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DEPTH & VELOCITY

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General Information:

Equipment:

I. Required equipment:

A. A55M ($1295.00), or B56M ($1890.00) Sounding reel, Rickly Hydrological Co.
B. Sounding weight, Rickly Hydrological Co. (either 75:$355, 50:$275, or 15:$185 lbs, see comments section)
C. 3/4" x 12" Hanger bar, Rickly Hydrological Co. ($18.00)
D. Connector link
E. Sensor mount
F. 75' of 0.10" diameter cable should be provided with the sounding reel
G. Standard wading rod
H. Marsh-McBirney Flow-mate model 2000 large river flow meter, stock number 6680flow, Marsh-McBirney Inc., ($3,770.00) or USGS "AA" type Price meter, Rickly Hydrological Co. ($705.00). This Price meter can have either a magnetic or stadard head
   I. Commercially available sonar device like a Hummingbird Wide 100 (Hummingbird Inc., Techsonic Industries, #3 Hummingbird Lane, Eufaula, AL 36022)

II. Marsh-McBirney meter operation

A. Operate velocity meter in "real time mode" (RTM)-This mode isautomatically initiated at start up.
B. Measure velocity in m/s. Pressing the ON/C and OFF keys simultaneously will switch between ft/s and m/s.
C. Beeper can be either on or off.
D. Use "Fixed Point Averaging" (FPA) setting-Press up and down arrow keys simultaneously to switch between FPA and Time Constant Filtering.
   1. The display should register the letters FPA when in this mode.
E. Set Filtering Mode to 10 seconds to average velocities.
   1. Press either the up or down arrow in FPA mode until 10 seconds are

reached. Then wait a few seconds for display to revert to velocity measuring screen.

III. Price Type AA meter operation

A. Assemble unit and adjust pivot (see Rickly Hydrological Co. 1996)
B. Replace sensor mount (used with Marsh-McBirney only) with entire Price meter unit. Price meter should slide over existing hanger bar, to a resting point, and can be fastened into place with an appropriate set screw.
C. Fasten electrical connector from 0.10" cable to the top binding post of the unit. The meter is now ready for submersion.
D. Connect sounding reel lead to Aquacount lead and turn Aquacount unit on.
E. Lower sounding weight to desired depth and press “start/stop” button.
F. Elapsed time, bucket revolutions, and velocity in ft/s can be read from the display. Feet/second will be converted to m/s by the following conversion: velocity in m/s = (velocity in ft/s) * (0.305 m/s).
G. The Price meter should be clean and dry while storing, and oiled once a week or every 8 hours of use.

IV. Acceptable Deviance

A. The permissible error rate for this meter is $\pm$ 0.015 m/s.

V. Velocity meter calibration

A. Zero Adjust
   1. Zero Adjust the velocity meter weekly (see Marsh-McBirney (1990) for instructions)
B. The velocity meter should be returned to the factory for official calibration about once a year prior to field sampling and any other time a problem is suspected.
C. Prior to use or Zero Adjust the unit should be cleaned and batteries checked for power (see March-McBirney (1990) for instructions).

VI. Depth Measuring Devices
A. A55M sounding reel
   1. The sounding reel has a metric depth dial on the left side and all depths should be recorded to the nearest 0.1 m depth from this dial.
B. Standard Wading Rod
   1. The standard wading rod should be marked at 0.1 m intervals and depth will be recorded from these markings.
C. Sonar Device
   1. Most commercial sonar devices will record depth in feet. After recording

depths in feet, field personnel should convert these depths to the nearest 0.1 m using the following conversion: depth in meters= (depth in feet) * (0.305 m).

D. It is the field crew leader's responsibility to determine if conditions are safe enough to use the sounding reel or sonar for depth measurements in high current velocities.

