LIONFISH FOCUSSED SEARCH METHOD

blue ventures beyond conservation

Lionfish Focused Search Method

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Summary

Two 50 m long x 10 m wide transects. Survey teams follow an S-shaped search pattern, swimming slowly and searching thoroughly in all crevices and under overhangs along one side of the transect first (i.e. to 5 m from the transect), and returning along the second half of the transect.

Three lionfish focused search (LFS) surveys can be performed:

- 1. Lionfish only: 4-man survey team
 - a. Lionfish total length estimated to 1 cm accuracy
 - b. Lionfish behavior and habitat
 - c. Lionfish culling (optional)
- 2. Lionfish and competitors/predators: 4-man survey team
 - a. Lionfish and competitor/predator total length estimated to 1 cm accuracy
 - b. Lionfish and competitor/predator behavior and habitat
- 3. Lionfish Threshold Density: 6-man survey team
 - a. Lionfish, prey fish and competitor/predator total length estimated to 1 cm accuracy
 - b. Lionfish and competitor/predator behavior and habitat

Survey Team

A survey team for one transect consists of one "leader" and one "recorder". The leader is responsible for setting the pace and distance of the search pattern. The recorder is responsible for filling out the data sheet. All surveyors must achieve at least 10% accuracy during a fish sizing test in-water (Annex 3). Two prey fish surveyors (minimum Fish ID <u>REEF</u> Level 3) are added to the team for Threshold Density surveys.





Materials

- 2 x 50 meter transect tapes
- 2 x 1 meter long reef relief sticks with 5 cm markings
- Clipboards
- Data sheets printed on underwater paper
- Pencils

Site Setup

Continuous reef

- Lay two 50 m long transects parallel to each other, approximately 15m apart
- If a spur and groove site, transects are laid along the spurs

Patch reefs

- As continuous reef, unless the patch is not big enough for two parallel 50 m transects
- If the patch is not big enough for two 50 m transects, the survey takes the form of a census
 - Lay the transect to cover the length of the patch, recording total length
 - Survey the entire width (record total width) of the patch using an S-shaped pattern





Figure 1: Transect set up at survey site

Method

- 1. Before entering the water, recorders fills in header section of survey sheet (Name, Date, Time, Site, Transect, Cloud Cover, Wind Speed; Annex 1)
- 2. Divers descend and determine transect 1 placement and orientation.
- 3. Recorder for transect 2 waits at 0 m for transect 1, holds onto the end of the transect tape while the leader for transect 2 swims away perpendicular to the direction for the transects. The leader gives the tape three tugs when they reach 15 meters to signal the recorder to release the tape.
- 4. Leaders of both survey teams signal to each other that they are ready

1. Lionfish Only

- 5. Leaders lay out both 50 meter transects simultaneously, maintaining approximately 15m between transects.
- 6. Recorders complete header sheet (Depth, Water Temp, Visibility, Current, Transect Length¹, Start Time; Annex 1)
- 7. Each transect:
 - a. Leader positions him/herself at 47 m and recorder positions him/herself at 50 m to start. If visibility is poor, surveyors should move closer together.
 - b. Leader and recorder swim together following an S-shaped search pattern along the first half of the transect, swimming the designated distance away from the transect (5 meters unless at a small patch reef, in which case the maximum width of the patch is recorded) and thoroughly checking for lionfish in crevices / under overhangs.

¹ Transect length will be 50 m except on patch reefs





- c. For every lionfish sighted, both surveyors pause to record details of the sighting. If the lionfish has been sighted by the leader, the leader communicates using hand signals to the recorder (Annex 2). Record:
 - total length (±1 cm)
 - hard / soft relief and relief height (±1 cm)
 - habitat (reef, sand, sea grass, sponge, open water)
 - detection (exposed, sheltered)
 - behavior (rest, swim, hover, hunt)
 - distance along transect
 - If culling, also record: time lionfish sighted, tally attempts (number of attempts to spear lionfish), time captured/conceded, capture (Y/N), gear type (e.g., 3 foot long 3-pronged Hawaiian sling with barbs)
- d. Repeat along the second half of the transect.
- e. Once both halves have been completed, the recorder notes the end time.
- 8. Roll up the transect tape and end dive.



