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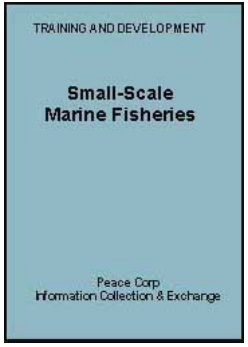


Small-Scale Marine Fisheries - A Training Manual (Peace Corps, 1983, 631 p.)

- **Week 4: Training**
  - ***(introduction...)***
  - **Session T-29: Introduction to fish handling and care - I**
  - **Session T-30: Fish processing and presentation special project - filleting**
  - **Session T-31: Community analysis introduction**
  - **Session T-32: Fish handling and care II**
  - **Session T-33: Fish processing and preservation water filtration systems special project**
  - **Session T-34: Community analysis - Part II**
  - **Session T-35: Fish handling and care III - Cleaning and processing on the fishing boat**
  - **Session T-36: Weather for the mariner special project**
  - **Session T-37: Community analysis - part III interview skills - spatial relationships**
  - **Session T-38: Introduction to fish preservation**
  - **Session T-39: Ice box construction - special group project**
  - **Session T-40: Problem analysis**
  - **Session T-41: Fish silage - Special project**
  - **Session T-42: First aid afloat**
  - **Session T-43: Exploratory fishing trip I - Preparation**

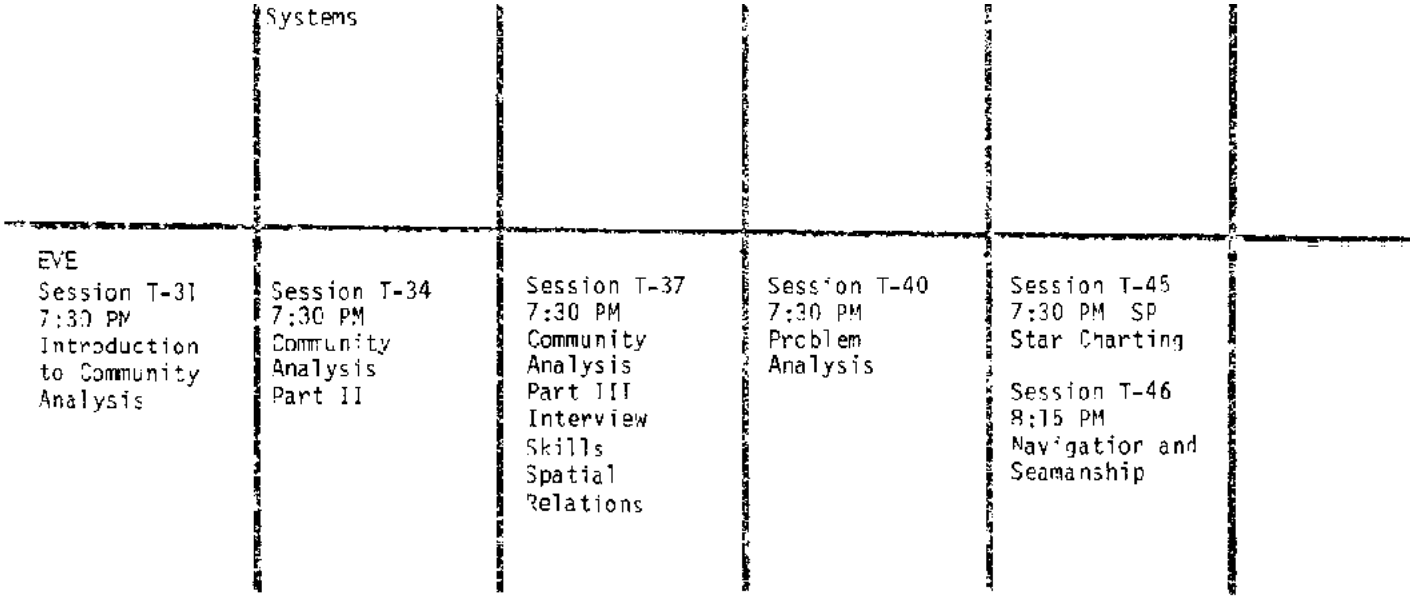
- **Session T-44: Individual interviews/net mending**
- **Session T-45: Star charting special project**
- **Session T-46: Navigation and seamanship**

