

SOP 9: Training Survey Personnel

Version 1.0

Revision History Log:

Previous Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #
	September 2013	S. Hoekman, W. Johnson, B. Moynahan, C. Sergeant	Initial version		1.0

Summary

Training survey personnel requires a combination of pre-season and in-the-field preparation in order to ensure successful data collection and safety during field operations. In particular, Observers must develop and maintain required proficiencies, including murrelet identification, distance estimation, and on-transect data reporting. General knowledge of the larger context of data collection and analyses is also beneficial, including understanding assumptions of distance sampling, methods for abundance estimation, and basic operation of NPTransect software. When applicable, we refer to other portions of the protocol to provide more information.

General Observer Qualifications

Observers should have previous experience with field survey logistics, identification of birds using binoculars, and general outdoor safety. Surveys require observers to stand at the bow of an 8 to 10 m research vessel in variable sea and weather conditions using binoculars to detect, enumerate, and identify murrelets for up to 10 hours per day. Although no previous experience with murrelets or at-sea line transect surveys is required, inexperienced Observers will require extensive training, preferably with an experienced Observer.

New Observers should be familiar with objectives and general methods of this protocol, but should pay particular attention to the protocol narrative and SOP 1, which describes field methods for Observers. The protocol narrative provides background information and conservation context, justifies the KIMU monitoring program, and summarizes details of the sampling design and analytic methods. Upon completing training, Observers should be able to efficiently scan each transect using binoculars, work alone or in cooperation with other Observers, competently identify KIMU and MAMU, use the angle board, accurately estimate at-sea distances ≤ 200 m, and transmit observations to the Data Recorder using correct procedures.

Accurately Identifying Murrelets

KIMU and MAMU are cryptic species (sympatric with similar morphology and behavior) and cannot always be distinguished in the field. But with knowledge of identifying characteristics (Table SOP 9.1), photo study (Figures SOP 9.1, SOP 9.2), and practice in the field, Observers can confidently

identify most individuals in typical survey conditions. It is important to remember that the SEAN sampling design allows Observers to classify murrelet observations as “unidentified.” This species class should be used when identification is uncertain, on account of high murrelet density (i.e., insufficient time to identify each individual), difficult viewing conditions, or other factors. Misidentified murrelets incur greater risk of biasing population estimates than unidentified murrelets; therefore, murrelets should be classified to species only when confidence in identification is high. Use of the “unidentified” class is preferred to guessing species identity when identifying characteristics are not seen. Color of outer tail retrices is the primary diagnostic characteristic, but is visible only in the first few seconds after take-off from the water. Note both species may have white on flanks of rump or on undertail coverts. The “KEER” calls of MAMU are also diagnostic, but may be difficult to associate with individuals. Other identifying characteristics describe overlapping continuums between species and are best used in aggregate to inform species identification. Be aware changing lighting conditions can strongly influence impressions of bill length and especially overall coloration.

Surveys occur in early to mid-July, so the majority of murrelets will be in summer plumage, which is generally darker and more muted than black and white winter plumage. By mid-July, small numbers of juvenile murrelets may also be present on the water. In both cases, KIMU typically have black caps that do not include the eye, while MAMU typically have black caps including the eye, although plumages may be highly variable.

Table SOP 9.1. Main identifying characteristics of Kittlitz’s murrelets in summer plumage in comparison to marbled murrelets; adapted from K. Kuletz training presentation.

Identifying characteristic	Kittlitz’s murrelet	Marbled murrelet
Outer retrices	White	Dark brown
Bill length	Relatively short; hard to see at times	Relatively long
Head shape	Overall shape more triangular, blunt	More tapered toward bill
Overall color	Mottled; white/grey to tan/brown	Uniform chocolate to mixed tan/brown
Belly/flanks in flight	Mostly white to all white; high contrast between light underparts and dark wings	All dark to mostly dark
Call	Nasally, one-note, “MWAH” (rare)	High-pitched “KEER” or “KREE” (common)

Many representative photos of KIMU and MAMU exist that can aid in identification training. The SEAN plans on developing a visual training module in cooperation with other agencies and non-government organizations involved in KIMU surveys throughout Alaska. A future coordinated training effort will help ensure similar identification skills among murrelet survey observers across Alaska. At this time, future Observers will discuss the appropriate level of training and necessary review materials with the Project Leader before surveys begin. After a new Observer has studied photos, discussed murrelet identification with an experienced Observer, and completed existing training materials, the next step is field practice. Individuals with average field experience will likely

devote a day to office study (including reading protocol materials) and two or three days to field practice.

