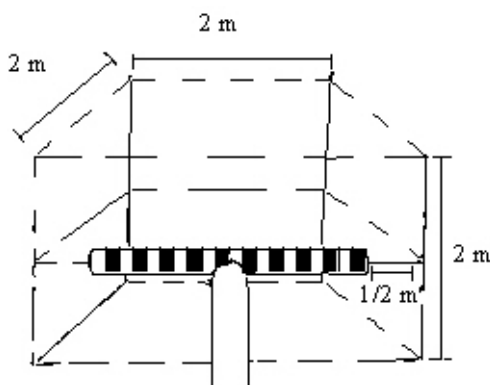


## CORAL REEF FISHES

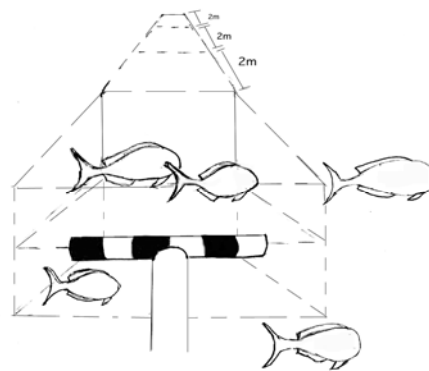
For fish sampling, biases are often due to difficulties arising from seeing fishes, accurately counting or estimating length, and differentiating among certain similar species (Sale 1997). An effective way to census such mobile organisms as fish are through a method that most imitates an instantaneous survey of a pre-defined area (Sale 1997). The AGRRA fish method includes two different methods to characterize reef fish populations – a belt transect and rover diver method.

### Estimating 2 m wide belt transect

The first challenge is to visualize the boundaries of a 2-m wide X 30 m long belt transect for fish censuses. The sample unit has been specifically delineated to a small 2-m wide width because it is a small enough width for the observer to be able to estimate the distance easily while allowing for a large enough sample area. A 1 m t-bar (with 5 cm markings) is used to assist observers in estimating the distance (below left). To estimate the 30 m length, try to visualize the transect as a 2-m wide square tunnel. Start the first box at least 1-2 m ahead of t-bar. When sampling the transect belt, the observer should give uniform attention to each successive 2-m segment (below right). This requires swimming at a more or less constant rate, and looking consistently about 2 m ahead, except when actually recording data.



A 1 m t-bar is used to help visualize the 2 m wide belt transect.



Each 2 m segment of belt transect is surveyed separately.

### Counting fish

Uniform attention should be given to each successive 2-m segment of the transect when surveying. It is important to swim in a consistent manner while actually sampling the fish, although it is permissible to pause while recording data, and then to start swimming again. A speed that counts each 30-m transect in 6-8 minutes should be attempted. High densities of counted species will slow this rate in some cases. By remembering to keep effort equivalent on all segments of the transect, you can focus on counting just those members which happen to be within the boundaries of the transect and limit the tendency to count all members of a large school of fish on either side of the transect. In other words, keep your eyes focused straight ahead of the transect and do not get distracted side to side as a large school swims by. Large groups of individuals of a species that occur within a 2-m segment will be classified by attempting to put them into one or more size categories as necessary.

### Estimating length

Fish observers should be trained to estimate fish lengths by using consistency training methods both on land and underwater (e.g., GBRMPA 1979, Bell et al. 1985, English et al. 1994). The AGRRA method assigns fish lengths to the following size categories (0-5 cm, 6-10, 11-20, 21-30, 31-40, >40cm). A 1 m

T-bar with 5 cm increments is used to assist in estimating sizes. We use a variety of fish models cut out of closed-cell foam into the different size classes (plywood or plastic can also be used). The shape of the fish models used represent some of the species included in the AGRRA survey.

**Rover diver**

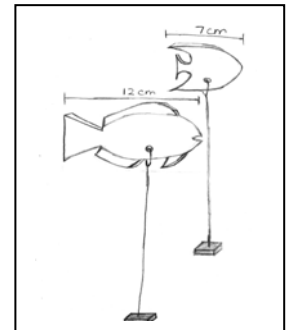
Fish surveyors should be proficient in identifying Caribbean reef fishes. For minimizing and recognizing observer bias and differences with the REEF rover diving technique, we suggest reading the guidance provided by Schmitt et al. (1998). The “Reef fish identification (Florida Caribbean, Bahamas)” book and cd-rom by Paul Humann are very useful for improving and testing your fish identification.

**Exercise 1:** While snorkeling or diving, each observer should have a T-bar marked with 5 cm increments and a datasheet (see below) and should be 2-m from the fish models. One person should have a series of different sized fish models (of known lengths). One person holds up one fish model at a time and each observer estimates the size of each fish and assigns it to one of the following size categories (0-5 cm, 6-10, 11-20, 21-30, 31-40, >40cm). The holder should write down on a datasheet the order in which the fish models that are shown and the corresponding actual lengths. After at least 10 fish models have been estimated, the observers should rotate to allow each person a chance to practice estimating length. After the exercise, the divers compare their answers to the actual answers and determine any differences from the actual known amount and the difference between observers. The exercise should be repeated until individual observer estimates are > 95% accurate and observers are consistent with each other.

Example datasheet

Size (cm)	0-5 cm	6-10	11-20 cm	21-30 cm	31-40 cm	>40 list size
Fish 1		X				
Fish 2			X			
Fish 3			X			

**Exercise 2:** In this exercise, observers practice fish counting along a belt transect and estimating fish size. Each observer should have a T-bar, a 30-m transect tape, and a datasheet. A practice transect line is laid on the substratum and fish models (made from styrofoam and attached to a weighed line of varying lengths) are haphazardly placed along the transect (see figure to right) with some models placed just outside the 2 m wide belt transect. One observer starts at the beginning of the transect line and uses a T-bar to estimate the width of the 2-m belt transect and the length of fish. Observers should mark on their data sheet the size class for each fish (model) observed in the sample area. Each observer should run the survey. After completing the exercise, compare the answers of all the observers with the correct fish lengths. Repeat exercise until observers are consistency between each other and their answers are close to the correct answers.



**Exercise 3:** While diving, two observers (one hovered above the other) survey a 30 m transect at the same time (with one laying out the transect). The data is then compared between the two observers. This approach is especially effective if one of the observers is already well trained and experienced.