

Knots

Knots for Anglers

Ronald A. Howard Jr.¹

Objectives

Participating young people and adults will:

1. Practice tying some basic fishing knots
2. Practice knot selection for various applications
3. Practice some additional useful knots
4. Have fun while learning.

Youth Development Objectives

Participating young people will:

1. Enhance fine motor skills
2. Practice decision making and problem solving
3. Enhance self-image and self-concept
4. Gain self-confidence
5. Increase recreational skills and stress relief
6. Explore practical science

Roles for Teen and Junior Leaders

1. Assist with teaching area set up and break down
2. Deliver demonstrations on knot tying
3. Assist members in learning knots
4. Assist members in knot strength tests
5. Critique knots and aid in improving them
6. Conduct knot choice exercise

Potential Parental Involvement

1. See "Roles for Teen and Junior Leaders" above
2. Arrange for or provide teaching space
3. Arrange for or provide teaching materials
4. Arrange for or provide transportation
5. Arrange for or provide refreshments

Evaluation Activities/Suggestions

1. Evaluate changes in knot tying ability with repeated attempts at each knot selected.
2. Establish a decision making activity to match knots to the application.
3. Review activities for evidence of peer teaching and positive reinforcement.

Best Time: Any time of year

Best Location: Comfortable work area

Time Required: 60-90 minutes

Equipment/Materials

14-17 pound test monofilament (two colors)
heavy monofilament (30 to 50 pound test)
light cord fly line pieces
demonstration hook fly leader tying kit
yardstick or tape measure
nail clipper reel spool
fly tying vise pliers or hemostat
barrel swivels size 1-6 hooks
short dowels with small screw eyes in one end
8-10 # monofilament
* yellow, orange, green, blue, clear

References

- Practical Fishing Knots*, L. Kreh and M. Sosin, 1972. Lyons and Burford, NY.
- Practical Fishing Knots II*, M. Sosin and L. Kreh. 1991. Lyons and Burford, NY.
- McClane's Standard Fishing Encyclopedia*. A. J. McClane, ed., 1972. Holt, Reinhart and Winston, NY.
- Fishermen's Knots, Fishing Rigs, and How to Use Them*, B. McNally. 1993. McNally Outdoor Publications, Jacksonville, FL.

Line manufacturer's literature

Safety Considerations

¹ Professor and Extension Specialist, Texas Agricultural Extension Service, 7607 Eastmark Drive, Suite 101, College Station, TX

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Lesson Outline

Presentation

- I. Knots and fishing
 - A. Essential to make connections
 - 1. Quality of connection important
 - 2. Variation in knot strength
 - B. Importance of good technique
 - 1. Sound, well-tied knots
 - a. Maintain strength of line
 - b. Remain secure
 - c. Stand up to pressure
 - 2. Poorly tied knots
 - a. Low shock resistance
 - b. Tendency to slip
 - c. Reduce line strength significantly
- II. Attaching line to reels
 - A. Arbor knot
 - 1. Tying procedure
 - a. Pass tag end around spool
 - b. Tie overhand knot around standing end
 - c. Tie another overhand knot beyond first
 - d. Pull second knot tight and trim
 - e. Draw first knot tight
 - f. Second knot should touch first one
 - 2. Usefulness
 - a. Easily tied and simple
 - b. Weak connection
 - c. Will not hold in monofilament lines
 - d. Fine if never “spooled” by a fish
 - B. Improved clinch knot
 - 1. Around standing line
 - a. Intermediate strength
 - b. May slide until a few wraps are made
 - c. Weak point if spooled by fish
 - 2. Improved clinch knot around arbor or spool
 - a. Much stronger connection
 - b. May slide until wrapped
 - c. About 90 percent knot strength
- III. Connecting line to terminal tackle
 - A. Improved clinch knot
 - 1. Designed for monofilament lines
 - 2. Better than 90 percent knot strength

Application

PROVIDE each member with two pieces of monofilament about 8 to 12 pound test. Using gloves or small pieces of dowel to protect their hands, have them attempt to **BREAK** the line by pulling steadily on it. Then tie an overhand knot in the middle of each remaining piece and have them repeat the test. (See fact sheet - *Testing Knot Strength*) **DISCUSS** the differences in perceived breaking strength. (An overhand knot decreases the breaking strength of the line to about half its normal strength.) **ASK** what made the difference (the knot) and how that could be important to them while fishing. **NOTE** that all anglers need to use knots to connect their lines to their other tackle and to the fish.

DEFINE tag end as the short end of the line and standing end as the line going to the spool or reel.

DIAGRAM the knot and show how it is tied with a dowel as the spool and a piece of moderately heavy cord as the “line.”

NOTE that the connection includes two single layers of line and tends to cut itself under heavy pressure.

Ask participants to **DETERMINE** which of these they would like to use in light monofilament line. Which one would they choose for attaching fly line backing to a spool?

DEMONSTRATE tying an improved clinch knot and have the members **TIE** one of their own using the screw eye and dowel for a “lure”. [*Working in small groups with parents or teen leaders as guides and assistants works best.*]

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3. Tying procedure

- a. Pass tag end through hook eye (etc.)
- b. Wrap tag end around standing line
 - 1) 3-4 times in heavy lines
 - 2) 7 or more in light lines
- c. Pass tag end through opening between tag end and standing line
- d. Pass tag end through loop just formed
- e. Hold tag end
- f. Moisten knot with saliva
- g. Pull steadily on standing end to tighten securely
- h. Trim tag end neatly with clippers

4. Variations

- a. Twice through improved clinch knot
 - 1) Pass tag end through eye twice to form loop
 - 2) Proceed as above
 - 3) Pass tag end through loop and opening between lines
 - 4) Finish as above
 - 5) Better knot strength - very light line
- b. Double improved clinch knot
 - 1) Double a short section of line
 - 2) Tie a clinch knot with doubled line
 - 3) Better abrasion resistance - light line

B. Palomar knot

1. Excellent knot strength (nearly 100%)
2. Excellent knot for co-polymer lines
3. Simple, compact knot
 - a. Pass doubled tag end through eye
 - b. Tie loose overhand knot around standing end
 - c. Pass loop over hook, lure, etc.
 - d. Hold loop forward
 - e. Pull on both ends to tighten

C. Kreh end loop knot

1. Many loop knots for attaching lures
 - a. Variable in strength
 - b. Some close when pressure applied
2. Strength and loop stays open
 - a. Jig and other lures
 - b. Better lure action
 - c. Proper tying vital
3. Tying procedure
 - a. Tie a loose overhand knot in line
 - 1) About 8 inches from end of line
 - 2) Pass tag end through hook eye
 - b. Return tag end through knot
 - 1) Keep original knot open
 - 2) Back through same side

NOTE that moistening the line before it is drawn tight keeps it cool, helps the tier clinch the knot down tightly, and prevents abrasion as the line rubs against itself. All of these things can weaken the line and the knot.

If desired, **DEMONSTRATE** these knots and have the members **PRACTICE** one of their own. Since the procedure is the same, doing these knots reinforces the original one.

DEMONSTRATE and have members **TIE** one or more Palomar knots. You may want to conduct a relative knot strength test between the improved clinch knot and the Palomar knot. Simply tie each knot on an eyed dowel. Being careful to apply pressure steadily and to avoid putting the line in the gap where the screw eye is closed.

STRESS the importance of keeping all three pass-throughs by the tag end going through the first overhand knot in the same way! This keeps the knot from cutting itself.

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- c. Wrap tag end around standing end
 - 1) 3-4 turns for heavy line
 - 2) 5-6 turns for medium weight lines
 - 3) 7-8 turns for lines 4 pound or less
 - d. Pass tag end back through overhand knot
 - e. Pull both ends to secure knot
- D. Snell knot
- 1. Attaching hook to line
 - a. Bait hooks
 - b. Trailer hooks
 - 2. Strong attachment
 - a. Grasp hook in fingers of one hand
 - b. Pass line through eye toward bend
 - 1) May be omitted if desired
 - 2) Several inches of line needed
 - c. Loop the line
 - 1) Toward eye and back
 - 2) Tag end near end of shank
 - 3) Grasp loop near eye
 - d. Wrap top strand of loop around shank
 - 1) Wrap toward bend of hook
 - 2) 5-7 turns of line
 - 3) Bottom of loop stays atop shank
 - e. Pull standing end to tighten
 - 1) Forms compact loops around shank
 - 2) Pull tag end to check
 - 3) Trim tag end
- E. Break-away knots
- 1. Sometimes important for bottom rigs
 - 2. Losing part of a rig to save the rest
 - 3. Usually used with sinkers
 - 4. Options
 - a) Lighter line than main rig
 - b) Overhand knot above sinker
- IV. Connecting lines of nearly equal diameter
- A. Blood knot
- 1. Nearly line strength
 - 2. Compact
 - 3. Diameter differences up to 0.003-0.005
 - 4. Simple to tie
 - a. Cross tag ends over each other
 - b. Wrap one tag end around other standing end
 - 1) Wrap away from crossing point
 - 2) Minimum of three wraps
 - 3) More wraps with lighter lines
 - 4) Up to 7 or 8 with light lines
 - c. Push tag end back through starting point

STRESS the importance of drawing the knot down snugly as it is being tied.

NOTE that this knot is much easier to tie than it is to describe. **DEMONSTRATE** it with large line and a huge hook, then have the participants **TIE** their own with help from teen leaders and parents. **NOTE** that it can simply be tied around shanks if desired, particularly on ringed eye hooks.

ASK the group if there is ever a time when they want the line to break. **DISCUSS** situations where breaking the line to a sinker could save the rest of a rig and reduce the time required to get back into action.

Be sure to **USE** different colors of lines in tying these knots for demonstration purposes, so the members can see the knot develop more easily.

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- d. Hold tag end
 - e. Repeat process with other lines
 - 1) Wrap in opposite direction
 - 2) Same number of wraps
 - f. Insert tag end through opening in knot
 - 1) Same location as first one
 - 2) Opposite direction from first one
 - g. Moisten
 - h. Pull standing ends to set knot
 - I. Hold tag ends until tightening starts
 - j. Trim tag ends carefully
 - k. Check for security of knot
- B. Barrel knot
- 1. Very similar to blood knot
 - 2. Wraps back toward cross-over point
 - 3. Slightly weaker than blood knot
 - 4. Some find it easier to tie
- C. Surgeon's knot
- 1. Finished looks like blood or barrel knots
 - 2. Easy to tie
 - a. Overlap lines about 12 inches
 - b. Tie one overhand knot in crossed lines
 - c. Repeat one or more times
 - d. Hold all four lines
 - e. Draw all ends tight together
 - f. Moisten and pull on standing ends
 - g. Trim away excess tag ends
- D. Double nail knot
- 1. Strong, smooth knot
 - 2. Complex tying process
 - a. Cross two tag ends over each other
 - b. Lay nail or tube beside one tag end
 - c. Wrap 4-6 turns over nail
 - 1) Toward standing end of same strand
 - 2) Over other line
 - d. Insert line under wraps along nail or through tube
 - e. Extract tube, holding loops
 - f. Pull standing and tag ends to tighten wraps
 - g. Alternate between lines
 - h. Pull on standing ends to tighten
 - 1) Leave no slack between the knots
 - 2) Snug down firmly
 - I. Trim tag ends
 - j. Useable joining lines of different diameters
- V. Connecting line to shock tippets
- A. Albright Special knot
- 1. Two lines of very different diameter

DEMONSTRATE this knot if desired. **NOTE** that most youngsters have more trouble tying this poorer knot than the better blood knot. May be omitted or merely mentioned at the leader's discretion.

