side setting position where the main line shooter mount is installed, selected for use when the vessel targets tuna, is blocked by the wall of the setting shack, and would require cutting a hole in this wall to route the main line, or might possibly be able to be routed through the window. The side setting position is not optimal in terms of saving time moving totes from the new setting position and forward hauling positions, and does not provide the captain with a substantially improved view of setting operations.

**Reason(s) for change to side setting:** Participated in incentives program and received \$1000 towards expenses, but probably was not deserved.

### **Summary of Changes**

Removed main line shooter mount from stern position and relocated to a position 2 m forward of the port stern corner.

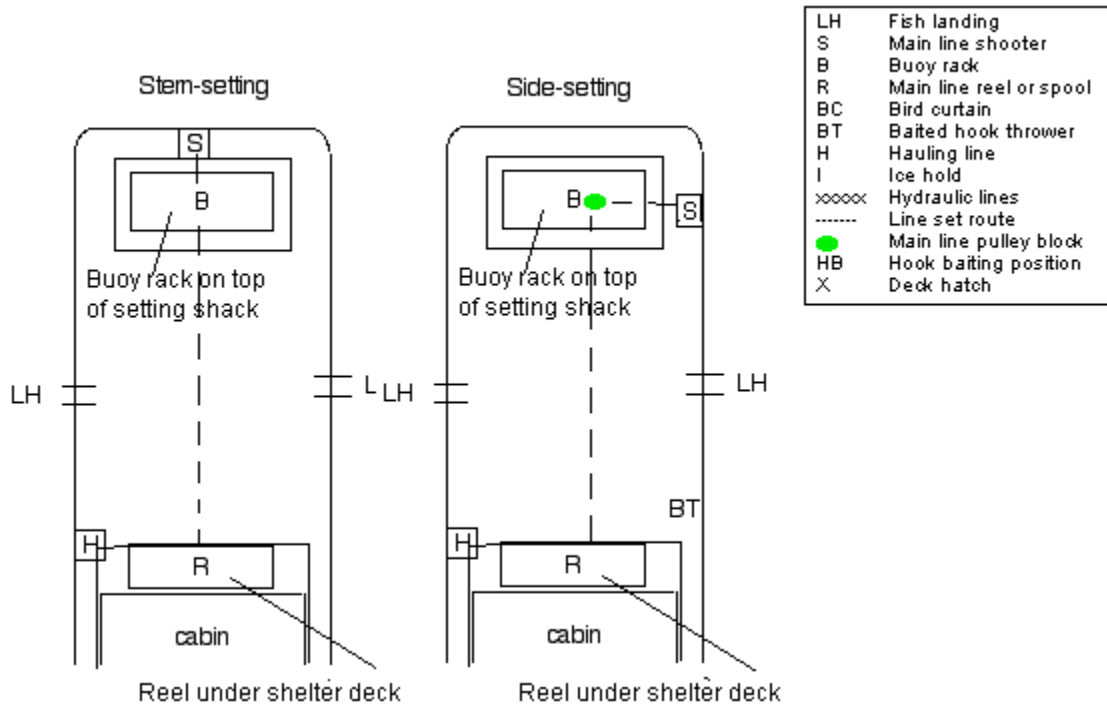


Fig. 46. Illustration of plan view of F/V Crystal deck layout when stern setting (prior to “conversion” and when targeting swordfish), and when side setting when targeting tuna.



Fig. 47. F/V Crystal port-side, showing location of spool behind the cabin, setting shack, and buoy rack.



Fig. 48. Port-side main line shooter mount to be used on the F/V Crystal when targeting tuna.

## 2.23. F/V Miss Lisa

### Summary of side setting information for evaluation of bird avoidance performance:

Baited hooks are estimated to be 4.4 m deep when the vessel stern passes, the bait throwing position is 6.3 m from the port corner, baited hooks are thrown approximately 13.3 m forward from the stern, and a bird curtain is mounted 3.3 m from the stern and 1.0 m from the shooter.

### Summary of pros and cons of side setting conversion related to operational benefits:

The distance totes have to be moved is reduced, and the captain can now see the setting operation, increasing safety.

**Reason(s) for change to side setting:** Owner/captain is not entirely convinced that side setting is going to be operationally acceptable, but is willing to give it a try.

