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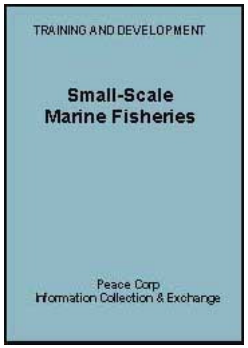
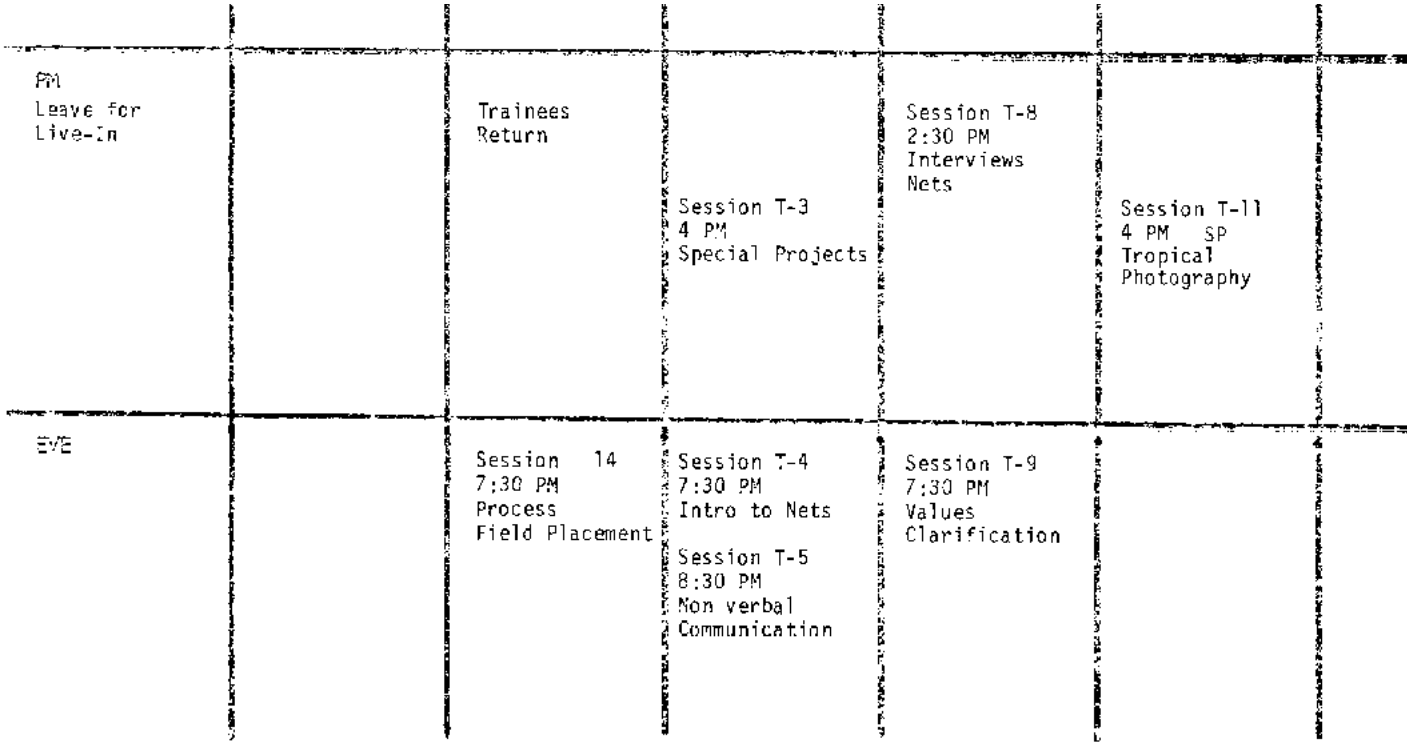


Small-Scale Marine Fisheries - A Training Manual (Peace Corps, 1983, 631 p.)

Week 2: Orientation

WEEK 2 SESSIONS 0-13 THRU T-11

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
AM Session 13 Field Placement	Live-In		Session T-1 7:30 AM Introduction to Technical Training Session T-2 9:30 AM World Wide Fisheries	Session T-6 7:30 AM Net Mending Session T-7 9:30 AM Intro to Outboard Engines	Session T-10 7:30 AM Outboard Engine Trouble Shooting	



Week 2, Sessions 0-13 Thru T-11

Session 13: Field placement

Time: 7:30 AM

Goals:

- **For trainees to experience living in a new culture, with a fishing family, in their community**
- **For trainees to collect data under the 14 social sub-systems**
- **For trainees to identify areas of technical competence they need to develop and skills they need to acquire**

overview :

For the next three days trainees will live with families of local small-scale fishermen. They will experience living in a different culture. Previous to trainees arrival these placements have been arranged. During the pilot program we found the only restriction was families' preferences according to the sex of the trainee. This was usually determined by the trainee having to share a room with children in the family. This was a very rewarding experience for the trainee. This field placement laid a solid foundation for later sessions where cultural differences, communication, community analysis and extension practices are introduced.

Materials:

- **Flip chart paper, markers**
- **Fourteen Social Sub-Systems on newsprint or hand out**
- **Map of area**

Procedures:

Time	Activities
10 Minutes	1. Trainer gives the following assignments to the trainee to be carried out during their field placements;
	a. Observe the fishing operations, ask questions, and determine what areas of expertise you will need to develop in order to be a successful marine fisheries extensionist. List

	technical skills you need to acquire in the next seven weeks to feel confident in your role as a Peace Corps Volunteer.
30 Minutes	b. Trainer now reveals the list of 14 social sub systems. Asks trainees to record as much data as they can without being over bearing or intrusive. Record all data in your journals; you will use data later in training program.

S01. KINSHIP	Birth, Sex, Marital Status, Ethnic Groups, Habitation, Migration, Family, Relatives, Demography, Population.
S02. HEALTH	Hygiene, Infirmity, Hospitals, Campaigns, Nursing, Pharmacy, Medicine, Dentistry, Sanitation, Public Health, Morality.
S03. MAINTENANCE	Consumers, Bars, Stores, Hotels, Diets, Food, Drink, Clothing, Warehouse, Malnutrition.
S04. AFFINITY	Friendship, Love, Hate, Association, Clubs, Unions, Coops, Federations, Societies, Solidarity, Integration.
S05. LEISURE	Tourism, Holidays, Games, Free Time, Music, Songs, Sports, Hobbies, Exhaustion, Relaxation, Diversions.
S06. COMMUNICATIONS	Trips, Transportation Accidents, Languages, Newspapers, Broadcast Stations, Telecommunications, Networks, Transport.
S07. EDUCATION	Culture, Teachers, Didactics, Research, Study, Schools, Library, Education, Academics, Teaching.
S08. OWNERSHIP	Public/Private Property, Possessions, Assets, Wealth, Salaries, Rich/Poor, Distribution of Wealth, Stock Market, GNP.
S09. EXTRA-AGRI-IND-ART	Manufacture, Enterprises, Firms, Specialists, Departments, Arts, Technologies, Farming, Energy, Extractive Industry.
S10. RELIGIOUS	Creeds, Beliefs, Participation, Churches, Ministers, Rites, Congregations.
S11. SECURITY	Police, Order, Combativity, Defense, Attack, Crimes, Violence, War, Armed Forces, Military Operations, Fear.
S12. ADMINISTRATIVE	Public Power, Planning, Political Parties, Bureaucracy, Regime, Public Administration, Government.
S13. JURIDICAL	Laws, Justice, Rights, Duties, Courts, Codes, Legal Process, Jurists.
S14. STATUS	Prestige, Respect, Merit, Competition, Privilege, Titles, Excellence, Elites, Who's Who, Nobel Prize, Monuments.

Table

20 Minutes	2. Trainees are now given the names and location of the families they will be staying with. They are given travel money and instructed to give money for live - in to family. Trainer explains that this is a very sensitive area, since families place high value on hospitality. Stress tact and diplomacy are to be used by trainees. A map of the area is posted and trainees are instructed to take public transportation to their sites. Trainees are told to return day after tomorrow in late afternoon. Next session is at 7:30 PM on that day.

Trainer's Notes:

After individual interviews, you will have a good idea where trainees can best be placed. Families will have been notified of trainees' name.

Some trainees will not be comfortable taking public transportation and introducing themselves to strangers. It is important to be firm that everyone is to follow these instructions and that the families do expect them.

Session 14: Processing of field placement

Time: 7:30 PM

Goals:

- **For trainees to share their experiences with each other**

Overview:

During this session trainees share their experiences with each other. The data they have collected is not shared at this time, just their experience.

Materials:

- **Flip chart paper, markers, tape**

Procedures:

Time	Activities
30 Minutes	1. Trainer welcomes trainees back. Makes a few remarks about how important the field placements will be to future training. Asks trainees to divide into small groups of three or four and list on newsprint common experiences they have had over the last three days. Be prepared to share these experiences with the rest of group. Each person should also be prepared to share with total group an experience they had that was unique.
	2. Trainees now share their experiences. Trainers make appropriate remarks, and point out experiences that will he repeated in volunteer service. Each trainee tells his/her own unique experience.
	3. Trainer wraps up evening by reminding trainees the importance of keeping their journals and does a general wrap up orientation and makes a few general remarks about the beginning of technical training in the morning.

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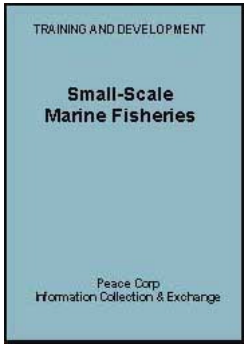
Small-Scale Marine Fisheries - A Training Manual (Peace Corps, 1983, 631 p.)
Week 2: Training
Session T-1: Introduction to technical training



- **Session T-2: The oceans, rivers, streams of the world an overview of world wide fisheries**
- **Session T-3: Special projects**
- **Session T-4: Introduction to nets**
- **Session T-5: Non-verbal communication**
- **Session T-6: Introduction to net construction and repair**
- **Session T-7: Introduction to outboard engines**
- **Session T-9: Values clarification**
- **Session T-10: Outboard engine trouble shooting**
- **Session T-11: Tropical photography - extension**

Small-Scale Marine Fisheries - A Training Manual (Peace Corps, 1983, 631 p.)

Week 2: Training

Session T-1: Introduction to technical training

Time: 7:30 AM

Goals:

- **Introduce goals of the technical training program**
- **For trainees to share their expectations of technical training**
- **Introduce schedule for technical training**
- **For participants to get acquainted on a professional level**
- **To begin building a sharing atmosphere**

Overview:

In this first session of technical training the overall goals of the program are introduced. The program is described in some detail. Trainees share their expectations of technical training and trainers explain how expectations will be met by going over the schedule for the next seven weeks of training. Trainees have gotten to know each other on an interpersonal level during the orientation sessions, now they will work together using both interpersonal skills and technical skills. Through an exercise, trainees will reveal areas of technical expertise and start building an atmosphere of sharing and skill transference.

Exercises:

1. Introduction of Goals, Expectations and Schedule 2. Get acquainted professionally

Materials:

- **Flip chart paper, markers, tape**
- **Technical Training Schedule**

EXERCISE 1 - Introduction of Goals, Expectations, and Schedules Time: 7:30 AM - 9:15 AM

Goals:

- **Share goals of technical training**
- **Share trainees expectation**
- **Describe training program**
- **Share schedule**

Overview:

The goals are presented and posted on newsprint in the training room where they will

remain throughout the duration of training. Expectations of technical training are discussed using the schedule to show trainees where they can expect to have their expectations met. During this session any expectations that are unrealistic are discussed, and explanations of why they can not be met are given.

Procedures:

Time	Activities
Introduction to technical training and training goals	1. Trainer begins by describing the technical training program, using the following outline to make these points:
15 Minutes	a. be intense (little free time)
	b. continue to build on cross-cultural skills
	c. entails use of resource materials
	d. teach technical skills
	e. be experiential
	f. highlight and improve interpersonal skills
	2. Trainer lists goals for technical training program and briefly discusses each one.
	o to enable trainees to recognize their skills and to feel competent in the use of those skills;
	o to teach trainees how to transfer the technical skills they have to others;
	o to identify and improve skill areas that need strengthening;
	o for trainees to understand their role as Fisheries Extension Peace Corps Volunteers in the host country; o to help trainees identify and find resources avail

	able to them in their community sites and host country agencies;
	o the illustration of competency in fisheries extension techniques, in fish processing, fish preservation, outboard/Diesel repair and maintenance fisheries economics and marketing, small-scale fishing and fishing vessels, and vessel repair and construction;
	o the ability to analyze properly communities social systems, which should identify problems and help communities seek solutions;
	o an understanding of the basic theories of fisheries extension work;
	o increased interpersonal, team building and communication skills; and,
	o a better understanding of global and country specific fisheries issues.
	Trainer moves to next exercise after answering any questions trainees may have.
Introduction5 Minutes Put items of List	3. Divide into small groups. Explain the purpose of the exercise. Ask participants to write on news print the expectations they have for this training flip chart program. Encourage the groups to record as many items as possible in this short time. Expectations may include things they want:
	o to know
	o to have given to them
	o to have happen/not happen
	o the facilitator to do/be
	o the other participants to do/be
	o to be able to do
	Encourage group to record as many items as possible Expectations in a short time.
15 Minutes	
Priority 10	4. Now ask each group to prioritize the top five expectations that they all share.

Minutes	4. Now ask each group to prioritize the top five expectations that they all share.
	5. Ask groups to share their expectations with large group.

Trainer's Notes:

Large schedule made by using six sheets of newsprint is made and posted in training classroom where it is intended that it remain during training program.

Reporting Expectations 20 Minutes	Take a few minutes to review the list of expectations, and compare it to the training schedule now posted.	
	Comment and eliminate those that the training program cannot hope to address. Those who are not part of the program may be met depending on ingenuity of the facilitator and technical expertise of the trainer. Do not leave group with a list of expectations the facilitators or the program cannot meet.	
Discussion	6. Trainer now produces on newsprint, the	a. How did your group work together?
20 Minutes	following list of questions about group dynamics:	b. Who took leadership?
		c. Did everyone participate?
		d. Did anyone

		check to see that everyone was included?
		e. Who recorded for the group; how was that decision made?
		f. Who talked a lot, who talked a little, quality?
		g. How did decisions get made (consensus, voting, railroading)?
		h. Did anyone summarize for group?
Wrap-up 10 Minutes	Trainer asks for observations about what things were the most helpful in each group and records them on newsprint - Asks for things that perhaps weren't quite as helpful, and records them on newsprint.	
	Trainer points out that a great deal of our work will be done in groups and that it is important for us to be aware of our own process, how we get work done and thus get the most out of the training program.	

	Further, we will from time to time ask groups to look at their own process.	

Trainer's Notes:

You will want to save the expectation list to go over at a later date. It is best to leave posted if possible.

1. Trainer now leads into next exercise.

EXERCISE 2 - Getting Acquainted Professionally

Time: 30 Minutes

Goals:

- **To allow participants to get acquainted**
- **To get people talking**
- **To begin building a sharing atmosphere**

Overview:

This exercise gives participants an opportunity to get to know each other. Even though they have met in training before this activity allows them to see each other in a different way and to begin talking and interacting.

Procedures:

Time	Activities	
Introduction	1. Introduce exercise by stating the purpose and	ON YOUR CARD WRITE OR

Set-up	asking participants to get an index card and pin.	PRINT ANY SPECIALIST CLASSIFICATION YOU MAY HAVE. NEXT LIST SPECIAL INTEREST YOU HAVE, i.e., PHOTOGRAPHY, MUSICAL
10 Minutes 20 Minutes for mingling Time Check Summary	2. After everyone has a card, show the following newsprint:	INSTRUMENT, ART...AND FINALLY TWO HUMAN INTERACTION SKILLS THAT YOU HAVE i.e., GOOD LISTENER, ABLE TO MIX WELL IN NEW GROUP,
	When you have completed your card please pin it on and start to mingle with other participants and discuss each others' card. Try and meet with as many people as possible. Trainers should join group as participants after you have set up the exercise and are sure people are mingling with each other.	
	Let the participants know when they have five minutes left so they can check to be sure that they have talked with as many people as possible.	
6 Minutes	3. Ask individuals to share some of the interesting"things" they have discovered about each other.	
5 Minutes Linkage	4. Trainer now makes remarks about this session. Summarizes the interactions of the session and links to future sessions.	

Trainer's Notes:

Listed below are five possible introduction exercises that can be used. You may prefer to use another exercise that will accomplish the same purpose.

1. Dyad-Quartet

Each person meets and gets to know the other; he/she in turn introduces his/her partner to another dyed.

2. Depth Unfolding Process Because it takes five minutes per person, this exercise should be done in small groups. The leader should disclose first to make trainees more comfortable.

In the first three minutes, tell what has brought you to this point in your life. Use one minute to describe your decision to join Peace Corps. Use the last minute to answer questions from others.

3. Structured Introductions

In dyads, small groups, or in large group, participants can tell why they joined Peace Corps, or write a letter to a friend about their decision.

4. Life Map

Each person draws on newsprint with crayons or magic marker a picture of their vision of their Peace Corps service, using stick figures and symbols.

5. Sentence Completion The trainer presents a series of unfinished sentences, asking each group member in turn to complete the statement.

Example:

- **One of the things I anticipate about my Peace Corps service is**
- **The thing I will miss about home**

Session T-2: The oceans, rivers, streams of the world an overview of world wide fisheries

Time: 9:30 AM

Goals:

- **To provide a global view of Marine Fisheries today and in the future**
- **To provide information on Peace Corps Marine Fisheries Goals**
- **To bring the individual volunteer's role into perspective**
- **To have participants brainstorm key problems and possible solutions concerning small scale fisheries in and around their site**

Overview:

This session is to bring into focus the global view of the worlds' fish supply. Are we depleting the fish of our oceans? Do we need controls world wide? These are two of the many questions that are addressed. Discussion then moves to Peace Corps goals in marine fisheries, and finally brings into perspective the role of the individual volunteer.

Exercises:

1. Participants brainstorm problems and solutions
2. Lecture on global views, Peace Corps Goals, individual perspectives

Materials:

- **Flip charts, markers, tape**

EXERCISE 1 - Problems and Solutions in Marine Fisheries That Trainees May Encounter

Total Time: 45 Minutes

Overview:

The purpose of this exercise is to have trainees brainstorm and record problems and solutions in marine fisheries that they expect to encounter.

Procedures:

Time	Activities
45 Minutes	1. Trainer asks for groups to form based on the countries they will be going to for service. Trainer then asks groups to brainstorm problems that they expect to encounter and list them on newsprint. After problems have been listed, list possible solutions.
	2. Small country groups present their lists of problems and solutions to large group.
	3. Trainer summarizes the activity and points out similarities and differences.

EXERCISE 2 - Overview of Marine Fisheries From-A Global Prospective, The Peace Corps Goals, and The Individual Volunteer Role

Total Time: 1 Hour

Overview:

The purpose of this exercise is to give information on the world problems in marine fisheries, to state Peace Corps Goals and to give hope to the individual volunteer that they

can play a part in changing the grim predictions for the world's fisheries.

Procedures:

Time	Activities	
45 Minutes	1. Trainer (or, if possible, a visiting authority on Marine Fisheries)gives lecture on global picture. Lecture outline follows: GLOBAL PERSPECTIVE A. Commercial Ventures	
	1. What impact they have on the small-scale fisherman	
	2. What impact they have on the world fish population	
	B. Small-Scale Fisheries	
	1. Past	a. Technical proficiency
	2. Present	b. Personal fulfillment
	3. Future	c. Community involvement
	C. Peace Corps Goals	
	1. Education of fisherman in:	a. Preservation
		b. Processing
		c. Marketing
15	D. What can the individual do	

15 Minutes	2. Trainers and/or speakers ask for questions from participants. Trainer summarizes - pointing out that volunteers are a part of a large picture and have a valuable job to do and that we are going to spend the next seven weeks getting ready to do that job.	

Session T-3: Special projects

Time: 4 PM

Goals:

- **To introduce special projects. Explain in detail how they are to be done, and when. (Important for trainees to see how special projects are integrated into schedule of training.)**

- **Have trainees choose one project from special group projects to lead and take responsibility for**

- **Have trainees choose three individual special projects overview**

The purpose of all special projects is to identify those participants with special skills and have them assume responsibility for transferring those skills during training program; and to give all participants special assignments which are problem solving exercises that they will have to complete during training. For trainees to use materials made available for their use in the resource library.

Materials:

- **Newsprint with projects listed (trainer responsible for project and space for trainee to sign up.) Date that project is due is also listed**

Trainer's Notes:

This session is confusing for trainees and has to be gone over several times. Should be checked again at beginning of next session.

SPECIAL PROJECTS AND SPECIAL GROUP PROJECTS

The following is a listing of the special projects and special group projects used in the pilot training program. Special projects are worked on individually; special group projects, although one trainee signs up as group leader, involve any number of trainees on a volunteer basis. Depending on the size of the group and the level of marine fisheries development in the countries of assignment, the technical trainer may wish to add to or delete from these lists. A trainer will act as advisor for each project.

In presenting the lists (with the sign-up sheet, the due date, and the trainer advisor), it is important that a brief description of the project and requirements be given. Special group projects, unless otherwise noted, each require a write-up of the project for the Trainees' Resource cook (described below) including necessary charts, diagrams, and references. Special project write-ups fall under three headings:

- **List A - projects which will require written reports along with essential diagrams, charts, and reference;**
- **List B - projects which will require diagrams with "how-to" steps, essential charts and references; and,**
- **List C - projects which will require only a list of references.**

Because project write-ups most likely will not be typed, they must be concise and clearly written in black ink in order to provide a good photocopy for the Trainees' Resource Book.

Suggested Special Projects

List A:

1. **Poisonous/toxic fish (see Session T-51)**
2. **Corrosion control (see Session T-54)**
3. **Color depth charts (see Session T-69)**
4. **Tropical seabirds (see Session T-50)**
5. **Weather for the Mariner (see Session T-36)**
6. **Fish aggregating devices (see Session T-72)**

List B:

1. **Artificial reefs/Tire breakwaters (see Session T-94)**
2. **Outboard/Diesel repair facilities (see Session T-22)**
3. **Water heater (see Session T-102)**
4. **Water filtration systems (see Session T-34)**
5. **Gyotaku (see Session T-87)**
6. **Filleting (see Session T-30)**
7. **Metric systems (see Session T-59)**
8. **Anatomy of hooks (see Session T-22)**
9. **Anchoring techniques (see Session T-73)**
10. **Fish silage (see Session Tell)**

List C:

1. **Tropical Photography (see Session T-11)**
2. **Library (see page 7)**
3. **Aquaculture (see Session T-107)**
4. **Efficient charcoal making (see Session T-58)**
5. **Blueprint reading (see Session T-68)**
6. **Seaweed farming (see Session T-65)**

7. Cookbook for Third World fisheries (see Session T-28)
8. Constructing a scarf joint (see Session T-76)
9. Fiberglassing techniques (see Session T-79)
10. Star charting (see Session T-45)
11. Transportation Systems (see Session T-90)
12. Trainees' Resource Book (see below)

Special Group Projects

1. Gardening, Composting and Small Animal Raising (see Session T-16)
2. Communication through Illustration/Lesson Plans/Audiovisual Aids (see Session T-52)
3. Diesel and Outboard maintenance Schedules, fuels, and costs (see Session T-19)
4. Alternative Energy (see Session T-101)
5. Nutrition/fish culinary skills (see Session T-66)
6. Salt making (see Session T-49)
7. Ice box construction (see Session T-39)
8. Sailing (see Session T-84)
9. Trolling for Spanish Mackeral (see Session T-22)
10. Fish cooperatives (see Session T-91)
11. Solar fish dryer (see Session T-56)
12. Smoker: wood and tin (see Session T-57)
13. Fund raising (see Session T-88)
14. Fish issues (see Session T-98)
15. Ecology/conservation issues (see Session T-99)
16. Marketing survey of local fish products (see Session T-81)
17. Language (see Session T-3) Trainees' Resource Book

The Trainees' Resource Book is a compilation of the special project and special group project write-ups. Not only does it afford trainees the opportunity to practice putting their

knowledge and experience into writing in an easy-to-follow, how-to format; it also provides them with a valuable reference in the field.

The trainee who chooses the Trainees' Resource Book as a special project will be responsible for the following:

- **presenting the write-up formats for each list to the trainees;**
- **setting deadlines for write-up completions,**
- **Manual cover design;**
- **Table of Contents; and,**
- **photocopying.**

SPECIAL GROUP PROJECTS AND INDIVIDUAL SPECIAL PROJECTS LISTED BY TOPIC AREAS

DIESEL/OB	**NAVIGATION/SEAMANSHIP**
Diesel and O/B Costs	Sailing
Corrosion Control	Tropical Seabirds
O/B Diesel Repair Facilities	Weather for the Mariner
Fuels	Anchoring Techniques

Star Charting

FISH PRESERVATION-PROCESSING

	BOATBUILDING, MAINTENANCE, CONSTRUCTION
Salt Making Ice Box	Metric Systems
Solar Fish Dryer	Blue Prints

Solar Fish Dryer	Blue Prints
Smoker	Construction of a Scarf Joint
Filleting	Fiberglassing Techniques
Water Heater	
Water Filtration System	OTHER PROJECTS
EXPLORATORY FISHING	Library Trainees' Manual
Color Depth Chart	Aquaculture
Poisonous/Toxic Fish	Efficient Charcoal making
Fish Aggregating Devices	Seaweed Farming
Artificial Reef/Tire Break Waters	Alternating Energy
Physiology of Hooks	Language Lessons
Trolling for Spanish Mackeral	

FISH ECONOMICS-MARKETING

Fish Cooperatives
Marketing Survey
Fund Raising
Gyotaku

EXTENSION

Tropical Photography
Communication Thru Illustration
Audio Visual/Lesson Plans
Fish Issues
Ecology & Conservation

NUTRITION

Nutrition and Fish Cooking
Gardening and Small Animal Raising
Cookbook for Third World Fisheries

Special Group Project: Languages

Time: 15 Minutes

Goals:

- **To expose trainees to language training**
- **To acquaint trainees with the languages in their countries of assignment**
- **To show trainees that language learning can be fun and rewarding**
- **For trainee assigned the special group project to build on leadership, communication and technology transfer skills**

Overview:

Many people experience anxieties around learning a new language. The few minutes spent each morning during technical training learning a few new words or phrases in French, Spanish or Swahili will insure a smooth transition to in-country language training on the part of the trainee. The daily language lessons should be no more than 10 or 15 minutes, and the content should be limited to the very basics, i.e., days of the week, numbers, colors, market items, how to ask directions, how to order in a restaurant, vocabulary for fishing gear, etc. In other words, building vocabulary is emphasized more than grammar.

Activities:

1. Trainee assigned the special group project organizes daily language lessons, alternating among the languages of the countries of assignment.

Trainer's Notes

In the pilot program held in Puerto Real, Puerto Rico, the daily language lesson was Spanish - even though none of the trainees were going to Spanish-speaking countries. It was the feeling of the training staff during the pilot program, that the importance of learning the local language - regardless of the length of time one spends in a place - needs to be emphasized and reinforced throughout the training. Trainees in the pilot program were very positive about the Spanish lessons, and were pleased with their progress over the eight weeks of training, progress which was evident to them in their day-to-day interactions with people in Puerto Real.