DEMONSTRATE this knot if desired. It is essentially a double or triple overhand knot tied in the tag end of the line with an overlapped tag end of the leader. Properly tied it is a very strong knot.

If desired, **DEMONSTRATE** this knot and have participants **TIE** it. One of the best tools for the nail knot is a large gauge needle with the point cut off and beveled (check local laws on possession of even modified needles). A small plastic or brass tube can be used effectively as well. This knot could be tested against similar blood knot to determine if any difference in knot strength is worth the effort.

DEMONSTRATE tying an Albright Special knot using 8 to 10 pound test monofilament and 40-80 pound test shock leader.

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- a. 20-80 pound test leaders
- b. Light spinning lines or leaders
2. Often used in fly fishing applications
3. Simple tie
 - a. Bend heavy line back on itself
 - b. Pass smaller line up through loop
 - c. Wrap 10-15 times toward closed end of loop
 - d. Pass tag end of light line through loop
 - e. Pull both ends of light line to tighten and lock
 - f. Trim tag ends of both lines
- B. Improved blood knot
 1. Lines of very different diameter
 2. Double lighter line
 3. Tie as for blood knot

VI. Knots for fly fishers

A. Nail knot

1. Attaching leader butt to line
2. Tying procedure
 - a. Lay nail or tube along tip of fly line
 - b. Lay leader material along tube
 - c. Wrap tag end of leader material
 - 1) Around lines and tube
 - 2) Toward tip of fly line
 - d. Insert end of leader material in tube
 - e. Hold loops in place
 - f. Extract tube or nail
 - g. Cinch knot down firmly
 - 1) Pull alternately on ends of leader
 - 2) Keep wraps snugly together
 - 3) Pull until firmly cinched in place
 - h. Pull on standing end of leader and fly line
 - I. Trim butts of both leader and fly line
 - j. Coat knot cement (e.g. Pliobond®)¹

B. Perfection loop

1. Loops used in many ways
 - a. Connecting two lines
 - b. Connecting snelled hook to line
 - c. Connecting dropper to dropper loop
2. Tying procedure
 - a. Form a loop in the tag end of line
 - b. Form second loop over and around first
 - c. Pass tag end between two loops
 - d. Reach through first loop and pull second one through
 - e. Hold loop open
 - f. Hold tag end

Have each participant **TIE** a similar knot with the assistance of teen leaders or parents.

DEMONSTRATE the improved blood knot. **NOTE** that it is used in the same types of situations as the Albright Special. Lines need to be a bit closer to the same size, e.g. 10 pound test and 30 or 40 pound test, to use this knot effectively.

If desired, **DEMONSTRATE** the nail knot using a short piece of waste fly line and a heavy piece of leader material. Have each member attempt to **MAKE** the knot with the assistance of adult or teen leaders. **CRITIQUE** each knot and suggest ways to correct any errors in the tying process. Keeping the wraps close together is one of the greatest challenges.

NOTE that this knot can be tied after passing the leader through the center of the fly line. This is sometimes called a needle knot

DEMONSTRATE the perfection loop and have participants **TIE** one or more until a strong knot is accomplished.

NOTE that this is the same knot as the surgeon's knot except that it is tied in an intact line rather than as a way of joining two lines.

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- g. Moisten and tighten
 - h. Trim tag end
 - C. Surgeon's loop
 1. Easy to tie
 2. Strong loop knot
 3. Tying instructions
 - a. Form loop in tag end of line
 - b. Pass terminal end through loop twice
 - c. Moisten and pull tight
 - D. Dropper loop
 1. Used to create a dropper loop
 - a. Attach looped dropper leaders
 - b. Attach other terminal tackle
 2. Tying procedure
 - a. Bend line into a loop
 - b. Hold single line at bottom of loop
 - c. Wrap doubled line around itself
 - d. Push loop through opening between doubled lines
 - e. Pull tight
 - E. Extension blood knot
 1. Used to create a dropper
 - a. Multiple fly casts
 - b. Sinker for deep drifts
 2. Tying procedure
 - a. Blood knot as above
 - b. Leave about 8-10 inches of tag end
 - c. Trim other tag end a bit long
- VII. Many other useful knots
- A. Fishing knots
 1. Bimini twist
 2. Duncan loop (uniknot)
 3. Jansik special
 4. George Harvey knot
 - B. Boating knots
 1. Square knot
 2. Bowline
 3. Clove hitch
 4. Two half-hitches
 5. Taut line hitch

DEMONSTRATE the knot and have members **TIE** one with the assistance and help of teen or adult leaders.

NOTE that this is essentially a blood knot or barrel knot tied in an intact line, producing a fixed loop in the leader.

DEMONSTRATE the knot and have members **TIE** one under the supervision of teen or adult leaders. **NOTE** that this knot requires a bit more dexterity than the simple blood knot because the long tag end is a bit more difficult to manage. If necessary, **ALLOW** the participants to work in pairs to get the knot tied. Make sure the knot is very snugly tied and that a bit of extra tag is left on the opposite side from the dropper.

If desired, **ADD** these knots to the lesson. For beginning anglers, the previous set of knots is completely adequate and will consume a full lesson.

Summary Activity

Pose a series of scenarios in which the participants must select and tie a knot to suit a situation. Tailor the scenarios to the skill level of the participants and their level of angling experience. A contest or game with teams selected by the instructors and gag prizes might be appropriate.

Lesson Narrative

Knots are an essential part of fishing. Anglers cannot fish without attaching hooks or lures to their lines or lines to their reels. Knots determine the quality of the connection between the angler and the fish. Often, they are the weakest link between the fish and the angler. Since the type of knot determines the potential strength of the

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connection and the way knots are tied can affect their actual strength, the way the knots are tied is important to the angler's success. Learning to select and tie appropriate knots is a skill all accomplished anglers should achieve. The presence of a mentor or guide in the process is one of the most important factors in that learning process.

Attaching Line to Reels

Whenever reels must be loaded with line, the first knot that must be tied is one that attaches the line to the reel's arbor or spool. A modification of the jam knot often is used to attach a line to the spool. Although it is not a particularly strong one, the **arbor knot** is used to attach a line to the reel. It is basically a pair of overhand knots tied in the following manner. First pass the tag end of the line through any necessary parts of the reel (level wind mechanism, bail, etc.) and around the arbor. Then tie an overhand knot in the tag end, passing the open loop of the overhand knot around the standing end of the line. Tie another overhand knot in the tag end of the line, pulling it tight. Gently pull on the standing end of the line to draw the knot around the standing end tight with the other knot down against it. Finish the knot by trimming the tag end of the line short. This knot is likely to break if the angler is "spooled": by a fish, so many anglers prefer a stronger connection.

A much stronger connection can be made by using an improved clinch knot (below) around the standing end of the line and drawing it tight. Some anglers use a clove hitch backed with a couple of half hitches (below) as well.

Knots for Attaching Terminal Tackle

One of the basic knots for attaching terminal tackle is the **improved clinch knot**. This common knot is used for attaching line to terminal tackle, particularly with monofilament lines. Well tied, it has excellent knot strength – exceeding 90 percent. The knot is initiated by passing the tag end of the line through the eye in the hook or other terminal tackle. Wrap the tag end around the standing end of the line an appropriate number of times, 3-4 times for heavy lines and up to 7 or more times for light ones. Pass the tag end of the line back through the opening between the standing and tag ends at the eye, and then through the loop that was just created. Hold the tag end. Moisten the knot with saliva, and pull steadily on the standing end to tighten the knot securely. When the knot is cinched down tightly, trim the tag end to complete it.

In light lines, a variation of this knot can add a bit of knot strength if it is well tied. When the line is passed through the eye, carry it back through the eye to form a complete loop. Complete the remainder of the knot as usual, but pass the tag end through the closed loop and the opening between the lines. Complete the knot by carefully drawing it tight.

Doubling the line before tying the knot produces one with a bit more abrasion resistance, the double improved clinch knot. Like the previous one, this knot can be a bit difficult to draw tight. Remember that knots that slip are the ones that break under pressure.

Palomar Knot – The Palomar knot is both simple to tie and has outstanding knot strength, approaching 100 percent of the line strength. It works well for monofilament, co-polymer and braided lines. The knot lies compactly, belying its strength. Start tying it by passing a doubled piece of line through the eye (or by passing the tag end through the eye then back through it). To start out, give yourself plenty of line to work with. Tie a loose overhand knot around the standing end and the tip of the tag end using the doubled portion of the line. Next, pass the loop over the swivel, hook or lure. Moisten the knot and draw it tight by pulling on both the standing and free ends of the line. If they cannot be pulled tight simultaneously, pull each piece alternately until the knot is tightly cinched down.

Kreh End Loop Knot – Many loop knots have been used to attach lures while allowing them to move freely, having better action. It works well with jigs and is one of the better knots for allowing streamers or bucktails to move freely while using heavy shock leaders or tippets. Most other loop knots either lack knot strength or tend to close when pressure is applied. The Kreh loop knot was designed by Lefty Kreh for this purpose. Properly tied and cinched down, the knot is very strong and will not collapse on itself when pressure is applied. Start by tying a loose overhand knot in the line, leaving about 8 inches of tag end beyond the overhand knot. Pass the tag end through the

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hook eye, then back through the overhand knot, making sure the tag end passes through the overhand knot in the same way it emerged from it. Make the primary loop fairly small. Wrap the tag end around the standing end of the line above the overhand knot, taking 3-8 turns. Pass the tip of the tag end back through the overhand knot (again being careful to go through the knot in the same way). Moisten the knot and pull both ends to cinch the knot down. The number of turns taken with the tag end is specific to the line strength. Lines in excess of 20 or 25 pounds need only 3-4 turns, medium weight lines in the 6-15 pound class require 5-6 turns, and light lines (4 pounds or less) need 7-8 turns for maximum strength.

Snell Knot – The snell knot is used to attach hooks to a leader or line. It can be used with bait hooks, trailer hooks, or tandem hooks in fly tying. Gang rigs using several snelled hooks on a single leader are often used in fishing live or dead baits, like night crawlers or large bait fish. This knot provides a strong attachment with a straight pull from the line to the hook shank. In some ringed eye hooks, the snell knot is tied around the shank behind the eye without passing through it.

To tie the snell knot, grasp the hook in the fingers of one hand. Pass the line through the eye toward the back of the hook. Pull enough line through the eye to form a modest loop, leaving the tag end along the shank. Grasp the loop near the eye, and start winding the forward part of the loop around the shank, applying 5 to 7 turns toward the bend of the hook. Pull on the tag end of the line to start tightening the loops. Pull on the standing end of the line to finish the process, sliding the loops forward before the final tightening. Trim the tag end closely to finish the knot.

Break-away Knots

On some occasions, an angler wants to tie a knot that will break away. Generally these situations are associated with wanting to sacrifice some portion of the terminal tackle to save the remainder. Where snags are prevalent, anglers may choose to sacrifice the sinker in order to save the rest of the rig and to get back into fishing quicker after a hang-up. Several options are available. One of the more simple ones is to use a lighter line for the dropper holding the sinker. Another is to add to the probability of breaking the line at the desired point by tying a simple overhand knot in the dropper line above the sinker.

Knots for Connecting Lines of Nearly Equal Diameter

Every angler encounters the need to connect one line to another. For those that are nearly equal in diameter, one of the best connections is the blood knot.