No matter what training materials are available, the Project Leader determines whether an Observer is prepared to conduct field surveys.

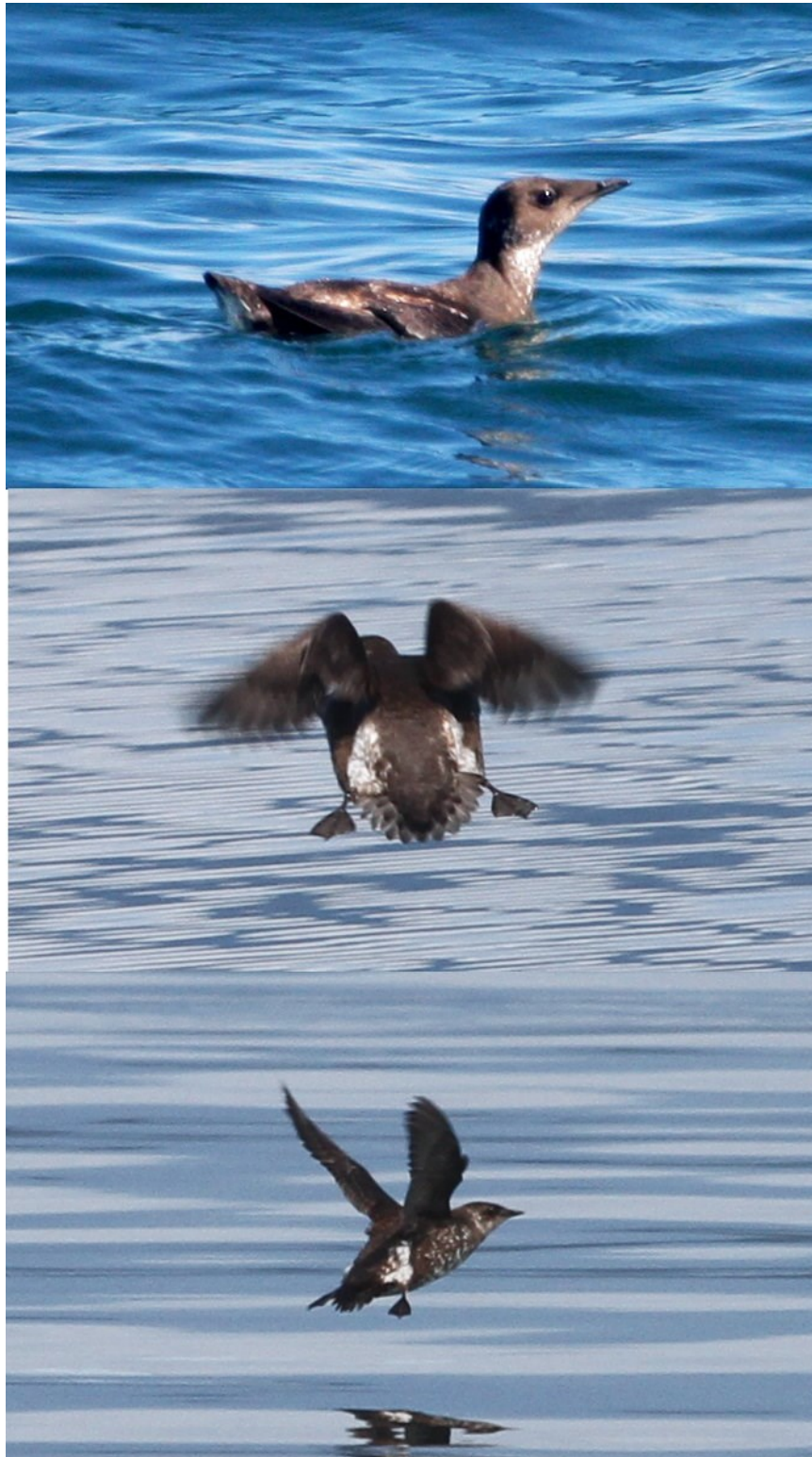


Figure SOP 9.1. Representative photos of MAMU; note longer bill and relatively uniform dark brown color (top; B. Moynahan/NPS photo), white-sided rump but brown outer retrices (middle; C. Sergeant/NPS photo), and speckled but mostly dark underparts/belly (bottom; C. Sergeant/NPS photo).