Resources:

- **Peace Corps Language Books**

APPENDIX 7

Glossary of fishing gear terms	Glossaire de termes d'engins de pche	Glosario de trminos de aparejos de pesca
A. aimed trawling	chalutage contrl	arrastre dirigido
anchor seining (Danish seining)	pche /a senne danoise au mouillage	pesca con red de cerco danesa
angle of attack	angle d attaque	ngulo de ataque
(of trawl board)	(de panneau de chalut)	(de puertas de arte de arrastre)

B. backstrop (de panneau de chalut)	patte (de las puertas)	pate de gallo
bag, bunt	poche, sac	copo del arte
bagnet	filet trappe	red de copo
balt	appt	cebo
battings (2) petit dos	(1) diminutions (2) casarete, cazarete	(1) reduccin de mallas
ballast	lest	lastre
bar	paste	media malla
(of mesh)	(ct de la maille)	(lado del cuadrado)
basket	pander	cesto
(of longline)	(de palangre)	(de palangre)
beach seine	senne de plage	arte de playa, atarraya
beamtrawl	chalut perche	arte de arrastre de vara, vara da barra
becket	erse	gaze
belly	ventre	vientre
(of trawinet)	(de chalut)	(de arte de arrastre)
bellyline	barrette do ventre	estrobo
boat seine	senne de bateau	red de cerco
bobbin	diabolos, sphres	boles. dibolos
(of groundrope)	(de bourrelet)	(de relinga inferior o de promos)
bolchline	filira	cabo de entrallar
bonding	fixation	fiiacin

bosom	carr	burln
(of trawinet)	(de chalut)	(de arte de arrastre)
bottom-act	cal sur le fond	calado en el fondo
bottom trawl	chalut de fond	arte de arrastre en el fondo
bracket	branchon	brazo
(of trawl board)	(de panneau de chalut)	(de puerta de arte de arrastre)
braided	tress	trenzado
(netting Yarn)	(fil pour filet)	(hilo pare red)
braiding	laage	trenzado
(of netting)	(de filet)	(de la red)
brailer	salabarde	salabardo
branchline	avanon	brazolada
breaking load	rsistance A la rupture	resistencia a la rotura
bull trawl	chalut-boeuf	baca
bunt	poche	copo
(of purse seine)	(de senne coulissante)	(de arte de cerco de jareta)
buoyancy	flottabilit	flotabilidad
buoylight	leucalenal de boue	boya luminosa
butterfly	guindineau triangle	caln
(of trawl)	(de chalut)	(de red de arrastre)
C chafer	tablier	refuerzo
(for codend)	(pour cul de chalut)	(del copo)

codend	cul	saco copo
(of trawlnet)	(de chalut)	(de arte de arrastre)
codline	raban da cul	estrobillo
(of trawinet)	(da chalut)	(de arte de arrastre)
coil	glne	rollo
(of rope)	(de filin)	(de cabo)
coir	coco	bonote
combination rope	filin mixte	malleta alambrada
crowfoot	patte d'oie	pate de gallo
cutting rata	processus do coupo	indice de reduccin
(of netting)	(do filet)	(de paos de red)
D. Danish seine	senna danoise	red danesa
danleno	guindineau	caln
depressor	plongeur	depresor
dipnet	filet soulev	salabardo
disc roller	diabolo plat	dibolo, rodillo
(for groundrope)	(pour bourrelet)	(de relinga da promos)
double knot	double noeud	nudo doble
double rig	grement double	aparejo doble
(trawling)	(chalutage)	(arrastre)
dredge	dragues	draga, rastra
driftnet	filet drivant	arte de derive
E elasticity	lasticit	elasticidad
(of netting yarn)	(do fil pour filet)	(del hilo para red)

(of netting yarn)	(de fil pour filet)	(del hilo para red)
elongation	silongement	estiramiento
(of netting yarn)	(de fil pour filet)	(del hilo para red)
end bracket	gousset d'extrmit	pie de gallo
eye splice	oeil pis	gaze
F. fishing lamp	lampe da pche	lmpara de pesca
fish pump	pompe poisson	bomba para peces
flapper	voile tambour	trampa
((of trawlnet)	(de chalut)	(de la red de arrastre)
fleet (of nets)	tsure (de redes)	andana
float	flotteur	flotador
floatline	ralingue do flotteurs	relinga alta, de corchos
fly-draggTng	dragaga la vole	pescar en marcha
(Danish saining)	(pche la senne danoise)	(con red danesa)
flying mesh or flymesh	maille folle	malla libre
foam plastic	mousse do plastique	plstico poroso
footrope	bourrelet ralingue infrieure	relinga de promos, burln
front weight	poids antrieur	peso anterior
full mesh	maille franche	malla entera
(in cutting of netting)	(on coupe de filet)	(en la reduccin de la red)
funnel	entonnoir	embudo
G. gear (for fishing)	engin (pour la pche)	equipo, material de pesca
G-(hook)	croc en G	gancho en G
gillnet	filet maillant	red de enmalle

grassrope	bourrelet de coco	relinga de bonote
(of trawl)	(de chalut)	(de arte de arrastre)
groundrope	bourrelet	telinga de promos
H. halving back, see splitting strop		
handline	ligna main	aparejo, llnea de mano
hanging	montage armement	armar un arte
(of netting)	(d'un filet)	
hanging ratio	taux d'armement	coeficiente de armadura
headline	corde da dos	relinga de corchos
heaving bag	double poche extrioure	saco de izar
high opening trawl vertical	chalut grando ouverture verticale	arte de arrastre de mucha abertura
hook	hameon	anzuelo
hook shaft	tige do l'hameon hampe	brazo del anzuelo
hook tip	pointe do l'hameon ardillon	punta del gancho, muerte
hoop	cerceau	cercar, rodear, cerco
hydrofoil	hydrodynamique	hidrodinmica
(trawl board)	(panneau do chalut)	(puerta de arte de arrastre)
I. Inflatable float	flotteur gonflable	flotador
J. jig	faux	muestra
joining	abouture, collage	unin
(of net sections)	(do pices de filet)	(de paos de red)
K. kelly a eye	huit	ocho

kite	plateau l'vateur	elevador
knot	noeud	nudo
knotless netting, Raschel	filet sans noeuds, Raschel	red sin nudos, Raschel
knotless netting, twisted	filet sans noeuds, retordu	red sin nudos, colchada
l. lacing	transfilage	pasar una randa, ligadura,. atadura
lampara net	filet lamparo	mamparra
lastridge	couture	relinga de contorno
(of trawlnet)	(de chalut)	
by	commottega	colchado
(of rope, etc.,)	(d'un filin etc)	(de un cabo, etc.)
lazyline	baillon hala--botd	vira-vira
leadline	ralingue plombe	relinga de promos
leg (of trawl)	patte (de chalut)	pernada
lengthening piece (of trawlnet)	rallonge (de chalut)	antecopo
liftnet	carrelet	balanza, medio mundo
light fishing	pche la lumire	pesca con luz
line	ligne	linea
links	maillons	eslabones
(of chain)	(do chaine)	(de cadena)
live bait	appt vivant	cebo vivo
longline	palangre, cordo	palangre
longliner	palangrier, cordier	buque palangrero
lure	leurre	aagaza

M. mainline (of longline)	ligne principale (de palangre)	linea. linea madre
mesh	maille	malla
meshsize	longueur de la maille	luz de la malla
(stretched)	(tire)	(estirada)
midwater trawl	chalut plegique	aite de arrastre pelagico
monofilament	monofilament	monofilamento
mudrope (of trawl)	bourrelet pour fond do vase (de chalut)	relinga de promos pare fondos sucios
multifilament	multifilarnont	multifilamento
N. net	filet	red
netting	nappe de filet, alze	pao de red
netting Yarn	fil pour filet	hilo pare redes
O. opening type (puree ring) otter board. See trawl board	anneau do coulisse du type ouvrant	anillas que se pueden abrir
otter trawl	chalut panneaux	arte de arrastre de puertas
outrigger	tangon	tangn, botaln
overhand knot	noeud simple	nudo llano
P. pair trawl	chalut-boeuf	arrastre de pareja
panel (of net)	face (de filet)	pao
patent link pelagic trawl, see midwater trawl	maillon brevet	eslabn de patente
pennant	rapporteur	amante

plaited	trass	trenzado
(netting yore)	(fil pour filet)	(hilo para redes)
point	maille de ct	malla lateral
(in cutting of netting) poke, pork line, see lazyline	(en coupe do filet)	(corte da paos)
pole and line (tuna fishing)	canne (pche du thon)	pesca con caa
pony board	poney	puerta secundaria
pot	nasse, casier	nasa
pot warp	orin do castor	cabo de nasa
pound not	filet pige	almadraba. trampa
preservation (of yarns, etc.)	conservation (des fils, etc.)	conservacin
pureed lampara net	filet lampara coulissant	mampara de cerco
puree line	coulisse	jareta
puree ring	anneau do coulisse	anilla
purse ring bridle	pantoire d'anneau de coulisse	cabo de anillas, rabiza de anilla
purse seine	senne coulissante, bolinche	red de cerco de jareta
purse seiner	senneur	embarcacin que pesca al cerco. cerquera
Q. quarter points (au coin do carr)	triangle d'aile	secciones del burln
quarter rope R. Raschel, see knotless netting	parpaillot, biribi	vira-vira
recessed link	maille mplats	eslabn ranurado
reef knot	noeud plat	nudo llano

rig	grement	armar
(of gear)	(d'engin)	(el arte)
ringnet	filet tournant	red de cerco
rollor	diabolo	dibolo, rodillo
(for groundrope)	(pour bourrelet)	(pare relinga da promos)
rope	filin, cordage	cabo
runnage	longueur par unit de poids	longitud por unidad da peso
S. scoop net	puisette, haveneau	salabardo
seam	couture	costure
(of net)	(de filet)	(de red)
seine	senna	red de cerco
selner	sonneur	cerquero
selvedge	bordure renforce	enchace, borde, costura
semi-pelagic trawl	chalut semi-plagique	arte de arrastre semipelgico
et gillnet	filet maillant cal	red de enmalle fija
setnet	filet cal	red fija
hackle	manille	grillete
shear-chain	chaine d'cartement	cadena de refuerzo
sheet bend, or weaver knot	noeud d'coute ou de tisserand	vuelta de escota, nudo de tejedor
shoe plate	lement de semelle	zapata
(of trawl board)	(de panneau de chalut)	(de puerta de arrastre)
shrimp trawl	chalut crevette	arte camaronero
shrimp trawler	crevettier	camaronero (embarcacin)

shrinkage	retrait au mouillage	contraccin
(of yarn, etc.)	(de fil, etc.)	
sideseam	couture latrale	costura lateral
side trawler	chalutier latral	arrastrero por el costado
sinker	lest	promos
snood	empire	tanza
spacer diac	intermdiare	espaciador
(for groundrope)	(de bourrelet)	(de relinga de promos)
splitting strop	erse de cul	estrobillo
square (of trawinet)	grand dos (de chalut)	cielo del arte, visera
stake	pieu	estaca, posse. pilote
stakenet	haut-parc et bas-parc	arte de estacada
staple fibre	fibre, discontinue, schappe	fibra corta
sterntrawler	chalutier arrire	arrastrero por pope
stick-held dipnet	filet soulev soutenu par un bton	salabardo con mango
stow net	diable, chalut l'talage	biturn
strand	toron	cabo trenzado, rebenque
(of yarns)	(de fil)	
strengthening rope	filin do renfort, ralingue	cabo da refuerzo, relinga
Strip	bande	pao
(of netting)	(de filet) ou nappe	(piezas de redes)

strop	erse	estrobo
sunk driftnet	filet drivant on profondeur	red de derive en profundidiad
surrounding net	filet encerclant	red de cerco
sweepline, sweep	bras	malleta
swivel	merillon	grillete giratorio
T. take-up	recrue	reduccin
(of meshes)	(de mailles)	(de malias)
tanglenet	folle, filet emmlant	red de enmalle
tapering	diminution	reduccin
taper ratio	rapport de diminution	Indice de reduccin
throat	gorges, tambour	garganta
(of fyke net)	(de verveux)	(biturn con alas)
tickler chain	chaine gratteuse	cadena pare levantar camarn
trammelnet	trmail	trasmallo
trapnet	filet pige	nasa, trampa
trawl board	panneau de chalut	puerta del arte
trawler	chalutier	arrastreto
trawl gear	engin de chalutage	arte de arrastre
trawlnet	chalut	red de arrastre
troller	bateau de pche la traine	curricanero
trolling	pche la traine	pesca a la cacea
trynet	chalut d'essai	red de ensayo
(for shrimp trawling)	(pour chalutage la crevette)	(pare pescar camarn al

(for shrimp trawling)	(pour chalutage à crevettes)	(para pescar camarón al arrastre)
twins	fil, fil retors	hilo
twist factor	coefficient do torsion	coeficiente de torsin
(of yarn)	(de fil)	(del hilo)
V, vinge trawl, see wing trawl		
W. warp	fune	cable de arrastre
(for trawl)	(de chalut)	
weaver knot	noeud de tisserand	nudo de tejedor
(or sheet bend)	(ou noeud d'coute)	(vuelta de escota)
webbing, see netting		
wing	aile	alsa, bandas, pernadas
(of trawinet)	(de chalut)	
wingtip	pointe d'aile	extremo del ala
wing trawl	chalut grande ouverture verticale	arte de mucha abertura vertical
wire rope	filin d'acier	cable, cable de acero
Y. yarn, see netting yarn		
Z. zipper line jareta	ligne de transfilage	matafin, cabos pare dividir 105 cerc
zipper ring carco de jareta	anneau pour transfilage	anillas de los cabos de divisin de

Session T-4: Introduction to nets

Time: 7:30 PM

Goals:

- **For trainees to acquire basic information about nets and their usage by small scale-fishermen**

Overview:

In this session trainees will be introduced to a variety of fish nets, tools, floats, etc. They will have several types described and they will try to ascertain their use.

Materials and Equipment:

- **Flip chart, pens, nets, lines, floats, net needles and twine**

Trainer's Notes:

We borrowed nets from local fishermen and had trainees handle nets, floats, etc.

Procedures:

Time	Activities
	1. Technical trainer has trainees pick up net. Has them straighten net out. Trainer asks how they invision net being used.

Trainer's Note

If possible, borrow a Gill Net for this exercise.

2. Technical trainer now draws a rough sketch of a Trammel Net and has trainees once again tell

how they think this net is used. Trainer repeats this process with drawings of the following:	
	- Drift Gill Net
	- Common Haul Seine
	- Long Haul Seine
	- Long Seine
	- Short Seine
	- Otter Trowl
	- Cast Net

Trainer's Note:

You will want to describe several types of nets, especially those that you know trainees will be using or will see being used.

3. Trainer concludes the session by saying that nets and net mending are an intrinsic part of small scale fishermen life. They not only provide a means of catching fish, but also play an important part in the social life of the fishing community. As volunteers, you will be prepared to mend nets and be good at mending nets. Over the next several weeks you will have lots of practice time.

Session T-5: Non-verbal communication

Time: 8:30 PM

Goals:

- **To identify ways we communicate verbally and non-verbally**
- **To identify patterns of non-verbal communication**

- **To look at perceptions one has about one's non-verbal message**
- **To identify some implications of non-verbal communication for cross cultural effectiveness**
- **To develop non-verbal communication skills**

Overview:

This session explores communication as a process. Trainees will have received some non-verbal communications training previously. This session will reinforce those learnings and concentrate on building nonverbal skills.

Exercises:

1. "Messages" and lecture

2. Reflections on non-verbal communications and observations of another.

EXERCISE 1 - Messages Total Time: 30 Minutes

Overview:

We communicate our likes and dislikes; actually, we communicate more non-verbally about relationships than we do in any other way. In this exercise we are going to communicate non-verbally only.

Procedures:

Time	Activities
5 Minutes	1. Trainer announces that "we are going to try a game, the meaning of which we will discover later, trust me." The game is structured rather like charades except that one may

	not use charade-like signals (such as spelling with the fingers or using word conventions). Even if you have played this game before, it is fun to see if you are becoming skillful at it.	
10 Minutes	2. In pairs, give each person a message on a piece of paper (see list below); then tell the group that they have three minutes to try to get the message across without using words. They cannot write, spell or talk. Trainer keeps track of time. After first three minutes, switch so that the other person can try it out also. A sample list of messages follows (you may add your own but the message should include either an emotion or communicate something about a relationship, as well as try to give a message about a thing).	
	Messages (have them written out on slips of paper):	a. "I'm angry because the goats ate my garden."
		b. "I'm happy because your crew arrived to work today."
		c. "I'm frustrated because you never listen to me."
		d. "You can't understand me, and this frightens me."
		e. "I'm surprised at your youthful appearance."
		f. "I like you and want to be your friend."
		g. "I'm weak (and submissive)and you are strong(and dominant)."
5 Minutes	3. After the non-verbal experience, gather group reactions:	o What was that like for you?
		o What was easy about it (i.e., what part of the message could you get)?
		o What was difficult (i.e., what part of the

		message couldn't you get)?
10 Minutes	4. Build a lecture out of group experience:	o How many of you know about non-verbal communication?
		o What is it? Give some examples.
		o What does non-verbal communication communicate?
		o How aware are you of your own non-verbal message?
	As trainees answer these questions, write down the answers on a flip chart and examine them with the group. At the end, the group and the trainer should arrive at a working definition of non-verbal communication which they can test out during the next week with each other.	

EXERCISE 2 - Reflections on Non-Verbal Communications and Observations Of Another

Total Time: 30 Minutes

Overview:

The purpose of this exercise is to give individuals time to think about how they communicate non-verbally. They can then decide if there is perhaps some new or different non-verbal behavior they would like to try out during training.

Procedures:

Time	**Activities**	
15 Minutes	1. Trainer lists on newsprint the following:	o Body Bearing
		o Appearance

		o Tone of Voice
		o Use of Space
		o Content of Language
		o Gestures
		o Ornaments
		o Touching
		o Facial Expressions
		o Smells
		o Colors
		o Signs
		o Grooming
		o Manners
		o Eye Contact
		o Clothing
		o Actions
		o Sounds
		o Others
	Asks participants to take a few minutes to write down how and what they think they communicate non-verbally in each one of these categories.	
5 Minutes	2. Ask participants to look over responses to the non verbal categories. Determine if there is some area of non-verbal communication they want to strengthen or perhaps change.	
5 Minutes	3. Ask participants to choose partners which will be for the purpose of "observing each other" for a one week period in order to learn more about non-verbal communication and	

	the way we are perceived by another. The task is to "watch each other" during the week whenever possible, and to notice how the other person uses non-verbal communication. At this point, they may want to share with each other their responses to the non-verbal categories-to check-out their perceptions of how and what they communicate non-verbally.
5 Minutes	4. Trainer says that at the end of the week, the same pairs will meet to both provide each other feedback on how they communicated non-verbally and to draw some generalizations from the experience about how people from our culture communicate non-verbally. Also, participants will be able to check their own non-verbal images with their partners.

Session T-6: Introduction to net construction and repair

Time: 7:30 AM

Goals:

- **To have trainees learn basic net mending techniques focusing primarily on the Becket Bend as well as the nomenclature of nets**

Overview:

In this session trainees learn how to construct and/or repair a net using the Becket Bend.

Materials and Equipment:

- **Sections of netting, net needles (various sizes, types) net twine, hand-out on Becket Bend**

Trainer's Notes:

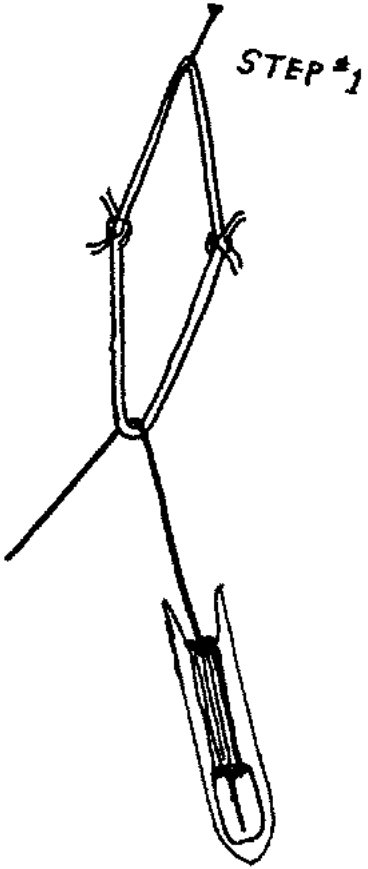
Practice is necessary for net mending proficiency. We had trainees practice out of doors in

view of local fishermen. Local fishermen took great interest, helped trainees by showing them how they tie knots, etc, and reinforced net mending as a social event as much as a practical skill.

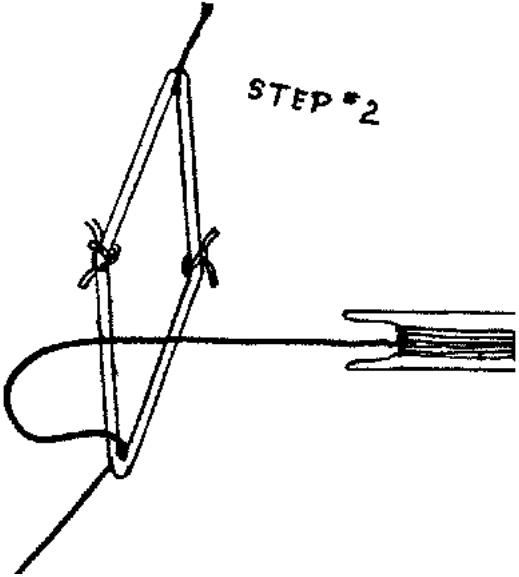
Procedures:

Time	Activities
30 Minutes	1. Technical trainer passes out instructions for Becket Bend. Next passes out net which has been cut so that it can be repaired. Trainees are given net needles and twine. Technical trainer shows each one how to mend using Becket Bend.
1 Hour	2. Trainees spend the remainder of session mending net. Technical trainer remains at scene but does not offer help unless asked. At the end of first hour, inspects trainees work and makes appropriate comments. 3. Trainees continue net mending. At end of the hour the technical trainer goes over highlights of the net session from the night before and links to future net mending sessions.

Instruction card



Step 1



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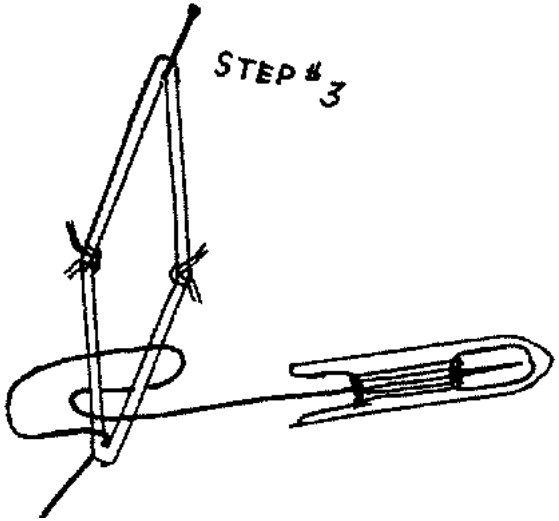

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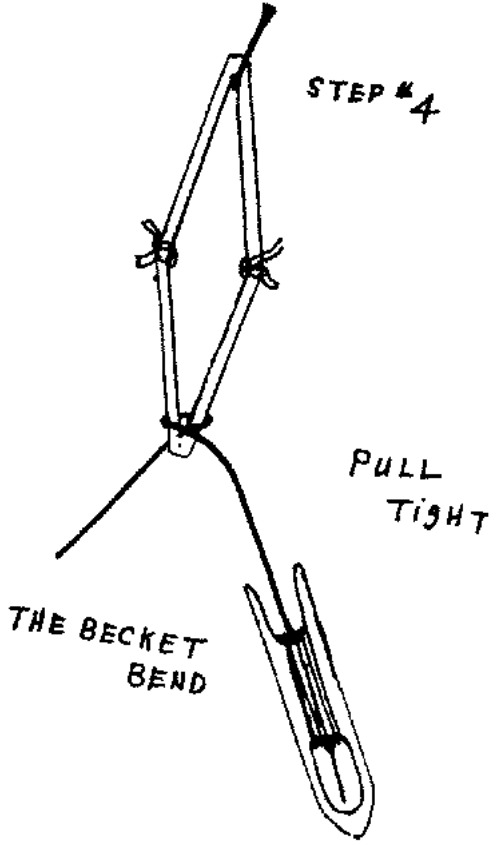

Step 4

Session T-7: Introduction to outboard engines

Time : 9:30 AM

Goals:

- **To introduce very basic internal design and operating procedures for the two-cycle low horsepower outboard**
- **To have trainees be able to speak of/about outboard in proper terminology**

Overview:

In this session trainees are introduced to the outboard engine. For some this will be a refresher; for others, the workings of an engine will be brand new. The technical trainer will use an outboard motor to demonstrate the functions. As the technical trainer talks about how engine operates and various parts, used parts will be passed among trainees for them to see and handle.

Materials:

- **Outboard engine, engine parts, schematic of O.B. engine**

Procedures:

Time	Activities	
	1. Technical trainer introduces outboard engine. Points out:	o power head
		o water check
		o pump vent
		o exhaust column
		o water pump
		o cavitation plate

		o cavitation plate
		o lower unit
		o carburetor
		o spark plugs
		o power pack (if appropriate)

As technical trainer points these parts out, used parts are passed around for trainees to handle. Trainer explains each function.

2. Trainer covers outboard engine and asks each trainee to draw an outline of the O.B. (basic schematic) and try to identify as many parts as they can and where they belong in the engine.

3. Technical trainer now shows trainees a schematic which has been drawn earlier with all parts labeled.

4. Technical trainer explains the importance of knowing the right names for parts and their functions.

5. Technical trainer links to next O.B. engine session which will be about maintenance and its importance.

Trainer's Notes

Parts to be handed out should cover as wide a range as possible: old blocks, pistons, gears, carburetors, etc. If possible contrast an old part and a newer one pointing out signs of wear, neglect or poor maintenance.

Outboard motor maintenance tips

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Adapted, by permission, from Basic Outboard Motor Maintenance, published by the University of Hawaii Sea Grant College Program, August 1977 (UNIHISEAGRANT-AB-77-03).

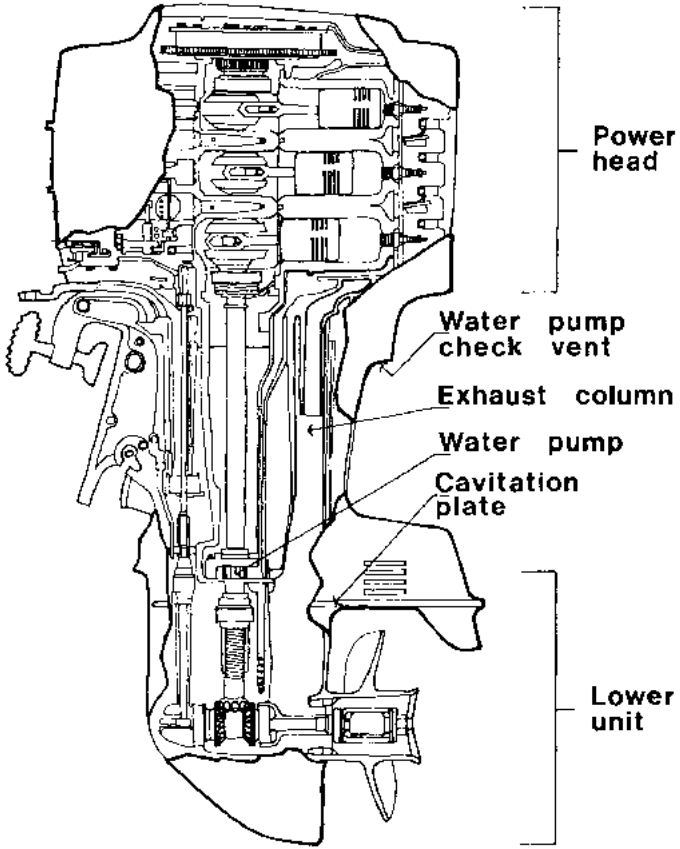

Figure 1. - Cutaway drawing of typical internal combustion, reciprocating outboard engine (Otto Cycle).