Method:

I. General:

A. Deep water macrohabitats (>1.2 m) (i.e., outside bend, inside bend, main channel, tributary mouth-large, deep secondary channels: connected, secondary channels: non-connected)

1. Depth measured to nearest 0.1 m with A55M Sounding Reel or sonar
2. Velocity measured to nearest 0.1 m/s at:
   a. the bottom (representing bottom velocity) Note: This measurement should only be attempted if field personnel determine conditions are safe enough.
   b. (0.8) bottom depth
   c. (0.2) bottom depth
   d. b & c are averaged to obtain mean column velocity (Orth 1983)

B. Shallow water macrohabitats (<1.2 m) (ie., tributary mouth-shallow, shallow secondary channels: connected, secondary channels: non-connected, inside bend-sand bar)

1. Depth measured to nearest 0.1 m with standard wading rod
2. Velocity measured to nearest 0.1 m/s at (0.6) bottom depth to represent mean column velocity (Orth 1983).

II. Gear specific location

A. Trammel net and benthic trawl

1. Trammel nets and the benthic trawl are fished in a parallel direction with the current for 150 m. Depth and velocity will be measured at the midpoint of each trammel net drift or trawl tow (letter a, Figure 1 in Appendix 1).

B. Boat electrofishing

1. Boat electrofishing will only be conducted along shorelines. The boat should be anchored to the shore prior to measuring depth and velocity. Depth and velocity will be measured on the channel side of the boat at the midpoint of each electrofishing run (letter b in Figures 2 & 3 in Appendix 1). (*Hint*: for boats that have a boom mounted velocity/depth recorder on one side of the boat, you should face the boat either upstream or downstream so that measurements are taken on the channel side of the boat). When electrofishing along dikes in inside bend macrohabitats, depth and velocity will be recorded 1 m downstream from the mid-point of the dike.

C. Stationary gill nets
   1. Stationary gill nets are set parallel to current and shorelines in inside bend pool and perpendicular to the current and shorelines in small tributary mouths, and secondary channels: non-connected. Depth and velocity will be measured at the mid-point of the net in inside bend pools. In secondary channels: non-connected and small tributary mouths, depth and velocity will measured at 25, 50, and 75% of the net's length (letter c, Figure 4 in Appendix 1). These values will be averaged to obtain an estimate of depth and velocity for these locations. Readings will be taken at the small mesh end of the net first.

D. Bag seine
   1. The bag seine will be used to collect fishes in shallow macrohabitats (i.e., inside bend:sand bar, shallow secondary channels:connected, deep secondary channels:connected, secondary channels:non-connected) along shorelines. The seine will be deployed in a 180-degree arc from the shoreline. Depth and velocity will be measured along a transect at the mid-point of the 180-degree arc (approximately the 90-degree angle of the sampled area). Depth and velocity will be measured at 2, 6, and 10 m from the bank (letter d, Figure 5 in Appendix 1). If the water becomes too deep, measurements are made at each point along the transect that are shallow enough to permit this, and at the greatest distance from the shoreline that was seined. All depth and velocity measurements for each seine haul will be averaged to obtain an estimate of depth and velocity for that sample.

III. Procedure:

A. All depth and velocity measurements will be made after fish have been collected.

B. In deep water macrohabitats the boat will be anchored or held stationary with the motor at the location of each depth/velocity measurement. Depth will recorded using either the sounding reel or sonar. After recording depth the sounding reel will be used to position the velocity meter at 80% bottom depth and a velocity value recorded. The weight is then raised to 20% bottom depth and a second velocity reading taken. Move to the next location and repeat the process if it is a deep water macrohabitat.

C. In shallow water macrohabitats, one person with the wading rod and velocity meter locates the positions of depth and velocity measurements.
   Important: Make sure all personnel are standing downstream from these locations to minimize impacts to velocity readings. The person then measures depth with the wading rod and positions the velocity meter to (0.6) bottom depth and records velocity. This is repeated for each depth/velocity point along the transect.

Comments:

I. Selection of the proper sounding weight is dependent upon water velocity. In faster velocities a heavier weight will be needed. Determination of the appropriate weight size is left to the discretion of the principal investigator. However, whatever weight size is selected needs to be adequate to allow the sounding reel cable to remain in a vertical (90 degree angle to the bottom) position.

II. A summary table of appropriate values for (0.2), (0.6), and (0.8) bottom depth is provided in Appendix 2 to facilitate quicker collection of column velocities in the field.