Blood Knot – For lines of nearly equal diameter, this knot is compact and retains nearly 100 percent line strength. It is suitable for lines that differ no more than about 0.003-0.005 in diameter, particularly with light lines. Attempting to connect lines of much greater difference in diameter can result in knots that slip or weak knots that do not carry the line strength of either line. This knot is a simple one to tie. Cross about 6-8 inches of the two tag ends, holding them between the thumb and forefinger of one hand. Select one tag end and wind it over the standing end of the other line a minimum of three to 7 turns. Insert the tag end through the crossing point of the lines and hold it out of the way. Repeat the process with the other tag end, winding the same number of wraps in the opposite direction and inserting it through the cross-over point in the opposite direction. Hold the tag ends and pull on the standing ends to start tightening the knot. As it begins to close, moisten the knot and pull firmly on the standing ends to snug the knot firmly. Trim the tag ends closely and test the knot for security. It is critical to have enough turns in the knot for the line diameter or strength – 3-4 turns is adequate for heavy lines, but as many as 7-8 turns may be required for lines 4 pound test or less.

Barrel Knot – This knot is slightly more likely to slip than the blood knot, but properly tied it can be very nearly as strong as the blood knot. Some people find it easier to tie. Start by tying an overhand knot in the two tag ends. Bend the knotted line around to the standing ends are crossed. Wind the knotted middle of the knot around the two standing ends. (Essentially this is a blood knot with the wraps coming back toward the crossover point rather than away from it.) Separate the two standing ends in the middle of the wraps, and poke the knot through the opening. Moisten the knot and pull on the standing ends to cinch it down snugly.

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Surgeon's Knot – The surgeon's knot is similar in appearance to the blood knot and the barrel knot, but it is tied in a different manner. Start by overlapping the two lines for about 12 inches. Form a loop by bending them in a circle. Pass one line and the tag end of the other through the loop, then repeat the process at least one or two more times. Holding both the tag ends and standing ends together, moisten the knot and draw all the ends tightly together. Finish by pulling on the two standing ends to form a tight knot. Trim away the excess material on the tag ends. This knot will work even with monofilaments that are a bit more different in diameter than will the previous ones. Properly tied, it is a very strong knot.

Double Nail Knot – The double nail knot is a strong, smooth knot that is essentially each line snelled around the other. The tying process is fairly complicated, and extra hands are helpful until the process is well learned. Because of the process, the knot is useful with both lines of nearly equal diameter and with those that differ significantly. Cross the two tag ends over each other, leaving tags of about 8-10 inches. Lay a nail or thin tube along the standing end of one line. Wind the tag end of that line back toward the standing end and over the nail or tube from 4-6 turns, keeping the turns tightly together and holding them in place. Insert the tag end in the tube and withdraw it with the line from under the loops just formed. Pull gently on both the tag end and the standing end to draw the wraps tightly down on the other line. Repeat the process with the other line. Moisten the knot and pull on the standing ends of the lines to bring the knots together. Alternately pull on the tag ends and the standing ends of each line to cinch the knot down tightly. Once the knot is tight, trim the tag ends to finish the knot. [Note that a large gauge needle cut off and beveled or an extremely small tube (just big enough to pass the line through) makes tying this knot neatly much easier.

Connecting Line to Shock Tippets

Many anglers have occasion to use a heavy monofilament shock tippet of 40 to 80 pounds, connecting it to their normal line or leader. A double nail knot might work with lines that are nearly the same stiffness; but for most real shock tippets, a different approach is essential.

Albright Special Knot – One of the best shock tippet knots for lines very different in diameter is the Albright Special. While it is useful with spinning lines and monofilament shock leaders, it is most often used in fly fishing. It is a simple knot to tie, depending upon the greater stiffness of the heavy shock tippet to form a locked loop. Start by bending the heavier line back on itself to form a loop. Insert the lighter line through the loop and take 10 to 15 turns back toward the starting point with it. Pass the tag end of the light line through the closed end of the loop. Hold both ends of the light line in one hand and both ends of the shock tippet in the other. Moisten the knot and pull of the knot to tighten it. Once the knot is firmly locked, trim the tag end, leaving a small tag.

Improved Blood Knot – The improved blood knot is almost exactly the same as the blood knot. The exception is that the lighter line is doubled before beginning to tie the knot. This results in a knot that will tighten adequately. Although this knot will permit considerable difference in the line diameters, it will not cover differences on the order of the Albright Special.

Knots for Fly Fishers

Fly fishermen encounter the need for a variety of knots, including those above. Others may be used in setting up a cast, attaching a leader, attaching backing to a fly line, or simply repairing a tippet.

Nail Knot – This knot was explored earlier as the double nail knot. Its primary use is in attaching a leader but to a fly line or attaching backing to the tail of a fly line. Start tying the knot by laying a nail, needle, or tube along the tip of the fly line. Lay the leader material beside the tube with about 10 inches or so of material beyond the tube. Wind the leader around the fly line and tube, laying tight turns back toward the tip of the fly line. Once satisfied with the number of turns, push the end of the leader material back through the needle or tube to emerge where the windings began. Holding the turns of line and the fly line in the fingers to keep everything aligned Pull the needle or tube off the tag end of the leader material. Pull alternately on the tag and standing ends of the leader to begin closing the

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loops on the fly line. Continue the process until the turns lie tightly together and are bound tightly to the fly line. I usually find that grasping the tag end with pliers and wrapping the butt section around the hand allows adequate pressure to bind the materials down firmly. On the last pull, grasp the fly line and the leader, allowing them to set up in line, then trim the tag ends closely. Finish the knot by putting a drop of Pliobond® or a similar cement on the entire knot, rolling the cement between the fingers to form a football-shaped element that will flow easily through the guides of a flyrod.

The nail knot can be turned into a needle knot by simply inserting the tag end of the leader or backing material through the center of the fly line before tying the knot. This approach has the advantage of being a bit smoother in passing through the guides.

Perfection Loop– Loops are used in many ways by anglers - connecting two lines, connecting a snell to a leader or line, or connecting a dropper to a dropper loop. The perfection loop is formed by forming a small loop in the end of a line. A second loop of about the same size is then formed. Reach through the first loop and pull the second one through it. Retain your grip on the tag end, moisten the material and pull it tight. The resulting loop is nearly round in moderately stiff materials.

Surgeon's Loop– The surgeon's loop is essentially the same as a surgeon's knot tied in a doubled, intact line. It is a strong loop knot that tends to lie a bit closer. Start by doubling the tag end of the line. Bend the end of the line into a loop, then pass the doubled end through that loop at least twice. Moisten the knot and pull it tight.

Dropper Loop – The dropper loop is essentially a barrel knot tied in an intact line. It is used to attach looped dropper leaders to the main leader in building a multiple fly cast, commonly used by wet fly anglers. It can also be used in building bait rigs, combination lure rigs, or attaching other types of terminal tackle. Begin tying the dropper loop by bending the leader material or line into a fairly large loop. Wind one piece of the loop around the other one (you must keep one stable to do this) at least 4-7 times. Push the active loop (the one you are wrapping) through an opening between the wraps on the second line. Moisten the line, hold the loop open with one hand of your lips, and pull on both ends to draw the wraps tight.

Another way to form a dropper is to tie an **extension blood knot**. Simply tie a blood knot as usual, but leave one tag end at least 8-10 inches long as the knot is tightened. This knot may be a bit stronger than the dropper loop, but it does suffer occasionally from being pulled apart. To prevent that from happening, remember to keep the extended tag end as a part of the leader going directly to the main line rather than the end following it.

Other Useful Knots

There are many other knots useful to the angler, some for fishing and others for working with boats or cargo. For offshore anglers, learning the Bimini twist may be important. For anglers who cannot tie the Palomar or improved clinch knots, perhaps the Duncan loop or uni-knot would be a valuable addition. The Jansik special and George Harvey knots are useful as well, as are the @turtle knot and others. All of these go beyond the basics and can be learned with a good text or teacher who is willing to share them.

Boaters and packers will find abundant use for some other knots, the square knot is one of the fundamentals that can be used in many situations. Half hitches are useful in taking care of loose line or making a temporary attachment. The bowline is a loop knot that will not slip or close yet is easy to untie when needed. Clove hitches, particularly when backed by a half-hitch or two provide secure attachment for anchor lines or similar items. The sheep shank is a method of shortening a line without re-tying or cutting it. The taut line hitch is very useful in binding down equipment where you need a tight line.

Spend some time learning knots. You will find them both useful and interesting. Learn to test them to see if you have an improvement on one that is old and familiar. Above all learn to choose the right one for the purpose at hand.

Exhibit or Sharing Suggestions

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1. Prepare an illustrated talk or demonstration on a selected knot and present it to an appropriate audience.
2. Assist other anglers in learning to tie some of the knots you have learned.
3. Make a photographic essay that illustrates a knot of your choice.
4. Give a demonstration on relative knot strength, discussing factors that make knots break.
5. Make a knot board using heavy monofilament or colored cord, illustrating how to tie some useful fishing knots.

Community Service and "Giving Back" Activities

1. Participate in a National Hunting and Fishing Day celebration or a similar activity, teaching fishing knots to the public.
2. Participate in a youth fishing day or similar activity in your community, assisting young anglers in setting up their tackle and learning to tie good knots.
3. Serve as a teen leader for your club, teaching about knots and knot tying.

Extensions or Ways of Learning More

1. Conduct a series of experiments using potential knots for several purposes and seeing which ones are stronger or more consistent. Share your results with others who are interested.
2. Obtain or check out a book on fishing knots (see references section) and practice those knots on your own.
3. Explore the origins of various knots and the purposes for which they were designed. Share that knowledge with your club or another interested group.
4. Study the origins of various fishing lines and the materials used in making them. Relate the nature of the lines to the knots used in them.

Links to Other Programs

Knots are useful in everything from making a secure package to packing either with a backpack, horseback or by boat or other vehicles. They can be used in making useful items from macrame to nets or hammocks. While many of these things can relate either directly or indirectly to fishing, the skills used apply to other programs as well. Tomato stakes do not help if a useful knot to bind the vines to the stake is not available. Lashing a tarp over other materials requires the use of knots. Making a knot board may require some basic or advanced wood working skills. Knots are useful in many other areas. Think about the applications briefly.

The use of Pliobond® in this text does not imply endorsement of the product or any censure of similar products on the market. It is simply included as a material useful to the angler in forming the knot in question.

Barbless Hooks: De-barbing, Sharpening and Using Them

Phil Genova² and Ronald A. Howard Jr.³

A large number of anglers, particularly those who fish with flies, prefer to use barbless hooks. These hooks offer several advantages for the angler. They have a smaller cross section, making them penetrate better. This feature makes it easier to hook fish with the barbless or de-barbed hook. They are easier to remove from either the fish or the clothing or anatomy of the angler because they have no barb to catch on the way out. When catch-and-release is being practiced, this allows for faster, less traumatic handling of the fish. Since the hook tends to leave only a small hole or a slightly elongated hole in soft tissue, there is less tearing around it, less tissue damage to the fish, and a higher probability of survival if the fish is landed in a similar time to that taken using barbed hooks. Using barbless hooks may cost an angler a fish once in a while, but good technique can keep those losses to a minimum. If a tight line is maintained, the hooks hold well and result in relatively few lost fish.

Some manufacturers compromise between barbed and barbless hooks by offering hooks with mini-barbs, very low, short barbs. At least two styles of hooks are available currently without barbs. One is a simple, straight hook without a barb. Another features a small hump in the shank between the bend and the point. These are not available in all styles and sizes, however. Anglers who wish to use barbless hooks for fishing, or those who are required to do so by local regulations, must know how to de-barb their hooks without damaging the hook.