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Another title in the series

Marine recreation outboard engines

Most outboards, given proper care, require little service other than periodic maintenance and adjustment. The individual engine owner can handle most of the periodic maintenance. This bulletin was written to aid the individual in basic outboard maintenance skills. Most of the procedures are possible without special tools. If you are in doubt about your motor's service, consult a dealer or, in minor cases, the factory authorized owner's manual for your particular engine.

Power source

The power source for all outboard motors is the internal combustion, reciprocating engine (see figure 1). The basic difference in these power sources is the way in which the fuel mixture is ignited. Most outboards have their fuel ignited by an electric spark (Otto Cycle Engine), as opposed to heat of compression ignition (Diesel Cycle). In most outboards, one complete crankshaft revolution completes the series of events necessary to make the engine run. This is called a two-stroke cycle.

In a two-stroke cycle engine, five events must take place in two strokes of the piston, or in one revolution of the crankshaft. They are: (1) intake (fuel and air), (2) compression, (3) ignition, (4) power, and (5) exhaust. A compressed fuel charge is fired each time the piston reaches the top of the cylinder, and each downward stroke is a power stroke.

In order to accomplish this, the initial pressure of the incoming fuel-air mixture must be

raised to a point somewhat higher than the lowest pressure existing in the cylinder; otherwise, a fresh charge of fuel could not be admitted and the engine would not run. This elevation of pressure requires the use of an air pump, or compressor, of approximately the same volume as the cylinder itself.

Coincidentally, such an air pump is available with a minimum of additional parts, cost, or frictional losses by utilizing the opposite side of the piston and cylinder as the pump. Such engines, called crankcase-scavenged, are almost universally used in the outboard motor industry.

In the crankcase-scavenged engine, most of the frictional parts requiring lubrication are located in the fuel intake system. Lubrication is accomplished by mixing the required amount of oil with the fuel, so that a small amount of oil, in the form of a fine mist, is drawn into the crankcase with each fuel charge.

It should be pointed out that the new oil brought into the crankcase can do little more than supplement the losses; therefore, it is necessary that the frictional parts be well lubricated at the time the engine is started. The use of too much oil in the fuel mixture results in spark plug fouling, excessive carbon buildup, and poor performance, as well as being wasteful. Too little oil results in excessive wear and shorter engine life.

Periodic servicing Many of the troubles related to outboard motors will be much easier to repair if caught before they do extensive damage. Sometimes the lack of proper servicing is the primary cause of failure.

The following list of procedures may help in a regular program of preventive maintenance for your outboard. Preservice checkout. Perhaps the boat has been out of the water and the engine has not been run for a long period - say, several months. Here are a few simple preservice procedures:

1. Remove, clean, inspect, and properly gap spark plugs. Replace defective plugs. (Use new gaskets and tighten the plugs to the manufacturer's recommendations.)
2. Remove oil level plug from gearcase and check for proper oil level.
3. Thoroughly clean and refinish engine surface, as necessary. Undercoat bare metal with anodyzing primer (such as zinc chromate), then paint with marine enamel.
4. Check battery for full charge and clean terminals. Clean and inspect battery cables. Cover cable connections with grease to prevent corrosion.
5. If possible, run motor in test tank prior to installing on boat. Check water pump and thermostat operation.

Inservice checkout.

1. Drain and flush gearcase. Refill to correct level, using manufacturer's recommended lubricant.
2. Remove and clean fuel filter bowl. Replace fuel bowl element. Always use new filter bowl gasket.
3. Clean and regap spark plugs to recommended gap. Replace worn, cracked, or burnt spark plugs. (Use new gaskets and tighten plugs to manufacturer's recommendations.)
4. Check propeller for correct pitch. Replace if propeller is badly worn, chipped, or bent.
5. Lubricate all grease fittings using manufacturer's recommended lubricant.
6. Check remote control box, cables, and wiring harness. Shift lever should move through full range from reverse to forward. Throttle lever should move smoothly from low idle to full open. Lubricate exposed movable lengths of control cables. Adjust lever tension on control box so levers operate smoothly yet remain where positioned when you take your hand off.
7. Check steering controls for smooth movement without slack; lubricate mechanical steering.
8. Lubricate all carburetor and magneto linkages with manufacturer's recommended lubricant.

9. Adjust tension on magneto and/or generator drive belts.
10. Clean and coat battery terminals with grease.
11. Check thermostat and water pump operation. Engine, when in neutral, should pump warm spray of water (not more than 160° F, or 71° C) from hole in exhaust tower.
12. Check breaker points condition and timing.
13. Check carburetor and ignition synchronization.
14. Check carburetor adjustment. On most models, turn high speed adjustment slowly clockwise until engine loses speed or dies, then counterclockwise (about 1/8 turn) until engine returns to highest speed. Turn low speed adjustment slowly clockwise until engine idles roughly or dies, then counterclockwise until it returns to smooth idle.

Installation

Proper transom height and engine tilt are critical to good performance. If the motor is mounted too high above the water, the propeller will slip, churn, and cavitate with little useful power. If mounted too close to the water, the motor will drag, kick up excess spray, and tend to submerge in a following sea. Wrong angle or tilt of the motor pushes the bow or stern down, slows the boat, and wastes fuel. Most installations are just right when the lower unit is vertical at full boat speed, but you will probably want to experiment for best performance.

Propellers

Propeller selection (see figure 2) is generally an easy matter for the outboard owner. If the motor is used on an average runabout, the standard propeller is usually adequate.

For other than average conditions, you may want to change to a different pitch propeller. Pitch is the theoretical distance that the propeller would travel in a solid substance if it made one complete revolution without slippage (figure 3). Increasing the pitch reduces rpm at full throttle, while reducing the pitch will increase rpm at full throttle. If your boat

is large and slow, you may do better with a lowpitch propeller; if your boat is light and fast, higher pitch will help. An important point is to use a propeller that allows the engine to spin within rated speed range at full throttle.

Spark plugs

Regular spark plug service is important because outboards are tough on plugs. Use exactly the recommended plugs, clean and adjust gaps regularly, keep outside porcelain dry, and always carry a spare set of plugs. Remember to use a good gasket when replacing the plugs. The gasket not only prevents loss of compression but is also responsible for keeping the plug electrode at design temperature.

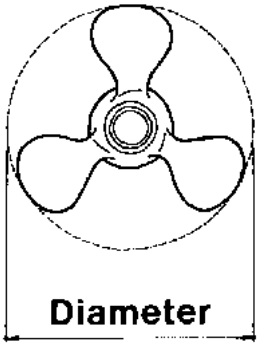


Figure 2. - Propeller diameter, one of two common dimensions wed to describe propellers.

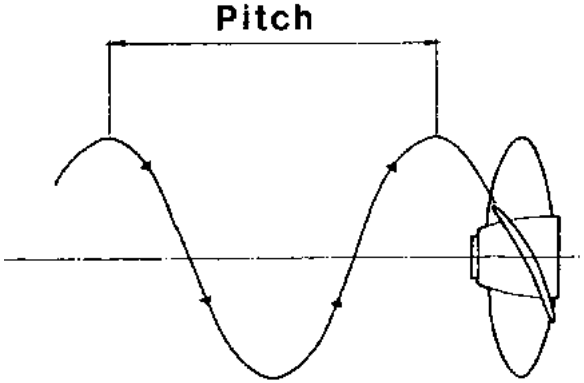


Figure 3. - Propeller pitch, the second common dimension used in describing propellers.

Saltwater care

Motors that are used in saltwater present special problems and require meticulous care. Aluminum alloys used in outboard motors are highly resistant to corrosion by oxidation (breakdown of metal, caused by its combination with oxygen) but very susceptible to galvanic action (electrical process of depositing atoms of one metal, in solution, on the surface of a different metal).

Although oxidation cannot occur under water, it is very prevalent in humid environments. Aluminum parts are protected from galvanization by anodizing (the process of coating metal with a hard shell of aluminum oxide). But this covering is only protective if it

remains unbroken. Here are some tips for care of all motors used in saltwater:

1. After each use, tilt the motor out of the water and flush out the entire motor with coot fresh water. Flush for 1 to 2 minutes and do so within 1 to 2 hours of use to prevent salt buildup inside the motor. A garden hose with a flushing attachment is convenient for rinsing saltwater out of the motor.

2. If possible, periodically flush the motor with fresh water, following manufacturer's recommendations.

3. Be sure the motor is adequately protected with an approved paint. Check regularly for chips and scratches. NOTE: Do not use antifouling paint, since it contains copper or mercury and can hasten galvanic corrosion, unless the manufacturer states that it is intended for use on aluminum.

4. Check frequently to be sure that no aluminum parts are left unprotected. Protect bare metal quickly with an anodizing primer and marine enamel topcoat.

5. A small self-sacrificing block of unpainted corrosion-susceptible metal - a "zinc" - mounted near the part to be protected will sometimes spare a valuable part from corrosion. Zincs can be mounted on the flat cavitation plate, after stripping the finish down to bare metal, with stainless steel or hot-dipped galvanized screws. All surfaces around the block must be protected with paint. NOTE: Consult a dealer before attempting to install such a device.

For further reading

Chilton's Repair and Tune Up Guide for Outboard Motors 30 Horsepower and Over, published by Chilton Book Co., Radnor, Pa. 19809.

Outboard Motor Service Manual, published by ABOS Marine Publications, 9221 Quivira Rd., Overland Park, Kans. 66212.

9-78/5M

Extension Service, Oregon State University, Corvallis, Henry A. Wadsworth, director. This publication was produced and distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914. Extension work is a cooperative program of Oregon State University, the U.S. Department of Agriculture, and Oregon counties. Extension's Marine Advisory Program is supported in part by the Sea Grant Program, National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

Extension invites participation in its activities and offers them equally to all people, without discrimination.

Session T-8: Individual interviews/net mending

Time: 20 to 30 Minutes per Person

Goals:

- **To give each trainee individual time with trainers**
- **To give feedback to each trainee on their progress**
- **To review the assessment dimensions**
- **For trainees to practice net mending**

Overview:

In this session trainees are given formal feedback by the staff, based on staff consensus. Trainees are asked if they have any feedback for staff. Personal concerns that trainees may

have are checked for. This time is seen as a time for building trust between the staff and trainee. This is basically a time for net mending practice and trainees are called out of practice for interviews.

Procedures:

Time	Activities
	1. Trainees are assembled at their net mending site. Trainers conduct interviews nearby but in a private place. The following format is recommended for this weeks interviews:
	o Do you have any concerns that you want to talk about?
	o On a scale of 1-10 and based on the eight week training design
	content, how would you rate your technical skills?
	o Do you have any questions about the assessment dimensions?
	o Where are you in your decision to go?
	o Anything you want the staff to be aware of?

Trainer's Notes:

You should allow yourself a few minutes between interviews to record "quotes" and impressions from interviews. This early in the training program you will want to record all data and information.

Session T-9: Values clarification

Time: 7:30 PM

Goals:

- **For trainees to get in touch with their own value system**

- **To see what we have learned so far about Purero Rican cultural values**
- **To explore commonalties and differences**
- **To find ways of accepting cultural differences**

Overview:

In this session, trainees will be asked to list their own cultural values. The purpose is to see how many more of their own values they have identified since living in Puerto Rico and to look at Puerto Rican cultural values, so that trainees can begin to see commonalties and differences. Finally, trainees will be seeking ways to accept the differences. This lays the ground work for extension work training later in the program.

Exercise:

1. Cultural value explorations: mine, ours, theirs, acceptance.

Materials:

- **Flip charts, marker pens, tape**

EXERCISE 1 - Cultural Values: An Exploration- Mine, Ours, Theirs, Acceptance Total Time: l Hour 45 Minutes

Overview:

To explore different cultural systems. Find ways to accept the differences.

Procedures:

Time	Activities	
5	1. Trainer posts on newsprint the following diagram:	BELIEFS

Minutes		
		CULTURE
		VALUES
		BEHAVIOR
	Give a brief lecture stating that values are not good or bad, they just are. The reason we want to take a good look at our cultural values in this session is to start at just basically a very general point culture. The unique lifestyles of a particular group of people is a learned behavior that is communicable. We are able to see two very key concepts of culture. It is communicable, thank goodness. It means you can learn something about it. Because if it were not communicable, we would have nothing to do here today or for the rest of your volunteer service. To learn about the behavior of others is also very meaningful, not only in a social sense, but also in a management sense, because I think it is important for people to understand the influence that environment has on culture, on you and understand that you are not "born" with a culture. You can be born into a culture but you are not born a culture, if I could make that distinction. Another positive aspect of learned behavior says to us that we can also not only broaden our appreciation of other cultures, but also broaden our ability to participate in other cultures, in other cultural milieu. To start our participation in this culture, we need to go back to ourselves and then come forward.	
15 Minutes	2. Trainer asks trainees to make a list of their own cultural values. You may have done this before, so it will be easy. You may also notice that you have gotten in touch with values you were unaware of since coming to Puerto Rico.	
30 Minutes	3. Trainer now asks participants to form groups of four. 0Share their lists of cultural values and look for similarities and differences in their lists.	
15 Minutes	4. Trainer now asks group to share their differences and write them on newsprint. Then asks for ways in which we accept differences in our own culture.	
20	5. Trainer now asks groups to list as many cultural values of Puerto Rico as they can.	

Minutes	Trainer asks that after they have completed this list, they once again check for commonalties and differences.
15 Minutes	6. Trainer now asks the groups to make a list on news print of ideas they may have for accepting these differences.

Trainer's Notes

List is included as a guide.

15 Minutes	7. Trainer now requests that small groups share with large groups their ideas.
	Trainer now leads discussion of how these ideas can be used in the volunteer experience.

List of Ways of Accepting Differences
- Adjust to environment
- Have respect for culture and customs
- Cultural sensitivity
- Patience
- Be outgoing
- Empathy
- Introspection
- Be flexible enough to (tolerate, accept) values different from our own
- Educate ourselves to explain motives for values
- Realize our values are as different to them as theirs to us
- Conformity/compromise
- Understanding that the differences are deep-rooted and cultural
- Ability to modify outward behavior without modifying inward values

- Keep an open mind - culturally and personally
- Good sense of humor (able to laugh at self)

Session T-10: Outboard engine trouble shooting

Time 7:30 AM

Goals:

- **For trainees to become oriented to trouble-shooting techniques necessary in outboard engine maintenance, repair and operation**
- **For trainees to do actual maintenance work**
- **For trainees to be checked out in small boat handling skills**

Overview:

During this session trainees learn about outboard engine troubleshooting. They will learn how to do simple maintenance tasks and the importance of doing these tasks regularly. During this session each trainee will go out in a small boat with technical trainer to be "checked out" in their ability to handle a small boat.

Materials and Equipment:

- **Outboard engine, new parts, spark plugs, starter cord, fuel filter, transmission oil, propeller, grease gun, WD 40/Solvent, OB engine tool kit Procedures**

Time	Activities
2	1. Technical trainer asks for trainees to volunteer to do one of the following maintenance

Hours	functions on the demo outboard engine Ignition systems
	- remove spark plugs, clean and/or replace
	- use spark plug wrench correctly
	Starter Cord
	- remove starter cord housing
	- remove starter cord
	- replace with new starter cord
	- check main spring for cracks
	- lubricate and replace starter cord housing
	Carburetor
	- adjust idle valve/screw (for rich and/or lean fuel mix, one quarter turn for each
	adjustment)
	Fuel Filter and Transmission Oil
	- remove filter and clean with gasoline, replace filter
	- transmission oil/drain old oil, replace lower unit housing transmission oil
	Engine Housing Maintenance
	- clean upper and lower unit with fresh water. Wipe salt water from unit with clean rag after use
	- clean inside of upper unit with clean cloth soaked in solvent and/or WD 40.
	- flush water cooling intake with fresh water, to clean out collected salts and prevent marine corrosion
	Propeller
	- remove and or replace propeller, locate nicks and/ or cracks in propeller and file down
	- remove propeller and replace shear pins Grease

	- properly grease all bearings and/or grease valves Corrosion
	- locate pitting and/or corroded surfaces, clean, file down do bare metal, repaint with anti-fouling compound paint. Use only approved paints for aluminum surfaces.
	2. Technical trainer announces that all trainees will have to be able to perform all of these maintenance functions within a week. They are free to practice on demo, but will be expected to do a complete maintenance check on one of the local fishermen's outboard engines.

Trainer's Notes:

Trainee will have to make own arrangements to do free maintenance on fishermen's O.B. engines. It is advisable to have one of the trainees who understands O.B. functions to check out those who are doing maintenance for first time. Every trainee must be able to perform all functions. It is important for you to emphasize that O.B. engines will last a long time with proper maintenance, and that one of the biggest problems found in developing countries is that maintenance functions are not demonstrated thoroughly to fishermen. Consequently, there are many unnecessary costly repairs incurred by the small-scale fisherman.

20 Minutes/ trainer	3. While trainees continue to practice maintenance trainee functions technical checks out trainees in small boat handling.

Trainer's Notes:

For some of the trainees this will be the first time handling a small boat. Technical trainer will give these trainees initial instruction and allow them to operate the boat in open water. Trainees will have to find practice time, and until they check out will have to go out in boat with one of the trainees who can operate a boat safely and correctly. Once again

trainees have only one week in which to acquire this skill and be checked out. When they feel they are ready, it is up to them to ask to be checked out.

1. Trainee check out list:
- PFD
- Overview of check-out
- Starting
- Reverse
- Low speed (no wake zone)
- High speed
- Wide circle
- Tight small circle
- Bay entrance
- Stop engine
- Start engine
- Return to dock
- Low speed (no wake zone)
- Docking
- Night navigation/operation

Session T-11: Tropical photography - extension

Time: 4 PM - 5 PM

Goals:

- **To provide information regarding camera care in a tropical environment**
- **To suggest alternative ways to photograph subjects in the tropics**
- **To provide technical transfer and workshop skills to the trainee presenting the session**

Overview:

This session is presented as a special project by a trainee. The need to document work is important, especially when dealing in technical areas. The opportunity for the PCV in the field to record workshops and/ or special projects is only limited by expertise as a photographer. In the tropics, there are special considerations that must be adhered to; it is these "rules" that this presentation of tropical photography deals with.

Procedures:

Time	Activities
1 Hour	1. Trainee presents an overview of photography and brings into focus the relevant procedures for insuring quality photographs in a tropical environment.
	2. Trainee presents a list of resources for additional information on the above.

Materials and Equipment:

- **Flip chart, pens, misc. cameras and camera equipment**

References:

- **Eastman Kodak Co. Rochester, N.Y. 14560 Notes on Tropical Photography, 1978**
- **Photographing Tidepools, Velma Bosworth, Oregon State University Sea Grant, 1978**

Notes on Tropical Photography

Suggestions for Residents:

The instructions in the following sections are intended for photographers who work in tropical climates either as residents or on location for a considerable time. The

precautions may or may not be necessary, depending on the particular climate and on the facilities available. Today, many buildings in the tropics are air-conditioned, and such appliances as humidifiers, dehumidifiers, and refrigerators-portable or otherwise- are either available locally or they can be shipped in and used where there is a supply of electricity.

Care of Photographic Equipment:

Moderately high temperature is not in itself detrimental to cameras and accessories, but intense heat should be avoided except for those times when the equipment is in actual use. When high temperatures is coupled with high humidity, the growth of fungus on bellows, camera cases, fabrics and even lenses is a certainty.

Do not leave cameras and accessories either in hot sunshine for longer than is necessary or in enclosed spaces, such as the glove compartment or the trunk of a car that is standing in the sun. Remember that a white surface reflects heat as well as light. For this reason, a white-painted enclosure remains cooler in sunshine than a dark-colored one.

Abrasive dust is a major problem in many tropical climates. There are few enclosures that can exclude it altogether. Enclosing the camera and auxiliary lenses in plastic bags is helpful, but in a humid atmosphere the stagnant air in the bag promotes the rapid growth of fungus. Equipment should not be kept enclosed in this way for longer than a few hours.

Constant cleaning of the camera parts before and after use is a necessary procedure. Special care must be taken with lenses; the abrasive action of gritty dust is a serious threat to the glass surfaces, and consequently, to the photographic image. Clean lenses by gently brushing or blowing off dust. Any wiping or cleaning with fluid or tissue must be done with the greatest care and as infrequently as possible. Keep both ends of lenses capped when not in use.

Some photographers mount a haze filter or a piece of optical glass permanently on the lens as protection against abrasion by dust. A scratched filter can be renewed at moderate cost if necessary. A Haze filter has no appreciable effect on exposures.

Storage of Photographic Materials:

Sensitized photographic materials are perishable products under practically any conditions. Proper storage is therefore important at all times, especially in tropical climates, because deterioration is rapid in a hot and humid atmosphere.

Black-and-white materials withstand moderate heat without serious changes in their characteristics. Color films intended for amateur use (sometimes called "consumer" films) should be stored where the temperature will not rise above 24°C (75°F) for more than a few days. Kodak color films intended for professional use (they have the word "professional" in the film name) should always be stored in a refrigerator at 13°C (55°F) or lower.

Extremes of relative humidity are a serious threat to all photographic materials, even at moderate temperatures. At high temperatures, the effects of humidity are greatly accelerated. Not only are the sensitometric characteristics of the material impaired, but physical damage occurs as well. Sheets of film may stick together or become glazed in patches where they touch one another. Rolls of film may "block" or stock so that they cannot be unwound, or the outside edges of the roll may be affected more than the inside so that the film buckles. Moreover, cardboard cartons swell and break open, labels drop off, and cans rust. These effects can be expected if the relative humidity remains above 60 percent. Extremely low relative humidity, on the other hand, is not quite so serious, but if it falls below 15 percent for a considerable time, an electric humidifier should be installed and set to maintain a relative humidity of 40 to 50 percent in the storage area.

Storage of Films and Color Papers: These materials are supplied in packages incorporating

a barrier to protect them against moisture vapor. Only when the relative humidity is above 60 percent for most of the time is it necessary to protect the packages against dampness. Black-and-white films and papers can be stored at normal room temperatures in an air-conditioned room, for example Professional color materials should be stored in a refrigerator until the seal is broken.

When the seal has been broken, films should be used as soon as possible. Since the air in a refrigerator is moist, partially used packages should be returned to the refrigerator in a sealed can together with a desiccant to absorb the moisture within the container. When partially used packages of color paper are stored in a refrigerator, press out excess air from the foil envelope, make a double fold at the open end, and seal with adhesive tape.

In general, do not keep more film and paper than necessary in stock, particularly when good storage conditions are not available. Photographic materials are also affected by chemical activity of fumes and gases. These include some plastic formulations, paints, lacquers, exhaust from internal combustion engines, and sulfide toning solutions. In a hot atmosphere, the solvents in paints, lacquers, etc, evaporate and permeate the air in an enclosed space much more rapidly than they do at normal temperatures. Consequently, do not store papers and films in newly painted rooms or cabinets, and keep the materials as far away as possible from the kind of containment mentioned above.

Storage of Black-and-White Photographic Paper: Although Kodak black-and-white papers are very stable materials, their photographic and physical properties deteriorate when they are stored for considerable periods under conditions of high temperature and high relative humidity.

Ideally, black-and-white paper should be stored at temperatures between 5 and 10°C (41 and 50°F). However, paper intended for use within a few months can be kept in an air-conditioned room at normal temperature. Unlike films and color papers, black-and-white

papers are not sealed against moisture; they should, therefore, be kept in a place where the relative humidity is not too high. Remember that in a hot and humid climate, the relative humidity will be even higher in a basement or other place where the temperature is lower than that of surrounding areas. A refrigeration dehumidifier installed in the storeroom will help keep the humidity within acceptable limits. If the relative humidity is below 25 percent most of the time, photographic paper will dry out and become brittle and difficult to handle in use. Then an electric humidifier should be installed and set to maintain a relative humidity of about 45 percent.

As a general rule, do not stock more paper than you expect to use within a few months. However, if large stocks of paper must be maintained, it would probably be economical to provide the best possible storage conditions. A conditioned room or chamber in which the temperature and the relative humidity can be controlled is ideal.

Warm-up Times:

When films are taken from cold storage or from an air-conditioned room into a warmer atmosphere, allow sufficient warm-up time before opening the heat-sealed envelope or other moisture barrier. Otherwise, moisture condensation forms on the surfaces if the film temperature is below the dewpoint of the surrounding air.

Care of Exposed Films:

When a film has been removed from the moisture-resistant package, it is immediately subject to deterioration in a hot and humid climate.

When the film has been exposed, the latent image will also deteriorate. Color films are particularly susceptible in this respect. Consequently, all films should be processed as soon as possible after exposure. If processing facilities are not available in your vicinity, mail the film to the most convenient processing station immediately. If you are unable to

do this for some reason, enclose the films in an airtight jar or can together with a desiccant and place them in a refrigerator. Exposed films can be kept for several days in this way.

Exposure:

Although it has often been said that less exposure is needed in the tropics as a general rule, this is not necessarily so. Measurements made in various parts of the world have shown that when atmospheric conditions are similar and when the sun is at the same elevation in the sky, the intensity of illumination is practically the same regardless of geographical location. Since the sun reaches a higher elevation in the tropics than elsewhere, the light intensity is extremely high when the sun is at its zenith. This in itself is not a difficulty--exposure can easily be adjusted for the higher light intensity. However, when the atmosphere is clear and the sky cloudless, the lighting contrast is also extremely high. In these conditions, shadows tend to lack detail even though the highlights are correctly exposed or perhaps overexposed.

With nearby subjects, fill-in flash is helfpul and the only remedy available for color pictures other than waiting for more favorable lighting conditions. In black-and-white work, you can give extra exposure to get more shadow detail and then reduce the development of the film to lower the highlight density. Another effect of taking photographs when the sun is directly overhead occurs in landscapes without high trees or buildings. The absence of shadow then yields a very flat, uninteresting picture. The only way to avoid this result is to photograph the subject either earlier or later in the day when shadows are longer.

Preservation of Negatives:

Because deterioration caused by residual chemicals in the emulsion takes place rapidly in a hot and humid atmosphere, always fix and wash films thoroughly. In handling negatives,

wear Kodak Cotton Gloves to avoid finger marks. When the negatives are not in actual use, keep them in clean envelopes, because any greasy residue deposited on the surfaces by indoor atmosphere promotes the rapid growth of fungus, which eventually destroys the gelatin coatings on the film.

The most important consideration in storing negatives in a humid climate is to keep them dry. That is to say, maintain a relative humidity between 40 and 50 percent in the storage area. If a building is properly air-conditioned, the relative humidity will not be higher than this.

However, if it exceeds 55 percent for any considerable period, install an electric dehumidifier. If other means of keeping negatives dry are not available, they can be stored in a heated cabinet. Alternatively, they can be enclosed in a metal box with a desiccant.

For the best storage conditions, negative envelopes should conform to American National Standard Requirements for Photographic Filing Enclosures for Storing Processed Photographic Films, Plates, and Papers ANSI PH4.20-1958 (R1970). In a tropical climate, however, negatives should not be stored for a long time without inspecting their condition. Do this at regular intervals so that any deterioration that might have taken place can be remedied and more suitable storage conditions arranged.

Preservation of Prints:

In general, the same remarks apply to preserving prints as to preserving negatives. Careful processing and storage in a dry place are the principal requirements.

When black-and-white prints are used for decoration or display, hypo alum toning has been found helpful in preserving the prints from atmospheric effects and from attack by fungus. Color prints should be lacquered so that they can be wiped clean occasionally.

Prints should always be dry-mounted--many pastes and gums are hygroscopic, and they attract insects and fungus. Use photography-quality mounting board-impurities in ordinary cardboards may discolor the prints in a short time. This applies also to interleaving paper and album leaves.