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

Week 4: Training

WEEK 4 SESSIONS T-29 THRU T-47

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
AM Session T-29 7:30 AM Introduction to Fish Handling and Care I	Session T-32 7:30 AM Fish Handling and Care II	Session T-35 7:30 AM Fish Handling and Care III	Session T-38 7:30 AM Introduction to Fish Preservation Session T-39 10:00 AM SSP Ice Box Construction	Session T-41 7:30 AM SP Fish Silage Session T-42 8:30 AM First Aid Afloat Session T-43 10:30 AM Exploratory Fishing	Session T-47 4:30 AM Fishing Trip
PM Session T-30 4 PM SP Filleting	Session T-33 4 PM SP Fish Processing and Preservation Water Filtration	Session T-36 4 PM SP Weather for the Mariner		Session T-44 2:30 PM Interviews and Nets	



Week 4, Sessions T-29 Thru T-47

Session T-29: Introduction to fish handling and care - I

Time: 7:30 AM

Goals:

- **To provide trainees with proper orientation on procedures necessary for good fish handling and care**
- **To give trainees opportunity to work in a fish processing area, with proper tools, on fish**

in a hygienic manner

Overview:

This session begins by explaining the basic tenets of fish handling and care. A guest lecture by a local fisherman at the outset emphasizes the need for proper care control of fish when first brought aboard the fish vessel. Also, this lecturette promotes a basis for future involvement of local fishermen in the area of fish handling and care.

Procedures:

Time	Activities
30 Minutes	1. Guest lecturette (local fisherman)
	a. handling of fish on board the boat
	b. care of fish on board the boat
	c. equipment necessary for proper handling and care (knife, ice)
2 Hours	2. Technical trainer continues lecture with the shelf life of fish
	a. 32°F is ideal holding temperature
	b. ice is the best cooling medium
	c. white fish (snapper, cod) will stay edible approximately 15 days after caught if well iced and held at constant 32°F
	d. fatty fish - herring, tuna, have slightly shorter shelf life
	e. shelf life is the measure of success in delaying the inevitable microbial meal Fish go bad because:
	a. bacteria
	b. microbes live symbiotically in skin, skull and guts of fish

	b. histozoic live symbiotically in skin, skull and guts of fish
	c. after fish dies, enzymes in stomach are first to trigger an autolytic process "self-digesting"
	d. if fish is reasonably well handled, microbiologists expect to find a bacteria count of about 300 organisms per gram of tissue e. punctured and bruised fish can have a bacteria count as high as 800 million per gram of tissue Seafood handlers thermometer a. water temperatures b. danger zone c. critical zone d. fresh storage zone e. freezing temperature f. frozen storage temperature 9. quick frozen
1 Hour	2. Fish processing room orientation
30 Minutes	a. explanation of room's function
	b. traineeslearn fish care, handling, cleaning by doing five fish each
	c. demonstration of clean-up procedures (prior to processing, post-processing). Trainees do clean-up after demonstration

Materials and Equipment:

- **flip chart, pens, scrub brush, bucket, fresh water, demo fish**

Trainer's Note:

Important to utilize local fisherman in initial orientation to fish handling and care.

References

- **"Life Begins at 40°: How to use Seafood-handlers Thermometer". W. O. Davidson. Oregon State University, Sea Grant Extension SG32. September, 1975**
- **Ocean Leader. Fall 1981. Seattle, Washington. "Life on the Shelf is a race against bacteria" p. 26**

- **Local fisherman Ramon Corrales. Puerto Real, P.R.**

Session T-30: Fish processing and presentation special project - filleting

Time: 4 PM

Goals:

- **To provide trainees with proper filleting techniques**
- **To acquaint trainees with the various skills needed in the filleting procedure**
- **To build on technology transfer skill**

Overview:

This session was done as a special project. The trainee in charge of this project needs to be properly versed in filleting techniques of the various fish, i.e., round, flat, etc.