References:

Orth, D. J. 1983. Aquatic habitat measurements. Pages 61-84 in L. A. Nielsen and D. L. Johnson, editors. Fisheries Techniques. American Fisheries Society, Bethesda, Maryland.

Marsh-McBirney. 1990. Model 2000 Installation and Operations Manual. Marsh-McBirney Inc., Frederick, Maryland 21701.

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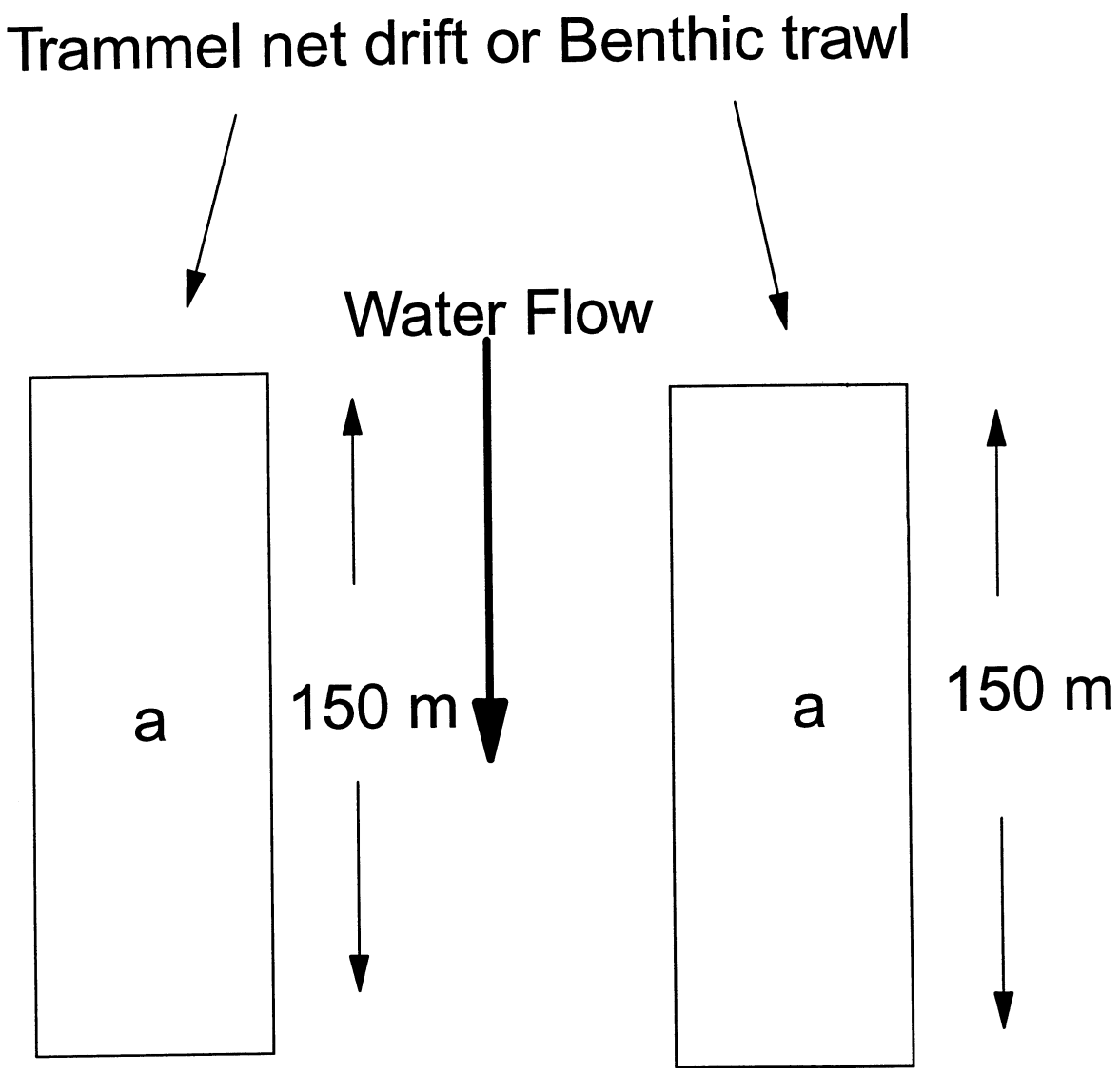

Figure 1. Depth and velocity measurement locations (a) for drifting trammel net and benthic trawl fish collections.