At relative humidities below 60 percent, prints keep well in an album if the pages are large enough to allow a 3 1/2 inch border on all four sides of the prints. The closed album then gives a measure of protection against atmospheric effects and attack by insects or fungus, particularly when the prints have been treated with a fungicide such as Hyamine 1622.

If the relative humidity is above 60 percent, pack the prints or the album in a sealed container together with a desiccant. Single prints, whether mounted or unmounted, should be interleaved with good-quality paper. To be sure that-deterioration is not taking place, inspect valuable material periodically and renew the interleaving paper or any other packing material at these times.

Fungus:

Airborn spores of fungus are everywhere, and they exist in immense variety. Mold and mildew are the familiar kinds that fourish in warm, damp places. Generally, the type of fungus troublesome to photographers in the tropics grows most readily at temperatures between 24 and 29°C (75 and 84°F). It feeds on dead organic matter such as leather, cloth, wood, paper, and gelatin, but it will spread and damage other materials-the glass of lenses in cameras and binoculars, for example.

Moisture is essential to the growth of practically all varieties of fungus, and they thrive in darkness. Obviously, in a hot damp atmosphere, cameras, sensitized materials, negatives, and prints, as well as clothing and other fabrics, will be attacked. The only really practical way to prevent the attack of fungus is to keep the articles dry and clean as far as this is possible.

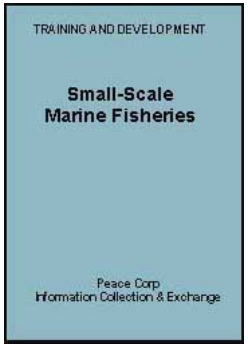
A heated box or a cabinet in which an electric light bulb or a small electric heater element is kept switched on can be used to keep cameras and other equipment dry. Adjust the temperature in this type of enclosure so that it is about 5.5°C (10°F) higher than the room temperature. Also, allow air to circulate through ventilation holes in the top and bottom of the box or cabinet. Do not keep films or photographic papers in enclosures such as that described above.

The best way to reduce the relative humidity in a room is by using a refrigeration-type dehumidifier. The room must, of course, be resistant to the passage of moisture through walls, ceiling, and floor, and it must be kept closed. Then the heated enclosure described above is not necessary. In this connection, remember that although a room-type air conditioner reduces the temperature, in doing so it may increase the relative humidity. Some units are more efficient in dissipating moisture than others. In a properly air-conditioned building, however, the difficulty will not arise.

Notes on Tropical Photography Kodak Publication No. C-24

Home"" """"> ar.cn.de.en.es.fr.id.it.ph.po.ru.sw

Small-Scale Marine Fisheries - A Training Manual (Peace Corps, 1983, 631 p.)
Week 3: Training
(introduction...)
Session T-12: Introduction to diesel engines
Session T-13: Knots, net sewing and construction small-scale fishing gill nets



- **Session T-14: Coping skills**
- **Session T-15: Diesel power systems; Diesel trouble shooting**
- **Session T-16: Special group project gardening, composting and small animal raising**
- **Session T-17: Introduction to extension**
- **Session T-18: Outboard/diesel field trip**
- **Session T-19: Diesel and outboard maintenance schedules, fuels and costs special group project**
- **Session T-20: Volunteer's role as an extensionist**
- **Session T-21: Introduction to small-scale fishing**
- **Session T-22: Trolling for spanish mackeral - special group project; Anatomy of hook - special project**
- **Session T-23: Extension III - Extension of extension by an extensionist**
- **Alternate session T-23: Marine fisheries extension**
- **Session T-24: Small-scale fishing**
- **Session T-25: Individual interviews/net mending**
- **Session T-26: Communication through illustration special group project**
- **Session T-27: Small scale fishing appropriate fishing technology II New Zealand long-line reel**
- **Session T-28 Special group project cooking fish and nutrition**

Small-Scale Marine Fisheries - A Training Manual (Peace Corps, 1983, 631 p.)

Week 3: Training

WEEK 3 SESSIONS T-12 THRU T-28

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
AM Session T-12 7:30 AM Introduction to Diesel Engines	Session T-15 7:30 AM Diesel Power Systems Diesel Trouble Shooting	Session T-18 7:30 AM Outboard/Diesel Field Trip	Session T-21 7:30 AM Introduction to Small-Scale Fishing	Session T-24 7:30 AM Small-Scale Fishing Appropriate Fishing Technology I Deep-Line Snapper Reel	Session T-27 7:30 AM Small-Scale Fishing Appropriate Fishing Technology II New Zealand Long-Line Reel	
PM Session T-13 4 PM Knots, Net Sewing and Construction Small-Scale Fishing Gill Nets	Session T-16 4 PM SGP Gardening and Compost and Small Animals	Session T-19 4 PM SGP Diesel & O.B. Maintenance Schedules, Fuels, and Costs	Session T-22 4 PM SGP Trolling for Spanish Mackeral 5 PM SP Anatomy of Hooks	Session T-25 2:30 PM Interviews and Net Mending	Session T-28 3:30 PM SGP Cooking Fish and Nutrition	
EVE Session T-14 7:30 PM Coping Skills	Session T-17 7:30 PM Introduction to Extension	Session T-20 7:30 PM Volunteer's Role As An Extensionist	Session T-23 7:30 PM Extension of Extension by an Extensionist	Session T-26 7:30 PM SGP Communication thru Illustration		

Week 3 Sessions T-12 Thru T-28

Session T-12: Introduction to diesel engines

Time: 7:30 AM

Goals:

- **To acquaint trainees with the basic principles of the operation of a Diesel engine**

Overview:

This introductory session is the first of three sessions focusing upon the Diesel engine. The importance of the Diesel to small-scale fisheries is evident in its usage as the sole power plant for many fishing vessels, and with electrical generators for operating freezing and cold storage facilities. Because the diesel has not reached its maximum power and efficiency potential, we can expect it to be with us and the small-scale fisherman for years to come.

Materials and Equipment

- **Diesel parts, flip chart of two-stroke cycle, Diesel engine**

Procedures:

Time	Activities

30 Minutes	1. Technical trainer gives lecturette from the following outline which is posted on newsprint:	
	A. Principles of Operation	1. The diesel engine is an internal combustion power unit in which the heat of fuel is converted into work in the cylinder of the engine.
		2. In the Diesel engine air is compressed in the cylinder; after the air has been compressed, a charge of fuel is sprayed into the cylinder and ignitions made by heat of compression.
	B. Two-cycle Diesel	1. In the two-cycle, intake and exhaust take place during part of the compression and power strokes - in contrast to the four-cycle Diesel.
		2. A blower unit/pressure forces air to expell gases and supply cylinder with fresh air for combustion.
		3. A unidirectional flow of air produces a scavenging effect leaving the cylinder full of clean air when piston covers inlet air ports.
		4. As piston continues in upward stroke exhaust valves close and a charge of fresh air is subject to compression.
		5. Before piston reaches highest position a required amount of fuel is sprayed into the combustion chamber by fuel injection.
		6. Intense heat is generated during high compression of air ignites fine fuel immediately. Combustion continues until fuel injected has been burned.
		7. Resulting power forces piston down on power stroke, exhaust valves are again opened when piston 1/2 down allowing exhaust gases to escape.
	2. Technical trainer passes around Diesel parts for trainees to handle.	

	3. Technical trainer now takes trainees to see an operating Diesel.

Trainer's Notes:

It is important that arrangements be made in advance with fisherman to have trainees look over operating Diesel. It is also important to find one that is well maintained for this session.

4. Technical trainer asks trainees to explain what is happening as they observe operation of the Diesel.

Session T-13: Knots, net sewing and construction small-scale fishing gill nets

Time: 4 PM

Goals:

- **To provide trainees with opportunity to work on proficiency of knots, net sewing and construction**
- **Provide individualized instruction with Becket bend, bowline, clove hitch, reef knot and sheet bend to trainees**
- **To provide instruction to trainees in proper handling of a gill net**
- **To allow trainees the opportunity to work with a gill net in proper placement and retrieval techniques**

overview

In this session trainees will review net skills to date. Trainees are allowed to work at own speed on sewing and generally becoming familiar with nets and various knots. This session also allows for the trainees to be introduced to the proper handling and fishing techniques of a gill net. In addition, a comment about the quality of the net--as to whether

proper care has been given or if the net is ragged, full of holes, etc., is made by the trainer at the start of the session.

Materials:

- **Flip chart, markers, tape, net twine, netting and net needles**
- **Cill net(25'-50'), small fishing boat, PFD's**

Procedures:

Time	Activities
1 Hour	1. Technical trainer reviews net skills to date. Trainees practice marine knots that technical trainer introduces as follows:
	- reef
	- sheet bend
	- double sheet bend
	- figure of eight
	- clove hitch
	- rolling hitch
	- half hitch
	- sheep shank
	- bowline
	- bowline on a bight
	Trainees practice these knots under the guidance of technical trainer
	2. Technical trainer introduces Gill nets using following outline:
	I. Introduction to a Gill net A. How it works to enmesh fish

	I. Introduction to a Gill net	A. How it works to entmesh fish.
		B. Construction materials.
	II. Various Gill net styles	A. Floating
		B. Sinking
		C. Deep-sea
		D. Trammel(Reference to earlier net session T-4.)
	III. Demonstration of proper handling techniques	A. Float line coil
		B. Lead line coil
		C. Laying net flat
	IV. Demonstration of proper fishing technique	A. Setting from boat
		B. Mangrove encirclement
		C. Retrieval of net
	V. Fish removal from Gill net	A. Care in handling fish
		B. Care in handling net

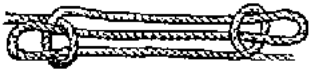
Trainer's Notes:

Very essential that a gill net is borrowed for this session. In addition, a fisherman skilled in the proper use of gill net fishing should be enlisted prior to the session to demonstrate or assist in the demonstration of the above. A demonstration such as this would normally attract a crowd, so take advantage of other fishermen to assist in the ''proper" techniques.

KNOTS, BENDS AND HITCHES

NAME	USE	REASONS	SKETCH
Reef	Joining two ropes of the same thickness, Tying bandages, slings, lifejackets, sail reefing.	Flat, easily undone even when wet.	
Sheet Bend	Joining two ropes of different thicknesses. Heaving lines, lifelines, mooring rope "Messengers".	Quick, easily undone, non slip	
Double Sheet Bend	Same as for sheet bend but used where some security is required, Bosun's Chair, Rescue.	Same as for sheet bend plus the extra safety factor, will not jam.	
Figure of Eight	To stop the end of a rope from unreeving through a block, a temporary stop on a rope end.	Larger than an overhand knot and less likely to slip or jam.	
Clove Hitch	Securing ropes to railings and bollards when a straight pull is required.	Quick, a jamming knot very easily released.	

Knots, Bends and Hitches

NAME	USE	REASONS	SKETCH
Rolling Hitch	Same as for Clove Hitch but used where greater security is required. Heavy sideways pull, rope tail to larger rope, mooring rope stopper.	Same as for Clove Hitch but with greater security.	
Half Hitches	Same as for Clove Hitch, not so neat, securing a rope to a ring.	Easy to tie and easy to release, quick.	
Sheep-Shank	To shorten rope without cutting, tent guys, stays, lashings.	Reduces wastage, effective and secure yet very easily released.	
Bowline	Making a temporary loop in rope, "Anchor" man in climbing, rescue, lifeboat cover ropes.	Safe, non slip, non jamming, easy to release.	
Bowline on a Bight	Lowering/raising a person where more control is needed - injured or unconscious person.	Same as for Bowline but two loops are formed.	

Knots, Bends and Hitches Continued

Session T-14: Coping skills

Time: 2 Hours

Goals:

- **For trainees to see how necessary it is to have coping skills as a PCV**

- **To discuss with trainees openly and frankly differences in the cultures they will be in and possible effects these differences may have on their personal lives**

Overview:

The purpose of this session is to enable trainees to introduce sensitive subject matter concerning the possible effects that living in a new culture may have on the trainees. In this session the mores of the Host Country are openly discussed, so that trainees understand how they will have to conduct themselves as PCVs if they are to be effective in their role. Trainers initiate questions and encourage open discussion between themselves and trainees.

Materials:

- **Flip chart, markers**

Trainer's Notes:

This session requires trainer to have researched the attitudes, values, mores, and cultural norms of Host Country, if not first hand knowledge.

Procedures:

Time	Activities
2 Hours	1. On newsprint trainer lists the following items:
	a. mores of Host country
	b. corruption
	c. sexuality
	d. drinking/drugs

	e. how children are treated
	f. how animals are treated
	g. women roles/rights
	h. hospitality
	i. privacy
	j. personal safety

2. Men and women are asked to meet with a trainer in separate groups. After presenting the newsprint with the above items, trainer gives brief definitions /explanation of each as follows:

a. Social customs: eating with hands, special greetings, etc.

b. Corruption that may be evident in host country, i.e., the importance of not handling others money.

c. Sexuality: the openness in some cultures or strictness, including some ways of coping with suggestiveness from members of opposite sex in host country.

d. The drinking practices 1n Host Country, ways of coping with not wanting to drink, the appropriateness of women drinking or not drinking. Drugs reinforcing Peace Corps policy of "no drugs", even if they are available.

e. How children are treated. In some countries, child beating is practiced (but only by parents). How to deal with having to tell parents that the child is misbehaving if a beating may insue.

f. How animals are treated. The sometimes rough treatment of animals and the advisability

of keeping pets.

g. Women's role. Long hours of work, how to manage your feelings about women's acceptance of their roles.

h. Hospitality in Host Country. Why your denial of food or drink would be considered rude.

i. Privacy, or lack of privacy.

j. Personal safety, not inviting aggressive behavior through your own rudeness (or what could be perceived as rudeness).

It is usually advisable to go down the list one at a time. Ask trainees to feel free to ask questions in areas of concern. Trainer should state that no question is unimportant if it is of concern to trainee. Trainer should emphasize that these areas will most likely be gone over in in-country training.

Trainer's Note

We have found that trainees have concerns in these areas and are reticent to ask question. By having this session early in training you are able to dispel myths and clear up misinformation that trainees have either gotten from outside sources or faulty assumptions on their part that have created concerns.

Session T-15: Diesel power systems; Diesel trouble shooting

Time: 7:30 AM 5 Hours

Goals:

- **To give trainees further understanding of Diesel engines**

- **For trainees to understand and perform the maintenance functions of a Diesel engine**

Overview:

In this session trainees are further inculcated in the workings of the Diesel engine. They will learn how to perform basic maintenance functions on Diesel engines.

Materials and Equipment:

- **Flip chart, markers, fishing vessel with diesel engine in operating condition, spare parts**

Exercises:

1. Diesel Power Systems
2. Diesel Troubleshooting

EXERCISE 1 - Diesel Power Systems

Total Time: 3 Hours

Goals:

- **To provide trainees with basic familiarization of Diesel power systems**
- **To enable trainees to become properly oriented to working capabilities and general mechanical operation of a Diesel engine.**

Overview:

This session is a follow-up on the Introduction to Diesel (Session T-12). Its scope is to allow trainees the opportunity to engage in the operation of a Diesel engine, as well as to begin to achieve some proficiency in the operation of the fuel, lubrication and cooling

systems, transmission, turbocharger, instrumentation and starting systems, and exhaust systems.

Procedures

Time	Activities	
	1. Using the following outline posted on newsprint.	
	Technical trainer gives lecture:	
	I. Introduction to Diesel Power Systems	A. Review of Introduction to Diesel (Session T-12)
		B. Review of Principles of Operation
	II. Fuel Systems	A. Operation
		B. Filters - primary/secondary
	III. Lubrication System	A. Component operation
		B. Oil pump
	IV. Injection System	A. Purpose of the injector
		B. Nozzle Types
		C. Droplet size
		D. Spray Patterns
	V. Cooling System	A. Fresh water (closed)
		B. Sea water (open)
	VI. Transmission Systems	A. Operation
		B. Gear Ratio
		C. Clutches
	VII. Turbocharger	A. Operation
		B. Layout

		D. Layout
	IX. Starting Systems	A. Compression
		B. Electrical
	X. Exhaust System	A. Dry
		B. Wet
		C. Exhaust manifold
		D. Pyrometer

Trainer's Notes:

Very important to have access to a Diesel engine, preferably in a fishing vessel. Again a small (under 50 HP) Diesel is preferred. Intent of session is to familiarize trainees not to make them into master mechanics.

EXERCISE 2 - Diesel Trouble Shooting

Total Time: 2 Hours

Goals:

- **For trainees to understand the necessity for proper maintenance of the Diesel engine**
- **For trainees to be able to perform simple maintenance chores**

Overview:

This session follows the O.B. engine trouble-shooting. It will not be possible for each trainee to do a maintenance check-up on a Diesel engine; each trainee should be able to do one maintenance function based on what they have learned from O.B. engine sessions.

Materials and Equipment:

- **operating diesel engine preferably in fishing vessel**

Procedures

Time	Activities	
1 Hour	1. Technical trainer asks each trainee to perform one of the following maintenance functions until complete maintenance check-up is done:	
45 Minutes	Sea water cooling system:	Trace water intake pipes/hoses to engine block inlet.
		Trace water outlet pipes/hoses to overflow part.
		Locate and remove zinc plugs, check for corrosion and possible replacement of zinc; replace zinc plug.
	Fresh water cooling system:	Check and maintain proper water level in fresh water reservoir.
	Both systems:	Check all hoses/pipes and clamps for leakage and/or abrasion.
		Remove and install replacement hoses or clamps.
	Diesel Fuel System:	Trace fuel lines from fuel tank to engine - locate fuel shut off valves.
		Locate filters.
		Add Diesel fuel to tank, measure gallon capacity of fuel tank cubic inches of outside dimension divided by 235 = U.S gallon.
		Fuel filters
		Replacement of fuel filters
		- shut off valve on fuel line

		- drain fuel from filter and line
		- open fuel filter casing
		- clean with fuel to remove grit, grime and loose rust particles
		- replace filter with new filter
		- fill casing with clean Diesel fuel
		- replace casing and turn shut off line back on
		- check engine oil level
		- add engine oil to engine
		- check transmission oil level; add transmission oil to transmission housing if necessary.
	Exhaust System:	Trace exhaust system from exhaust manifold to muffler to stack
		Identify whether system is a wet exhaust system or a dry exhaust system
		Check all couplings for wear, rust, need for replacement
	Gear and Throttle linkages:	Trace cable and wires from control panel to engine; check RPM gauge
		Oil pressure gauge, water temperature gauge, pyrometer gauge, volt/amp gauge
		Grease gear cauplings and check connections on linkages
		Grease bearings
		Grease propeller shaft bearing
10	3. Technical train	Use grease gun properly on the importance of proper maintenance for

10 Minutes	3. Technical trainer gives short lecturette on the importance of proper maintenance for the longevity and reliability of a Diesel engine.
5 Minutes	4. Links the Diesel sessions to the field trip the following day.

Session T-16: Special group project gardening, composting and small animal raising

Time: 4 PM - 5:45 PM

Goals:

- **For trainee assigned to the project to build on leadership, communication and technology transfer skills**
- **For trainees to acquire a basic understanding of gardening and good gardening techniques**
- **To acquaint trainees with the techniques of composting**
- **For trainees to acquire a basic understanding of rabbit raising and poultry production**

Overview:

This special group project emphasizes the importance of the 'backyard garden,' both for meeting the nutritional needs of the PCV and as a secondary activity demonstrating good gardening practices to the community. All trainees should work in the garden and help with the compost pile--under the leadership of the group project leader--throughout the duration of the training program. Because of time constraints, rabbit raising and poultry production, on the other hand, are limited to a short presentation.

Procedures:

Time	Activities
40 Minutes	1 Group project leader and project team give presentation on garden site selection, seed bed preparation and layout, companion cropping and pest control (including fencing).
20 Minutes	2. Group project leader gives presentation on techniques of composting.
40 Minutes	3. Group project leader and project team give presentation on rabbit raising and poultry production.
5 Minutes	4. Group project leader presents garden planting schedule and sign-up sheet. All trainees are to have a garden assignment.

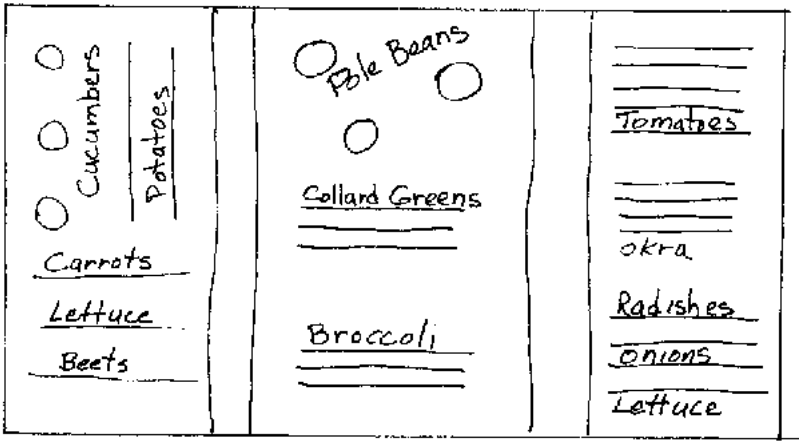
Trainer's Notes:

Rather than one presentation on all aspects of gardening, it is better to have several short presentations over the course of the training, scheduled appropriately to coincide with garden activities, i.e. thinning, weeding, staking.

Depending on the size of the group, small animal raising can be a separate group project.

References:

- **Small Vegetable Gardening, ICE.**
- **Small Animal Raising Resource Packet, ICE.**
- **Rabbit Raising, ICE.**
- **New Methods Pay with Poultry, ICE.**



Garden Plan

Plant basil, mint, parsley, oregano, garlic, thyme, rosemary, marigolds around whole border of garden.

Steps in small scale gardening

1. Considerations in picking a site

a. Available sunlight - amount depends upon crops to be planted
b. Soil - type depends on type of crops to be planted
c. Water
d. Miscellaneous - at present site I had to take into consideration the fact that there are many chickens around - chicken wire

Before Planting Soils and Soil preparations

1. pH

pH is probably the soil factor which the farmer can easily control.
The pH is easily tested with litmus paper and with a little bit of work can easily be altered. The ideal pH is between 65-70, slightly acidic to neutral. Most crops and flowers grow best in this range. If the soil is too acidic, add limestone (readily available). Why pH is important - some plants cannot take up nutrients if the soil is too acidic or alkaline.

Testing soil for pH - Take soil samples from different parts of the garden plot. Mix 10 parts water to 1 part calgon (if no calgon don't worry) solution with the crushed dirt. Test with both acid (blue) and base (red) litmus paper by putting a drop of the solution on each. If there is no change in color in either then the soil is neutral. If blue turns red = acid soil, if red turns blue = alkaline soil. Corrective measures should be taken.

Soil Nutrients

With the equipment available it will be hard to determine what and how much of the three major nutrients, Nitrogen, Phosphorus, and Potassium are present in your soil. You can, through compost, insure that there will be enough of these nutrients present in order to have a successful garden.

Nitrogen - Too much or too little causes a decline in plant productivity, but it is hard to get too much. This and the other two nutrients are easily depleted therefore they have to be continually renewed. It is very important in the building of a plant structure. If there is not enough n2 in the plant the color will be pale green or even yellow. Too much n comes from chemical fertilizers which causes the plant to grow too fast, therefore they are not made of a strong structure and are more susceptible to disease and insects.

Good N2 containing material

Raw bone meal	any type of manure	Peanut waste	pea hay
cottonseed meal	or urine	nutshells	coffee wastes
steamed bonemeal	crab	feathers	sewage sludge
gluten meal	lobster waste	dried jellyfish	
wheat meal	fish waste	dried blood	

Phosphorous - Again, this element is essential for plant growth, strong roots, fruit development, and resistance to disease. There must be plenty of organic material in the soil for there to be an abundance of phosphorous present.

Sources of Phosphorous

raw bone meal	dried ground fish	banana trash ashes
steamed bone meal	lobster refuse	citrus wastes
shrimp waste	raw sugar wastes	dried blood
any manure or urine	wood ash	cottonseed meal
	peapod ashes	

Potassium - Potash - Good for strong plant structure and resistance to plant diseases, also for counteracting affects of too much n2. Weak stems may indicate need for potash.

Sources of Potassium

wood ashes	tobacco stems	banana trash (ash)
any manure or urine	garbage	
cattail reeds	vegetable wastes	
waterlily stems	hay	

coffee grounds weeds

Composting

The use of a compost is the best method of returning nitrogen, potassium, phosphorous to the soil of your garden. Composting also increases the earthworm population in the soil which is very beneficial. Anything that will rot can make compost or humus, everything from kitchen scraps to bluejeans. Compost can be arranged in an open pile or a closed bin.

Compost pile construction

1. Work ground underneath pile site to allow soil microbes to migrate to pile.

2. Materials are added in two inch layers, vegetation first, soil next. Add soil quick to initiate decomposition and to keep smell down.

3. Each layer should be watered lightly (like a damp towel).

4. Try to mix in high n containing materials. N2 is good food for soil microbes and therefore it speeds up their activity.

5. If it is still slow chemical fertilizers can be added.

6. Also, the pile can be turned with a pitch fork in order to get more air introduced into the pile to speed up the process (take care when forming pile as not to pack down layers). All material on the outside should be turned to the inside.

7. Shredding the material also helps speed up the process.

8. The pile should be located near the garden, but also near a good water supply.

9. It should take 2 -3 months to be ready. The compost is ready when the material is brown and crumbly and the material first used cannot be recognized.

10. A pile 3 x 3 x 3 is enough for a 1000 ft garden.

11. Add to garden by turning it under.

Important - never add hot compost to garden.

Bed Construction Raised Bed Intensive Gardening - Benefits

A raised bed has a planting surface which is 4-10 inches above original surface area. They are usually 3-5 feet wide and any length. They are easier to weed, plant, fertilize, harvest, and control insects when compared to flat beds. When performing these activities the beds do not need to be walked upon. Therefore roots are not damaged and air space in soil is not destroyed. Also, all fertilizers are placed in root areas and not wasted in path ways. One last thing. Having the ground in the root area extensively prepared and loosened makes it easier for the roots to grow downward and thus they don't interfere with each others growth with sideways growth of roots.

Construction of the raised bed

This is difficult but it will pay off in the long run.

1. Soak for two hours with water

2. Let dry for two days

3. Loosen dirt with a shovel but do not turn

4. Weed area

5. One day rest Double-Digging

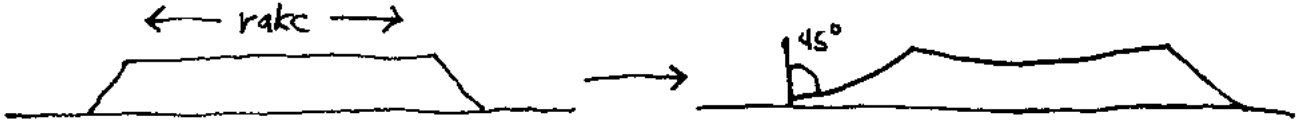
Plot - goal is to loosen and improve soil to two feet

1. Dig a trench across one end of the bed

2. Carry to the other side of the bed

3. Dig a second trench next to the first and put the dirt into the first trench

4. Repeat until the bed is completed. Put the dirt from the first trench into the last trench.

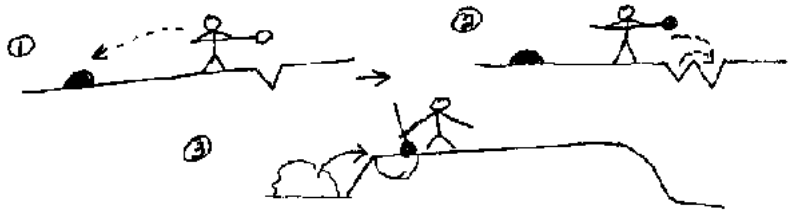


Composting (see compost section)

Add completely broken down compost before planting is done Antierosion device

This is especially helpful with a soil that has a high clay content.