Procedures:

Time	Activities
15 Minutes	1. Trainee presents lecture on the reasons for filleting fish. Also, a step-by-step chart on filleting techniques assists in the understanding of the fillet process.
45 Minutes	2. Trainees each fillet one fish. Clean up.

Trainer's Note:

It is important that the trainee restrict the presentation to the fillet process. Other sessions are devoted to related areas and also providing time for filleting of fish by other trainees.

Materials:

- **Fillet knife, cutting board, knife sharpener, fish (round and flat), flip chart, markers**

References:

- **Manual on Fish Processing and Marketing. UNPD/FAO. Manila, Philippines. 1980.**
- **Local Fisherman. Puerto Rico.**
- **Fish Cooperative. Puerto Real, P.R.**

Session T-31: Community analysis introduction

Time: 7:30 PM

Goals:

- **For trainees to understand the 14 sub-systems in the social cybernetics framework**
- **For trainees to see themselves as a system**

Overview:

In this session community analysis is introduced. The fourteen social cybernetic sub-systems will begin to enable trainees to understand and analyze the various segments of the community and how change in one segment can affect the other and vice versa.

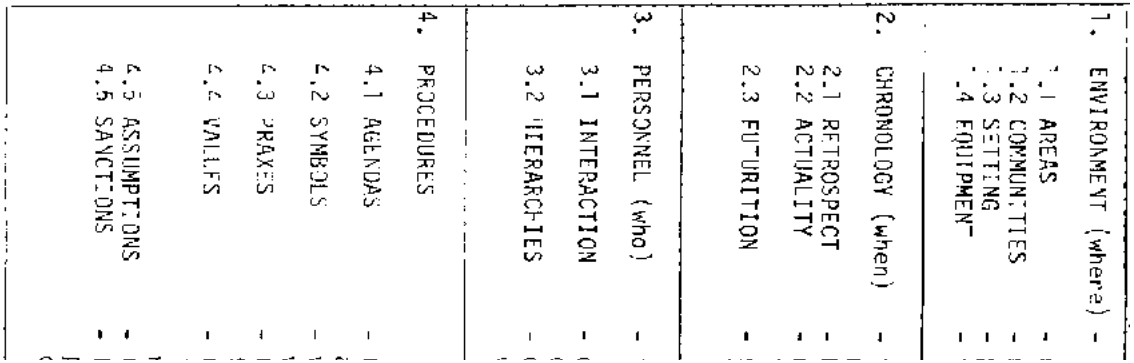
Procedures:

Time	Activities
15 Minutes	1. Trainer introduces the sub-systems, and gives rief lecture on social cybernetics.
1 1/2	2. Trainees then write their own autobiographies ccording to the 14 sub-systems of social

1 1/2 Hour	2. Trainees then write their own autobiographies according to the 14 sub-systems of social cybernetics. (They should be told earlier in the day to bring their journals to the evening session.) Trainer explains how important it is for trainees to see and understand themselves as a system before they can begin to see a community as one.
15 Minutes	3. The group reconvenes and breaks into groups of three to discuss the following questions:
	- What is it like to see oneself as a system?
	- Which systems do they know the least about themselves? The most?
15 Minutes	4. Large group comes back together. Trainer asks for general discussions on the small group findings.
10 Minutes	5. Trainer summarizes the session and links back to the marine fisheries Volunteer's role as an extensionist.

Trainer's Note:

For this exercise, trainees will need a working area/classroom with tables on which to write comfortably.



	space, atmosphere, soil contirerts, spheres rural, urbar plants, irstallations furnishings, material	time, evolution, rhythm history, cycles news, dynamics, rnovations short, medium, long range	(what to do) work, action verbal and non-verbal signs (how)methods, techniques, skills (with what)(how much) importance, quality, resources, means (why)myths, mentality (whether to) criteria, praise, penalties, consequences, feedback	imparters, imparting contacts, inter-change classes, levels, careers
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, Transportations, 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,			

S13. JURIDICAL	Codes, Legal Process, Jurists.
S14. STATUS	Prestige, Respect, Merit, Competition, Privilege, Titles, Excellence, Elites, Who's Who, Nobel Prize, Monuments.