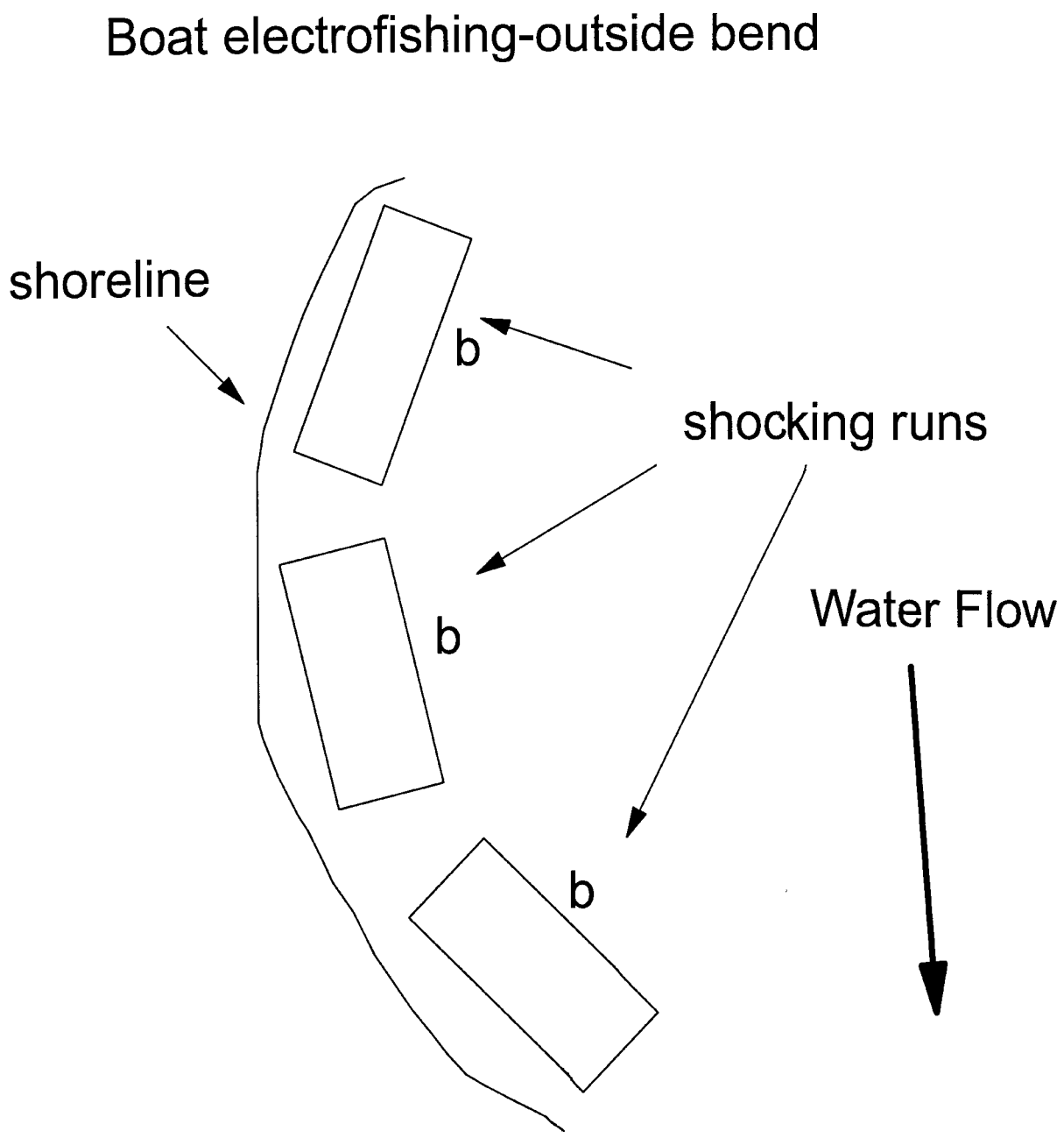

Figure 2. Depth and velocity measurement locations (b) for boat electrofishing in outside and inside bend macrohabitats.