1. Rake from center of the bed until edges are built up at a 45° angle from surrounding ground level



--Rick Winkler, PCV Sierra Leone

Session T-17: Introduction to extension

Time: 7:30 PM

Goals:

- **To introduce extension work**
- **To give historical overview**
- **To look at specific goals of extension**
- **To begin the process of developing an extension agent**

Overview:

Each trainee regardless of their job assignment will eventually become involved in fisheries extension work. This session begins by giving the historical overview of extension work in North America; then goes into "Six Axioms of Fisheries Extension."

Exercises

1. Historical overview and some techniques used in the past.
2. Six Axioms forfisheries extension; small group discussions

Materials

- **flip charts, marker pens, tape**

EXERCISE 1 - Historical Overview and Some Techniques Used in The Past

Total Time: 40 Minutes

Overview:

During the introduction to extension it is important for trainees to understand that the extension movement has 100 years of history. Though it may be a new concept in developing countries it come as a tried and true system for helping farmers. Experiences are shared to help trainees get a picture of an extension worker as one who must interact on a one to one basis in order to help a community develop.

Procedures:

Time	Activities
40 Minutes	1. Lecture on history of extension outline:
	- 1862 Morrill Act - Land Grant Colleges
	- 1887 Research - Experimentation
	- 1914 Extension
	- 1940-1950 - Good Neighbor Policy of Harry S. Truman, "Partners in Progress."
	- 1950 Application of extension principles to other areas of food production
	For extension to be most effective, it must achieve:
	General:
	1. National concern to improve agrarian structures

	1. National concern to improve agrarian structures.
	2. Rural population with high level of self esteem.
	3. Active participation in significant development programs, i.e., agrarian.
	Specific Goals of Extension:
	1. Significant objectives - precise, measurable, realistic
	2. Appropriate image
	3. Power - legal, money, political
	4. Institutional mystique
	5. Internal efficiency
	6. Effective communication with public
	7. Coordination with other agencies
	8. Democratic procedures

Trainer's Notes:

This is a good time for trainers to talk about their own experiences as extension agents or community development workers.

EXERCISE 2 - Six Axioms of Marine Fisheries Extension

Total Time: 1 Hour 10 Minutes

Overview:

In this exercise participants become familiar with the basic rules of extension work. Since extension work is such an instructional activity, the extension worker will find that there are ions periods of time when he/she feels as if he/she is not doing anything and is tempted to do more; he/she may also wonder, from time to time, if what he/she is doing

is actually advancing or retarding extension work in the community. In extension work the temperament and sensitivity of the worker influences to a large degree how effective the work will be.

Procedures:

Time	Activities	
15 Minutes	1. The trainer posts on newsprint the following axioms and speaks about each one.	o The marine fisheries extensionist should never do anything for people that they are able to do for themselves
		o The marine fisheries extensionist should never encourage the use of resources from outside the community until all the resources within the community have been exhausted
		o The marine fisheries extensionist should never try to organize people to deal with a need they don't themselves recognize (may have to educate first).
		o Marine fisheries extensionist's most important dedication must be to his/her community
		o Marine fisheries extension must be carried out from an understanding of the host culture and in terms of that culture
		o The marine fisheries extensionist role in his/her community is transitory. (There is no room for ego needs.)
	The trainer then adds that he/she was tempted to add a seventh axiom, which says that the above six should not be taken too seriously. If there is one single encompassing rule in extension work, it is that given the basic goals, the means ultimately are flexible -	

	subject to variations according to specific conditions.
45 Minutes	2. The trainer now asks participants to break into groups of four or five and discuss ways in which they can be successful extension workers. (Allow 20 minutes) Ideas are recorded on newsprint and presented to the entire group.
10 Minutes	3. Trainer now does summary of session, emphasizing that trainees are becoming members of a historical tradition - extension.

Session T-18: Outboard/diesel field trip

Time: 7:30 AM

Goals:

- **To allow trainees the opportunity to expand on information received during regular sessions**
- **To provide "on line's examples of Diesel and outboard repair facilities**
- **To provide trainees with functional examples of operating Diesel engines and to gather information from Diesel and outboard engine marine engineers.**

Overview:

This session allows for trainees to break away from the confines of the training site and to be able to gather information on Diesel and outboard operation, maintenance and repair. Since the availability of marine engineers to the training facility field trip is essential, a confirmation trip prior to the field trip should be made.

Procedures

Time	Activities
30 Minutes	1. Orientation to Diesel/outboard field trip

1 Hour	2. Overview of Diesel maintenance, overview of outboard engine maintenance
30 Minutes	
1 Hour	3. Repair facilities outboard/Diesel

Materials and Equipment:

- **Diesel repair facility**
- **outboard repair facility**

Trainer's Notes:

Important to have introduction session to both outboard and Diesel, and principle operating mechanics of each before taking trainees on a field trip of this magnitude. The trainees need to ask questions about what they see, but more important need to know what questions to ask. Trainers should encourage the asking of questions and role model if necessary.

Session T-19: Diesel and outboard maintenance schedules, fuels and costs special group project

Time: 4 PM

Goals:

- **To acquaint trainees with maintenance schedules for outboard and Diesel engines**

- **For trainees to understand that preventive maintenance practices as an extension package will benefit small-scale fishing operations more than expertise in Diesel or outboard engine repair**

- **To acquaint trainees with Diesel and outboard fuels, and some of the problems one might encounter in developing countries**

- **To acquaint trainees with initial Diesel and outboard investment costs, along with projected maintenance and operating costs**

- **For the trainee assigned the special project to build on leadership, communication and technology transfer skills**

Overview:

In this special group project, responsibility for obtaining information on Diesel and outboard engines over the course of the training program is placed directly on trainees. Eight weeks is not enough time to make Diesel and outboard engine experts out of anyone, especially when there are many other technical subjects to cover during the formal sessions. What this special group project demonstrates to trainees is that there are resource people among themselves and within the fishing community who can provide information and answers to questions on Diesel and outboard engines. This session should emphasize preventive maintenance schedules, fuel efficiency, and the economics of Diesel verses outboard engines for the small-scale fisherman.

Materials and Equipment:

- **Flipchart, marking pens, Diesel and outboard demonstration engines, Diesel and outboard operator/repair manuals**

Procedures:

Time	Activities
15	1. Group leader asks trainees to identify maintenance practices for the outboard...for the

Minutes	Diesel. Group leader records on separate newsprint.	
40 Minutes	2. Group leader and teen' members go over each newsprint, using a Diesel and outboard engine to demonstrate each point, and then adding additional maintenance practices overlooked by the trainees. It should be stressed that by far the greatest cause of Diesel and outboard break downs in developing countries is the result of poor maintenance practices. Daily, weekly, monthly and yearly maintenance schedules should also be thoroughly covered.	
25 Minutes	3. Group leader and/or member(s) of team present mini lecture on fuels and fuel efficiency. The following areas should be covered:	
	a. fuel efficient technology - gear modification, vessel design, low RPM's and fuel efficient engines; and, (See Appendix 1)	
	b. fuel quality and availability. (See Appendix 2)	
25 Minutes	4. Group leader and/or member(s) of team present mini lecture on initial investment costs - type and size of engine in relation to boat size - and their projected annual maintenance and operating costs.	
5 Minutes	5. Group leader assigns every trainee the following task:	o interview in the next two days one fisherman who operates a Diesel or outboard powered boat, to find out his initial investment and estimated monthly maintenance and operating costs.
	Trainees report information to the large group at the beginning of Session 25.	
10 Minutes	6. Trainer draws closure to the session by reviewing the topics covered, adding relevant personal knowledge and experience, and highlighting the important points made. Linkage is made back to previous Diesel and outboard sessions, and ahead to Sessions 23,89 and 99.	

Trainer's Notes

When trainees report out their information from activity #5 at the beginning of Session 25, trainer must process both the information collected (or lack of it) and the interviewing techniques used. Linkage should then be made to the session on interview (Session 39) and to the session on Economic Data Sheets (Session 89).

References:

- **Shulz, Erich Diesel Mechanics**

- **Perkins Diesel Engine Owner's Manual (Perkins Engines, 24175 Research Drive, Farmington, Michigan 48024 or 515 11th St., Canton, Ohio 44707.)**

- **Johnson or Evinrude Outboard Engine Owner's Manual. (Outboard Marine International, Inc., 37 N.E. 179th St. P.O. Box 693539, Norland Branch, Miami, Florida 33169.)**

Factors To Consider in Selecting Power Units for Small Fishing Boats

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Engine Horsepower Selection

Various factors must be considered when selecting an engine that is best suited to a particular vessel and fishery:

1. The required speed of the vessel, keeping in mind that the hull has a maximum speed irrespective of the engine's maximum speed.

2. The types of tasks required of the vessel, e.g., line fishing, trolling, and trawling.

3. The auxiliary power requirements of the engine, such as supplying power to a voltage alternator, freezer compressor, deck and bilge pump, trawl winch, etc. These auxiliary duties all require additional horsepower from the engine.

4. The lines of a vessel, as well as its displacement and weight. These factors determine the engine's placement in the hull. If a displacement hull is used, the ratio of engine weight to horsepower is not a critical factor; with a planing hull, however, this ratio becomes a major consideration.

5. The amount of available clearance that the hull design allows for a propeller. With a planing hull with twin engines, the propeller shaft is extended on a strut or "A" frame. This structure has the disadvantage of leaving the propeller unprotected and there fore more liable to damage from flotsam, reefs, etc.

From the above facts, a general rule for determining appropriate engine horsepower to hull length can be derived:

Vessels up to 4 m in length require up to 6 hp Vessels of 7 m require 6-15 hp Vessels of 8 m require 1525 hp Vessels of 10 m require 25-50 hp Vessels of 12 m require 50-100 hp

Engine Type Selection and Drive

A first consideration in choosing between gasoline or diesel engines is the availability of fuel. Assuming that both types of fuel are available, the cost per gallon (or litre) should be assessed against the amount the engine will burn per hour.

In addition, the dangers of gasoline must not be overlooked. Gasoline exhaust fumes are toxic, whereas diesel fumes are not. Also, the electrical system of a gasoline engine is very susceptible to damage from moisture and in general, this engine type is more difficult to maintain. The diesel engine will generally provide more hours of trouble-free service than

the gasoline engine.

Having selected an engine, one must next consider the drive unit. Several types exist: a conventional shaft directly coupled to the gear box, vee belt drive from engine to propeller shaft, inboard/outboard drive, outboard motor, jet unit, or vee gear box drive.

Gear boxes can be either hydraulic or manual. An advantage of the hydraulic gear box is its "fingertip control." Within this gear box, or bolted directly behind it, are the reduction gear and thrust bearings. As a rule, with a smaller number or propeller revolutions, slip is reduced and a greater operating efficiency is thus achieved.

When using the vee belt drive between engine and shaft, it is important to fit a thrust bearing onto the propeller shaft. A "jockey pulley" can be incorporated in this drive unit which will allow the propeller to idle while the engine is running. Unlike a gear box which can reverse the propeller's rotation, the vee belt drive is restricted to one direction only.

The inboard/outboard motor requires that the engine be mounted in the aft section in the vessel. In both cases, the purchase price includes a complete unit, including propeller, shaft and other parts. These units offer the advantage of being able to raise the propeller clear of any. obstructions. The outboard motors with lower horsepower can be readily removed for servicing as well. The jet unit must also be placed near the stern of the vessel and requires a high rpm engine. The absence of a propeller has definite advantages, but this type of drive is very inefficient at low rpm and thus is inapplicable for activities such as longlining and trolling.

Selection of Engine Systems

"Optional extras" offered by manufacturers are additional considerations when purchasing a marine engine:

Cooling. Three cooling systems are available. A saltwater cooling system involves pumping salt water directly through the engine. This system is simple to install, but often subjects the engine to severe internal corrosion.

Air cooling is a second system. If the motor is located in an open cockpit, this method poses no problem but if the engine is installed in an engine room, an air flow must be maintained to and from the engine.

The best cooling system is perhaps that of freshwater cooling. The simplest method is to "keel cool" an engine; the fresh water is first circulated through external pipes on the hull where it is cooled by water and then passed through the engine. The other freshwater method uses a head exchanger whereby salt water is pumped through a stack of tubes while the fresh water is circulated around these tubes and through the engine.

Starting System. The simplest starting method is hand starting. The other common type of starting is electrical, which relies on battery power and is more difficult to maintain. Some manufacturers, however, offer both forms of starting and this is a major advantage.

Auxiliary Drives. If other tasks are required of the engine, such as powering a trawl winch, line hauler, or freezer, it is advantageous to purchase a clutch-operated power takeoff. Generally, if no power takeoff is available, vee pulleys can be mounted on the front end of the crankshaft.

Instruments. Instruments can be either mounted directly on the engine or remote-mounted on the dash, and can be of the capillary tube variety or electrical. They should include a tachometer (preferably with a service house meter), oil pressure gauge, and water temperature gauge. If electricity is available, alarm units for low oil pressure and high water temperature should be fitted as they forewarn of problems before a serious breakdown occurs.
operation of Engine.

For maximum engine reliability and performance, some simple training should be provided to the operator. Initially, the operator should read the manufacturer's handbook for familiarization with the engine.

Any proficient boat operator should be capable of changing the engine lubricating oil and lube oil filters as specified by the manufacturer. For all engine types it is imperative that the correct grade of lubricating oil be used. In addition, the oil level in the sump should be checked daily, together with the freshwater level if applicable.

The operator should also be able to trace the fuel system from the tanks, through the primary filter/water trap, to the lift pump and thence to the fuel pump via the secondary fuel filter. All fuel filters should be changed and the water trap drained periodically. In the case of gasoline engines, a basic knowledge of electrical connections is necessary. For example, an operator should know how to deal with dampness on leads.

In addition, an operator should know how to check battery water levels, clean engine air filters and assess daily fuel consumption. A working knowledge of the bilge pumping arrangements is necessary as well.

If a diesel engine is difficult to start but has fuel, it can be assumed that the compression is down and the cylinder head should be removed so that the valves can be ground. In general terms, all modern engines require a valve grind at about 3,500-4,500 service/hours, which should be done by qualified engineers. The number of hours varies with different engine makes and models, however, and this figure serves as a guide only. All engines give better performance and lower running costs if they are not "overpropped," i.e., they must obtain their designed rpm when underway.

In summary, three major factors arc involved in selecting an appropriate engine type: the size of the boat, the desired speed, and the type of work required of the boat.

For greater reliability and economy the diesel engine is the better choice. After the horsepower and weight of a unit, the next important consideration is the availability of replacement parts and servicing. From experience gained, I would recommend the engines listed in Table I for marine use. These are drawn from those in the larger list in Table 2.

The necessary accessories (i.e., the type of gear box) must also be considered. Correct and careful installation of the engine is an additional critical factor. With regular and intelligent maintenance by the operator, many motors can be operated almost continuously, without frequent overhauling, for many thousands of hours.

An important point to remember is that when at sca and a breakdown occurs, you cannot get out and walk.

Table 1. Brands of motors recommended for marine use with comments on their best features.

Up to 12 hp	
Yanmar YSE 8	Simple to operate and install.
Yanmar YSE 12	Economical and very reliable. Has hand and/or electric starting.
Lister SRIN/G	For air-cooled applications.
Volvo Penta MD1 B	Similar to Yanmar.
Stuart Turner	Good reliable gasoline engine.
12 to 17 hp	
Yanmar 2QM20	Simple to operate. Reliable, economical and has optional starting.
Lister ST2MG/R	For air-cooled applications.
Volvo Penta MD2B	For inboard use.
Volvo Penta MB2A	For gasoline fuel.

Volvo Penta MD1 1C/100B	Diesel inboard/outboard use.
27 to 50 hp	
Lister ST3MG/R	For air-cooled applications.
Volvo Penta MD3B	For diesel inboard.
Volvo Penta MB20C	For petrol fuel.
50 to 80 hp	
Fiat CO3M	Reliable diesel.
G.M. Detroit 3.53	Compact 2-stroke diesel. Has good power to weight ratio.
Volvo Penta AQD21A/2700	Reliable diesel for inboard/outboard application.
Ford Cortina	Compact gasoline engine.
80 to 100 hp	
Fiat OMCP3M	Compact and reliable.
G.M. 4/53	Compact 2-stroke diesel. Has good power to weight characteristics.
Lister HR6	For air-cooled applications.
Volvo Penta AQI 15A/100	Gasoline inboard/outboard.
Volvo Penta BB11SC	Gasoline inboard.

Type	Diesel or gas	Hand-Elec start	Cooling	Budget price[a]
Up to 12 hp				
BUKH. DV10M	D	H or E	Sea water	NZ$2,000[b]
Lees One - 11	D	E	Sea water	1,650

Stuart Turner	D	H	Sea water	–
Yanmar YSE 8	D	H or E	Sea water	850/$1,350
Yanmar YSE 12	D	H or E	Sea water	960/$1,550
Penta MD 1B	D	H or E	Sea water	1,200
Kubota	D	H or E	Sea water	1,300
Lister SRIMG	D	H or E	Air	1,200
Petter AC1WM	D	H or E	Sea water	2,000
Stuart Turner	G	H	Water	1,050
Honda	G	H or E	Air	200 (up to)
Kawasaki	G	H	Air	415 (up to)
Briggs & Stratton	G	H	Air	350 (up to)
Various makes of petrol outboards	–	–	Water	700 (up to)
12 to 27 hp				
Petter PH2W	D	H or E	Sea water	NZ$1,640
Yanmar	D	H or E	Sea water	2,000
Volvo Penta MD2B	D	H or E	Sea water	2,800
Lister ST2MG/R	D	H or E	Air	2,300 + tax
Lister SW2	D	H or E	Sea water	2,300 + tax
Volvo Penta MD 11C/100B (inboard-outboard)	D	H or E	Sea water	3,650
BUKH DV20M	D	H or E	Sea water	2,700
Lees 4/27	D	E	Fresh water	3,100
Volvo Penta MB 10A	G	E	Sea water	2,000
Wisconsin THOM	G	E	Air	–
Briggs &Stratton	G	H	Air	400
Outboards up to	–	–	–	850
27 to 50 hp				
Lister ST3MG/R	D	H or E	Air	NZ$2,700 + tax
Lister HRW3	D	H or E	Water	5,450 + tax
Lister HR3	D	H or E	Air	3,800 + tax
Perkins 4/108M	D	E	Water	–
Perkins P3/152	D	E	Water	

Perkins D3/152	D	E	Water	–
B.M.C. Captain	D	E	Water	2,700
Volvo Penta MD3B	D	H or E	Water	3,800
Lees 4/53	D	E	Water	3,400
Volvo Penta MB20C	G	H or E	Water	3,000
Ford Escort	G	E	Water	2,300
Wisconsin WH4DM	G	E	Air	–
Outboards up to	–	–	–	1,500
50 to 80 hp				
B.M.C. COMMANDER	D	E	Water	NZ$3,300
Perkins 4/236M	D	E	Water	–
Lees 4/75	D	E	Water	5,320
G.M. Detroit	D	E	Water	7,000
Volvo Penta MD21A	D	E	Water	7,000
Fiat CO3M	D	E	Water	6,800
Volvo Penta AQD21A/2700 (inboard-				

Continued next page

Table 2. Brands of motors available in various ranges of horsepower and selected features of each brand.

outboard)	D	E	Water	5,100
Lister HRW4	D	E	Water	8,750 + tax
Lister HR4	D	E	Air	5,800 + tax
Ford Cortina	G	E	Water	2,400
Outboards up to	–	–	–	1,900
80 to 100 hp				
Ford 2715	D	E	Water	NZ$6,500
Perkins 6/354	D	E	Water	–
Caterpillar 3304	D	E	Water	10,000
G.M. Detroit 4/53	D	E	Water	7,500
Fiat OM CP3M	D	E	Water	8,600
Lister HRGMG/R	D	E	Water	9,100 + tax
Lister HR6	D	E	Air	7,100 + tax
Volvo Penta AQ115A/100 (inboard-outboard)	G	E	Water	2,300
Volvo Penta BB115C	G	E	Water	3,800
Outboards up to	–	–	–	2,300
Jet Units				
Berkeley 5J5	G	7 - 10 hp		NZ$ 160
Berkeley 6JA	G	10 - 40 hp		260
Hamilton 751	G	50 - 150 hp		670

[a]Prices quoted are as of September 1975.
[b]US$1.03 = NZ$1.00

Table 2 contd.

Marine fuels and primary fuel

Introduction

4 well designed fuel system will store, clean and supply fuel at the proper pressure and rate to satisfy all demands placed on the engine. A mechanic called to check an engine installation for proper operation must be totally familiar with all aspects of the fuel system. Each part of the fuel system should be checked to assure its operation whenever a lack of power complaint is registered by the owner of a ship.

To effectively accomplish this, the mechanic should be made familiar with the following:

Fuel Classification Numbers

Fuels that are usable in Caterpillar Diesel Engines fall into two groups: these are Fuel Oil and Diesel Fuel Oil. Fuel oil is listed by number as follows: No. 1, No. 2, No. 4, No. 5, No. 6. The higher the number the thicker the fuel. The thicker fuels have a greater BTU value but are not fluid enough to successfully operate in the Caterpillar fuel system. The number 1 and number 2 fuel oils are compatible in the fuel systems. The number 2 fuel oil is heavier and therefore supplies more BTU's per gallon and is more economical to use.

Diesel Fuel Oil is classified as No. 1-D, No. 2-D and No. 4-D. The number 4-D is a heavy fuel and is too viscous to be used in the Caterpillar fuel systems. The No. 1-D and No. 2-D fuels are acceptable in the Caterpillar fuel systems with the No. 2-D fuel preferred because of its greater BTU content.

The No. 3 and No. 3-D fuels are missing from the list. These classifications were dropped from the listing by the American Society for Testing Materials and are no longer used.

A marine Diesel fuel is also available in several areas of the world. This fuel is basically the same as the No. 2 and No. 2-D fuels with the provision that the sulfur content is held to a specific low level.

Fuel Variables

When checking a vessel's fuel system, more than the type of fuel in the ship's tanks must be known. Fuel qualities that directly affect the operation of the engine are as follows:

Sulfur content Pour point Filterability
Cetane number Cloud point

Sulfer Content

Sulfur is present in all fuels and should be held at minimal levels. During the combustion process the sulfur combines with the water that is produced by the burning of the fuel and forms sulfuric acid, H_2SO_4. The sulfuric acid will attack and react with the metals of the engine if it is left to build up within the engine. Series 3 lubricating oil will take care of most of this accumulation of sulfuric acid if the level of the sulfur in the fuel is less than 0.4%

When the sulfur content of the fuel is greater than 0.4%, the oil change period should be reduced by one half. If the sulfur content of the fuel is greater than 1.0% the oil change period should be reduced by three-quarters. The sulfur content of the fuel should always be known to prolong the life of the engine. If at all possible, the sulfur content of the fuel should never exceed 1.0%.

Cetane Number

Cetane number is an indication of the ignition performance of the fuel. The higher the cetane number, the easier the fuel will self ignite in the combustion chamber of the Diesel engine. The numbers range from 0 to 100. Generally, the heavier the fuel the lower the cetane number. Heavy fuels are very difficult to self ignite and generally have to be preheated. The minimum cetane rating that Caterpillar engines are designed to operate at is 35. The normal cetane ratings of several fuels are: No. 2 Fuel Oil 35-45, No. 1 Diesel

Fuel Oil-55-60, No. 2 Diesel Fuel Oil-48-50, and Marine Diesel Fuel-35-40.

Pour Point

Pour point is the lowest temperature at which the fuel will flow by gravity feeding. This figure should be at least 10°F. (6°C) below the lowest temperature at which the engine will be required to start. In extremely cold weather, No. 1 or No. 1-D fuel may be required because of its lower pour point.

In most marine applications the pour point figure is a relatively unimportant factor as the temperature of the fuel is very seldom below freezing.

Cloud Point

Cloud point is the temperature at which the wax that is present in the fuel will form crystals and plug fuel filters. The cloud point is usually about 10 to 15°F. above the pour point of the fuel. The cloud point should always be below the lowest temperature that the engine is required to operate in.

Filterability

Filterability is a measurement of the lack of sediment and water. Fuels used should be free from most contaminants. Generally no more than 1% of sediment and water should be allowed in the fuel. If a greater amount of sediment or water is present in the fuel, the filters and screens will plug at short intervals and hamper the overall performance of the engines.

From the preceding information it can be seen that if any of the fuel conditions listed are not corrected, an engine may not perform according to specifications. In the United States most fuels available for marine usage meet the minimal requirements for good operation.

However, in foreign countries fuel may not meet all of the specifications set forth above. The most common difference in fuels is the sulfur content. In several areas of the world the sulfur content will reach or exceed 1.0%. When this type of fuel is encountered, reduced oil change periods are a must.

Fuel Tanks

The fuel tanks are generally built into the ship at the time of construction by the shipyard. Normally a mechanic is unable to do anything about the general installation. However, if a problem in the fuel system is indicated, it is important that the mechanic knows several design features that are involved in the construction of the tanks and connecting lines.

The material that is used in the construction is one thing to consider. The material used should not react with the Diesel fuel placed in the tank. The main material that is objectionable is galvanized iron. The zinc used in galvanizing is unstable in the presence of sulfur, especially in the presence of moisture. A sludge is formed by the chemical action of the sulfur, zinc and moisture which is extremely harmful to the engine's fuel injection system and may cause deposits on piston rings, pistons, valves, etc. Any form of zinc should be avoided where continuous contact with Diesel fuel is involved.

This problem can occur when a pleasure boat is repowered from a gasoline powered boat to a Diesel powered boat. Galvanized fuel tanks are satisfactory for use with gasoline powered boats and are found in many installations. For the above reasons, when a boat is repowered, the material used in the construction of the fuel tanks should be checked.

Fuel Tank Drain Valves

All fuel tanks should have a drain valve located near the bottom of the tank. The bottom of the tank should be sloped towards the drain valve so that all the water and sediment can be removed from the tank. The drain valve should be periodically opened to remove any

accumulated water and sediment. This procedure may be required as often as every crew watch change.

If a failure indicates that dirt in the fuel system may have been a contributing factor to the failure, be sure to check the fuel tanks to see if provisions have been made to drain off sediment.

Fuel Tank Vents

All fuel tanks should be vented to the atmosphere. The vent should be constructed so it will not allow water to enter the tank under any operating conditions of the boat. The vent equalizes the air pressure in the tank when fuel is drawn off and also when the tank is filled. Most fuel tank vents use a ball type check valve and a screen to prevent the entrance of water and dirt.

Fuel Fill Pipes and Caps

One of the main places where dirt can enter the fuel system is the fill pipe. It is important to assure that the area around the fill pipe is clean and free of dirt whenever the cap is removed for fueling. This will prevent the entrance of unwanted dirt during the fueling operation.

The fuel cap should be chained to the fill pipe to prevent loss of the cap. A cap can be lost over the side very easily during a fueling operation. When this occurs, it generally takes some time before the cap is replaced, allowing the entrance of unwanted dirt into the tank while missing.

Fuel Tank Clean Outs

The fuel tanks of some large boats have cleanout plates. If the fuel tanks become

contaminated over a long period of usage, they may require internal cleaning. The cleanout plates provide access to the tank.

Causes of Moisture Accumulation in the Fuel Tanks

The fuel transfer pump on the engine supplies more fuel than the engine can use during normal operation. Excess fuel is usually returned to the fuel tank. When this is done, it is important that several design features be checked. The returning fuel will have picked up heat from the engine. This hot fuel returning to a cold tank can cause a build up of moisture in the fuel system. The fuel tank which is vented to the atmosphere can contain moisture laden air. The returning hot fuel heats the air in the tank and the moisture in the air condenses on the colder metal sides of the tank. The moisture then runs down the side of the tank and accumulates at the bottom of the tank. If this is not removed at frequent intervals, the water can enter the engine's fuel system.