### Summary of Changes

Replace weather wall, install a hinged aluminum shutter where setting will take place.

Purchase materials, fabricate bird curtain

Cut and fit bird curtain stand to bulwark

Main line shooter stand fabricated and attached

Purchase and install hydraulic pipes and fittings

Main line shooter cut and attached in new position

Rust proofed and re-painted areas that were welded and grinded

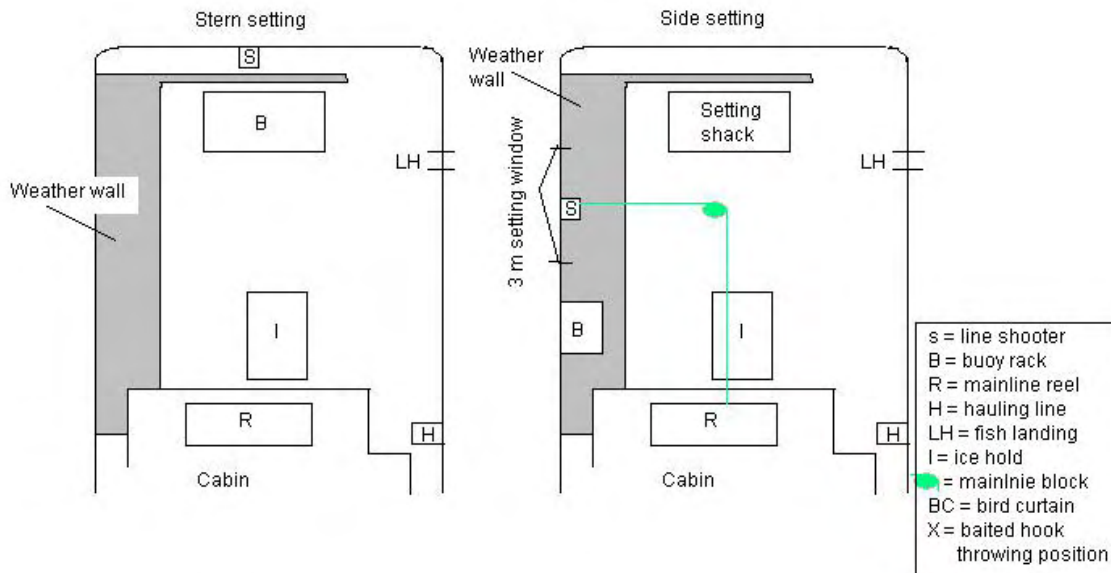


Fig. 49. Illustration of plan view of F/V Miss Lisa deck layout before and after conversion from stern to side-setting.

## 2.24. F/V Heola

### Summary of side setting information for evaluation of bird avoidance

**performance:** Baited hooks are estimated to be 4.4 m deep when the vessel stern passes, the bait throwing position is 6.3 m from the port corner, baited hooks are thrown approximately 13.3 m forward from the stern, and a bird curtain is mounted 1.65 m from the stern and 2.9 m from the shooter.

### Summary of pros and cons of side setting conversion related to

**operational benefits:** The distance totes have to be moved is reduced, and the captain can now see the setting operation, increasing safety.

**Reason(s) for change to side setting:** The owner expressed a strong desire to change to side set but would not provide a clear reason.