Theory of Human Organization - A.R. MULLER

Session T-32: Fish handling and care II

Time: 7:30 AM

Goals:

- **To introduce trainees to score sheets which will enable them to be professional in judging fish quality**
- **Trainees will perform the basic steps in the fish processing room, starting with pre-processing cleaning through clean-up**
- **Trainees to become aware of quality control**
- **For trainees to individually explore methods of transferring information as an extensionist**

Overview:

In previous Fish Handling and Care Session T-29, trainees learned how to ready fish handling area, clean fish and clean area after fish were cleaned. In this session trainees will repeat the steps. In addition they will judge the quality of the fish as they clean them. After completing a full cycle, trainees will explore methods they might utilize to transfer information to others about quality control as an extensionist.

Materials and Equipment:

- **Approximately six to seven pounds of fish per trainee from one to 10 days old**

- **One to two blade steel knives per trainee**
- **Equipment for cleaning processing room**

Trainer's Note:

You will need to get a variety of fresh fish for this session. It is important that the fish be a wide variety of species as well as from one to ten days in age. We found that we had to age the fish ourselves and freeze them in order to insure having fish of a variety of ages.

Procedures:

Time	Activities
10 Minutes	1. Technical trainer reviews the learnings from previous session and introduces the score sheet for raw fish. Trainees take time to acquaint themselves with the content of the score sheets.
10 Minutes	2. Technical trainer now gives instructions for trainees to prepare processing room and to clean and grade fish for quality.
20 Minutes	3. Trainees prepare processing room by scrubbing and following procedures learned in previous sessions.
2 Hours	4. Each trainee takes a fish to clean. After cleaning, judges the quality of fish and checks out their judgement 1 with technical trainer. Each trainee should process at least five different fish and check findings on each one with technical trainer.
20 Minutes	5. Processing room is scrubbed completely as previously performed in Session 29.
20 Minutes	6. Trainees are asked to break into small groups of three or four and asked to brainstorm ways in which they could pass on the information about fish quality as an extensionist. From the list of ideas generated by small group trainees prioritize which they feel will be

	most effective and why.
20 Minutes	7. Small groups report out to large group. Trainer processes presentations and reflects back to extension session.

SCORE SHEET FOR RAW FISH

Score	General Appearance	Approximate Days in ice
10	Black pupil, translucent cornea, glossy thin transparent Slime, bright opalescent silver gray-green Sheen, bright luminous spots, gills bright pastel rose.	1
9	Eyes flattening, slight greyness of pupil, loss of Sheen, specks no longer luminous, body slime cloudy, Slight bleaching of gills and accumulation of slightly cloudy slime.	3-4
8	Eyes similar, loss of greenness and irridescence of Spots, generally more pink, gills dark red, mottled, Appearance of some dark brown slime.	5
7	Eyes concave and general cloudiness of pupil, body Lost gloss, going grey, pinkening around head, slime On gills thickening and blood diffusing into slime, Lateral line less distinct.	6-7
6	Eyes either flat and cloudy or swollen and bloodshot, Body pale and anemic (bleached) no spots, lateral Line obvious, gills bleached in patches, slime more Copious becoming dark maroon-purplish.	8-9
5	Eyes sinking and cloudy, body well bleached, dorsal Area insipid steely grey (anemic), gills either well Bleached dark brown or mottled red, lateral line Very obvious.	11-12
4	Eyes sunken, pink or very cloudy, body covered in Yellow slime and loss of most grey color on dorsal Area, gills have thick slime which is brick red or	14-16