Regardless of how it is done, the process is easiest before the hook becomes part of a fly. Larger hooks can be de-barbed by filing the barb away carefully. Leaving a small, smooth hump where the base of barb was adds some security to the hook-up, but it is not necessary. While the hook is in hand and the file is available, this is a good time to sharpen the hook as well. Some anglers attempt to de-barb their hooks by cutting the barb away with a pair of wire cutters. This puts tremendous strain on the area from which the barb was cut. On small hooks that can further weaken what is already the weakest part of the hook, resulting in breaking points from the hook. Multiple missed strikes might be a clue that the hook is broken, but this process of counting coup on striking fish is taking the concept of catch-and-release a bit too far for most of us. A better alternative is to crush the barb down with a pair of pliers.

How the barb-flattening process is carried out is very important to the angler and the durability of the hook. The easiest way would seem to be holding the hook by the shank, inserting the barb cross-wise in the jaws of the pliers, and crushing it down into the cut from which it originated. Unfortunately, this obvious approach can be extremely damaging to hooks, particularly those that are tempered to be quite hard. The crushing process works the steel, often producing tiny cracks or breaks. If the point does not break off in the pliers, it will be likely to do so just when the trophy of a lifetime is on the other end of the line. The proper way to flatten the barb is to place the point of the hook in the jaws of the pliers tip first. This supports the metal as it is deformed and is less likely to cause breakage.

When the hook is being handled to de-barb it is also a good time to sharpen it. Several sharpening styles are in common use. Some anglers like to use a hone or hard carborundum stone and work around the point of the hook, bringing a sharper, needle-like point to it. Some like to file a diamond-shaped point with four sharply angled edges. Others prefer to use a somewhat triangular approach - flat on the bottom and pointed toward the top of the shank. The needle point is the most delicate of the three, easily damaged or rolled by contact with stones or hard mouth parts. The others are like cutting needles. They are designed to cut through tissue to embed themselves. These points are more durable and tougher than the needle point. They are also quicker and easier to touch up in the field.

² Director, Fly Fisher Apprentice and Community Fly Fisher Program, 407 West Seneca Street, Ithaca, NY 14850

³ Professor and Extension Specialist, 4-H Youth Development, Texas Agricultural Extension Service, Texas A&M University System, College Station, TX

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Most anglers find a fine-cut file useful in sharpening large hooks. The file allows more material to be removed more quickly than does a stone. Smaller hooks and the final sharpening on larger ones should be finished with a fine, hard whetstone. Tapered stones, called slips, or specially designed stones for fish hooks work best with smaller hooks. Regardless of the approach used, the point should try to catch on a finger nail when the hook is dragged across it.

Sharpening hooks, like sharpening knives or broadhead blades, takes practice. But sharpness is one of the critical factors in solid hook ups on fish. The popularity of laser sharpened or chemically sharpened hooks in spite of their prices is testimony to the value experienced anglers place on sharpness in the hooks they use. Spend a little time learning how to sharpen your hooks, and the time will be rewarded in increased success.

The decision on whether or not to use barbless hooks is your own, a personal ethical decision that grows from experience and immediate objectives. It is not a one-size-fits-all decision or one that makes the angler ethically superior or inferior to those that elect the other course of action. The decision is unlikely to be the same for all species, all techniques, all waters and all personal objectives. We do feel that it should be included in the list of options for every angler, particularly in catch-and-release situations.

Fact Sheet Earthworms

Raising Earthworms⁴

Ronald A. Howard Jr.

Professor and Extension Specialist, State 4-H Office, 7607 Eastmark Drive, Suite 101, College Station, TX 77843-2473

Earthworms of some type have nearly universal appeal as fishing bait. The worms may be dug from the ground or decaying vegetation, picked up from moist areas at night, captured using a worm fiddle or some other device, or purchased from bait dealers. Many types of worms can be grown as fish bait. Climate and the tolerance of the worms for heat or cold imposes limits on the production of earthworms or the selection of worms that can be raised in some parts of the country. Large types commonly called "night crawlers" or "dew worms" and smaller types like "red wigglers" or "ringed worms" are commonly raised for bait or other uses.

In the wild, worms eat detritus, decaying organic matter and tiny soil organisms. They respire through the surface of their skins, so that surface must remain moist at all times. They grow best under cool to moderately warm conditions, depending upon the species being grown. Most species are relatively intolerant of high levels of sand in the soil. As a result, the soil or rearing medium must be composed of a mixture that avoids sand, and its moisture and temperature levels must be controlled within the tolerance limits of the worms. Best production will occur when they are held at the optimum or preferred range for the species. Food must be supplied to promote rapid growth and reproduction.

Materials and Equipment

Earthworms can be reared in buckets, tubs, above ground boxes, and rearing pits. In each case, the rearing containers should provide for adequate drainage while preventing smaller worms from escaping the container. Some growers place screened rearing boxes on rearing tables covered with a layer of sand. The boxes are made of rot resistant wood that contains no preservatives or poisons that can kill the worms. They are large enough to hold and grow a significant number of worms, but small enough that they can be handled easily when worms are to be harvested or sorted, or when growing media are being changed. Protection from predators is important in most areas.

A good worm growing medium can be made by mixing equal parts. Where summers produce temperatures in excess of the tolerance or productivity limits for the worms being raised, shade or other means of keeping the worms cool is absolutely essential to production. The following materials are needed to make a worm rearing facility.

Setting up a Worm Rearing Facility

⁴These materials are adapted from *Raising Earthworms*, a publication of the Southern Regional 4-H Wildlife Literature Committee

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Rearing Worms

Additional Information Sources

Extensions and Connections to Other Programs

Clearly, rearing worms can have a direct link to conservation or natural history programs. It could also provide an entry into entrepreneurship programs if the participant decides to raise worms for sale to bait shops or direct sales to anglers or if the dried worm castings are sold to gardeners or others wanting an excellent soil amendment. Gardening or horticulture projects can be enhanced by participation in a worm rearing project. Woodworking or other engineering projects could become related if building projects are included.

Raising Crickets ⁵

Ronald A. Howard Jr. ⁶

Crickets are a preferred bait for many types of fishes. They can be captured in open areas or under lights at night or purchased from bait shops or laboratory suppliers, but many anglers prefer to rear their own. During the warmer parts of the year, crickets can be reared by an angler for use as bait. The equipment needed is simple, inexpensive and easily maintained, and rearing procedures are relatively simple. Approximately 400 crickets can be reared every three months for every 450 square inches of rearing space (about the size of a five gallon bucket).

Materials and Equipment

The following materials are needed to make a cricket rearing facility.

- one of more well-cleaned grease, paint or food containers
- window screening
- tape or other attachment mechanisms
- chick watering fount (or equivalent)
- sand
- excelsior or coarse, dry hay
- poultry laying mash
- saucer or tray
- rain shelter
- insect control

Setting up a Cricket Rearing Facility

Large grease, paint or food containers approximately 18 inches in diameter make excellent rearing containers. Start by thoroughly cleaning the containers. If metal containers are used, sand the top few inches of the inside of the can to a smooth finish and wax it with a hard furniture wax. This helps to keep the cricket in the can. Prepare a piece of window screening to fit tightly over the top of the can. A firmly attached screen will prevent entry by unwanted pests and keep the crickets inside. Add about 4 to 6 inches of clean, dry sand to the bottom of the can and moisten the sand until it feels damp to the touch. Place a small glass poultry watering fount (basically a glass jar turned upside down in a pan) in the center of the rearing container, and fill the pan with cotton batting to a level just above the water level. Set one or more saucers or small trays of laying mash on the sand and cover the sand with about 4 or 5 inches of excelsior or coarse hay, pulling it up around the saucers and watering fount. Be careful not to create a siphon that will cause the fount to drain into the sand and cause the sand to become excessively moist. Stock each container with 20 to 30 adult crickets, about half of them males and half females. Female crickets can be recognized by the presence of a long ovipositor protruding from the end of the abdomen. Adult crickets have wings. Young crickets can be stocked, but the time required for the first crop of bait crickets will be longer. Place the container in an area where it will maintain a temperature of 80 to 90 degrees Fahrenheit, and arrange to protect it from rain if the chamber is set up outdoors. If ants are a problem in the area, use an insecticide or some type of barrier to prevent their attacking the crickets.

Rearing Crickets

Normally the sand need not be moistened again for about three months. Crickets need relatively dry sand to have the young remain free from disease. Clean the watering fount, replacing the water and cotton every four to eight weeks. Keep food readily available at all times. Plan on replacing food every two to three weeks when crickets are small

⁵These materials are adapted from *Raising Crickets*, a publication of the Southern Regional 4-H Wildlife Literature Committee

⁶ Professor and Extension Specialist, Texas Agricultural Extension Service, TAMU System, College Station, TX 77843-2473

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and every four to five days when they are larger. Replace food as needed.

Adult crickets lay eggs at intervals of approximately 30 to 50 days, laying them in slightly moist sand. The eggs hatch in 15 to 25 days, and the young crickets grow very rapidly at the prescribed temperatures. They reach bait size in about a month of growth at that temperature, and they will reach sexual maturity in one or two months. They can survive, but will grow and mature much more slowly, at temperatures significantly above or below that range. Shade will help to keep temperatures down during hot weather, and artificial heat, like a low wattage bulb suspended inside the container, can be used to raise the temperature under cooler conditions. **Caution: The heat from a light bulb placed too close to the excelsior or hay may cause a fire!**

Two to four crops of crickets can be reared in each container without cleaning the container. Generally, larger crops will be obtained if the containers are cleaned and restocked with adults after every second crop of bait crickets.

Additional Information Sources

Many sources of information can be used to further your production of crickets. You might start with E. Lawrence Palmer (1954) *Crickets as Bait*, from the National Wildlife Federation, Earl F. Kennamer, Leaflet YA-11, Auburn University Extension Service, Auburn, AL, or D. T. Gardner, *Fish Bait Production*, Circular E-33, Cooperative Extension Service, Auburn University, Auburn, AL. Consult your local Cooperative Extension Agent for additional information if needed.

Extensions and Connections to Other Programs

Clearly, rearing crickets can have a direct link to entomology and conservation or natural history programs. It could also provide an entry into entrepreneurship programs if the participant decides to raise crickets for sale to bait shops or direct sales to anglers. Woodworking or other engineering projects could become related if building projects are included.

Fish Prints

Name Tag Knowledge and Needs
By Ron Bacon

Best Time: First meeting of group, repeated daily if necessary.

Best Location: Wherever the group meets.

Time Required: 5 minutes

Objective:

1. Identify individual skill strengths and skill deficiencies of participants with the intent of promoting on going mentoring to work on deficiencies.
2. Promote communication among the group.

Equipment: Self-adhesive labels 3" x 2" and pens

Narrative: At the beginning of every day, participants will write on self-adhesive label three of their angling skills which they would be willing to share with others. Also listed should be three skills with which they would like assistance. These labels are then attached on the bottom half of their name tags. Throughout each day, as time permits, participants should focus on sharing their expertise on this knowledge and needs basis (mentoring one another). The label listing can and probably will change on a daily basis.

Evaluation: At the end of this week, participants should have had an opportunity to both mentor and be mentored by their fellow participants, thus increasing their own knowledge in angling skills and mentoring.