### Summary of Changes

Purchase materials, fabricate bird curtain

Cut and fit bird curtain stand to bulwark

Main line shooter stand fabricated and attached

Purchase and install hydraulic pipes and fittings

Main line shooter cut and attached in new position

Rust proofed and re-painted areas that were welded and grinded

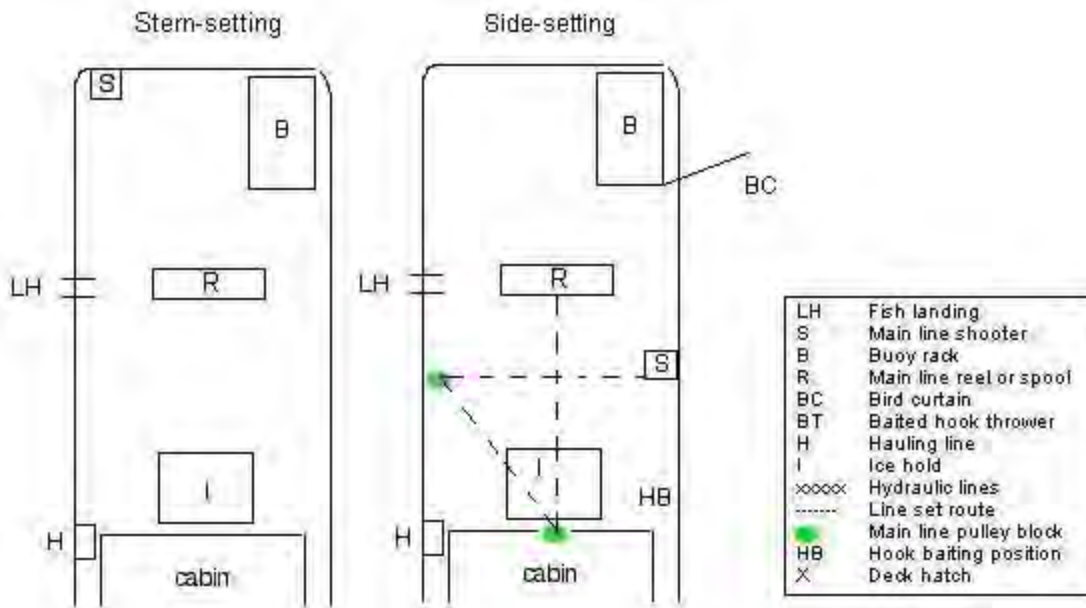


Fig. 50. Illustration of plan view of F/V Heola deck layout before and after conversion from stern to side-setting.



Fig. 51. Bow and port sides of the F/V Heola.



## 2.25. F/V Sea Falcon

### Summary of side setting information for evaluation of bird avoidance performance:

Baited hooks are estimated to be 7.3 m deep when the vessel stern passes, the bait throwing position is 11.5 m from the port corner, baited hooks are thrown approximately 18.5 m forward from the stern.

### Summary of pros and cons of side setting conversion related to operational benefits:

The distance totes have to be moved is reduced, and the captain can now see the setting operation, increasing safety.

**Reason(s) for change to side setting:** Increases operational efficiency, expects to reduce bird interactions, and will be an improved position in regards to weather.

### Summary of Changes

Purchase materials, fabricate bird curtain

Cut and fit bird curtain stand to bulwark

Main line shooter stand fabricated and attached

Purchase and install hydraulic pipes and fittings

Main line shooter cut and attached in new position

Rust proofed and re-painted areas that were welded and grinded

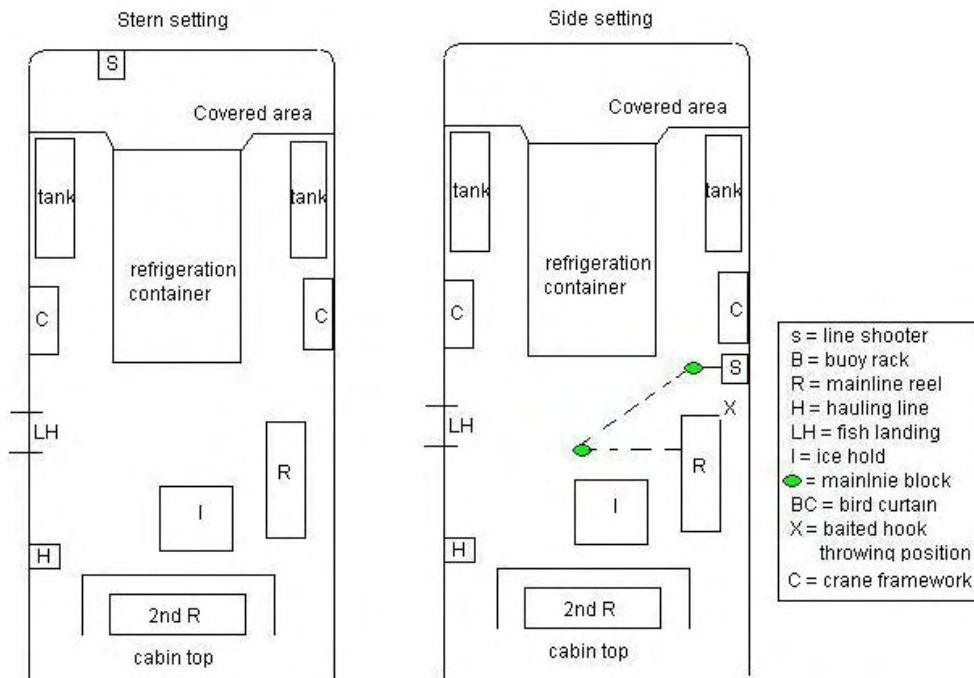


Fig. 52. Illustration of plan view of F/V Sea Falcon deck layout before and after conversion from stern to side-setting.