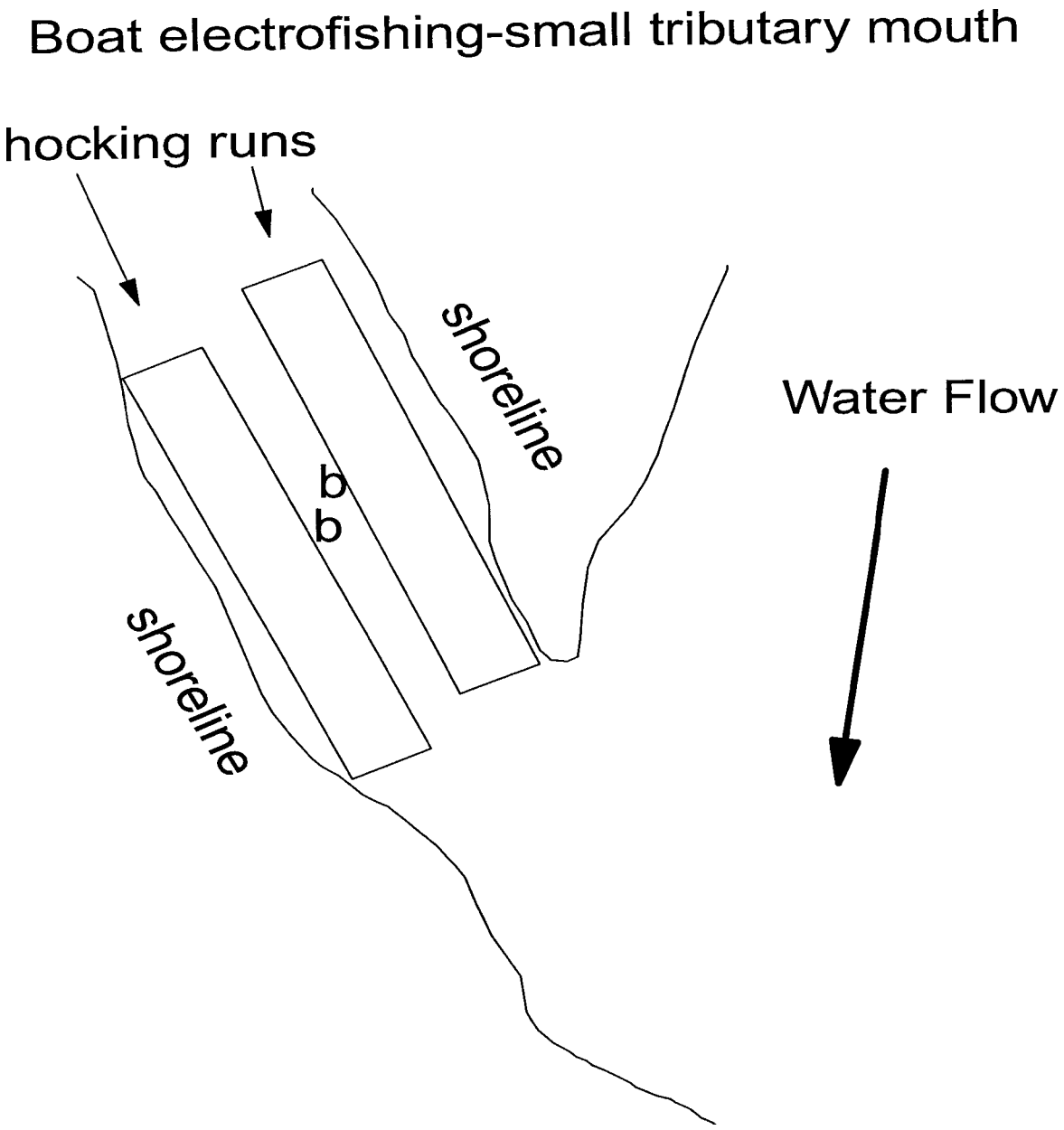

Figure 3. Depth and velocity measurement locations (b) for boat electrofishing in small tributary mouth macrohabitats.