Figure SOP 9.2. Representative photos of KIMU: note short bill, extensive feathering at base of bill, and overall white/grey mottled coloration (top; A. Schaefer/NPS photo), white outer retrices but unusually dark tan/chocolate coloration on back (middle; C. Sergeant/NPS photo), and short feathered bill, mottled

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white/grey coloration with mostly white belly contrasting with darker wings (bottom; S. Hoekman/NPS photo).

Distance Estimation

Accurate ocular estimation of distance to on-water objects is critical to surveys, and distance estimation calibration procedures consisting of training and assessment ensure Observers develop and maintain proficiency. Accuracy in distance estimation encompasses two conceptual components: bias (average deviation of estimates from truth) and variability (deviations of individual estimates from truth). Minimizing bias is paramount, as it propagates opposite but proportionally similar error in population status (i.e., abundance and density) estimates (Buckland et al. 2001). Unbiased, random variability in distance estimates creates negative bias in population estimates, although for line transect surveys resulting bias often is small and estimation of distances near the transect center line are of primary importance. When the average variability in estimates is $< \frac{1}{2}$ the width of the detection function's "shoulder," resulting bias in population estimates will be minimal ($\leq 3\%$).

For 2010-2012 surveys, width of shoulders for estimated detection functions have ranged from ~60-90 m (Hoekman et al. 2011, 2013a, b), suggesting variability averaging < 30 m will have a negligible effect on population estimates. Based on observations that distance estimates during surveys average ~120 m and that deviations during Observer calibration have been proportional to true distances (NPS unpublished data), we feel that achieving CVs in deviations of ≤ 0.2 will satisfy requirements for minimal bias in population estimates.

Observer performance objective: To minimize bias in population estimates from error in distance estimation, each Observer for a survey year should be trained to estimate on-water distances of ≤ 200 m with an average bias of $\leq 5\%$ and CV of deviations ≤ 0.2 .

Distance estimation calibration requires the following personnel and equipment:

- ≥ 1 Observer(s)
- 1 Boat Pilot
- 1 Session Sergeant (role typically filled by the Data Manager)
- 6-10 calibration buoys (oblong or cylindrical fishing buoys, 8-10" long x ~4" diameter, painted grey, marked with similar colored infrared retro-reflective tape)
- Laser rangefinder
- Dip net
- Distance Calibration-Observer and Distance Calibration-Session Sergeant forms on waterproof paper

Calibration buoys should be neutral in color and should be marked with reflective tape visible above the water line. Ideally, range finders should be able to obtain distance readings in ≤ 10 seconds at ranges ≤ 200 m under all survey environmental conditions.

Distance estimation calibration sessions will consist of variable numbers of trials in which Observers will record estimated distances to calibration buoys and the Session Sergeant will use a rangefinder to record true distances. Sessions can be for either training or assessment. During training sessions, the Session Sergeant will provide immediate feedback on true distances to Observers. No immediate

feedback will be provided during assessment sessions, but summarized measures of performance (average and CV of deviations) for each Observer will be provided after each session.

Each session begins by dispersing ~8 calibration buoys on the water in an area of diameter no more than 200 m. The Session Sergeant records data associated with each session on the Distance Calibration Trials: Session Sergeant Record form (initials of Sergeant and Observers, date, start/end times of session, description of training objects (buoys), session type, and environmental conditions). Each Observer records initials, date, session start time, and session type on his/her own Distance Calibration Trials: Observer Record form. See forms in Appendix E. The session start time marks the beginning of dispersal of buoys, while the end time marks when all buoys are retrieved or the session transitions to a different type (e.g., assessment to training).