50m 47m







2. Lionfish and Competitors/Predators

As (1), except whilst searching for lionfish, also search for lionfish competitors and predators (Annex 2).

3. Lionfish Threshold Densities

The threshold density is the number of individual lionfish that can remain on a reef without negatively impacting native fish populations and is estimated by conducting three surveys:

- A. Lionfish/competing predator survey as (2) above (buddy teams 1 and 2)
- B. For each transect: 1×50 m long and 2 m wide fish belt to count all fish with a total length (TL) greater than 30cm (buddy team 3 = two prey surveyors)
- C. 2 x 10 m long and 2 m wide prey fish belts per transect (buddy team 3)
- 5. Each prey surveyor positions him/herself at the beginning point for each transect, records start time and depth, and signals to each other that they are ready.
- 6. Team 3 simultaneously conducts a 2 m wide fish belt, laying the transect tape whilst recording any fish species greater than 30 cm TL.
- 7. Record transect end time and depth. If on a patch reef, record transect length.
- 8. Teams 1 and 2 wait 2-5 minutes at 0 m for the survey area to become undisturbed, and then begin the lionfish and competitors/predators survey as (2) above.
- 9. Team 3 wait 2-5 minutes at 50 m for the survey area to become undisturbed, and then conduct 2 x 10 m long and 2 m wide prey belts, the first from 40-30 m and the second from 20-10m, recording all fish. Move slowly and gently move hand over substrate (without touching) to search for tube-dwelling blennies, small gobies and cryptic species.
- 10. Team 3 has "right of way" along transect. If Team 1/2 encounters Team 3 along their survey, they must wait for Team 3 to pass before continuing their S-shaped search pattern.
- 11. The transect tape is rolled up once all teams are finished.





Acknowledgements

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Annex 1: Data sheet for use in-water

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Annex 2: Competitors, predators and hand signals

Target Species	
Caribbean Spiny Lobster	Create a "V" with your index finger and middle finger and place on your forehead (antennae) followed by drawing lines up & down your forearm (stripes)
Spotted Spiny Lobster	Create a "V" with your index finger and middle finger and place on your forehead (antennae) followed by pointing on different parts of your forearm multiple times (spots)
Green Moray	Open and close your fingers to your thumb
Spotted Moray	Move your hand horizontally in a wave like motion followed by pointing on your forearm in multiple spots
Cubera Snapper	Bring your index finger and thumb close together to your regulator, then move away from regulator (like you are smoking a cigar)
Mutton Snapper	Point index finger at your side (to represent spot on site)
Dog Snapper	Run one finger down your cheek (to represent tear on cheek)
Coney	Tap your pointer finger and your middle finger simultaneously on your regulator (to represent two spots on lower lip)
Graysby	Stick index and middle finger together with thumb up (to make a gun for "bullet holes")
Nassau Grouper	Run 3 or 4 fingers down your face (to represent tribal stripes on face)
Black Grouper	Rubbing your hand on the back of your forearm
Red Grouper	Cross your index finger and middle finger (the sign language symbol for "r")
Tiger Grouper	Make claws with one or both of your hands
Red Hind	Pat your rear
Lionfish	Place your thumb on your forehead and wiggle your fingers
Relief	
Hard	Signal hard reef height, then make a fist
Soft	Signal soft relief height, then wave your hand side to side
Visibility	
Exposed	Place your hand by your head and wiggle you fingers
Sheltered	Tuck your head into the crook of your arm



Behavior									
Resting	Lay your head in the palm of your hand								
Hovering	Circle your fist above your palm								
Swimming	Move your pointer finger & middle finger up & down while moving your hand in one direction								
Hunting	Wave your fist up & down								
Numbers									
0	Make a fist								
1-5	Raise fingers vertically								
6-9	Lay hand to side, pointing fingers horizontally								



Annex 3: Fish Sizing Test

Prepare a range sizes and shapes of toy/cutout fish.

Hold each fish up one at a time, at a distance of approximately 2m and the person being tested has to write down their best estimate in cm on an underwater slate.

Do this for 25 fish both on land as a practice and underwater while diving.

After the test, review the fish actual sizes and calculate the % difference between estimate and actual for each fish. Then get the average % difference. To pass, this should be $\leq 10\%$