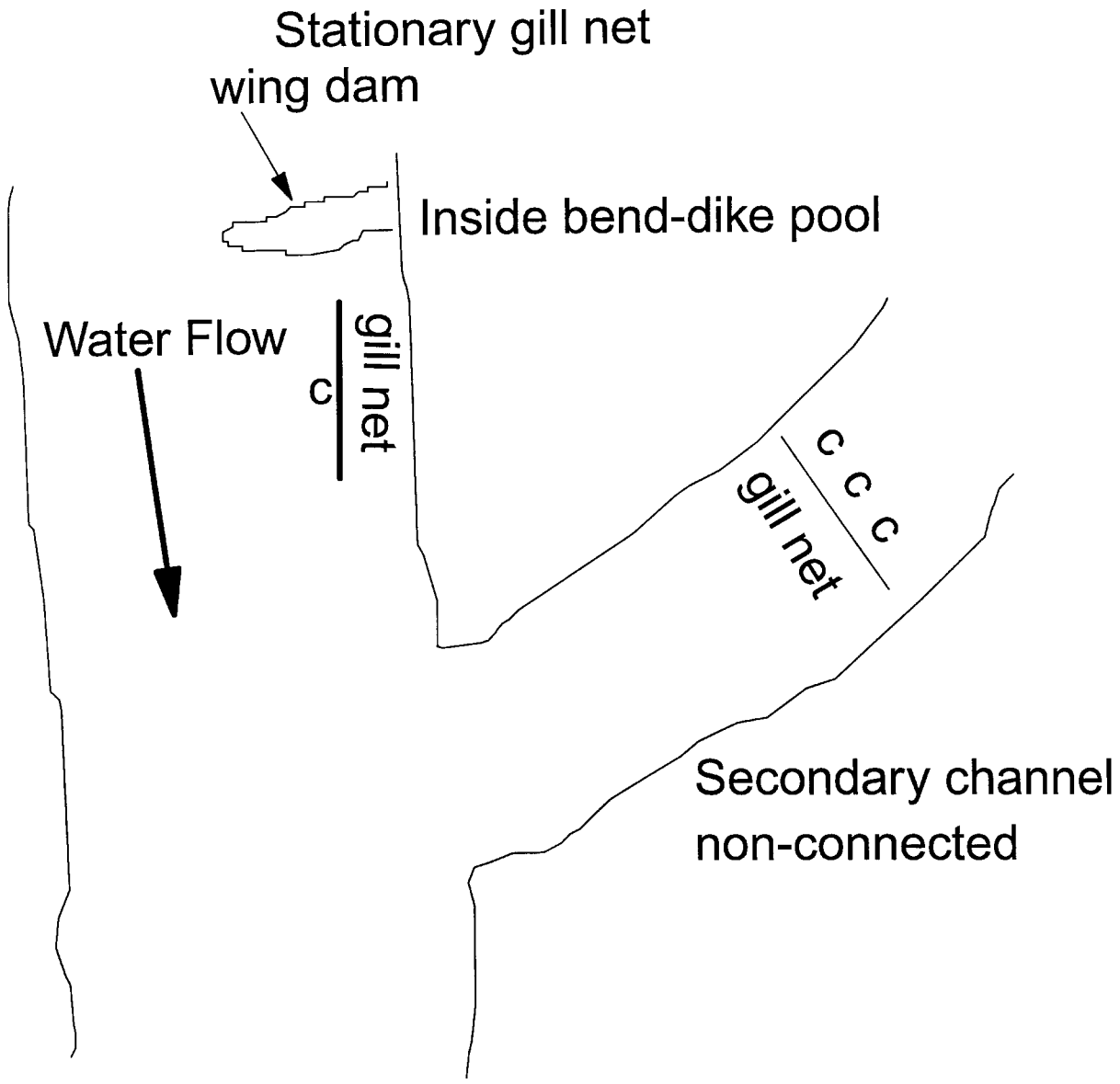

Figure 4. Depth and velocity measurement locations © for stationary gill net fish collections.