Water and Sediment Trap

All fuel systems should have some type of water and sediment trap in the fuel supply network before the fuel transfer pump, This trap should be large enough to allow the fuel flow to slow down to a point where the large particles that are present in the fuel can drop out and collect in the sediment trap. The purpose of this type of trap is to reduce the load on the primary filters and prolong the life of all fuel system components. The water trap is located at the lowest point in the fuel system. Water, being heavier than the Diesel fuel, will settle to the lowest point in the system.

Primary Filters

Primary filters are used to remove the larger particles of sediment that enter the fuel system. They are generally installed before the fuel transfer pump so that the internal components of the transfer pump are protected from damage. In most marine applications

two primary filters will be connected in parallel. With this arrangement the engine does not have to be stopped to service the filters. When the filters are to be serviced, a valve can be closed stopping the flow through one of the filters. The remaining filter will carry all of the pump flow. After the filter is serviced, it can be put back into the system and the remaining filter can be serviced.

If the primary filter becomes restricted it will reduce the flow of fuel to the engine and directly affect the performance of the engine. Air leaks in the filter gasket area can also cause poor engine performance; air drawn into the fuel system will cause the engine to lose power and run rough.

Secondary Filters

The secondary filters of the fuel system are the last protective components in the fuel system. The number of filter elements that are used vary from engine to engine. These filters offer very little restriction to the flow of fuel and are generally mounted in parallel. The filters will remove any particles larger than 10 microns in size. The filters are located at the highest point of the fuel system. This provides a very convenient place for any air that might enter the system to accumulate. A bleed valve is provided at this point to help remove the air.

The filters are changed only when the fuel pressure gauge reading drops. If the restriction of the fuel filter causes the gauge to enter the red zone of the gauge, the filter elements should be replaced. With this method the fuel system is not opened up and exposed to the dirty surroundings unnecessarily. The fuel filter housing has a drain valve at the base of the housing. This drain should be opened every 50 hours to remove any accumulated water and sediment. If dirty fuel is encountered, this procedure may have to be repeated more frequently.

A bypass valve is located in the filter housing to return the excess fuel that the transfer

pump delivers back to the supply tank or standpipe. If the bypass valve does not seat properly the fuel pressure to the fuel injection pumps will drop and poor engine response will result.

Fuel Day Tanks

In many large boat applications a fuel day tank is used. This tank is generally large enough to hold a fuel supply for eight hours of engine operation at the full load rating. Several rules should be followed when using this type of installation.

1. The day tank should be located so that the level of the fuel in the tank (when the tank is full) is no higher than the injection valves. The day tank should not be mounted so high "relative to the engine) that the gravity will allow fuel to leak into the combustion chamber in the event of the injection valve leakage. 2. The tank should be close enough to the engine so that the total of suction lift to the transfer pump with the fuel at low level, plus the restriction of the supply line, is less than 12 feet.

Session T-20: Volunteer's role as an extensionist

Time: 7:30 PM

Goals:

- **Examination of the roles of an extensionist**
- **Exploration of ways in which to introduce innovations to communities**
- **Practice in communicating with community people regarding an innovation**
- **To examine communication skills, verbal and non-verbal once more**

Overview:

In this session, seven roles are isolated in the process by which a volunteer in the role of an extensionist introduces new ideas to his/her community. The importance of good communication skills is brought up again and skills that volunteers need are focused on. The non-verbal observation assignment from the previous week is discussed, and trainees share with their partner their observations over the past week.

Exercises:

1. Extensionist roles
2. Communication skills - verbal and non-verbal, of an extensionist

Materials:

- **Flip charts, marker pens, tape**

EXERCISE 1 - Extensionist Roles Total Time: 1 Hour 20 Minutes Overview:

In this exercise we look at the seven roles of an extension worker. Trainees discuss ways in which they can adopt these roles as volunteers doing extension work in their communities.

Procedures:

Time	**Activities**	
1 Hour	1. Trainer introduces the following seven roles and gives an explanation of each:	1.1 develops need for change
20 Minutes		1.2 establishes a change relationship
		1.3 diagnoses the problem

		1.4 creates intent to change in community members
		1.5 translates intent into action
		1.6 stabilizes change and prevents discontinuances
		1.7 achieves a terminal relationship

Trainer's Notes:

For trainer's discussion use local examples to illustrate each role.

	1.1 Develops need for change - A volunteer is often initially required to help his/her community become aware of the need to adopt a new technique, such as using ice to preserve the catch. The unwillingness to accept change readily often results in the volunteer serving as a catalyst in the community. In order to do fisheries extension work, the volunteer points out new alternatives to existing problems, dramatizes these problems and convinces fishermen that they are capable of confronting them. The volunteer acting as an extension worker not only assesses the community at this stage, but also helps to create these needs in a consultative and persuasive manner.
	1.2 Establish a change relationship - Once the need for change is created, the volunteer must develop rapport with the community. He/she enhances his/her relationship with the community by creating an impression of credibility, trustworthiness, and empathy toward their needs and problems. Communities must trust the volunteer worker before they will accept the innovations he/she proposes.
	1.3 Diagnosis of the problem - The extension worker is responsible for analyzing his community's problems/ situation in order to determine why existing alternatives do not

	meet the community's needs. In arriving at his/her diagnostic conclusions, the extension worker must view the situation empathetically from the community's point of view and not his/her own. The volunteer extension worker must psychologically place themselves in their situations, put him/herself in their shoes, see their lives through their eyes. This empathy transferal is difficult.
	1.4 Creates intent to change in community members - After the volunteer explores various avenues of action that his/her community might take to achieve their goals, he should encourage an intent to change, a motive to innovate; but the change must be community-centered, rather than for change for the sake of change. Here the volunteer's role is to motivate.
	1.5 Translates intent into action - The volunteer now seeks to influence his/her community's behavior in accordance with his recommendations which are based on the community's needs. In essence, the volunteer works to promote compliance with the program he/she advocates. This means more than simple agreement or intent. It means action or behavioral change.
	1.6 Stabilizes change and prevents discontinuances Volunteers may effectively stabilize new behavior by directly reinforcing messages to those community members who have adapted, thus "freezing" the new behavior. This assistance frequently is given when the individual is at the trial-decision or confirmation function in the innovation-decision process.
	1.7 Achieves a terminal relationship - The end goal for the worker is development of self-renewing behavior on the part of his/her community. The volunteer should seek to put him/herself out of business by developing his/her communities' ability to be their own change agent. In other words, the volunteer must seek to shift the community from a position of reliance on the volunteer to self-reliance.
(The above 7 roles have been adapted from: Communication of Innovations by Rogers & Shoemaker)	
40	2. Trainer now asks group to form into small groups and envision the seven roles of an

Minutes	extension worker as objectives they have set for themselves and then come up with action steps to achieve these objectives. Make a list of these steps on newsprint.
15 to 20 Minutes	3. Small groups now share with large group their action steps.

4. Trainer now does a summary of the presentations and introduces the next exercise.

EXERCISE 2 - Communication Skills - Verbal and Non-verbal, of an Extensionist Total Time: 1 Hour 15 Minutes

Overview:

In the preceeding exercise we have looked closely at the seven roles that an extension worker plays. Now we want to look at the kind of communication skills a volunteer will need to carry out extension work. In this exercise, we also process the session of the previous week by discussing, generalizing and applying the experience accumulated by the trainees in one week of observing non-verbal behavior with each other. Then the participants give each other feedback on what they saw each other doing, discuss observations and arrive at some working assumptions/generalizations about how non-verbal communications may be the most important part of their communications system in the early days of their volunteer work.

Procedures:

Time	Activities
5 Minutes	1. Trainer asks participants to list various kinds of communication skills they are going to need to carry out their role as extension workers.

5 Minutes	2. Trainer now asks participants to call out skills, and lists them on newsprint while they are called out.	
3 Minutes	3. Trainer makes general comments about skills trainees have not identified. If non-verbal skills have not been listed, trainer adds and makes the point that in the early days of volunteer service participants will send out many non-verbal messages that will be his/her first impact on communities.	
10 Minutes	4. Ask the group to form into the same pairs that have been observing each other for the past week and spend a few minutes telling each other what they observed each other doing in terms of non-verbal communication during that time. This should serve as a way for individuals to gain insights into how they use non-verbal processes in ways which they may not be aware of.	
5 Minutes	5. Bring group back together and draw out some generalizations from the experience of observing each.	
	6. Ask each pair to get with another pair and discuss the following questions.	
	Discussion questions should be posted on flip chart.	o Did any of you learn anything new about yourselves? What?
		o Is there anything about non-verbal communications in general that you have learned from the experience?
		o Have you any ideas on how you can use non-verbal communication as an extension worker? What are they?
15 Minutes	7. Trainer now asks for comments from participants on communication skills. He then summarizes the verbal and non-verbal skills that an extension worker needs.	

Session T-21: Introduction to small-scale fishing

Time: 7:30 AM

Goals:

- **To acquaint trainees with various small-scale fishing gear apparatus**
- **For trainees to learn the proper care and maintenance of fishing gear**
- **To have trainees be able to identity various kinds of fishing gear and uses of that gear**

Overview:

This session is the introduction to small-scale fisheries and lays the foundation for all future fishing sessions. Gear identification is stressed in this session as well as gear care and maintenance of fishing gear. Trainees conduct a survey of the local dock area and identify as much fishing equipment as possible while conducting the survey to ascertain how to care for and maintain their fishing gear.

Materials:

- **Flip charts, markers, tape**

Procedures:

Time	**Activities**	
1/2 Hour	1. Technical trainer gives lecturette using the following outline: (with flip chart drawings)	
	I. Fishing Gear Identification	A. Nets
		B. Hooks and line
		C. Traps
		D. Fish Boats and gear
		E. Fishery

	II. Trolling		
	III. Deep-line, Long-line		
	IV. Care and Maintenance of Fishing Gear	A. Causes of Deterioration	1. chaffing
			2. oxidation
			3. bacterial action
	IV.	B. Preserving Fishing Gear	1. Prolong Life
			2. Protect twine from abrasion
		C. Maintain a good appearance, color, odor, other physical features	
		D. Camouflage the gear to be less visible to fish	
	V. Care of Fishing Gear	A. Washing by removing excess fish, seaweed, other debris	
		B. With fresh water remove solidified salts to lines, hooks	
		C. Drying, in shade, before reuse; allow sufficient time to dry	
		D. Storing, thoroughly dry the gear; do not compress in storage; storage area should not be damp; provide good ventilation	
	VI. Causes of Damage to Gear	A. Rough handling	
		B. Obstruction encountered while fishing	
		C. Physical friction	

		D. Mechanical wear and tear
		E. Distructive fish
		F. Rodent, insect damage
	VII. Maintenance of Gear	A. Repairing and mending nets, lines
		B. Checking seams, knots
		C. Sharpening hook points
		D. Checking hardware
2 Hours	2. Trainees are given assignment to survey dock and water front area to locate and identify small scale fishing gear, nets, hook and lines, etc.	
	Whenever possible they are to interview fishermen asking the following questions:	a. why they use that particular equipment or gear
		b. what maintenance procedures do they follow
		c. what other types of gear they have used
		d. do they make their own gear or buy their gear
1/2 Hour	3. Trainees are to diagram on chart fishing systems for gear identified. Write synopsis on each inter view conducted. Prepare a five minute presentation on information gathered during survey/interview period for large group.	
1 Hour	4. Trainees give presentations to large group. Trainer makes appropriate remarks as to use of systems and care and maintenance. As this is the first time trainees will have interviewed, trainer will want to stress techniques which were good and generated valuable information.	
10 Minutes	5. Trainer makes point of linking the session to future sessions by reviewing training schedule.	

Session T-22: Trolling for spanish mackeral - special group project; Anatomy of hook - special project

Time: 4 PM

Goals:

- **For trainees to become familiar with techniques used while trolling for Spanish Mackeral and other fish species**
- **To familiarize trainees with appropriate fishing gear used while trolling**
- **For trainees to become competent in tying '"Fisherman Knot #1".**

Overview:

This session was done as a special group project. In it the trainee becomes aware of small-scale fishing, utilizing trolling as a means of fish capture. The trainees have the opportunity to learn the technical skills associated with rigging bait/lure for use in trolling.

Materials and Equipment:

- **Flip chart, pens, wire leader, wire cutters, hooks (single, double), lures, line bait, trolling wire cable, nylon monofillament**

Procedures:

Time	Activities
1	1. Trainer presents an overview of small-scale trolling techniques on a world wide basis.

Hour	
	2. Demonstration by trainee of proper gear usage while engaged in trolling.
	3. Hands-on of hook knot tying, baiting by trainees.
	4. Philosophies of various small-scale fishing operations and what techniques can best be utilized by the trainees.

Trainer's Notes:

Tie this SP session in with earlier sessions -Introduction to Exploratory Fishing.

References:

- **Australian Fisheries Review, 1978**

"TROLLING"

The following information is taken from Peace Corps pamphlet 27-7, "Commercial Trolling for Spanish Mackeral". The authors name is not shown. The author was careful to state that any procedure or tackle mentioned was only a variation among many. Each individual fisherman will find variations in tackle and procedure that bring in a good catch. It is therefore incumbent on the fisheries extensionist to keen eyes, ears and mind open when learning any fishing technique.

Backing Cord - This is a heavy duty cord of approximately 8 MM x forty feet in length, and its purpose is to give the fisherman something thick to grasp when the strike comes. By its elasticity, it also has a tendency to take the initial strain if let out to its full length. Without the backing cord, the line would tear through the hand and serious injury could result.

Main Line - The main line can consist of anything from .045 steel Bowden cable, to nylon

line up to a breaking strain of 350 lbs (in training ours was 150 lbs). Roughly 80 feet is attached to the backing by means of a swivel. It must be remembered that when using steel cable, the shock of the strike is transmitted directly to the backing as the steel will not give, whereas nylon easily absorbs the shock.

Traces - Traces are usually made up of No. 8 or No. 10 steel piano wire. At the beginning of a season, 80 to 100 feet, and usually gradually shortened as the season intensifies. Special care must be made in tying swivels to trace and main line. Make neat knots as line disturbance in the water will spook the wary fish.

Leads - Leads are attached between the main line and trace. They are normally used only when garfish is used for bait. This adds "depth" to the bait and often produces positive results.

Hooks and Bait - The hook, usually a 3" or 9.0, is fastened onto the trace, by passing the trace through the eye, around the shank, away from the gap in the turn, bound three times around the shank and taken again through the eye from the other side, then wound around the trace three or four times and broken off.

The garfish bait mentioned is, ideally, about 9" long. Longer bait will tend to produce "short-strikes" where only the tail of the bait is taken. Refer to the diagram for hooking instructions.

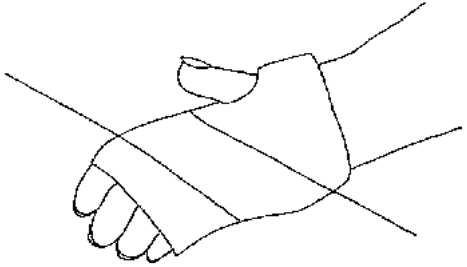
The gar must be as near natural as circumstance will permit. If the soft under-belly of the bait is found to be broken open when checked, then it should be replaced.

Remember these pieces of gear: 1) Gloves (See illustration); 2) Wire ; 3) Knife; 4) wire cutters; 5) Hook.

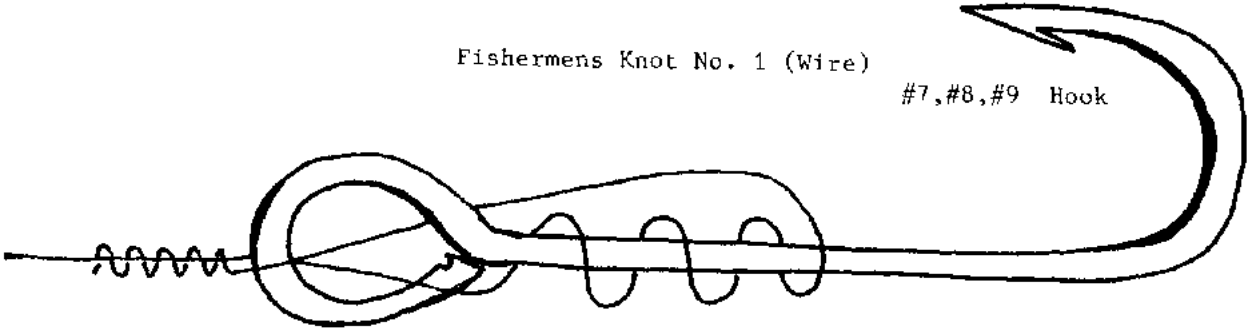
The most important piece of equipment you have is yourself. A good nights rest will allow

you to be alert while trolling. Check the bait every 10-15 minutes or more often if you suspect short strikes. Look lively at all times and be patient. Observe the trolling gear constantly You're out there to catch the big ones so think big, act positively and with assurance that you will get results.

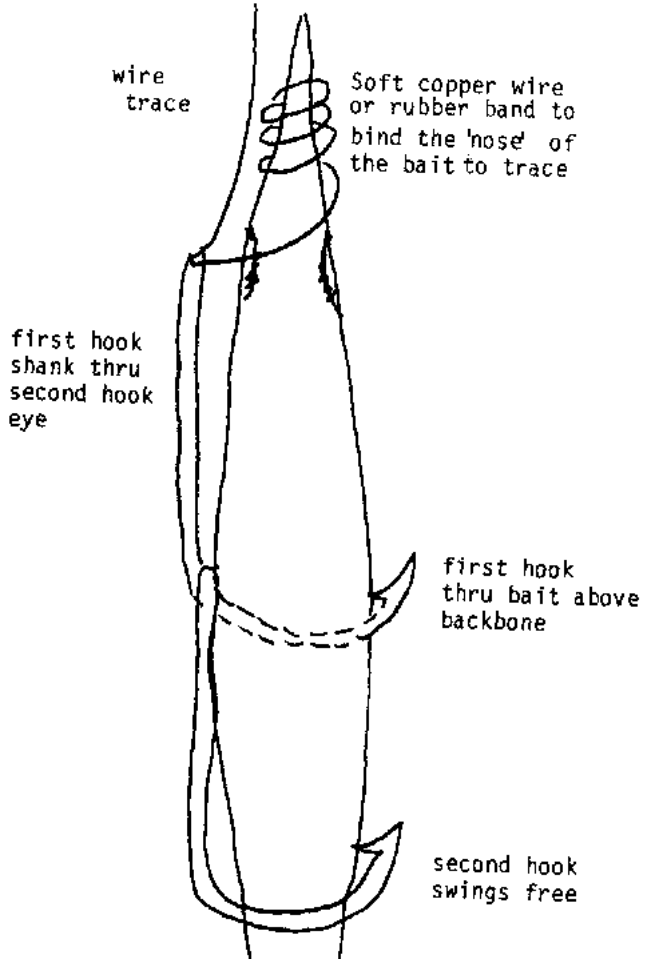
Appendix 1



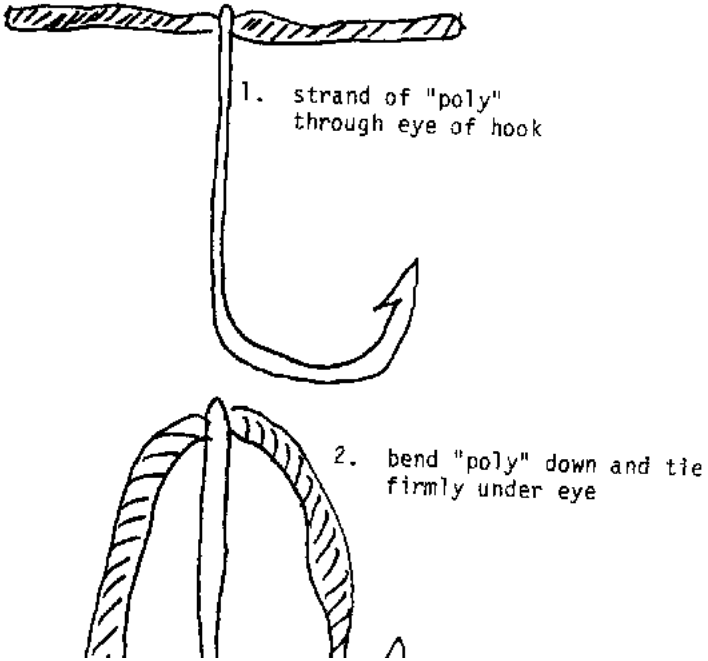
Important to wear hand protection, in this case inner-tube cut to fit the wearers hand. Inner-tube is sewn with monofillament line.

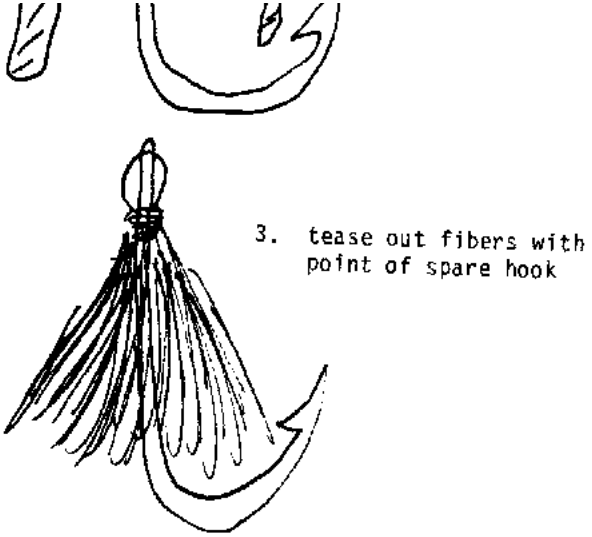


Wire leader attached to hook, final wrapping is tightly wound and securely snugged.


wire
trace
Soft copper wire
or rubber band to
bind the 'nose' of
the bait to trace
first hook
shank thru
second hook
eye
first hook
thru bait above
backbone
second hook
swings free

Hook


1. strand of "poly"
through eye of hook
2. bend "poly" down and tie
firmly under eye



Hooks

Part Two - Anatomy of Hooks Time: 5 PM

Goals:

- **To acquaint trainees with various hook designs, functions and usage.**
- **To provide information on hook nomenclature to trainees.**

Overview:

This session is to be done as a special project by a trainee. This session is used as a complement to the introduction to Exploratory Fishing, as well as the Trolling for Spanish

Mackeral SGP. In this session trainees become aware of the number one element in fish capture, its history, etc. Trainers have the opportunity to tie back to Introduction to Exploratory Fishing.

Materials:

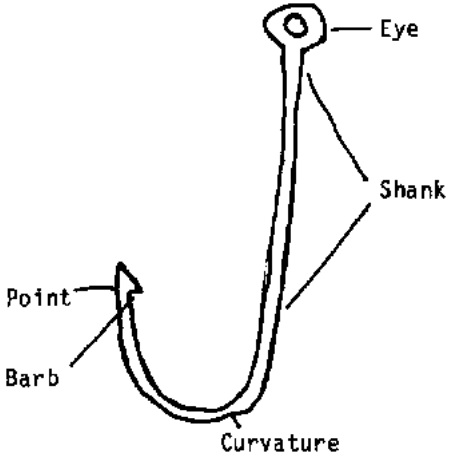
- **Flip chart, pens, numerous hooks by different net manufacturers.**

Procedures:

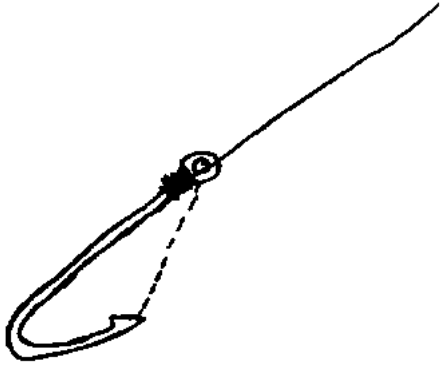
Time	Activities
1/2 Hour	1. Trainee presents an overview of hook designs, uses and functions.
	2. Various hooks are distributed, and various sizing systems explained to trainees.
	3. Final wrap-up by trainee presenting session.

References:

- **Guide to Small-Scale Fishing Gear of the World, FAO, 1976 o 0. Mustad. A History of the Fish Hook, 1972.**



Fish hook anatomy



The Curvature Angle

The curvature of a fish hook is such that the point makes a direct line with the eye. This allows maximum tension when landing a fish.

Fish Hook Material:

1 Spring steel
Commercial

3. Bronze Alloy
4. Sea Shells
5. Bamboo
6. Bones
7. Teeth
8. Coconut Shells
9. Almost anything else

DESIGN ANO FUNCTION

Trolling Hooks

- average length 2"-3"
- heavy gauge steel

- natural or live bait
- larger fish - 10 lbs up to hundreds of lbs. Tuna - (all types), Marlin (all types), Mackeral Bonita, Wahoo
- hook may tee offset to facilitate hooking

Double Hooked Hook

- 2"-3" - larger fish also
- used with lures to facilitate hooking since fish will only hit a lure or jig once
- from same types of fish as mentioned above

Bait Holder Hook

- bait holder barbs prevent bait from sliding off
- 1"-2'' - bottom fishing, squid or any cut bait
- for grouper, snapper, cod fish, sole, halibut, flounder and any other bottom fish

Straight Hook

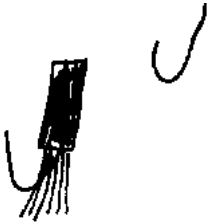
- under 2" - lighter gauge
- bottom fishing, halibut, snapper, grouper, cod fish
- natural bait
- small fish under 20 lbs.
- hooks can be offset (out of line) to facilitate hooking

Small Bait Hook actual size

- small hook with very light gauge steel
- usually used for catching bait fish
- bottom fishing

Live Bait Hook

- short shank
- heavy gauge
- used with live bait (placed through mouth and gills) live bait will "run" along surface or close to it
- larger surface feeding fish (tuna, marlin)



Circle, Self-Hooking, Cod, Japanese Hook

- self-hooking hook
- when a fish tries to back off from hook it will hook itself even further
- no pressure needed on line to hook fish - usually used for bottom fishing and long lining

Barb-less Hooks

- live bait (sardines) or lures - short line attached
- usually used for schooling fish where time can be saved by not having to unhook barbs from fish (tuna, mackerel)
- squidering used to simulate squid bait

References:

- **Fishery in Japan - Yamaha Motor Co., Ltd. Printed in Japan**

Session T-23: Extension III - Extension of extension by an extensionist

Time: 1 Hour 30 Minutes

Goals:

- **To enable trainees the opportunity to verify what they've learned about extension with a real extensionist**

Overview:

In Extension I and II, trainees learned about the role of the extensionist in the community and the important resource linkage the extensionist provides the fishing family to outside technical and material assistance. In this session, trainees have the opportunity to ask a local extensionist about his or her job: the positive and negative aspects of it; what works and what doesn't work when trying to convey a new idea or technology; how association with the government helps or hinders his/her job; and helpful hints for interacting with individual (or groups of) fishermen and fish processors, particularly members of the opposite sex.

Procedures:

Time	Activities
20 Minutes	1. Trainer introduces extensionist to trainees, and sets the climate for questioning by first dividing the group into small groups of 5 or 6 and asking them to put on newsprint everything they know about extension work. The groups report out.
1 Hour	2. The extensionist comments on the newsprint, provides examples and observations from personal experiences, and answers follow-up questions from the trainees.
10 Minutes	3. The trainer draws closure to the session by linking back to the previous sessions on extension and ahead to the upcoming community analysis sessions. Any personal experiences that the trainer has relevant to the extension discussion should also be added at this time.