Fig. 53. Crane framework and refrigeration container on the deck of the F/V Sea Falcon.



## **2.26. F/V Princess Jasmine and Princess Jasmine II**

These vessels have nearly identical layouts and required the same changes to switch from stern to side setting.

**Summary of side setting information for evaluation of bird avoidance performance:** The depth of baited hooks when the vessel stern passes, and the locations of the bait throwing position and bird curtain are not available at the time of writing this report. Fishing gear had not yet been prepared for this vessel, and a bird curtain had not yet been installed.

**Summary of pros and cons of side setting conversion related to operational benefits:** The distance totes have to be moved is reduced.

**Reason(s) for change to side setting:** Owner did not specify.

### **Summary of Changes**

Removed starboard sidewall to accommodate the main line shooter on the starboard side (this boat hauls on the port-side)

New radio beacon rack (stainless steel 2.25 inch pipe) installed across the stern bulwark (this is evidence that the boat will not revert to stern set as the radio beacons would be in the way of the aft setting work area)

Purchase materials, fabricate bird curtain

Cut and fit bird curtain stand to bulwark

Main line shooter stand fabricated and attached

Purchase and install hydraulic pipes and fittings

Main line shooter cut and attached in new position

Rust proofed and re-painted areas that were welded and grinded

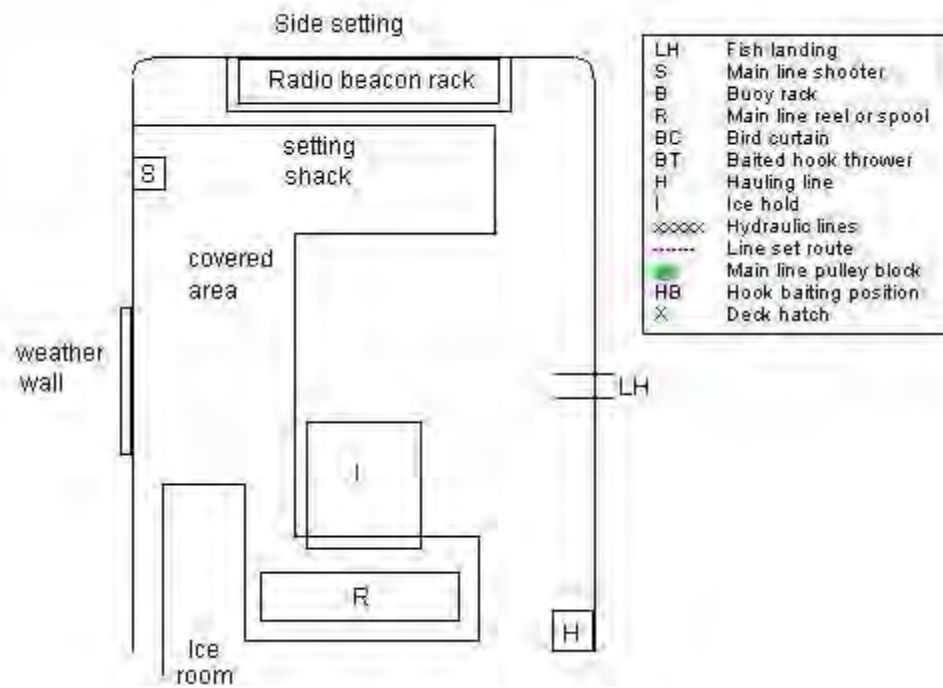


Fig. 54. Illustration of plan view of F/V Princess Jasmine and Princess Jasmine II deck layouts after conversion from stern to side-setting (these two vessels have identical layouts).

## 2.27. F/V Lihau

### Summary of side setting information for evaluation of bird avoidance performance:

Baited hooks are estimated to be 6.8 m deep when the vessel stern passes, the bait throwing position is 13.25 m from the port corner, baited hooks are thrown approximately 20.25 m forward from the stern, and a bird curtain is mounted 4.6 m from the stern and 6.65 m from the shooter.