	Pale dirty pink.	
2	Eyes cloudy and bloodshot, gills bleached with thick Pink slime, body white with patches of yellow slime. Eyes bloodshot, skin showing a mauve hue and starting	18-19
1	To disintegrate, gills totally bleached to a Pale brown pink, with watery rose colored slime. Odor of Gills	20-21
10	Seaweedy	1
9	Fresh celery	
8	Musty, earthy, stale mustard, wheatstocks, 4-5 Stale celery	
7	Briny, eely, bready, malty	7
6	Strong stale celery	9
5	Little odor, slightly eely, mustiness, Mousy	11-12
4	Turnipy, musty, brye, spicy celery (little odor)	14-16
2	Septic tank, faecal, rotting potatoes, Fermenting grass	18-19
1	Sour, faecal, acidic, rotting Vegetables, nauseating Flesh and Gut Cavity Appearance	20-21
5	Translucent flesh, gut cavity pearly white, blood Bright red.	1
4	Flesh steely grey but loss of some transparency, Gut cavity white and glossy, blood bright red, cut Flesh clear but pinkish.	2
3	Flesh lost transparency, now waxy white, but no	5
	Reddening, belly flaps pearly pink.	
2	Flesh white waxy, some pinkening on ventral half, Cut surfaces of belly flaps more pink.	9
1	Pinkening on ventral half of fillet, considerable Pinkening on gut cavity, blood	12

	dark, browning Along mid-line.	
0	Considerable pinkening of fillet. Raw Texture	15
5	Firm and elastic (hard)	1
4	Firm but some loss of elasticity, Scales starting to lift	3
3	Becoming soft, no elasticity, Flaccid	6
2	Plasticine like, sticky, plastic Rubber, scales loose	8-11
1	Very soft, mushy and gaping, scales Very loose Cooked Odor	14-18
10	Slightly seaweedy	1-2
9	Boiled or condensed milk, fish Fingers, mousy	3-4
8	Neutral, wet cotton wool, wet string	5-7
7	Condensed milk, toffee like, Slight carmel	8
6	Faint vomit, slightly burnt, Smoked fish	9
5	Slight oniony, soapy or tallow like, Boiled potatoes	11
4	Junket, wet newspapers	12-14
2	Slight ammoniacal odors, slight Burnt rubber	15-17
1	Sour vomit Cooked Texture	18-20
5	Firm thick white curd, wooly and juicy	
4	Firm elastic but drier	
3	Short but dry	
2	Firm, dry, sticky, stringy	
1	Soft and dry, no slickness	
0	Dry, chewy, like chewing newspapers Cooked Flavor	
10	Sweet, characteristic of species (meaty/lamb flavor)	1-2

9	Less sweet, faint lamb, herring Like, less flavor	4-5
8	Canned meat, metallic slight Oniony, definite loss of flavor	6-7
7	Little flavor, flounder like, flat - Sour, cold mutton	8-9
6	Absolutely no flavor, faint musty, Sweaty	10-11
5	Neutral, faint turnipy	12
4	Very slightly rancid, herring like, Slight fishmealy	
3	Strong metallic aftertaste, Astringent	15-16
2	Sour cold chicken, slight green Peas aftertaste	17-18
1	Strong ammoniacal, sour, difficult To taste	19-21

Session T-33: Fish processing and preservation water filtration systems special project

Time: 4:30 PM

Goals:

- **For trainee to research and present to other trainees the concept of clean water for fish processing**
- **For trainee to demonstrate the construction of a simple water filtration system which can be used on the community level in fish processing**
- **For trainee, for whom this is a special project, to practice transference of skills in communication and technology**

overview

This session is done by a trainee as a special project. The important concepts to be covered are: the use of clean fresh water in fish processing and the need to demonstrate filtration systems to the community if clean fresh water is not readily available.

The following outline was used in the pilot Small Scale Marine Fisheries Program.

Water Filtration

1. Water treatment includes a number of quality control processes by which impurities found in natural waters are reduced to acceptable levels.

A. Disinfection of water is the adequate destruction of water-borne pathogenic microorganisms.

1. Water-borne diseases include typhoid fever and bacillary and amoebic poliomyelitis (viruses) and salmonella - caused diarrhea.