To begin each trial, the Boat Pilot maneuvers the boat so that most buoys are on one side of the boat at distances of ~20-200 m and then cuts engine power and lets the boat drift with the current. When forward motion of the boat stops, the Session Sergeant indicates the position of the first target buoy. Within 5-10 seconds after all Observers have located the target buoy, the Session Sergeant records the true distance obtained from the rangefinder (to nearest m) and each Observer records their ocular distance estimate (to nearest 10 m) in box 1 for the trial. Each trial continues for up to 9 targets. New trials are initiated by the Sergeant requesting the Boat Pilot to move the boat to a new location, and the session continues until the desired number of trials (explained below) is reached. After the final trial, The Boat Pilot maneuvers the boat to allow buoys to be retrieved using the dip net.

After each session, the Data Recorder uses the Excel spreadsheet "Distance_Calibration.xlsx" stored on the data capture laptop in directory "C:\KIMU\ Distance_Estimation\" for data entry and generation of summary statistics. Bias (average deviation of estimated versus true distances) and variability (CV of deviations) for each Observer should be provided to Observers and the Project Leader. Additional summary analyses (e.g., relative to environmental conditions) may also be pertinent to assessing Observer performance. Assessment data will be kept available on the laptop and, after completion of the season, archived to the project area of SEAN's file server as detailed in SOP 3.

Prior to the start of surveys, distance estimation training sessions should be interspersed with other training activities until the Project Leader determines each Observer meets distance calibration accuracy objectives. During this period, the frequency and duration of training sessions are at the discretion of the Project Leader but should reflect experience levels and proficiency of Observers. When developing proficiency of inexperienced Observers, training sessions likely should be at relatively high frequency and duration (i.e., >1 session/day, 6+ trials/session). Once proficiency is demonstrated, it will be essential to maintain proficiency by conducting short training sessions (3-4 trials) on days surveys are conducted. Training sessions should be conducted across the range of environmental conditions experienced during surveys and should allow Observers to develop proficiency in estimation of distances ≤ 200 m. However, the Project Leader may choose to concentrate sessions on specific conditions to ensure proficiency for conditions for which Observers have little experience or substandard performance.

Assessment sessions generally should consist of three or more trials and generally should not immediately follow training sessions. Assessment sessions should begin during the pre-survey period after the Project Leader feels Observers have demonstrated proficiency in distance estimation during training sessions. The Project Leader should assess results in context of meeting Observer performance objectives over the course of each survey year. Because samples for individual assessment sessions will be relatively small, results from individual sessions are likely to be somewhat variable even if long-term averages meet performance objectives. Generally, individual sessions not exceeding 10% bias and CV of deviations of 0.25 will be within acceptable performance limits, although the Project Leader should consider factors extending across assessment sessions (e.g., have sequential sessions shown poor performance or moderate bias in the same direction?) when deciding if remedial action, such as retraining, is necessary. It should also be noted that average bias will contribute to the CV of deviations. Because bias is critical, it should be addressed first.

All Observers should meet performance limits during at least two assessment sessions under differing environmental conditions prior to commencing surveys. Once surveys have begun, conducting assessment sessions every other survey day is adequate for characterizing Observer performance. If results of assessment sessions fall outside performance limits, the Project Leader can prescribe additional training and assessment sessions as needed to improve and assess performance.

Conditions for assessment sessions ideally should match those during surveys as closely as practical. The distribution of true distances of targets should be typical of the distribution of estimated distances from survey observations (i.e., average = 100-120, SD =40-50). Furthermore, environmental conditions should be representative of those prevailing during the current survey year.

Distance Calibration Data Management

The Excel spreadsheet file "Distance_Calibration.xlsx" in directory "C:\KIMU\Distance_Estimation\" of the data capture laptop serves to store distance calibration data and provide feedback on Observer performance after each calibration session (Table SOP 9.2). Data are entered, proofed, and stored in Excel tables, and interactive PivotTables immediately generate summary statistics for each Observer, such as the average deviation of estimated versus true distances and the CV of those deviations. Filters and data categories may also be used to generate summaries for specific conditions or comparing factors (e.g., differing environmental conditions, training versus assessment sessions). The instructions below cover basic use and function of this spreadsheet, but native Excel help files will aid users in troubleshooting and exploring advanced functionality of pivot tables.

Detailed Steps

A. Create tables for the current survey year

1. In the "Calibration Draft.xlsx" file, right-click the 'Template' tab, select 'Copy', and rename the new tab with the current survey year.
2. On the current year tab, left-click within the Excel table (with the blue column headers) containing the sample data.