### Summary of pros and cons of side setting conversion related to operational benefits:

Minimizes the distance that totes have to be moved between the setting and hauling positions.

**Reason(s) for change to side setting:** Take advantage of the side setting technical assistance incentive program. The captain can now see the setting operation, increasing safety.

### Summary of Changes

Purchase materials, fabricate bird curtain

Cut and fit bird curtain stand to bulwark

Main line shooter stand fabricated and attached

Purchase and install hydraulic pipes and fittings

Main line shooter cut and attached in new position

Rust proofed and re-painted areas that were welded and grinded

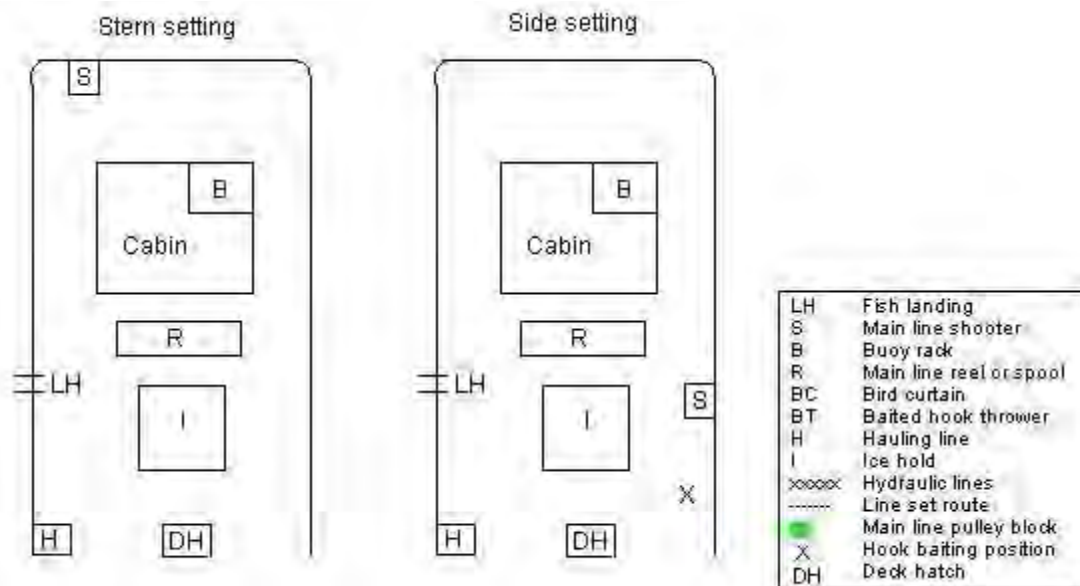


Fig. 55. Illustration of plan view of F/V Lihau deck layout before and after conversion from stern to side-setting.

### 3. BIRD CURTAIN AND MAIN LINE SHOOTER MOUNT DESIGNS

The bird pole is constructed from a standard 20 foot, 1 ¼ inch aluminum tubing cut to the appropriate length and then bent with a hydraulic pipe bending machine to an angle that can accommodate vessel roll without contacting the sea surface (Figs. 50-52). The mount for the pole is made of two 3 inch sections of 1 ½ inch schedule 10 stainless steel pipe. The upper one is drilled to accept 3/8 inch stainless steel bolt that locks the curtain in position. The lower one has a stainless steel plate welded across one end upon which the lower end of the curtain pole rotates. Both have a ½ inch x ¼ inch stainless steel tab welded down one side for welding onto the vessels.

Project coordinators worked with vessel crew to install bird curtains between the setting position and stern on all vessels that switched to side set. Project coordinators also provided assistance to vessels already side setting to construct and install bird curtains. The bird curtain is used when side-setting to increase the effectiveness of this bird avoidance method by preventing birds from establishing a flight path along the side of the boat where baited hooks are deployed. Use of a bird curtain is most advantageous to protect baited hooks when a tote tangle occurs or if baits inadvertently are thrown away from the protection of the vessel hull. Total cost for materials for a bird curtain and for welding services for mounting is about \$200.