Fish Prints

Fish-Match Mixer

By Ron Bacon

Best Time: First meeting of the group, repeated whenever the group needs to be divided into pairs.

Best Location: Wherever the group meets

Time Required: 10-15 minutes, depending on the size of the group.

Objectives: Participants will

1. Learn characteristics about indigenous fish species.
2. Learn name and something new about their partner
3. Practice communication skills
4. Experience system that divides group into pairs.
5. Have an enjoyable and social experience.

Youth Development Objectives:

1. Develop interpersonal communication skills
2. Increase self-esteem.

Evaluation:

1. Do participants have enough basic knowledge to “match” their fish picture?
2. Can the group be divided in an effective and timely manner?

Materials: Individual color plates (pictures) of fish indigenous to the area. Different species for every 2 participants. Each fishplate (to be cut in half) should be large (8 ½ x 11”) in size and laminated for repeat use.

Narrative: This lesson has 3 basic purposes:

1. Serving as a group social mixer, allowing participants to meet one another.
2. Divide group into pairs for future instructional purposes.
3. Learn specific information on local fish species.

Randomly pass out the one-half color plates to the group (one per participant) with instructions that they need to find their other half (match). When they find their match, quickly have them introduce themselves to one another. They should tell their new partner something that can be used to introduce them to the group. Discuss your “fish” and be ready to give one or two characteristics of the fish to the rest of the group.

When it appears that the matches are made, introductions and fish discussion are complete, call the group to order. By pairs, have each fish team member introduce their other half by name, and one or two particulars on the person and a characteristic of their fish. Once the entire group has spoken, you now have teams for the first paired activity.

The mixer can be repeated every time you need to divide the total group into pairs. At the end of 5 or 6 paired activities, most participants will know the names and have some background on the other members of the group as well as be familiar with different fish species.

If you need to create groups of 4 or more, you can group according to families such as sunfish, trout and salmon, catfish, pike, etc.

Alternate to the verbal explanation. The specific characteristics of each fish could be listed on sticky label attached to each ½ of the fishplate. Each time a match is made, write down a new characteristic. At the end of the day(s), the participants should have a thorough description of that particular species of fish.

Fish Prints

Games-Skill Building Activities

By Ron Bacon

Best Time: Anytime after a casting unit is taught. Preferably as a summary activity after all casting units have been completed.

Best Location: A wide-open area outdoors — parking lots, athletic field, etc. An indoor gymnasium or a large room can be used but is not preferred.

Time Requirement: 30 minutes to 2 hours

Objective: Participants will:

1. Practice proper casting techniques in a bait, fly, spin casting and spinning.
2. Increase opportunities to be proficient in hitting desired target.
3. Practice safety awareness.
4. Have fun while practicing.

Youth Development Objectives:

1. Practice responsible behavior.
2. Practice fine and gross motor skills.
3. Enhance hand/eye coordination
4. Enhance self-esteem and self-confidence
5. Experience in team building.

Equipment: Rod and reel of choice, utilizing soft casting plugs or yarn fly. It is suggested that similar type and pound-test lines and similar plug weights should be used whenever possible. Each participant should have their own rod and reel, in most cases. Targets can be made from cardboard (can be cut out to simulate fish), aluminum cans, plastic pans, etc.

Narrative: Utilizing games as part of the instructional unit introduces some “fun” into the often-boring need to practice, practice, practice. The slogan, “practice makes perfect” is most appropriate for proficiency in angling skills. The games used are examples of how you can enhance skill development.

Fish On — Working in pairs, have one participant cast the plug some distance. Then have the partner pick up the plug and act like a fish. Make sure the partner has a good hold of the plug and does not let go which could fly back and serious hurt someone. Caster must retrieve the “fish,” keeping the line taut and rod bent. This action simulates the actual experience of bringing in a fish. Have partners trade roles and repeat.

Fish Prints

Roving Plug — A small group roves through a backyard, field, or meadow. Someone picks out a brown oak leaf, a small stick or a stump 30 to 80 feet away and challenges the others to cast closer to it than he/she does. Each person casts. The nearest cast scores 1 point. If a hit is made, a 3-point bonus is scored. The caster coming closest to the object picks the next target. In this game, instead of retrieving the plug, the caster walks toward it as he/she reels.

Plug Bombardment — Two teams compete for a specified period. The team scoring the most hits on the target or targets wins. Alert judges are needed unless the targets used can be heard when they are hit.

Box the Compass — Eight targets are arranged in a circle with a 40-foot radius. The caster is at the center. These targets are arranged so that one is north of the center, one is south, and the others are east, west, northeast, southeast, southwest and northwest. The caster must hit each successive target before he goes on to another. Count each cast. The lowest score wins, that is eight points would be perfect.

Challenge — One caster challenges another to ten or more casts with targets at a specified distance. Competing casters decide who goes first and then alternate until each has cast the agreed number of times. The caster scoring the most hits wins. If a tie results, each of the two casts five or more times until one of them wins.

Rod N' Reel Golf — Using a rod and reel, casting plug or yarn fly combination, this game is played the same as golf. You count the number of casts (strokes) necessary to eventually cast your plug/fly into the target – plastic pan, tub, base of a tree etc. (cup). Each new cast begins where the previous cast ended up. Any number of persons can play, but this game is best suited to the usual twosomes, threesomes or foursomes. The course can be laid out in most outdoor environments, with safety precautions taken to avoid conflicting use, and can be as sophisticated as one desires with tee markers and yardage signs. Most courses are either 9 or 18 targets (holes). Winning team is determined by the least number of total casts (strokes) after playing the entire course.

Making Fish Prints⁷

Mary Jamieson Riley⁸

Objectives

Participating young people and adults will:

1. Review external anatomy of fish
2. Identify characteristics of fishes being printed
3. Relate form to function in external anatomy
4. Have fun while learning.

Roles for Teen and Junior Leaders

1. Assist with teaching area set up and break down
2. Demonstrate fish printing
3. Assist members as needed
4. Lead discussion of anatomy and function
5. Assist with labeling as desired

Potential Parental Involvement

1. See Roles for Teen and Junior Leaders@ above
2. Arrange for or provide teaching space
3. Arrange for or provide teaching materials
4. Arrange for or provide fish for printing

Youth Development Objectives

Participating young people will:

1. Enhance hand-eye coordination
2. Enhance fine motor skills
3. Expand science awareness
4. Relate form and function in living things
5. Practice cooperation

Evaluation Suggestions

1. Observe group behavior and interactions
2. Observe ability to follow simple directions
3. Observe ability to relate anatomy to function

Best Time: Following a fishing experience or as an introduction or summary activity for a fish anatomy lesson

Best Location: Anywhere comfortable location where paint spills will not be a problem

Equipment/Materials

Fish banners or pictures
whole clean fish
newspaper
large soft paint brush about one inch wide
paint containers (plastic dishes, pie pans, or baby food jars (number needed depends on the number of colors you will be using.)
markers
tempera paint
Fish T-shirts
acrylic paint
permanent clothing additive
hangers
permanent markers

References

Aquatic Sampling. NY SAREP Program Manual. Edelstein K. L. and B. E. Matthews.1993. Cornell University: Ithaca, NY. 75 pp.

Nature Crafts for Kids. Fish Print. Krautwurst G&T. . 1992

⁷ Adapted from multiple sources

⁸ Department of Fisheries and Wildlife, Michigan State University, East Lansing, MI 48824

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Fishes: an introduction to ichthyology. 3rd ed. Moyle, P. B. and J. J. Cech Jr., 1996.. New Jersey. Prentice-Hall, Inc. pp 18-20.

Safety Considerations

Be careful of younger youth putting paint into their eyes and mouths.
Make sure following this activity youth wash their hands.

Lesson Outline

Presentation	Application
<p>I. Introduction</p> <ul style="list-style-type: none">A. Preparing the fishB. Painting the fishC. Printing the fishD. Labeling the fishE. Finishing the banner	<p>Fish prints are an excellent way to save a memory of a fishing trip with a special picture. Anyone can learn to make a fish print, and the fish can still be eaten if it is kept fresh and non-toxic inks or paints are used. Individuals may select their own fish or a couple selected specimens may be used.</p>
<p>II.. Preparing the fish for printing</p> <ul style="list-style-type: none">A. Removing the slime<ul style="list-style-type: none">1. Mild vinegar solution2. Wiping with a cloth or paper towel3. Making a couple of printsB. Painting the fish<ul style="list-style-type: none">1. Work from head to tail2. Leave fins and eyes paint less for now3. Apply a very thin layer of paint<ul style="list-style-type: none">a. Less is generally betterb. Thin as required4. Paint fins and tail last	<p>Coarse scaled fish often make more interesting prints, but all slime must be removed. Use a mild vinegar solution to rinse the fish and dry it with a paper towel or cloth. Several treatments may be required.</p> <p>DEMONSTRATE the fish painting process. EMPHASIZE using a thin coat of paint applied from the head toward the tail. Be sure the fish is placed on a protective surface to catch extra paint or drips.</p> <p>PAINT the fins and tail last, just before printing. EMPHASIZE the importance of keeping the paint thin and the coverage light. There is a strong tendency to apply too much paint.</p>
<p>II. Printing the fish</p> <ul style="list-style-type: none">A. Moving the fish<ul style="list-style-type: none">1. Avoid smearing the paint2. Position the fish to show featuresB. Making the print<ul style="list-style-type: none">1. Lay printing material gently on fish<ul style="list-style-type: none">a. Newsprintb. Dampened rice paperc. Tee-shirt with newsprint liner2. Press printing material firmly against fish<ul style="list-style-type: none">a. Caution to avoid moving the materialb. Need to contact all parts of the fishC. Removing the print from the fish<ul style="list-style-type: none">1. Peel printing material away from fish	<p>DEMONSTRATE moving the fish to a clean, dry piece of newsprint, keeping the painted side up. This prevents having extra spots of paint on the finished print. NOTE the need to work rather quickly to avoid letting the paint dry on the fish.</p> <p>DEMONSTRATE the use of several printing media, allowing the youngsters to select the type they wish to have. While rice paper is more expensive, it makes a more permanent and artistic print. CAUTION shirt printers to insert a layer of newsprint between the layers of the shirt to prevent strike-through of the paints.</p> <p>NOTE that over-handling can result in smearing the print, but that full contact is needed to get all parts printed.</p> <p>Slowly and smoothly PEEL the printing material away from the</p>

Fish Prints

with a smooth motion

2. Fill in eye with a small brush, avoiding smearing wet paint or ink

Sign prints to avoid confusion

4. Set aside or hang securely until dry

D. Preparing the fish for the next print

1. Prints often improve with use
2. Remove paint and dry thoroughly

III. Labeling the print

A. Why label?

1. Increase knowledge of fish characteristics
2. Identification of unknown fishes
3. Label to meet objectives
 - a. Fish biology and anatomy
 - b. Fish art and trophies

B. External anatomy and function

1. Median fins

a. Dorsal fin(s)

- 1) Spiny dorsal
- 2) Soft dorsal
- 3) Functions
 - a) stability in the water
 - b) positioning
 - c) communication

b. Caudal fin

- 1) Tail fin
- 2) Many types and shapes
 - a) Homocercal
 - b) Heterocercal
- 3) Function - propulsion

c. Anal fin

- 1) Variable in type and shape
- 2) Primary function -stabilization

d. Adipose fin

2. Paired fins

a. Primary steering fins in motion

- 1) Vertical movement
- 2) Horizontal movement

b. Pectoral fins

fish. **AVOID** sliding the material across the fish body.