3. Rename the table "Tableyy" where yy is the last 2 digits of the survey year, by selecting 'Design' under 'Table Tools' in the ribbon bar and entering the name in the box under 'Table Name'.
4. In the Excel table, double left-click on the column headers with the "Obs1" to "Obs3" and rename as needed with the initials of survey Observers.
5. Left-click within the PivotTable (with the red column headers) and select 'Options' under 'PivotTable Tools' in the ribbon bar.
6. In the 'Data' box, select 'Change Data Source' and enter the name of the Excel table from 1.3 above.
7. Double left-click on the column headers of the PivotTable to replace 'Obs1' to 'Obs3' with initials of survey Observers.
8. Delete or replace the black sample data in the Excel table. The gray-shaded text under the gray header bar should typically not be altered unless changes are needed to the table structure or function (e.g., adding additional Observers).

B. Entering data after each session

1. Data should be entered immediately after each calibration session, typically by the Data Recorder.
2. The Excel table should contain one row for each distance recorded on the Session Sergeant record.
3. If sufficient rows are not available in the table, create additional rows by left-clicking and dragging down the bottom-right corner of the table. Gray text on the right-hand side of the table should propagate down the new rows.
4. Begin each session by entering the metadata from the Session Sergeant record in the first unoccupied row beneath existing data.
5. Beginning with this row, enter each combination of Trial #, Target #, and true distance on subsequent rows.
6. When reaching the end of the data for the Session Sergeant record, metadata from step 2.4 may be copied to all corresponding rows for the session.
7. For each Observer record, enter the estimated distances in the column corresponding to the Observer's initials by matching the Date, session Start Time, Trial #, and Target # with those already entered for the Session Sergeant record.
8. If distance estimates are missing for an Observer, leave corresponding cells blank in the Excel table.
9. Data entered in the Excel table should be proofed against the original data after entering each record.

C. Data summary

1. After making changes to the Excel table or the PivotTable, the PivotTable must be refreshed (sometimes twice) to reflect changes. Refresh by left-clicking within the table, select 'Options' under 'PivotTable Tools' in the ribbon bar, and then 'Refresh' in the Data box.
2. Because true distances to individual targets may be longer than ranges that Observers are trained and assessed, it may be useful to filter data to be used in the PivotTable.

All records with true distances greater than the distance specified in the purple filter box above the upper-left corner of the Excel table will be censored from Pivot Table summaries.

3. As initially set up, the PivotTable displays from left to right the average true distance to targets, the average deviation of estimated versus true distances for each Observer, the CV of deviations for each Observer, and the SD of deviations for each Observer.
4. Categories for data display are shown in the column under the 'Row Labels' header. The initial setup displays these summary statistics by survey day, and the 'Grand Total' row provide overall statistics.
5. The data filter, set to the 'Training' field, is displayed above the PivotTable. Left-clicking on the drop-down menu will allow display of statistics for training sessions ('Y'), assessment sessions ('N'), or all data ('All').
6. The PivotTable is interactive: left-click within the PivotTable to bring up the 'PivotTable Field List'. If this is not visible, select 'Options' under 'PivotTable Tools' in the ribbon bar, and make sure 'Field List' is selected in the 'Show' box.
7. Categories for comparing statistics may be added to or removed from the PivotTable by dragging the desired fields into or out of the 'Row Labels' box. For example, removing 'Date' and adding 'Beaufort' would show statistics for each Beaufort category recorded in the data.
8. Similarly, desired fields for filtering data may be added or removed from the 'Report Filter' box.
9. Remember that the PivotTable will not update until it is 'refreshed'.

Table SOP 9.2. Fields in spreadsheet file "Distance_Calibration.xlsx".