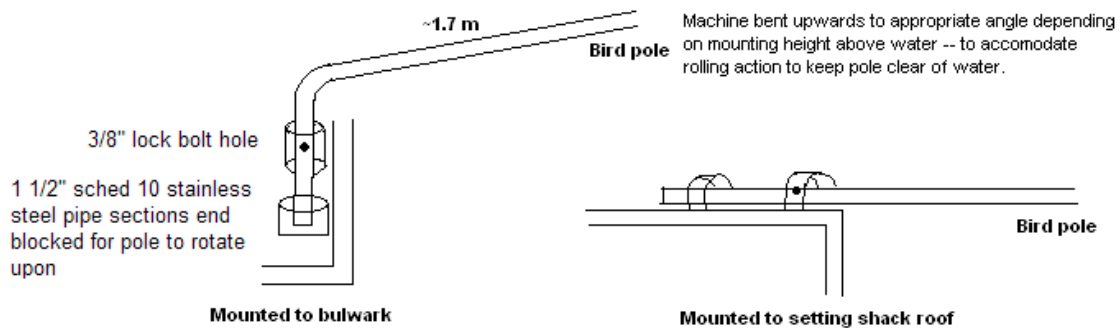
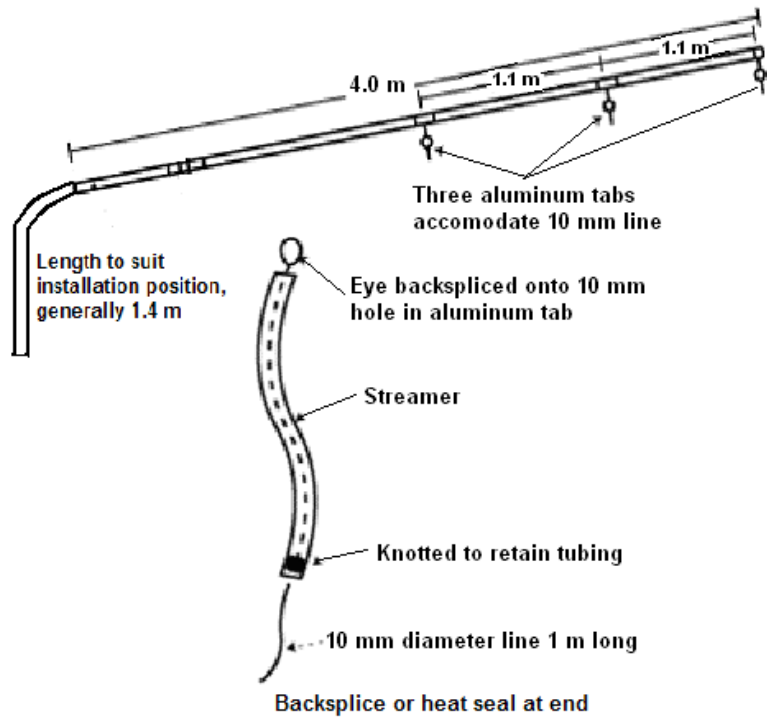
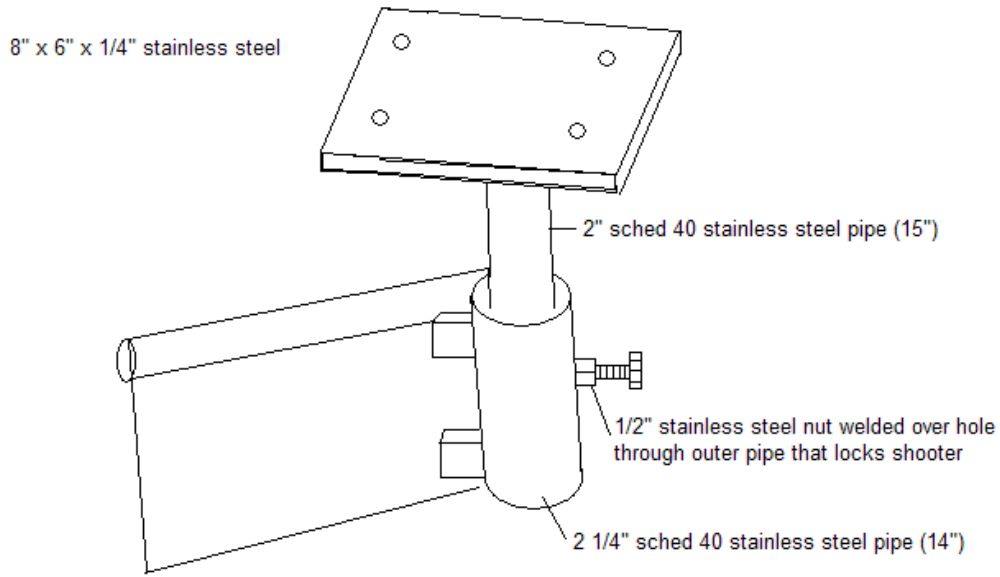