USE a small brush to fill in the eye on the print.

3.

A little extra time here will prevent possible misunderstandings or confusion later.

USE regular markers to label prints or banners and fabric pens to label shirt material.

NOTE that labels can be used for many purposes, from simple identification and dating of artistic prints or trophies to scientific or educational labels of external anatomy. The latter creates a learning aid to enhance knowledge of fish characteristics and function.

REVIEW the median fins found on the fish being used in the exercise. **NOTE** that their names come from Latin or Greek names for the location or composition of the fin. For example, dorsal means Aback@, caudal means Atail@ and anal means Anear the anus@, while adipose means Afatty.@"

NOTE that the dorsal fins can be of different types. Spiny dorsal fins have hard spines supporting the membrane, while soft dorsal fins have softer rays supporting the membrane. Both types are used for stability, minor position adjustments, and communication. **ASK** what type of dorsal fins are present and how many spines are present on the specimen fish.

NOTE types of caudal fins if appropriate to the audience. Homocercal (equal top and bottom) tails are nearly equally divided by the fish=s spine, while the spine extends into the upper lobe of a heterocercal (unequal top and bottom) tail. Also **NOTE** that primary propulsion is by this fin.

NOTE the location behind the anal opening and that the primary function is similar to the dorsal fin -- stability and attitude adjustment in the water.

NOTE that the function of the fatty tab-like fin is not clearly known, although it may be important for movement in fry. Adipose fins are present in only a few families.

NOTE that the paired fins are used for steering as well as communication. They adjust movement laterally and vertically, making the fish maneuverable. Pectoral fins are the shoulder fins or Aarms@ of the fish, while the pelvic fins are the hip fins or Alegs.@ Pelvic fins may be positioned at the throat, thorax or

Fish Prints

- 1) Shoulder fins or arms
- 2) Right behind operculum
- c. Pelvic fins
 - 1) Hip fins or Alegs@
 - 2) Locations vary
 - a) Throat area - jugal
 - b) Chest area - thoracic
 - c) Abdominal area - abdominal
3. Other external organs
 - a. Mouth
 - 1) Food gathering
 - 2) Type, location and size aid identification
 - b. Barbels
 - 1) Sensory organs
 - 2) Present in some families
 - c. Operculum
 - 1) Opening behind gills
 - 2) Protect gills from damage
 - d. Eyes
 - 1) Visual organs
 - 2) Location indicates feeding strategy
 - e. Nares
 - 1) Chemical receptors
 - 2) ANose@ holes
 - f. Lateral line organ
 - 1) Chemical and vibration receptors
 - 2) Line of sensory pores

toward the back of the belly.

Briefly **REVIEW** other external organs that can be observed in the fish prints or on the specimens used. **NOTE** that the location, size and type of mouth helps in identification and determining the feeding strategy of the fishes.

NOTE that barbels are located in some families of fishes and that they serve as chemical receptors to aid in locating food.

POINT OUT the operculum and note that it covers and protects the gills.

NOTE that the fish=s eye is similar in function to our own. **STRESS** that their location and size give clues to habitat and feeding strategies.

INDICATE the external nares and their chemical reception function.

ASK how a fish Ahears@ or picks up vibrations in the water. **NOTE** that the lateral line organ acts as both a chemoreceptor and a vibration receptor. **ASK** how this sense might be useful under dark or murky conditions.

IV. Finishing the banner or shirt

- A. Finishing the banner
 1. Turn banner face down
 - a. Fold along top edge
 - 1) Width adequate for suspending rod
 - 2) Stick along edge with rubber cement
 - b. Fold along bottom edge as above
 2. Insert dowel or bamboo rod
 3. Attach cord or yard to hang banner
- B. Finishing the shirt
 1. Iron in paint before wearing

Lesson Narrative

Fish Print History

After a good day of fishing, anglers like to revisit the day=s events and discuss their catches and losses. Although much of the fun in this story telling results from embellishment in the re-telling, recording the catch can also be fun. One of the ways of recording a good day=s catch can be to create a fish print of their own as a reminder, a learning aid, or even a trophy.

Fish Prints

Fish printing dates back to Japan over 100 years ago. Anglers made fish prints to record their catches and to save information on fish biology. The Japanese term for fish printing is Agyotaku (pronounced ghio-ta-koo), and it is an art form that can be useful in other ways as well. Although this method of printing does not provide the best avenue for fish identification, it can be very useful for learning external anatomy as well as recording a catch effectively.

The traditional Japanese method of fish printing used rice paper as a medium for the print, but prints can be made on other types of paper or cloth, including tee-shirts. Block printing paper makes excellent prints, but drawing paper, white paper, tissue paper or even plain newsprint can be used. Shiny, slick finished paper does not hold the paint or ink well, however.

Material Tips

The best location to purchase the necessary supplies for this activity is your local arts and crafts store. Most of these stores will carry the paint, paper, glue, etc. T-shirts can either be purchased or have the participants bring one from home. The T-shirts should either be white or light colored.

Although nearly any fish can be used, fish selection is important to the success of the activity. Fish with laterally compressed bodies are easier to handle, and those with relatively coarse scales and minimum amounts of slime are easier to print. Flounder, bluegill, perch, rock bass, crappie or similar shaped fishes are easiest for beginners to use. As they develop some skill in fish printing, they can use larger specimens and species with more rounded body shapes. Fish that are too large are difficult for youngsters to handle effectively, while those that are too small may lose some detail in the printing process.

Since the fish must be still, clean and dry to produce effective fish prints, the specimens must be dead before they are used. The potential benefits of having the dead specimen must be weighed against returning the fish to the water, just as the benefits of keeping a fish must be weighed against catch and release. Once the decision to keep the fish has been made, the animals should be killed humanely with minimum damage to their external characters. Freezing is an effective method of killing the fish without damaging them, although larger specimens may be killed with a sharp blow to the head. As in other uses of fish, avoid keeping the fish in conditions where they can begin to decompose if they are to be used in fish printing. Before the fish can be used for making prints, it must be free from slime, clean and dry. Some fishes will require treatment with a mild vinegar solution and being wiped down several times before they are ready to use in printing. Often the quality of the prints will improve with use as the slime layer is depleted.

Paint or inks should be applied sparingly, covering the body before applying material to the fins. The tendency is to put too much paint or ink on the fish rather than not enough. Paint the fins last, just before making the print. Leave the eye blank and paint it in by hand after making the print. This permits some artistic license and may allow an artist to make the eye look more lively by using some white space in the painting.

Color Selection

Although black ink on pale rice paper is the tradition, color adds to the attractiveness of the fish print and allows some artistic expression on the part of the printer. Allow group members to be creative in their painting schemes. The print need not represent the color pattern of the live fish, and the addition of color personalizes the print made by each youngster. That aids in identification of their own work and enhances interest. Remember that light coatings are MUCH better than heavy ones when print quality is concerned. A thick layer of paint will result in a poor replication of the fish.

Labeling

The use of this lesson should determine the type of labeling that takes place. If the specimen fish is a trophy that is being saved as a fish print before going into the family larder, labeling with the location, date, species, size and angler may be all that is needed. If it is to be a learning aid, labeling the external anatomy can prove very useful. In the latter case, forming small groups and providing some suggested labels can be very instructive. Providing quality leadership while they determine the locations of the various parts and

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how to label them is key to getting the information correct and neatly represented. Once the groups have come to independent conclusions on matching the labels to the fish anatomy on the prints, go over the parts and their functions with them. If possible, take the time to use a discovery approach in outlining the functions of the external features.

Use and Display

Once the paintings, banners or tee-shirts are completed, take the time to make them ready for use or display. Note that the tee-shirts should be ironed with a damp towel over the paint before wearing them or placing them in the laundry. Banners can be hung for display or matted and framed for the use of the maker.

Exhibit and Sharing Suggestions

1. Develop a group or individual display of fish prints representing local species for your county or state fair.
2. Develop a group demonstration for a fair or similar event, assisting others in learning to make fish prints or prints of other things - like flowers, leaves, or animal tracks.
3. Set up a display highlighting the external anatomy of different species of fish and how they differ.
4. Create a set of teaching posters to assist other young people in learning the external anatomy of local fishes. Make your teaching materials available to your leaders or volunteer to instruct other young people in external anatomy and identification.

Community Service

1. Volunteer to make fish prints with participants at a local fishing derby or national hunting and fishing day celebration.
2. Use the fish printing approach to teach fish anatomy with young children in a community setting.

Links to Other Programs

Links to other elements of the Sportfishing Program can be made easily, particularly with fish biology and ecology and with the angling skills areas. This lesson also can be used to develop artwork that can be shared in communications and artistic expression projects. The content can be used in other areas of conservation education, and the program fits well with elements of Project WET and Aquatic WILD, particularly with *Water Messages in Stone* (Project WET), *Water Plant Art*, *Micro Odyssey*, and *Fashion a Fish* (Aquatic WILD).

Planning the fishing trip

Sharon Rushton

Once participants have developed good casting skills, it is time for the real thing. Depending on the age level, the leaders may want to plan the first trip. However, it is important, that participants learn how to plan the trip on their own. So after, the first trip, turn the planning over to them.

Angling Skills Objectives

Participating young people and adults will:

1. Gather research and information.
2. Determine what options they have for places to fish
3. Determine where the fish are biting the best?
4. Determine which would be the best baits to use.
5. Determine which equipment they will need to take.
6. Determine how they are going to get there.
7. Determine what safety and food considerations need to be considered.
8. Have fun fishing.

Youth Development Objectives:

Participating young people will:

1. Enhance decision making and critical thinking skills
2. Enhance communications skills
3. Enhance relationships with adults and other youth
4. Enhance science and technology awareness
5. Enhance self concept
6. Gain self-confidence
7. Enhance teamwork.

Roles for Teen and Junior Leaders:

1. Assist with Internet searches.
2. Assist with mapping exploration

Potential Parental Involvement

1. Bring maps, magazines and newspapers
2. Bring cell phones
3. Arrange for or provide refreshments at the meeting.
4. Provide transportation.

Evaluate

Activities/Suggestions

1. Evaluate the meeting itself, and the communication skills used.
2. Evaluation of the fishing activity will be somewhat self-evident. Did youth catch fish? Did they bring the right equipment? Did they get hungry? Did they have a good time?
3. When they return, have participants evaluate what they will do different next time.

Best Time: Anytime the fishing season is open.

Best Location: Indoors where you have access to a telephone, the newspaper, magazines, maps and possibly the Internet. As part of the exercise, participants will decide the best place to go for the fishing experience itself.

Time Required: One meeting - 30 minutes. Second meeting (actual planning meeting) —60 to 90 minutes. Fishing trip can be variable from a few hours to a day. Follow-up meeting – 30 minutes.

Equipment Materials

Telephones /Telephone book
Computer connected to Internet (optional)
Maps of the area that show fishing locations
Newspaper articles on fishing conditions
Magazine articles discussing type of fishing condition for time of year.
Fishing rods and reels, line, hooks, bait, lures
Ice and Ice Chest
Food and Drink

Safety Considerations

There should be little safety concerns at the planning meeting itself. However, there are many safety considerations that need to be considered in the fishing trip itself. If there is

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deep or fast moving water, participants may need personal floatation devices. Water needs to be available to prevent dehydration. All participants should be required to wear glasses and a hat with a bill worn over their eyes.

Anglers should be reminded to always be aware of where their line and hook can potentially go when casting. A first aid kit should be available.

Lesson Narrative

As an ongoing project, have 4-H members collect magazine articles that would relate to fishing areas near where they live.