Trainer's Notes:

The trainees should be told at the conclusion of the previous extension session to prepare a list of questions for the guest extensionist. See the alternative session outline attached should a local extensionist not be available.

Alternate session T-23: Marine fisheries extension

Procedures:

Time	Activities
5 Minutes Individual discussion	1. Introduce session by briefly stating its goals and presenting an overview of the session.
20 Minutes	2. Ask participants to individually identify the major things they have learned regarding extension by writing down on a piece of paper the four or five thoughts or ideas which stand out in their minds as being most important about extension. Trainer can briefly summarize each extension session before participants start in order to help them remember and identify their learnings.
Subgroup work 15 Minutes	3. Ask participants to form groups of five or six and share their most important conclusions of extension work. Ask them to look for similarities and differences and select any ideas, questions, concerns, they want to present to the total group.
Group discussion 20 Minutes	4. Reconvene and ask participants for important ideas, questions or concerns which they discussed in their small groups. Example: You have identified ideas, questions, concerns, and now have some conclusions regarding extension. Are there any important thoughts you want to share with the group? Any similarities or differences which surprised you? Were there any concerns raised in your small group discussion you want to bring to the group? Trainer jots down on newsprint, remarks for each

	group. A discussion ensues based on statements and questions made by participants.	
Individual work15 Minutes	5. Ask participants to do individually the following task:	
	Based on what you have learned about	a) entering the community,
	extension, what could you do differently	b) getting to know the community,
	(strategies, actions, activities) as a PCV	c) meeting community people and making friends,
	starting extension work. Think of the following	d) identifying community needs,
	aspects of your future work:	e) entering the job,
		f) establishing secondary projects,
		g) evaluating "how you are doing" as a PCV.
	This is not an exhaustive list and participants do not need to address each of these areas. It is a guideline to help them think about the different aspects of their work and different actions they might take to consider extension projects and communities.	
Sub group analysis 20 Minutes	6. Ask participants to form groups of two or three and discuss their individual analysis. As they discuss, they should pay attention to which actions or strategies seem to address extension work more effectively; which seem more feasible given the culture, history and considerations in the host country, which are more practical and easy to implement. They should select the best strategies or activities to present to total group and receive feedback from other participants and trainer. The sub groups task can be presented on a flip chart as follows: Discuss your strategies or actions taking into consideration their effectiveness, cultural appropriate ness and feasibility. If necessary, develop new strategies out of your discussion. Select the best strategies to present for analysis and feedback.	
Group	7. In general session, trainer asks for examples of participants strategies. Trainers	

discussion 30 Minutes	react to proposed strategies using the following guidelines:
	o most likely to succeed strategies and why,
	o most likely to fail strategies and why,
	o suggestions and new ideas about strategies and activities which work and do not work based on their own experience.
Closure 10 Minutes	8. Trainer summarizes session by presenting or developing with the participants a list of different ways in which extension can take place in Peace Corps activities.

Materials:

- **Newsprint for activities #5 and #6.**

Session T-24: Small-scale fishing

APPROPRIATE FISHING TECHNOLOGY I
DEEP-LINE SNAPPER REEL

Time: 7:30 AM

Goals:

- **To make trainees aware of the various applications of intermediate fishing technology**
- **To acquaint trainees with various fishing systems that are appropriate, both technically and financially on the community level**
- **To familiarize trainees with basic fishing gear design and construction techniques appropriate for deepwater underutilized species exploitation**

Overview:

This session is particularly important for developing design and construction abilities in trainees. On the community level, little money will be available for "new'' fishing gear, thus the need for the trainer to be aware of techniques in utilizing materials for fishing projects that will benefit the community. (Session will cover marketing)

Procedures:

Time	Activities	
1/2 Hour	1. Trainer reviews present Industrial Fishing Technology	a) large vessels
		b) mechanized gear
		c) capital intensive operations
		d) fishery
	Trainer moves into review of Small-Scale Fishing Technology:	a) small boats for fishing
		b) subsistence level - no boats
		c) hand gear
		d) labor intensive
		e) fishery
	He continues on into introduction to labor/time saving "mechanized" fishing gear.	a) comparison of han-dline fishery with automated
		deep-line snapper reels (See appendix I)
		b) lowering of technology from deep-line electric or

		hydraulic reel to a hand-powered model.
	Lastly trainer covers application of hand-powered reel for small-scale fishing:	a) opening new offshore fishery
		b) marketing approaches
		c) fishermen training
	2. Trainer now gives trainees drawing of Deep-line Snapper Reel, with the following instructions (in groups of three):	a) Design snapper reel using locally available materials. After design is completed have technical trainer check design and approve design before moving to b.
		b) Construct snapper reel using woodworking tools. Pre-plan all cutting and fitting of parts for tight/secure fit.
		c) Fishing gear; after reel is constructed, prepare deep-line set up.
		- no hardware other than hooks needed, prefer tuna circle
		- weight - beer can with concrete
		d) Rig to be utilized on following fishing trip Session

Materials and Equipment:

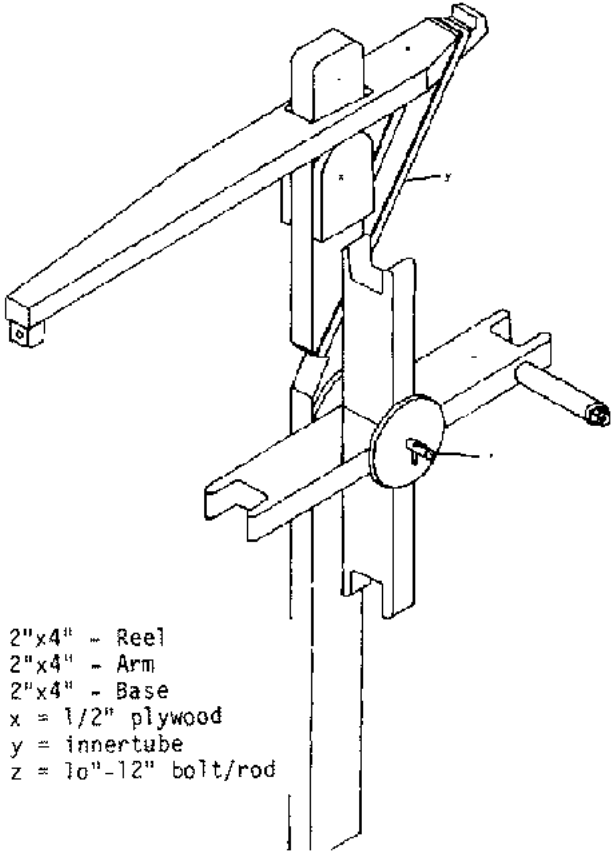
- **Flip chart, pens, woodworking tools, tire innertube (used), wood, hardware; nails, 10"-12" bolt/A-Bar for reel shaft, monofillament nylon #160 lb. tuna circle hooks if available**

Trainer's Note:

It is important to guide trainees in the actual design of the reel, but allow a free flow of ideas to put it all together. A working model can be easily built from the line drawing.

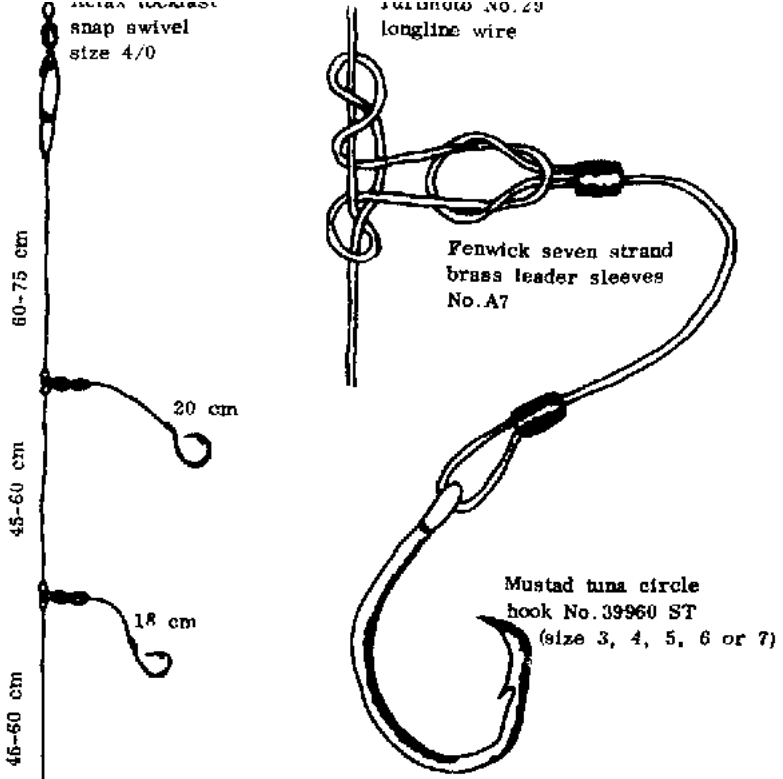
References:

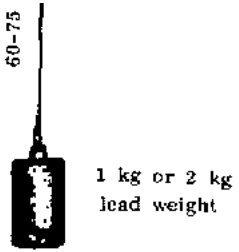
- **Mead, Paul. Report on the Second Visit of the South Pacific Commission Deep Sea Fisheries Development Project to the Kingdom of Tonga. South Pacific Commission. Noumea, New Caledonia. 1980.**



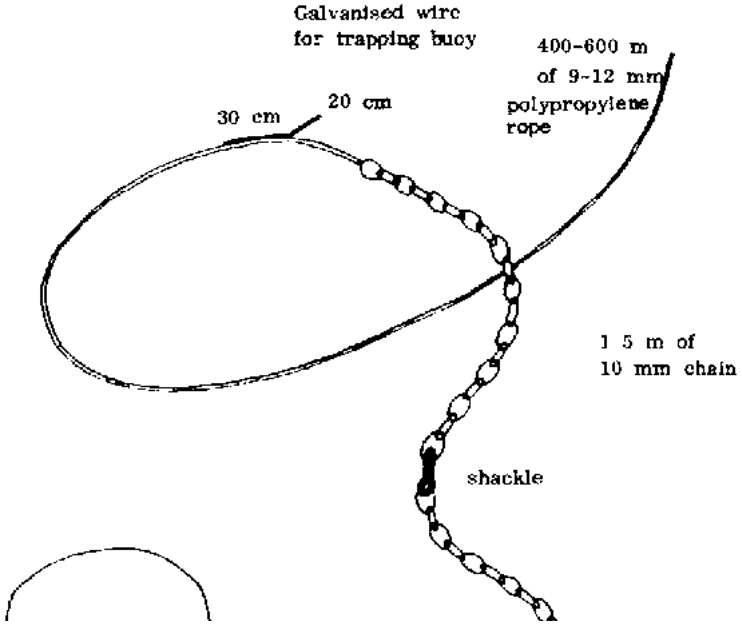
Figure

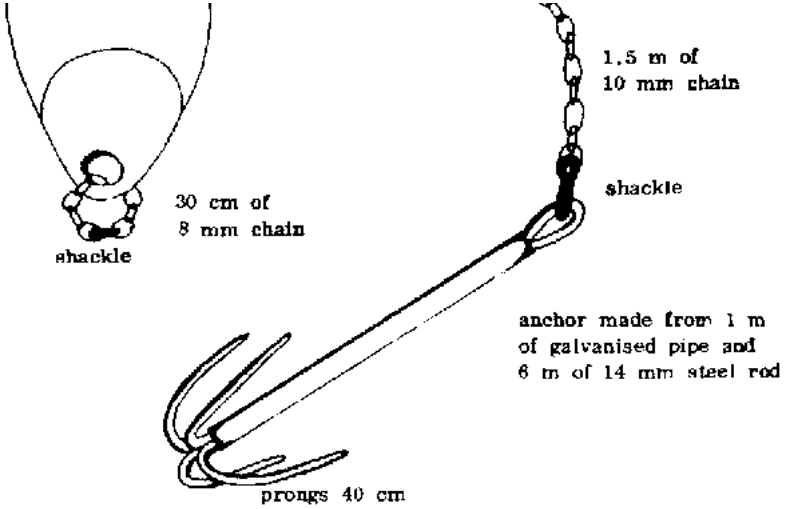
Kelex lockfast


snap swivel
size 4/0
60-75 cm
20 cm
45-60 cm
18 cm
45-60 cm
16 cm
cm
longline wire
Fenwick seven strand
brass leader sleeves
No.A7
Mustad tuna circle
hook No.39960 ST
(size 3, 4, 5, 6 or 7)



Terminal rig used for deep bottom fishing. Turimoto No. 29 longline wire and Mustad tuna circle hooks (sizes as shown) were used.





Anchoring system suitable for deep bottom fishing. Rope diameter depends on size of boat. All shackles should be seized.

Session T-25: Individual interviews/net mending

Time: 2:30 PM

Goals:

- **The goals for this session are the same as in previous interview session.**

Procedures:

The following questions are recommended for this session, in addition to formal feedback.

1. Do you have any concerns that you want to talk about?
2. On a scale of 1-10 and based on the training design content, how would you rate your technical skills in marine fisheries?
3. Where are you in your decision to go to?
4. Anything you want the staff to be aware of?

Session T-26: Communication through illustration special group project

Time: 7:30 PM

Goals:

- **To show trainees simple drawing techniques**
- **To have trainees understand the importance of being able to illustrate what they are saying verbally**
- **To have trainees practice drawing**
- **Special group project on simple poster drawing techniques and use of other materials for making posters**

Overview:

This session introduces the importance of illustration as a communication technique. In future sessions trainees will be expected to use illustrations as part of their presentations. The importance of using visual aids while talking to a group is also emphasized.

Exercises:

1. Special group project on simple poster drawing techniques.
2. Communication through illustration.

Procedures

Time	Activities	
30 Minutes	1. Trainees give presentation on various techniques for enlarging, lettering, etc., for posters and other visual aids.	
15 Minutes	2. Trainer then presents self as a non-artistic person and draws a series of stick figures which tell a message. Trainer explains that it's ok to make people laugh by your drawings as long as it gets your message across.	
30 Minutes	3. Trainer then tells trainees to use stick figures to put	- best presentation of message
	across a message related to marine fisheries. Trainer	- most creative use of materials
	explains that this is a contest and there will be prizes	- best effort by non-artistic person
	awarded. Awards will be given on:	- honorable mention in above categories
15 Minutes	4. Trainees present their posters.	
15 Minutes	5. Judges decide on awards. Apples are given out.	

Trainer's Note:

It's important for the trainer to link his/her non-artist approach to visual aids to the special group project presentation.

BASIC PRODUCTION OF ILLUSTRATIONS

I. Illustrations must be accurate, attractive and appropriate.

II. The basis for the production of good illustrations is a collection of visual materials.

A. Newspaper, magazines, calendars and catalogs are good sources of visual materials.

B. Embassies, consulates, information services, and local commercial concerns may have attractively illustrated literature which is representative of their countries.

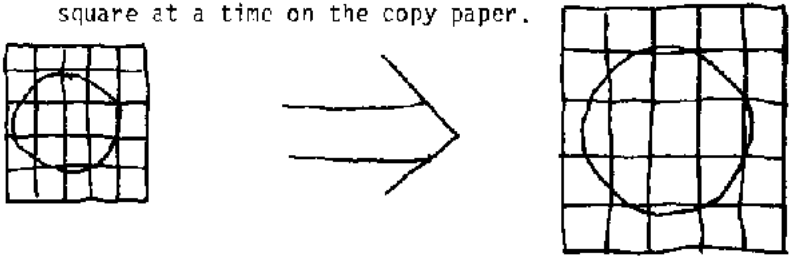
C. Potentially useful pictures should be clipped and filed into appropriate categories so that they can be located easily. Example: fish handling, fish marketing, fish preservation, fish identification, outboard motors.

D. Pictures may be placed on bulletin boards, backed with sand paper for flannel boards, used as "models" for larger drawings (flip charts, posters, etc.), and photographed for slides.

III. The production of an illustration generally involves one of two methods.

A. An illustration may be transferred to a chalkboard, sheet of cardboard, or paper using an enlarging/reducing technique.
1. The squaring method requires no special skills or equipment.
a. A series of squares (grid) is drawn lightly on the paper to be transferred.
b. A grid made proportionately larger or smaller is drawn on the copy paper, cardboard, or chalkboard.
c. The lines of the original picture are drawn one square at a time on the copy paper.

square at a time on the copy paper.



Figure

2. The pantograph is a device constructed from four strips of wood about 1/4"x 3/4"x 16".

a. Holes are drilled in each stick at one-inch intervals.

b. Bolts are inserted in certain holes to hold the strips together and to form joints which will move easily.

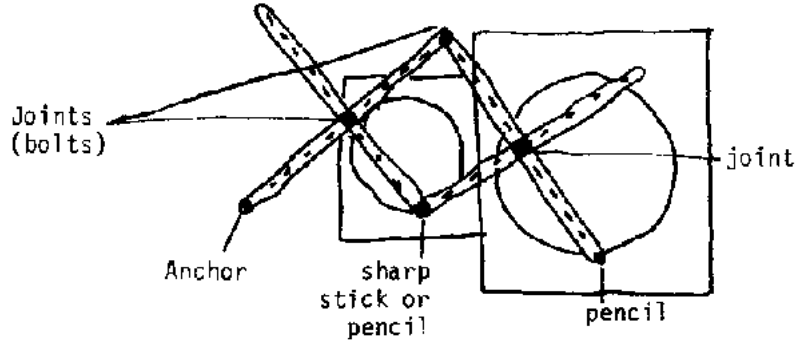
c. The position of the bolts determines the relative size of the copy.

d. The left end of the pantograph (for a right-handed person) is anchored to the drawing surface using a wood screw.

e. A pointed stick or pencil is inserted at the base of the pantograph diamond, and the picture to be copied is fastened beneath it.

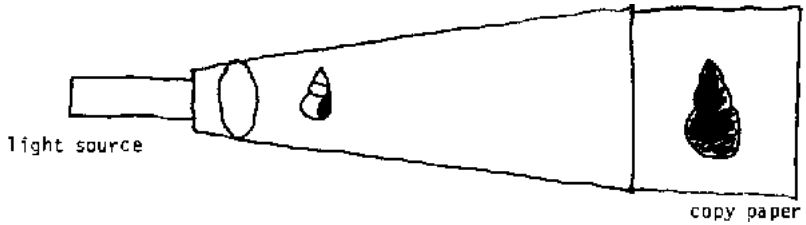
f. A pencil is inserted at the right end of the pantograph, and the copy paper is fastened beneath it.

g. The picture to be copied is traced using the pointed stick or pencil at the base of the device and is simultaneously enlarged/reduced and copied onto the copy paper.



Figure

3. The outline of a small object may be enlarged or reduced by producing its shadow on copy paper using a flashlight or lamp and tracing it.



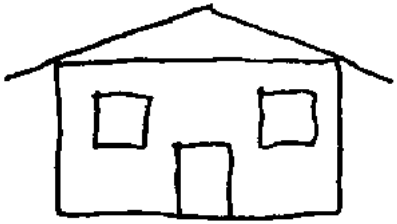
Light source

4. If an opaque projector (and/or electricity) is available, the projected image of a picture or object may be traced onto copy paper.

B. An illustration may be produced using simple drawing techniques.

1. Simplified drawings and stick figures may communicate better than detailed drawings or photographs.

2. Almost any object may be viewed as geometric shapes or a combination of geometric shapes.

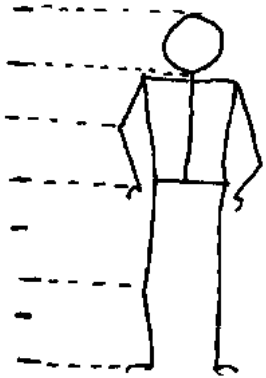


Building

Cat

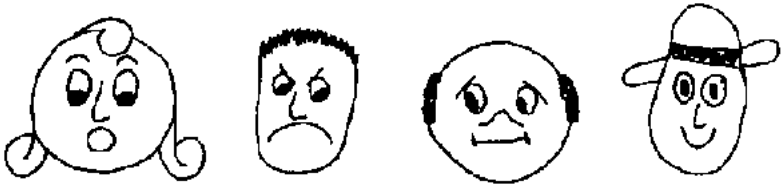
3. Figures to represent people are composed of basic shapes, but the factors of proportions, distinguishing features and body movement must also be considered.

a. If the length of the adult body is seven units, the head occupies one unit, the torso and arms occupy 2 1/2 units, and the legs occupy 3 1/2 units.



Figure

b. Distinguishing features include the shape of the face, hair and clothing, the shape of the eyes and the position of the pupils, the shape and position of the eyebrows, and the shape and position of the mouth and other facial features.



Figure

c. Body movements are indicated by the position and degree of extension of body parts.

1) use yourself as a model.

2) the weight on the left side of the backbone should balance the weight on the right side.

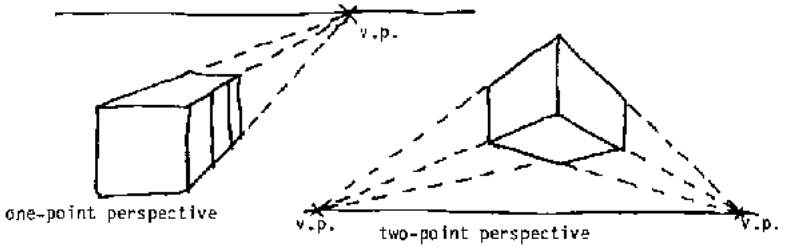
4. Drawings appear more realistic if the rules of perspective are observed.

a. Horizontal lines appear to converge toward a vanishing point on the horizon as the distance from the viewer's eye increases.

b. Vertical lines decrease in length with distance as do any spaces which occur between those lines.

c. In two-point perspective, horizontal lines to the right of the nearest corner of an object converge toward the vanishing point on the right and horizontal lines to the left nearest corner coverge toward a vanishing point on the left.

d. Almost anything that is drawn in perspective can be described initially within the framework of a rectangle.



Figure

References:

- **Peace Corps Audiovisual Communication Handbook**

-Marilyn Berry, PCV Sierra Leone

Session T-27: Small scale fishing appropriate fishing technology II New Zealand long-line reel

Time: 7:30 AM

Goals:

- **To make trainees aware of various applications of intermediate fishing technology**
- **To acquaint trainees with various fishing systems that are appropriate, both technically and financially at the community level**
- **To familiarize trainees with basic fishing gear design and construction techniques appropriate for shallow water and reef edge fish species exploitation**
- **To enable trainees to design a labor saving piece of equipment for long-line fishermen**

Overview:

This session is second in a series of appropriate fishing technology. The benefit of the long-line reel is not in the fishing system per se, but rather in the easy hauling and line handling ability the reel offers. Time is very much a factor, and this reel enables fishermen the opportunity to fish more hooks in less time.

Procedures:

Time	Activities
	1. Technical Trainer reviews Deep-Line Reel Session #24.
	a. Reel
	b. Mount Gives lecture using the following outline

	I. Introduction of New Zealand Long-Line Systems		
	A. Original concept was hand-lining		
	1. European)		
	2. Alaskan - U.S.) brief overview		
	3. Indo-Pacific) of long lining		
	B. Modern technology has mechanized long-line systems.	1. European	
		2. Alaska - U.S.	
		3. Capital Intensive Ventures	
	C. Small-Scale fishermen still haul lines by hand	1. Indo-Pacific	
		2. Latin America/Africa	
		3. Labor/time intensive	
	D. New Zealand long-line reel	1. Simple storage reel for long-lines	
		2. Keeps hooks separated; laying in water; hauling out	
		3. On small-scale basis is better suited for fishermen:	a. very low cost (scrounge)
			b. allows more hooks in water
			c. allows more "fishing

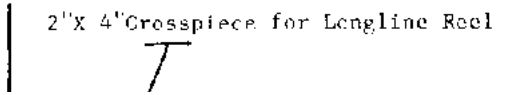
		time" per trip
	2. Trainees are instructed to do the following in groups of three:	a. Design using locally available materials (bamboo, old wood, etc.). Tire size denotes diameter of reel. Design is approved by Technical trainer then proceed to b
		b. Construction using wood working tools; preplan all cutting and fitting of parts for tight/secure fit. Construction checked by Technical trainer then move on to c.
		c. Fishing Gear; long-line set up. No hardware other than hooks and homemade anchor(prefer tuna circle type). Long-line will be utilized on the following fishing trip, Session T-47.

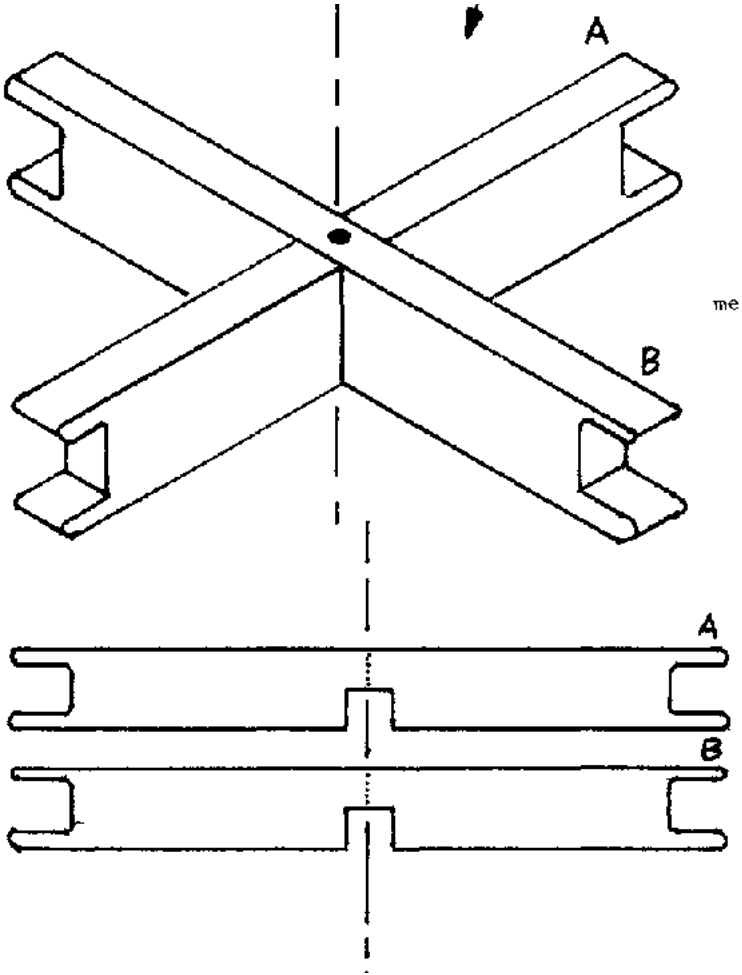
Materials and Equipment:

- **Flip chart, pens, woodworking tools, wood, hardware; nails and 10"-12" bolt/A-bar for reel shaft. Monofillament nylon #160 lb., tuna-circle hooks if available**

Trainer's Note:

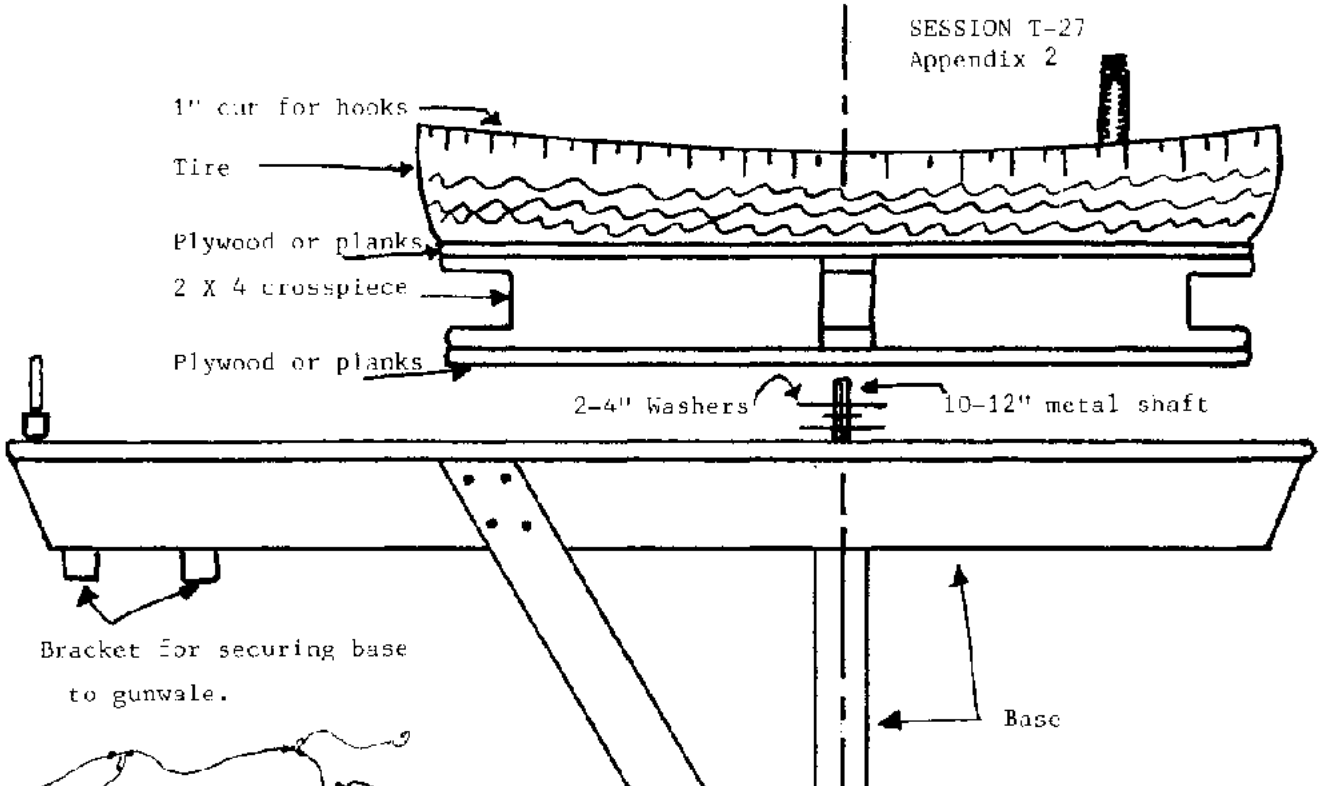
This session is designed to allow the trainees the opportunity to design the long-line reel. The responsibility of dimensions for this reel can be left up to the trainees decision (tire size denotes diameter of reel). The scrounge technique can be utilized if there is no pre-cut lumber nearby, and a tire can be found most anywhere. If not, locating one prior to the session is important. Let the trainees be innovative but keep to the master plan of the New Zealand long-line reel.