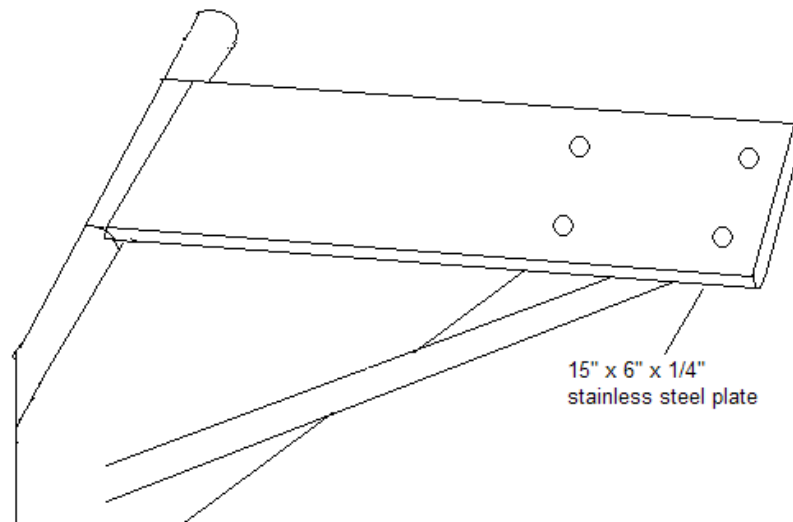
Fig. 56. Pole, streamers, and mounting bracket used to create the bird curtain. Mount can be attached to the bulwark (davit style mount) or on a setting shack roof, buoy rack frame, or other structure. Three streamers of 20 mm outer diameter, 14 mm inner diameter garden hose are attached to 3 aluminum tabs with stainless steel spring clips. The hose hangs 200 mm above the sea surface with 10 mm diameter line protruding about 1 m from the end of the hose to drag along the sea surface.



Fig. 57. Installing a bird curtain: attaching the streamers to the pole by either eye splicing through the 13 mm hole in aluminum tab on pole or onto stainless steel clips (top left), attachment of streamer to pole (top right), knot holding hose in position and either backsplice or heat seal at the end of the streamer (bottom left), and complete deployed bird curtain (bottom right).



**(a) Swivel base for mainline shooter**



**(b) Fixed base plate that has shooter protected within vessel side**

Figs. 58 a and b. Illustration of two types of mounts for main line shooters installed on Hawaii longline vessels, designed to safeguard the shooter from damage in its side mounted position.

#### 4. NEXT STEPS

- **Incentives Program:** Extend the duration of the technical assistance incentives program to capitalize on the current momentum and willing participation by the Hawaii longline industry to assist with all remaining vessels in the fleet that wish to switch to side set.
- **Observer Data Collection Protocols:** Ensure observer data protocols include the collect of information to assess possible causes for differences in bird avoidance effectiveness of side setting vessels. This includes adopting a consistent and replicable method to observe average albatross abundance during entire sets, practices of crew setting baited hooks (where are the baited hooks thrown, how far forward is their setting position), vessel setting speed, propeller direction, and gear weighting configuration. Because many vessels employ a variety of weighing configurations throughout their branch lines, this necessitates that observers collect information on each occasion a seabird is captured. This will enable scientists to assess each side-setting vessel to identify design and operational differences, and determine if there is a correlation between vessels having relatively low seabird bycatch rates normalized for albatross abundance and specific fishing gear, vessel design, or fishing methods. Similar data are required also for non side-setting vessels, including the position of the line shooter in relation to the stern and starboard corners.
- **Side Setting Lessons Learned:** Continue to document lessons learned by vessels in the Hawaii fleet that have switched to side set to maximize the efficacy of side setting deck designs and fishing methods at reducing seabird bycatch and maximize operational benefits. Document subsequent modifications made to the vessel designs and fishing practices to improve side setting performance and bird avoidance efficacy.
- **Trends in Side vs. Stern Setting:** Assess the durability of conversions with time: is there a trend for vessels that switched to side setting to switch back to stern setting, or do vessels that try side setting tend to stick with the new setting position?
- **Comparison of Bird Bycatch Avoidance Efficacy:** Compare seabird bycatch rates, normalized for albatross abundance, of vessels in the Hawaii fleet that are side-setting versus employing other methods to avoid seabird capture. This can be conducted through analysis of the onboard observer database.
- **Bird Curtain:** Assess the extent that use of a bird curtain contributes to the performance of side setting to reduce seabird bycatch.
- **Alternative Side Setting Methods:** Evaluate the viability of a modified side setting conversion for bird avoidance to suit those vessels unable or unwilling to accept the conventional side set system.
- **Export Lessons Learned:** Broadly disseminate to other longline fleets the benefits learned in the Hawaii fleet of the seabird avoidance and operational benefits of side setting.