First Meeting: At a meeting at least a month in advance of the “Planning the Fishing Trip” meeting, have members:

- Call or write to the state fish and wildlife agency to send fishing regulations and any information or maps the agency has on fish or fishing in your section of the state.
- Visit tackle stores and ask about places to go. If they have topographical maps or fishing maps available, purchase a copy if your club can afford it.
- Discuss and research who the anglers are in your area that fish a lot and get their phone numbers.
- Check what license requirements are and make sure anyone who is required to have a license, purchases one and has it on his/her possession while fishing.

Second Meeting: Have participants bring all available information they have located. This meeting should be facilitated by the leader, but not lead by the adult leader. The actions below are for the participants to do. Allow participants to discuss and to make the decisions. For the following to be effective, the actual fishing trip should follow the planning meeting within a few days. Therefore, if your meeting is on a Tuesday, plan the fishing trip for a day after school later that week or on the upcoming weekend.

- Assign tasks to group members and have them report back to group.
- Review the material and maps and list the fishing options available.
- List the kinds of fish found in the waters selected.
- Call tackle stores in the area to find out where the best fishing is currently and find out what types of bait the fish are hitting.
- Call anglers and possibly the conservation officer in the area to see where they are having success. Ask about where they are finding fish in the specific water (i.e. points, shallow coves, drop offs, around cover, etc). Ask what types of baits have been most effective.
- Check sites on the Internet to find local information and general fish behavior information.
- Be sure to involve the whole group in discussions and decisions. Make a decision on where to go and what fish you plan to fish for.
- Check the weather forecast. If there is a cold front or storm coming through, it will change the behavior of the fish from what they have learned from the anglers and tackle stores. However, by referring to magazines, books, information on the internet, have

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participants be prepared by having options of baits and a knowledge of where fish may move.

- Utilizing all the information gathered, make a list of the equipment that will be needed for the trip. Consider rod and reel types, size of fishing line, and types of baits to bring. Participants can change their line if need be at the meeting or when they get home. They need to be prepared for the fishing trip.
- When fish are caught, decide whether some will be kept for cooking or whether all fish will be released. If some fish will be taken home, decide who will bring a cooler with ice.
- Discuss safety considerations. Will personal floatation devices be needed? Who will bring the first aid kit? Will sun tan lotion be needed? Have everyone make a checklist to bring and wear glasses and a hat with a brim that can be worn over the eyes. Review casting safety. Review potential hazardous situations at the site you plan to go to and how to deal with them in a responsible manner.
- Will everyone be responsible for his or her own food or will a group be in charge of it? Make sure there is enough water to prevent dehydration. If a group is put in charge of food, decide what kind and how much.
- How is everyone going to get to the fishing site? Can you walk or ride bikes? If not, have participants make calls to parents that evening to line up transportation.
- Set a time and place for everyone to meet.

Fishing Day: Participants apply what they have learned. Review safety and hazardous things to be aware of again before participants disperse. They are encouraged to use decision-making skills, and adjust to changing situations. The most important thing is that everyone has a good time.

Meeting following the fishing day. Review what participants learned. Were the fish in the areas where they had planned? If not, were they able to locate them? Did it follow the patterns learned from information they had researched? What did they learn about different baits used? What would they do different next time?

Extensions: This is a format that can be used over and over. Fish change behavior as weather and seasons change. The more opportunities the participants have to fish in varying conditions, the more they will learn and the better anglers they will become. Explore fishing for different types of fish. Fish lakes, ponds, rivers... all offer different learning experiences. Fish out of canoes. Fish with adult anglers (maybe with tournament anglers with boats). Invite friends of 4-H members to go on a trip and encourage them to join the club after they find out how much fun they can have.

- Family Fishing Day — families go together. 4-H'ers help those learn who have not been before.
- Take A Friend Fishing Day
- Consider building a group ethical code of fishing prior to the fishing trip.

Skill-A-Thon

Angler Skill-a-Thon

Doug Hart

Best Time: any time as a skills review session

Time Required: 5-10 minutes per review station.

Objectives

Participating young people and adults will:

1. Review and demonstrate angling skills
2. Review and demonstrate mental processes developed
3. Enhance understanding of ethics and angler responsibilities
4. Have fun while learning

Youth Development Objectives

Participating young people and adults will:

1. Enhance leadership skills
2. Practice problem solving skills
3. Expand communications skills
4. Progress in developing a personal code of ethics
5. Practice stress reduction skills

Evaluation Activities/Suggestions

Based on the outcome of the skill reviews, the leader will be able to evaluate learned angler skills. The level of accomplishment should equate to the members age and ability.

Roles for Teen and Junior Leaders

1. Assist in setting up the skill-a-thon layout
2. Administer skill-a-thon station activities
3. Evaluate participant performance in activities or events
4. Assist in tabulation of results
5. Lead in award or recognition emphasizing personal development

Potential Parent Involvement

1. See ARoles for Teen and Junior Leaders@ above
2. Arrange for or provide equipment or props used in the skill-a-thon stations
3. Arrange for or provide a workshop location
4. Arrange for or provide transportation
5. Arrange for or provide appropriate refreshments
6. Assist in development of skill-a-thon stations appropriate for the location and skill level of participants

Skill-A-Thon

Leader Tips

The oral and demonstration test may be administered at the end of each lesson period or may be given as a "Round Robin" overall skill review at the end of the year. Make the test fun and a demonstration of skill and knowledge in a "No-Fail" atmosphere rather than a stress producing event.

Lesson Outlines

Station #1

The leader/volunteers will check on the ability of members to complete the following skills: (very young members can be helped by older members/volunteers to achieve all station goals.)

1. Casting closed and open face rod/reel at a target.
2. Tying and naming two knots.
3. Tying rigging of fresh and salt water tackle for bait.
4. Identifying artificial baits for two types of fish.

Station #2

The leader checks on the ability of members to explain and demonstrate:

1. Proper catch and release procedures - physical methods demonstrated with a "pillow fish" to prevent damage to the fish.
2. Why catch and release procedures are important to fish survival as wild breeding stock.

Station #3

The leader checks on the ability of the members to find and interpret the catch rules for two fish in their region. State sportfishing regulation booklets are available from many nearby license agents.

1. Members cross reference the codes, catch limits, size restrictions and open seasons of two species of fish located in their region. They orally report their findings.

Station #4

The leader will orally ask members questions about water safety issues:

1. Members demonstrate the proper wearing and "cinching-up" of a life jacket.
2. Members demonstrate the non-contact method of rescue by throwing a ring buoy to a target spot 25 feet away and how to get help.
3. Members demonstrate the safe way to remove an embedded hook from a bar of soap.

Station #5

The leader asks members to identify structures and temperatures most likely to find fish.

1. Members identify the most likely structure fish will be hiding under from a picture or slide of a nearby pond or river. The importance of the thermocline should also be included.
2. Members identify the components of the fresh or salt water food chain and their importance to the survival of fish.
3. Members will identify and explain the function of a fish's body organs and parts.

Skill-A-Thon

Station #6

The leader asks member to explain the function of the Water Cycle and the importance of clean, non-polluted water.

1. Members identify some of the chemical and waste pollutants that degrade our surface and subsurface water supplies.
2. Members identify some of the other degrading factors of the water such as discarded monofilament line, styrofoam worm cups, etc.

Station #7

The leader will ask members to explain their personal commitment about "getting involved with fish."

1. Members reflect upon their feelings about what a good steward of the resources entails.
2. Members describe their own personal code of ethics.
3. Given a hypothetical situation relating to fishing, have members describe how they would respond to this dilemma.

Keeping a Fishing Field Journal

Shari L. Dann⁹ and Ronald A. Howard Jr.¹⁰

Objectives

Participating young people and adults will:

1. Record fishing experiences in a journal
2. Practice writing observations and outcomes
3. Practice a scientific communications skill
4. Enhance observation and reporting skills
5. Have fun while learning

Youth Development Objectives

Participating young people will:

1. Practice written communication skills
2. Learn the value of self-reflection
3. Develop planning and analytical skills
4. Enhance enjoyment of fishing and outdoor recreation
5. Enhance relationships through shared experiences

Roles for Teen and Junior Leaders

1. Share examples of their journal entries with members
2. Assist members with spelling or sketching entries
3. Share uses they have found for their journals

Potential Parental Involvement

1. See Roles for Teen and Junior Leaders@ above
2. Assist members with making journal entries
3. Reinforce use of fishing journals at home
4. Encourage use of journal information to answer questions about fishing and fish

Evaluation Activities/Suggestions

1. Have youths read aloud from their journals if they are willing to share what they have written. Discuss each angler=s journal entries.
2. Encourage (but don=t require) members to share parts of their journal entries with parents.

Best Time: During or after any fishing outing

Best Location: anywhere

Time Required: 10 to 40 minutes

Equipment/Materials

paper (100% cotton fiber is most waterproof)
pencils or permanent (waterproof) pens
clipboard or small 3-ring notebook
newsprint and markers

Safety Considerations

Some youths, particularly early adolescents, may record personal information they would rather not share. Respect their privacy, and encourage them to find some small part of their journal they are willing to share, or to share parts of entries with just one or two other teens.

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⁹ Assistant Professor and Extension Specialist, Department of Fisheries and Wildlife, Michigan State University, East Lansing, MI, 48824

¹⁰ Professor and Extension 4-H and Youth Development Specialist, Texas Agricultural Extension Service, Texas A & M University College Station, TX, 77843-2473

Journal

3. Observe changes in journal entries with practice.

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Lesson Outline

Presentation

Application

I. Why keep a field journal

- A. Fishing related
 - 1. Record of catch
 - 2. Record of effort
 - 3. Record of fish kept, released
 - 4. Record of methods tried and results
 - 5. Record of habitats fished
 - 6. Basis for understanding changes in an area
- B. Fishery science or management related
 - 1. To assist fisheries managers with data
 - 2. To better understand an area
 - 3. To provide historical data describing fisheries from journal entries
- C. Personal enjoyment
 - 1. Recording experiences
 - a. Ease of recalling
 - b. Accurate record of experiences
 - 2. Sharing experiences with others

Ask youths to **BRAINSTORM** reasons that an angler might want to record information about their fishing trips? **LIST** their responses on newsprint or on a blackboard, grouping them in a manner similar to the outline. Be prepared for youngsters to list a variety of ideas, mostly concrete ideas such as Ato be able to find a good fishing hole over and over,@ and Ato remember where the big fish are.@ **USE** probing questions (for example, AWho else might use written notes...and why?@) to encourage youths to see other good reasons for writing down information about their fishing outings.