Field	Type	Description
Excel table		
Year	integer	4-digit survey year
Sergeant	string	Initials of Session Sergeant
Date	date	Date (<i>mm/dd/yyyy</i>)
Start time	time	Start time of session (24:00)
End time	time	End time of session (24:00)
Training	string(1)	Y N indicator for whether data are for a training session
Trial	integer	Number of trial within session
Target	integer	Number of buoy target during Trial
Distance	integer	True distance from rangefinder
Obs1	string	Placeholder for initials of Observer(s)
Beaufort	integer	Beaufort Scale for sea state. 0: Calm <1 km/h; 0 cm, Glossy 1: Light air 1-3 km/h; 0-20 cm, Ripples 2: Light breeze 3-7 km/h; 20-50 cm, Few whitecaps 3: Gentle breeze 8-12 km/h; 50-100 cm, Scattered whitecaps
Weather	integer	Weather conditions. 0: <50% Cloud cover, 1: >50% Cloud cover, 2: Fog, 3: Mist – Light rain, 4: Moderate – Heavy rain
Visibility	integer	Code for seeing distance in meters. 1: >500 m, 2: 250-500 m, 3: <250 m
Buoys	string	Brief description of survey buoys (size, color, etc.)

Field	Type	Description
Notes	string	Additional relevant information
PivotTable		
Row Labels	numeric	Field(s) used to categorize summaries
Avg{Distance}	numeric	Average true distance
Avg{dObs1}	numeric	Average deviation (estimated – true distances) for Observers
CV{Obs1}	numeric	CV of deviations (SD{deviations}/{average true distance}) for Observers
Avg{dist1}	numeric	Average estimated distance for Observers
SD{dObs1}	numeric	SD of deviations (SD{estimated – true distances) for Observers

Survey Observations

From the bow observation deck, Observers locate groups (associations of same-species murrelets separated by <~5 m) and transmit records to the Data Recorder via a park radio. Section 3 of SOP 1 details the manner in which observations are reported. In most conditions, it is best to hold the radio 1–2 inches from one's mouth while speaking in a regular tone. Confirm with the Data Recorder that your voice is coming through clearly. As detailed in SOP 1, data is transferred to the Data Recorder in the following order:

1. "Record" (notifies Data Recorder of incoming record and serves as a sacrificial word in the event of a cut transmission, so critical data are fully transmitted after the first word)
2. Angle to observed group
3. Distance to observed group
4. Group size
5. Species class (K – Kittlitz's, M – marbled, U – unidentified *Brachyramphus* murrelet)

Two examples of observation transmissions are:

1. "Record, one-three-zero degrees, nine-zero meters, 2, K"
2. "Record, one-eight-four degrees, two-zero meters, 1, K, and, 2, M"

Note that in the second transmission, both two species classes were observed at the same location and reported in the same record.

Distance and angle to the observed group should be estimated simultaneously. Ideally, estimates should fix the group's initial location, although this may not always be possible (e.g., because of high density of groups, because groups dive before estimate are obtained, etc.). Distance is an ocular estimate to the nearest 10 m. Observation angle is determined by an angle board mounted on the bow between observers. Once a group is spotted, the angle is measured as soon as possible by pointing the angle indicator in the direction of the group and reading the resulting angle from the board. Dead ahead of the boat is 180°; angles <10° from the center line (171-189°) should be estimated to nearest 1°, all others to the nearest 5°.

Safety in the Field

SEAN abides by the safety policies set forth by GLBA management. These policies describe the necessary Personal Protective Equipment (PPE) for various field conditions and requirements for boat-based surveys. These safety considerations are touched upon in the protocol narrative and reiterated here. This is not considered an exhaustive safety discussion but is meant for SEAN field employees to be aware of what GLBA safety requirements must be understood and abided by before working in the field. Since safety protocols continually evolve, we remind new survey team members that each person is responsible for learning what training is necessary before field work may begin.

Generally, each onboard member of the KIMU survey team must be familiar with the safety features of the research vessel. For the *R/V Fog Lark*, these safety features include emergency position-indication radio beacons (EPIRBs), personal flotation devices (PFDs), immersion suits, park and very high frequency (VHF) radio, radar, fire extinguishers, first-aid kit, and chart plotter/depth sounder.

Boat Pilots operating the *Fog Lark* must complete the full one-week Department of the Interior Marine Operator Certification Course (DOI-MOCC), and attend one-day refresher courses every two years. In addition, Boat Pilots must be certified by GLBA staff (typically protection rangers and/or Coast Guard certified captains) to operate specific vessels. This certification process includes knowledge testing of boating etiquette and safety, and skills testing of driving and mooring.

Before the start of a field day, Boat Pilots must ensure that each survey team member is well-versed in the safety features of the vessel and understands how to act in an emergency, including situations such as what to do in the case of a person overboard.

Literature Cited

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