## **5. ACKNOWLEDGEMENTS**

Support for this project was provided by U.S. NOAA Fisheries Pacific Islands Fisheries Science Center, Western Pacific Regional Fishery Management Council, and Starbucks Coffee. The owners and crew of the vessels that participated in this technical assistance program were extremely cooperative and supportive of the side setting conversion project. The members of the Hawaii fleet who had already been side setting provided much encouragement to others and useful, practical, aspects of conversion to consider. Phon Do demonstrated extreme persistence and support as a welder and liaison with boat operators to discuss the project and side setting conversion options available. Sean Martin and Jim Cook of Pacific Ocean Producers, without awareness or recognition by most of the participants in the project, supported the project through procuring materials, providing advice, and providing free access to their workshop and equipment. Pacific Ocean Producers staff were very helpful throughout.

## 6. GLOSSARY

Terms are defined relative to the gear configurations of the Hawaii pelagic longline tuna and swordfish vessels.

**Branch line:** The hook line that attaches to the **mainline** with a **clip**, generally 6-10 m in length with the following components: **clip**, 6-10 m of monofilament nylon line (a few vessels use chord), 45 or 60 g lead center **swivel**, **leader** (wire or monofilament); and hook.

**Bulwark:** The sides of the boat (wall or fence) above the deck level, generally 80-90 cm high.

**Buoy:** Plastic float used to support the mainline.

**Buoy rack:** Storage compartment for buoys. Generally constructed of steel tubing.

**Clip:** Standard spring action stainless steel wire that attaches branch lines to the mainline.

**Float:** See **buoy**.

**Leader:** The line or wire between the hook and swivel on a branch line.

**Level wind:** Mainline guide that track across the spool width in order that the mainline is laid evenly onto the spool.

**Mainline:** Monofilament line that is deployed horizontally off of a **reel** onto which **branch lines** with baited hooks, **buoys**, and radio beacons are attached.

**Pulley block:** A large aluminum pulley with hanging eye that is used to re-direct the mainline on or off the spool or through the **level wind**.

**Reel:** See **spool**.

**Setting shack:** A semi-enclosed roofed room at the aft deck area within which line setting is carried out with some comfort and protection from the weather (sun, rain). A common feature on Vietnamese-American vessels that have targeted swordfish. A major obstacle to side setting because converting might require crew to set outside of the shack to side set. One disadvantage of deploying gear from within a setting shack is the captain cannot observe hazardous activities.

**Shooter or mainline shooter:** Hydraulic machine that sets the mainline at a controllable and variable rate as desired to achieve the desired line set depth (manufactured by the company Lindgren Pittman).

**Snap:** See **clip**.

**Spool:** Hydraulic drum upon which mainline is wound (manufactured by the company Lindgren Pittman).

**Swivel:** Lead center.

**Swivel mainline shooter base:** An inner and outer pipe that, when disengaged from a locking pin, allows the **mainline shooter** to swivel around as a means of protecting a side-mounted shooter from damage during dock-side activities. Also permits the shooter position to be adjusted to allow the main line to entire at the correct angle.

**Tote:** The boxes used to store branch lines. A standard molded nylon 29" x 44" box is generally used. A few boats use unique wooden boxes. Each tote contains up to 400 branch lines. Most boats carry 6 totes.

**Trace:** See **leader**.