II. What should or could be written about your fishing experiences?

- A. Working from memory
 - 1. Forgetting important things
 - 2. Losing lessons learned and experiences gained

One-minute field notes exercise B [**NOTE**: This must be done after a fishing outing or other outdoor experience.] **ASK** youths to think privately (without talking) about their most recent fishing outing or outdoor experience. **TELL** them that they will have 1 minute to write down as much as possible about where they went and what happened. **NOTE** that spelling and grammar are not important for this exercise -listing everything they can remember or using running phrases is fine. Let them **WRITE** for 1 minute. Have each youth **SHARE** their writing with one or two others. **ASK** how easy it was to remember the details of the fishing experience. **QUESTION** if they have captured enough information to be able to return to the same place and fish in the same way just by reading what they had written 10 years from now. Lead them to **DISCUSS** their perspectives, emphasizing

Journal

- A. Heading information:
 - 1. Date
 - 2. Name(s)
 - 3. Location (in detail)
- B. Body of entry:
 - 1. Anyone who was with you
 - 2. Time of day (and time zone information)
 - a. Often written in the left margin
 - b. Show time events occurred
 - 3. Weather conditions
 - a. Temperature
 - b. Wind conditions
 - c. Cloud cover
 - d. Precipitation
 - e. Previous weather influences
 - f. Weather changes during outing
 - 4. Water conditions (as applicable)
 - a. Water temperature
 - b. Depth
 - c. Current or tide conditions
 - d. Wave conditions
 - e. Water clarity (e.g. Secchi disk depth)
 - 5. Purpose(s) of your outing.
 - 6. Time progression
 - 7. Habitat descriptions
 - 8. Appearance of fish or wildlife
 - a. Markings
 - b. Size
 - c. Age and sex (if known)
 - 9. Numbers of fish/wildlife
 - a. Observed - seen, heard, etc.
 - b. Caught or lost
 - c. Kept or released
 - 10. Wildlife behavior and surroundings
 - 11. Fishing methods used
 - a. Baits or lures
 - b. Tackle
 - c. Other equipment
 - d. Techniques
 - 12. Sketch maps or drawings
 - 13. Notes on the activities of the day
 - a. When did most fish hit
 - b. Where were most fish caught
 - c. What bait, lure, technique was most effective

how important it is to record the details of our experiences while they are fresh in our minds. **STRESS** that the field journal is a structured way to keep certain records of our experiences, in order to enable us to return to the same spot time after time, or to remember our experiences and our enjoyment.

Ten-minute field journal exercise -- Ask youths to **BRAINSTORM** the types of information they might want to record after going fishing to remember details of their experiences. **RECORD** their responses on a newsprint pad or chalkboard. **HELP** them develop a list that includes:

- Where** they were fishing
- What** they did and observed
- Where** the fish were located and reasons for their being there
- What** methods and other tackle were used
- Any **likes or dislikes** about the experience
- Reflections** on the experience and things that might alter outcomes under similar conditions
- Things** to be tried next time

After the group develops their own list of what could be included in field notes, let them take 5 minutes to **WRITE** a journal entry about their last experience. **Optional:** have each youth share parts of his/her entry with one or two other youths.

Twenty-minute journal -- Full scientific format

TELL youths that many anglers choose to keep notes in something called a field journal, a way of keeping notes that is sometimes called a log, a logbook, or an angler's diary. **REVIEW** the format and components of a field journal with them (see Lesson Narrative for additional information). **SHOW** them your field journal, or a few pages of your field notes! (Nothing encourages kids to write like having role models reveal and share their own writing!) **TELL** them that now they will have a chance to write their own notes in full, scientific form. Let them **WRITE** a complete journal entry and **SHARE** their writing with one or two other youths.

CLOSE the session by reading from your own fishing journal entries, and discussing what they mean to you, or by reading from another writer's work (see References).

Journal

Summary Activity

1. Do a *One-Minute Journal* as a group or in small groups (see instructions, above, for the 1-minute field notes exercise.)
2. Do a *Memory-Walking* sketch of your fishing experience. Have youths recall where they started on their fishing excursion, and draw a simple line sketch of that place in their notes. Then, have them draw the other places that they visited during this excursion (as though drawing a sketch map). Finally, for each place that was drawn, have them add a few words to describe the place and their experiences there. This exercise is described in more detail in Hannah Hinchman's book: *A Life In Hand: Creating the Illuminated Journal*. It is a good teaching strategy for starting someone in the practice of journal-writing, and a good strategy for people who are visual learners or who enjoy sketching or drawing.

Lesson Narrative

Keeping a Fishing Field Journal

Why Should I Keep a Journal? - *The strongest memory is weaker than the palest ink.* This statement, by an unknown source, sums up one value in keeping a field journal, or a *fishing log*, or diary. As we all know, memories of pleasant events fade with age! Recording observations, feelings, successes and failures, techniques and companions provides both information and enjoyment that cannot be retained from memory alone.

A field journal serves several purposes. First, it provides a detailed record of a field experience. (Of course, the level of detail must be provided by the person recording the experience.) The journal keeper may want to return to a specific, favorite outdoor location and may want to remember the exact conditions of the site and the exact observations of fish or wildlife. The journal keeper may also want to communicate his/her observation, so that any reader can return to the site and make additional observations for comparison. For example, an angler might use the journal to describe fishing conditions, to keep a checklist of fishes caught and methods used, and to make decisions about where and how to fish in the future. He or she also might wish to refer to the field notes to monitor changes in fish catch rates over time in an area. Finally, the angler may wish to share the journal with researchers and fisheries managers. Sometimes, biologists collect and read anglers' notebooks to monitor fish populations, or to learn about the amount of fishing effort on a given body of water. Natural history museums or public libraries may even accept donations of well-written, organized field journals for their permanent files. Journals by early explorers, traders, settlers and travelers can provide both historical information and early observations of previously unknown fishes or records of fisheries resources available at the time of their writing.

Finally, and most importantly, a field journal can provide enjoyment for you. You can relive your experiences by reviewing your old field journal entries. By reading a journal entry (yours or someone else's) you can recall a pleasant summer fishing trip even in the midst of a stormy winter day! You'll be amazed, too, at how just writing the journal sharpens your observational skills; you'll see more while you're afield, and you'll have more to reflect upon after your experience.

How Do I Keep a Field Journal?

The style of recording field observations depends mainly on the purpose for which they will be used, and on the preferences of the writer! Above all, the notes should be clear and to the point. The format should be convenient for field use and easy to file and retrieve later. A few tips might be useful to help in maintaining a field journal.

- Use a looseleaf notebook (3-ring binder) for easy filing. (Some prefer file cards or bound notebooks.)
- If possible, use 100% cotton fiber paper (100% rag content); it doesn't disintegrate when wet.
- Try to leave completed journal pages at home. Some of your notes may not be replaceable if lost! You can never reconstruct complete notes from memory, and you may never witness the same event or catch the same fish!
- If you can, use waterproof ink and a drafting pen, not an ordinary ball point pen. (A pencil is a good second choice.) That way, you won't see your notes disappear when you take an accidental dunking or get caught

Journal

outside in the rain.

- Reread old entries periodically. Besides being entertaining, this activity serves to motivate one to get outdoors more often and to continue keeping field notes!

Tips on Field Journal Format

In order to be useful, field journal notes need to be complete. Yet, the field journal is simply a series of brief entries, like in a diary. Two major components of the journal entry include 1) the heading and 2) the body. The heading should describe the location of your observations very specifically. The description should be detailed enough to allow someone unfamiliar with this area to locate it, now or in the future. Each time you change locations or start a new day or entry in the journal, you should record the following basic information in the heading:

- your name
- the date (written so it is not ambiguous)
- a page number (in case pages become separated) - usually written in the upper right hand corner of the page
- the specific location (distance and direction from nearest town or village, road names, and Areal@ name for the location such as the name of the body of water fished -- not a name that is used among your friends, or family members which isn't commonly known).
- the general location (county, state or province, and country if outside the U.S.)

Put this heading in the center of the page, and underline it (some use a wavy underline.) It should look something like this:

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Shari Dann
13 May 1995

Ovid Lake, Sleepy Hollow State Park,
1/4 mi. NE of corner of Price and Shepardsville Rds.,
Ovid Township, Clinton Co., MI

The body of the journal entry should contain other background information, as well as your observation notes. First, be sure that you have included this information:

- describe who else was there with you
- time of day (and time zone information) - often written in the left margin, showing the time certain observations happened
- weather conditions (your observations might be influenced by such things as weather or amount of daylight)
- water conditions: water temperature, water depth, current and tides (if applicable), wave conditions, pH and secchi disk depth (if available)
- purpose(s) of your outing.

Then, write your observation notes as running phrases. Don't worry about grammar, but be sure you have recorded complete ideas. Make note of these types of things:

- time progression, weather changes
- habitat descriptions
- appearance of fish or wildlife: markings, size, age and sex (if known)
- numbers of fish/wildlife observed, caught, heard; numbers of fish kept or released (by species)
- behaviors (and the surroundings of the fish or wildlife as they behave in a certain way)
- fishing methods used: bait, lures, rods, reels, other equipment
- sketch maps, drawings
- notes such as: When (what time of day) did you catch most fish? Where were most fish caught? What bait(s) or lure(s) caught the most? How did you use baits or lures?

Record your notes carefully, and try to avoid changing them once they are recorded. If you change your notes, or

Journal

try to copy them over, you might re-think your observations, and they may be less accurate! [If you do change something, be sure to record the date and time and to initial it, leaving the original notes as well.] Record your observations as soon as possible, in detailed phrases, ideally while in the field. And enjoy reading them.

What To Do With Younger Writers

Younger writers (and even some older writers) may prefer not to use the usual field journal format. Another popular format for recording field experiences is the checklist. Decide what information you want to record, and design your own checklist.

Birders, anglers, and other naturalists use a variety of types of notes. Some separate their angling or hunting experiences into a separate set of sporting notes. Another format is to write species accounts (observations of particular species of interest); yet another format is a specimen catalog (a listing of the locations, measurements, species and other information about specimens collected). All of these formats are useful. It is up to you to decide what format will be most useful to you and to any readers who see your writing! And, it is up to you to make field journal writing a fun part of outdoor enjoyment!

Exhibit or Sharing Suggestions

1. Publish a community or a club fishing Anewspaper@ or submit an article to a local paper, based on your field journal entries and those of other club members.
2. Display your field journal at a local fair or science event. Consider making a poster to accompany your field journal; include such things as fishing techniques used, habitat type fished. Display actual tackle used, too.
3. Type your journal entries into a computer, word-processing file. Add graphics, video, information you collect (from doing readings) on fish species, habitats, etc. Create a multimedia show which is based upon your field notes!

Community Service and AGiving Back@ Activities

1. Visit a housing facility for older citizens. Read your journal entries to someone who once fished or hunted. Share in listening to their memories of outdoor experiences. Help them to record their memories (see Activity entitled AFishing for Stories@).
2. Write a thank-you note to those who have taken you fishing or who have provided access to a fishing site. Refer to your journal to share your experiences.

Extensions or Ways of Learning More

1. Make your own book for use as a journal. Develop some way to bind your journal pages together. Decorate the cover with sketches from your fishing trips, photos, or a Afish print@. Add quotes from anglers, outdoor and environmental writers, or sketches to some of the pages. Design your own format for journal pages.
2. Contact your state fisheries management agency. Find out if you can participate in an angler diary program. These programs involve anglers in keeping records of fishing effort, fish caught, water quality conditions, and other important information. Fisheries agencies then use this information to make decisions about managing fish populations and habitats.
3. Read journal entries of other writers (see books by Aldo Leopold, Jimmy Carter, and others in References section of this lesson plan). Learn more about sketching techniques, and incorporate sketches into your journal entries. Set up a pen-pal correspondence with an angler from another part of the world. In your letters, use segments from your field journals. Ask for them to share their fishing field notes. Exchange videos along with your written field notes.
4. Invite a local outdoor writer to speak to your club or interview him/her. Ask about how, as a writer, this person

Journal

keeps notes on outdoor experiences. Read the writers= articles and/or books.

5. Find out if any local museums or libraries hold journals of early settlers or recreationists. Visit to view and read these materials.

Links to Other Programs

Journal keeping is a valuable, common record keeping skill. Check other 4-H projects for activities which make use of journals for making observations and reflecting upon experiences.