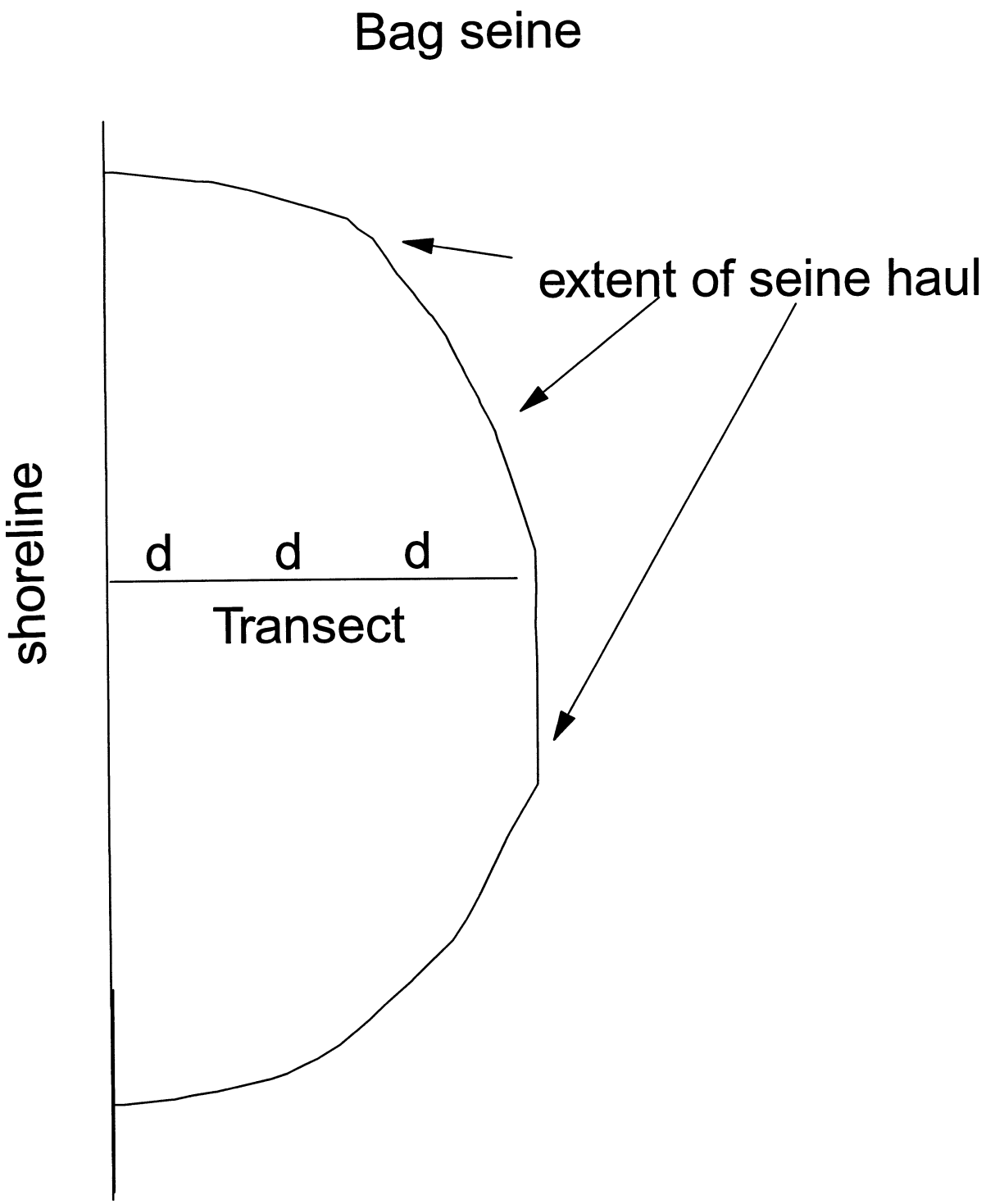

Figure 5. Depth and velocity measurements locations (d) for bag seine fish collections.