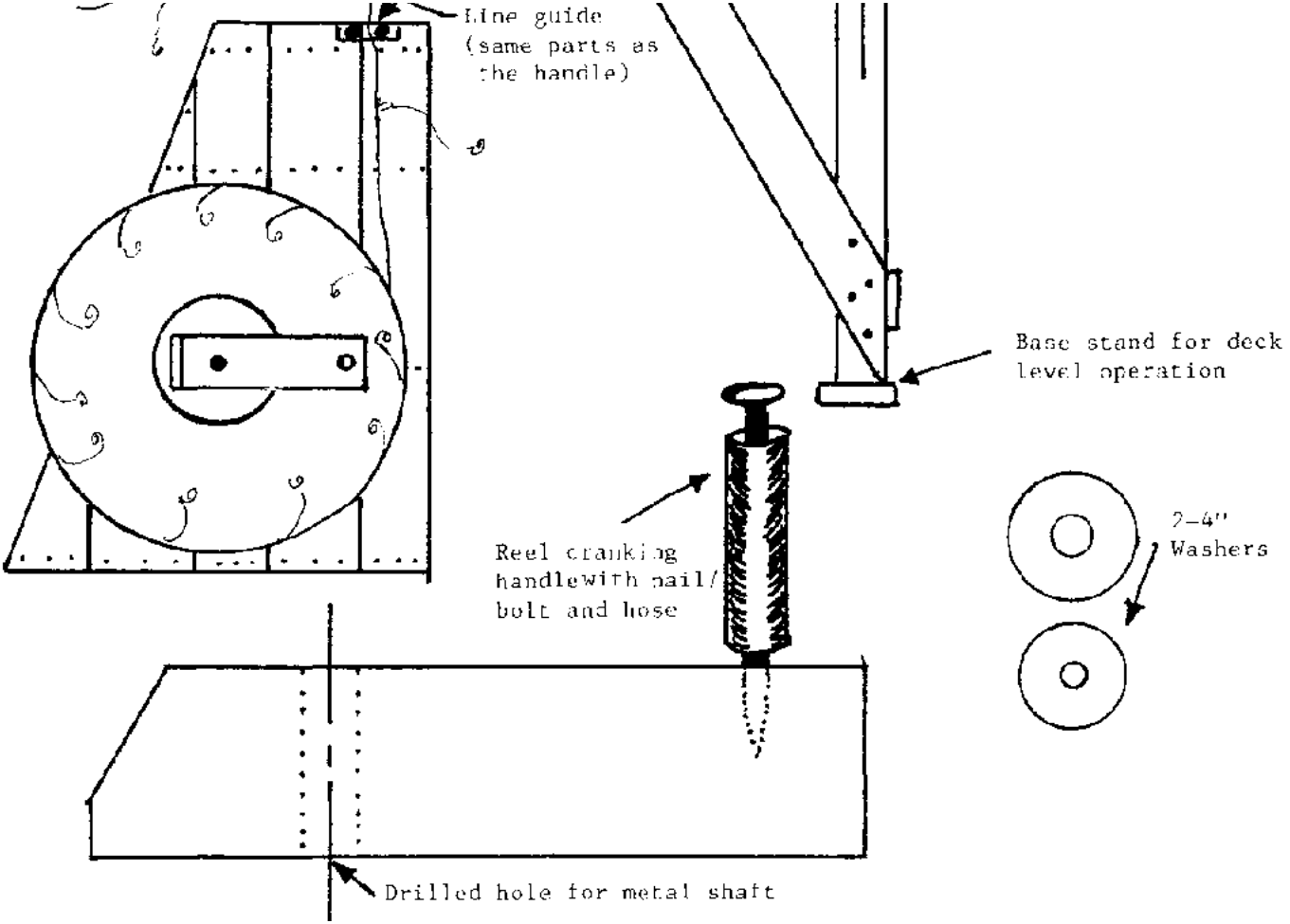




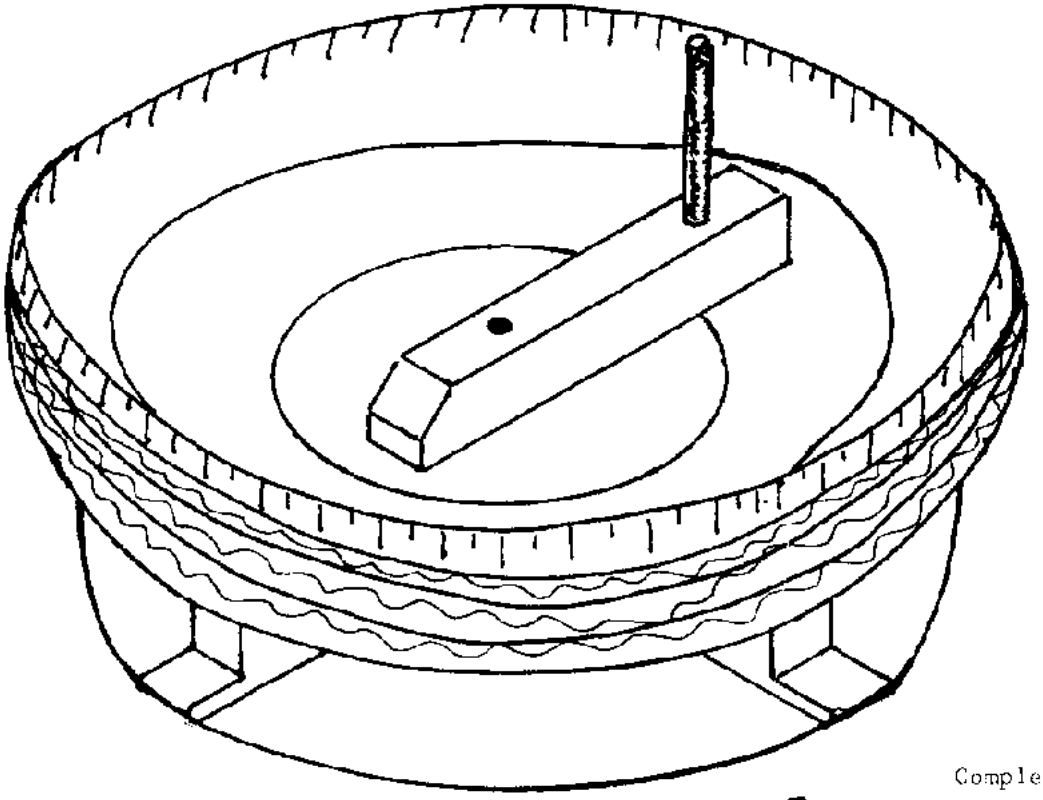
2" X 4" or
metric equivilent

Appendix 1

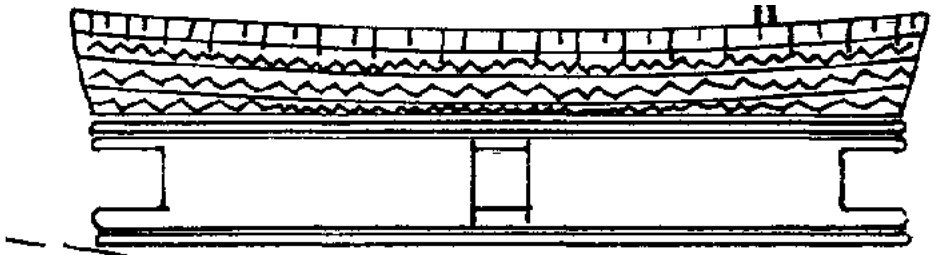

SESSION T-27
Appendix 2
1" cur for hooks
Tire
Plywood or planks
2 X 4 crosspiece
Plywood or planks
2-4" Washers
10-12" metal shaft
Bracket for securing base
to gunwale.
Base

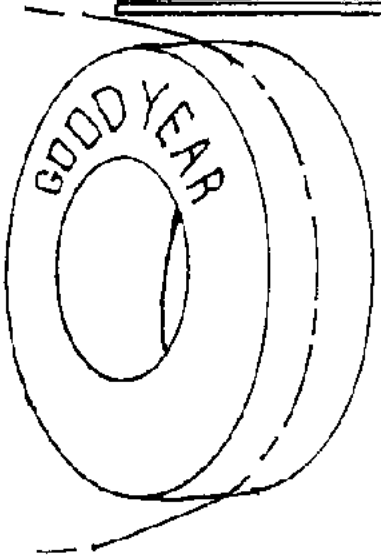

Line guide
(same parts as
the handle)
Base stand for deck
level operation
Reel cranking
handlewith nail/
bolt and hose
2-4"
Washers
Drilled hole for metal shaft

Appendix 2



Completed reel

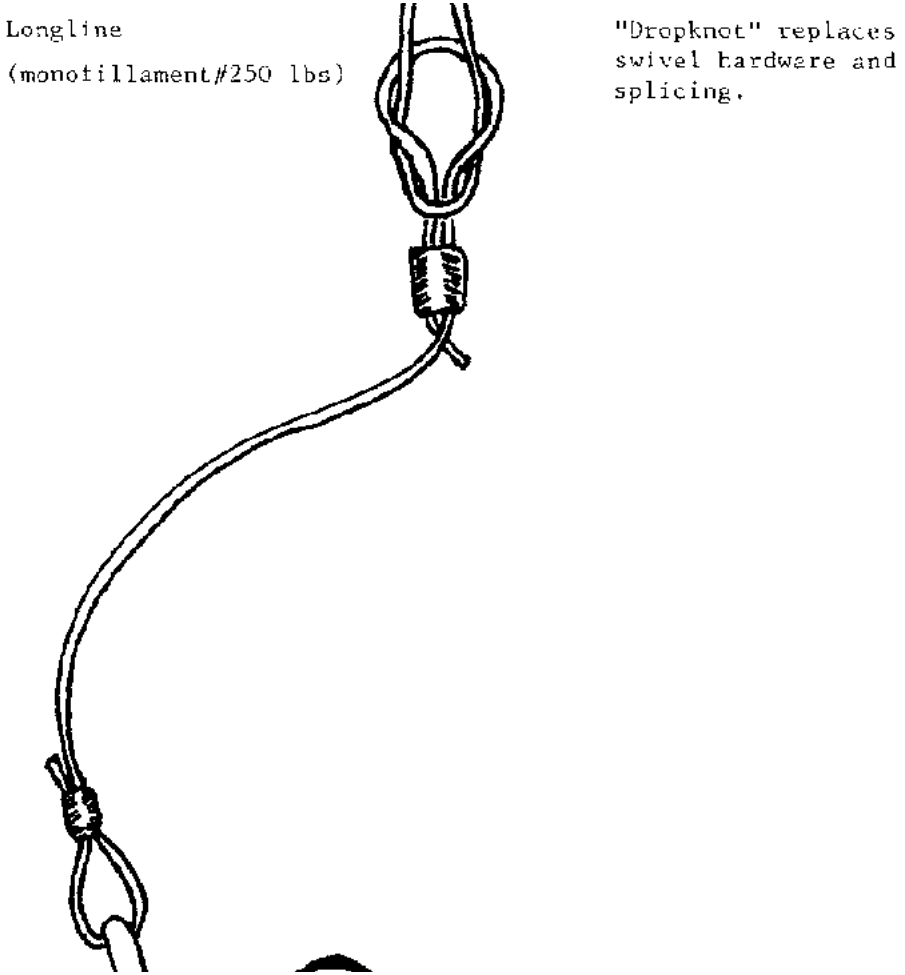




Cut car tire in half,
use sharp knife or hand saw
and water to lubricate cutting.

Diameter of tire denotes
overall diameter of the reel.

Appendix 3


Longline
(monofillament/250 lbs)
"Dropknot" replaces
swivel hardware and
splicing.

Tuna Circle Hook
(Mustad No. 39960 ST
size 3, 4, 5, 6,or 7)

Bait should be in 1" wide strips or chunks, either fresh or salted.

Appendix 4

Session T-28 Special group project cooking fish and nutrition

Time: 3:30 PM

Overview:

Group project leader for cooking fish and nutrition gives presentation to trainees on relevant cooking techniques and nutrition. This special project emphasizes the importance of various seafood preparation techniques utilizing local fish products, as well as nutritional information for the needs of the PCV; and as a secondary activity demonstrating quick, easy, and nutritional cooking practices to the community.

Procedures:

Time	Activities
25 Minutes	1. Group Project leader gives presentation on relevant cooking techniques, as well

	as basic nutritional information.
15 Minutes	2. Group Project leader presents cooking schedule and sign-up sheet for other trainee participation.
1 Hour 30 Minutes	3. Preparation time for group cooking (important - time beforehand should be well organized by Group Project Leader).

Trainer's Note:

Rather than one presentation, the advising trainer should suggest a time where trainees will be relaxed and able to enjoy a cooking demonstration. Enough demonstrations should take place to enable all trainees to be directly involved in baking, boiling, broiling, poaching fresh fish.

Materials and Equipment:

- **Flip chart, pens, cooking utensils, fish and food**

References:

- **Fanny Farmer Cookbook**
- **Joy of Cooking**
- **Marine Fish Recipe Cards**
- **Session Developed by URI Marine Fisheries SST, August 1981**

SEAFOOD PREPARATION

Mussels

2 lb. fresh mussels	3 tsp. coriander
3 Tbsp. oil	1/4 tsp. chili powder

3 Tbsp. oil 1/4 tsp. chili powder
2 large onions, chopped 1/2 tsp. salt
4 cloves garlic, chopped 1 cup water
1/2 tsp. tumeric Lemon juice

Scrub mussels well and beard them. Fry onions and garlic in oil. Add tumeric, coriander and chili powder and stir for three minutes. Add salt and water, bring to a boil and simmer covered for five minutes. Add the mussels, cover and steam for 10-15 minutes or until the shells have opened. (Discard any that do not open during cooking.) Remove from heat. Taste gravy -- add lemon juice and more salt, if necessary. Spoon gravy over and into mussel shells.

Shrimp

1 1/2 lb. shrimp 1 tsp. tumeric
1 Tbsp. oil 2 cups coconut milk
2 medium onions, sliced 1 tsp. salt
2 cloves garlic, crushed Lemon juice to taste
1 tsp. grated ginger

Wash shrimp. Heat oil, fry onions, garlic and ginger. Add tumeric and fry one minute longer. Add coconut milk and salt and bring to simmering point. Simmer, uncovered, for 10 minutes, then add shrimp and cook for 10-15 minutes. Remove from heat, stir in lemon juice.

Coconut Milk

Put two cups grated coconut in a bowl. Add 2 1/2 cups hot water. Cool. Kneed coconut with hands. Strain coconut through cheese cloth. Squeeze out as much liquid as possible.

Squid

8 oz. fresh squid	1/2 tsp. salt
4 dried chilies	4 Tbsp. palm oil
1 small onion, chopped	2 tsp. sugar
3 cloves garlic	1/4 cup lemon juice

Clean squid, removing head and ink sac. Cut squid into narrow rings. Grind chilies, onion and garlic in mortar and pestle. Fry mixture in oil. Add squid, lemon juice and salt. Simmer uncovered for 30 minutes. Stir in sugar.

NUTRITIONAL VALUE OF FISH

The following is a brief summary of the nutritional value of fish.

Proteins - Fishery products contain useful amounts of fish protein which is important to maintain good health both in children and adults. Fish protein contains little or no connective tissue and is therefore very easily digested and assimilated by the body. This fact makes it especially valuable in diets for children, older people and convalescents.

Vitamins - The same fishery products that contain the fish protein also contain vitamins in useful amounts to help maintain the health of nerve tissues and the normal energy-yielding processes of the body. B complex vitamins which include thiamine, riboflavin, niacin, vitamin B6, vitamin B12 and pantothenic acid are found in fishery products.

Minerals - Minerals are essential for certain functions of the body, particularly the maintenance of teeth and bones. Fish are a good source of calcium, iron, potassium, phosphorus, copper, iodine, manganese, cobalt, and other trace minerals. The flesh of both salt-water and fresh-water fish is quite low in sodium content, making it particularly

adaptable for strict, low sodium diets.

Fats - Of interest to weight-watchers is the fact that fish are high in protein but low in calories. The fat content of the different species varies widely-- it may be less than one percent for fish of the cod family or as much as 20 to 25 percent for salmon or mackerel. When fish are cooked by means other than frying, and served without the addition of rich sauces, they tend to be low in calories.

Distributed by the Rhode Island Seafood Council, P.O. Box 219, Narragansett, Rhode Island 02882

TROPICAL FOODS

I. Calorie Sources

A. Grains In many areas of the world, cereal grains provide 70% or more of the total calorie intake. Although high in carbohydrate, cereals contain between 6% and 13°/ protein. In general, the biological value of cereal proteins are not as high as that of animal protein. Most cereal grains are relatively low in the amino acid lysine. Whole grain cereals contain significant amounts of iron, thiamin (Vitamin B1), riboflavin (Vitamin B2) and niacin. Milling of grain removes the germ which contains a large percentage of the vitamins, minerals and fat present in the grain. The principle cereal grains used in tropical areas are:

1. Rice - Grows best in wet, tropical climates. It is not widely grown in the Pacific Islands, but is often imported. Rice is relatively low in protein, but the quality of the protein is good. Beri Beri, the thiamin deficiency disease, was widespread in rice eating populations of Southeast Asia following introduction of commercial rice milling.

2. Maize - Grown widely in the Southern United States, Southern and East Europe, Latin

America and parts of Asia and Africa. Maize is about 10% protein. The biological value is poor as maize is limited in the amino acid tryptophan as well as lysine. Niacin in maize is not available biologically unless the grain is treated. Maize is traditionally a "poor man's food". Pellegra, the niacin deficiency disease, was widespread in poor populations whose diets consisted mainly of maize. Yellow maize does contain some carotene.

3. Millet - Several varieties are grown in poor soil in areas of little rainfall. Millet is traditionally a "poor man's food". Millet contains about 10% protein.

4. Wheat - Grown widely in temperate or dry climates. Wheat contains about 10-12°% protein; biological value is poorer than that of rice. Although not widely grown in Southeast Asia and the Pacific, wheat and wheat products are often imported.

I. B. Starches and Starchy Roots Starches provide a major calorie source in some areas of the world including the Pacific Islands. They are easily cultivated and give high yields. They are generally poor in protein (1 to 2% protein) and seem limited in most vitamins and minerals. Principle starchy foods used in tropical areas include:

1. Taro - A major crop in wetlands of the Pacific Islands and part of Africa and Asia. Several varieties are grown. Improperly prepared taro may cause irritation to the gums and mucous membranes due to the presence of raphides (oxalate crystals).

2. Yam - A basic crop in some dry areas of the Pacific. Several varieties are grown; some grow to very large sizes. This is not the sweet potato-type crop grown in the United States.

3. Sweet Potato - A basic crop in some Pacific areas including Papua New Guinea. Several varieties are grown. Those with orange flesh provide carotene.

4. Cassava (manioc) - Grown on the Pacific Islands and in parts of Southeast Asia and

Africa. Easily cultivated but very low in protein. The leaves can be eaten and supply protein, ascorbic acid and carotene. However, leaves and tubors must be processed carefully to remove the cyanide.

5. Green Banana - Used as a staple food in parts of the Pacific. They do not have the sweet taste of ripe bananas.

6. Sago - Prepared from the trunk of the Sago palm. The starch is extracted from the inner stem of the palm.

7. Breadfruit - This fruit can be boiled, cooked in stews, baked or roasted. In the Pacific, it is sometimes dried and fermented.

C. Sugars

Sugar is generally obtained from sugarcane or coconut palm. Unrefined sugars contain small amount of vitamins and minerals. They do not contain protein.

D. Fats and Oils

Concentrated energy sources, yielding twice as much energy as an equivalent amount of protein or carbohydrate. Fats and oils used in tropical areas include palm oil, coconut oil and pork fat. Red palm oil is a source of carotene.

II. Foods for Proteins and Amino Acids

A. Meats and Poultry Meats of domestic and wild animals and birds are used. Meats average about 20% protein and biological value is relatively good. Red meat is an excellent source of iron. Meat and poultry are good sources of several vitamins including riboflavin and vitamin B12 and of many minerals including zinc. In general, however,

meats lack vitamin C, vitamin A and calcium.

B. Insects

Serve as a valuable source of protein for much of the world's population. They are especially important for populations which cannot afford other sources of animal protein.

C. Eggs An excellent source of protein, but very expensive in many parts of the world. Eggs have the highest biological value of all foods usually consumed by humans. The yolk is a source of vitamin A and also contains significant amounts of thiamin, riboflavin and niacin. There is no vitamin C. Duck eggs may be more available than chicken eggs. Duck eggs should be cooked thoroughly to prevent salmonella poisoning.

D. Fish and Shell Fish Fish and shell fish are excellent sources of protein of good biological value. Small fish and shrimp, eaten whole, are excellent sources of calcium. Fish liver is a source of vitamins A and D. The nutritional value of fish and shell fish are similar to red meat except that they are not as rich in iron.

E. Milk Availability of milk is limited in most tropical countries. Dairy production is difficult and milk products pose serious sanitation problems when refrigeration is limited. Milk products are excellent sources of protein, calcium, riboflavin, vitamin A, vitamin B12, thiamin and other nutrients. Milk products are lacking in vitamin C and iron. Although fresh milk may not be available, canned and powdered milks are often imported. Because of expense, these milks are frequently over diluted thus decreasing their nutritional value. Dilution with unclean water may lead to infection and illness.

F. Legumes Legumes, dried beans and peas are approximately 20% protein. Dry soybeans, with about 38% protein, are a noticeable exception. In general, protein quality is relatively poor; again, soybean is an exception. Legume proteins are low in the amino acid methionine but they provide lysine. Therefore, legumes and cereal grains are

complementary proteins and, when eaten together, provide relatively high quality protein. Legumes also provide carbohydrate, iron, thiamin, niacin, zinc and fiber. They are lacking in vitamin C and vitamin A. Legumes, except soybeans, are relatively low in fat. Legumes are important sources of protein for world populations when animal products are expensive; not available or unacceptable.

III. Foods for Vitamins and Minerals

A. Leafy Vegetables In general, leafy vegetables are good sources of vitamin C, carotene, folic acid, calcium and iron. Indigenous dark green leafy vegetables such as the leaves of papaya, sweet potato and taro are usually richer in nutrients than introduced vegetables such as lettuce and cabbage.

B. Root Vegetables In addition to those discussed under Starchy Roots, turnips, carrots, yam bean, Chinese radishes and onions are also available in the Pacific and Southeast Asia. Carrots are valuable because of the carotene content.

C. Fruit-Bearing Vegetables Pumpkin and several varieties of squash are widely used. Those with yellow flesh are useful for their carotene content. Tomatoes are fairly widespread and provide some carotene and ascorbic acid. Other vegetables include bitter melon, okra and eggplant.

D. Seaweeds Several varieties of seaweed can be used. They are sources of iodine and flourine and some fresh seaweed contains vitamin C. Some seaweeds are thought to provide vitamin B12 due to the bacterial contamination.

E. Fruits Containing Vitamin C Many tropical fruits provide considerable amounts of vitamin C. These include oranges, lemons, lime, pineapple, soursoup, jack-fruit, pummelo, carambola and mulberry.

III. F. Fruits Containing Carotene In general, dark yellow fruits are good sources of carotene. In tropical areas, mango, papaya, and passion fruit are rich sources.

NUTRIENT CONTRIBUTION OF SELECTED FOOD GROUPS

Food Group	Major Nutrients	Alternate Sources of Nutrients
Meat, Fish Poultry	protein	Milk products, legumes, grains, nuts, seeds. (Complement poor quality proteins)
	iron	Legumes, grains, dark green vegetables(iron from these sources poorly absorbed, add ascorbic acid to increase absorption).
	Vitamin B12	Milk products, eggs, fortified soy milk, fortified yeast products, vitamin supplements.
	Zinc	Eggs, whole grain cereals, legumes
		(absorption may be poor from plant
		sources).
Milk Products	riboflavin	Meat products, green leafy vegetables, whole grain and enriched cereals.
	Vitamin D	Fish liver oil, fortified soy milk, vitamin supplements, adequate exposure to sun.
	calcium	Collard greens, kale, mustard greens, broccoli, lesser amounts in legumes and seeds.
	Protein, Vitamin B12	Listed above.
Cereal	fiber (whole	Fresh fruits and vegetables, legumes,

Products	grain)	
	Carobhydrate	Fruits and vegetables, legumes, sucrose.
	thiamin	Legumes, meat, fish, poultry, milk products eggs.
	riboflavin	Listed above.
Fruits	ascorbic acid	Dark green vegetables, tomatoes, cabbage, lesser amounts in onions and potato.
	Carotene	Dark green and yellow vegetables; preformed vitamin A from milk products, egg yolk.
	fiber	Listed above.
Vegetables	carotene	Dark yellow fruit, sources of vitamin A. Listed above.
	ascorbic acid	Citrus fruits, berries, cantaloupe, mango.
	fiber	Listed above.