2. Heating water to a temperature of 140° F for 15 minutes or boiling it for 10 minutes is sufficient for disinfecting.

3. The most reliable type of disinfectant for small-scale applications is chlorine or a chloric compound.

a. Chlorine stock solutions are generally prepared using calcium hypochlorite or chlorinated 1-ime and should not exceed 10% chlorine by weight (5% is typical of common laundry bleach).

b. The required concentration of chlorine in solution for adequate disinfection is about 1 to 5 parts per million (ppm).

c. The volume of water that can be disinfected by a specific volume of stock chlorine solution is given by the following equation:

Vw = 10,000 * PV * c1/C

where V is the volume of water to be disinfected (gallons); Vcl is the volume of stock chlorine solution (gallons): P c is the percent, by weight, of chlorine in the solution; and C is the concentration of chlorine in the final mixture (ppm).

B. Filtration, probably the oldest and most easily understood process of water treatment available, is used to remove suspended particles and some bacteria from water.

1. The filtration process is inexpensive and makes use of readily available materials (i.e., sand, gravel, screen, ceramic filter candles, burnt rice husks, coconut fibers).

2. The filtration process has a variety of applications in developing areas.

a. It can be used to provide water supplies of acceptable quality for drinking and general use in towns and villages and for ice making.

b. It can be used in pollution control, bringing effluents to a condition allowing discharge into rivers

c. It can be used in fish farming, providing clean water (both salt and fresh, free from parasites), especially for rearing fry.

d. It can be used to abstract water from harbors for use in washing fish, boxes, boats and fish markets. e. It can be used to provide bulk supplies of clean sea water for marine laboratories and aquariums.

3. The filtration process takes place in two parts.

a. The physical cleaning of the water occurs on the surface layer of the filter where a mat forms.

1) Running the system to waste for 15 minutes will establish it and form a good filter

surface. 2) Particles down to about 203 microns (excluding the larval forms of parasites) and approximately 80% of the bacteria are removed.

b. As oxygenated water is drawn through the bed, the zone becomes aerobic and a biological filter forms.

1) The biological filter requires between 8 and 10 days to build up in tropical regions. 2) Total bacteria is reduced by 95% and ammonia and BOD are reduced by 70-90%.

II. Sand/gravel filtration systems, such as the Sea Water Supplies (SWS) village unit, the SWS mini unit, the horizontal prefilter and the upward flow sand filter are perhaps the most commonly used.

A. The SWS village unit utilizes gravel and sand bed rivers, streams and sea shores by abstracting water which has been cleaned by passing through the water bed.

1. The site can be simply and easily assessed, and artificial beds may be used if the natural bed is not suitable.

2. Relatively polluted rivers or streams can be utilized.

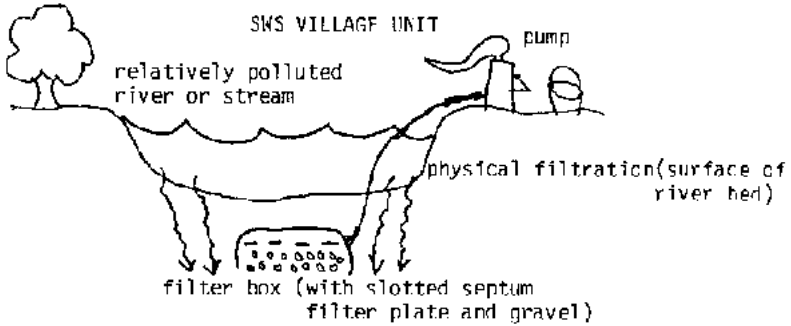
3. Physical filtration takes place at the layer on the top of the river bed.

4. The biological filter is created as oxygen laden water is drawn through the bed to the filter box from a six meter radius.

5. A manual or power pump is used to abstract the water.

6. During the first hour's operation after installation, fine particles are evacuated through a slotted septum filter plate, thus ensuring that the filter box is filled with coarse gravel.

7. The village unit has a capacity of approximately 20,000 liters/hour.



SWS village unit

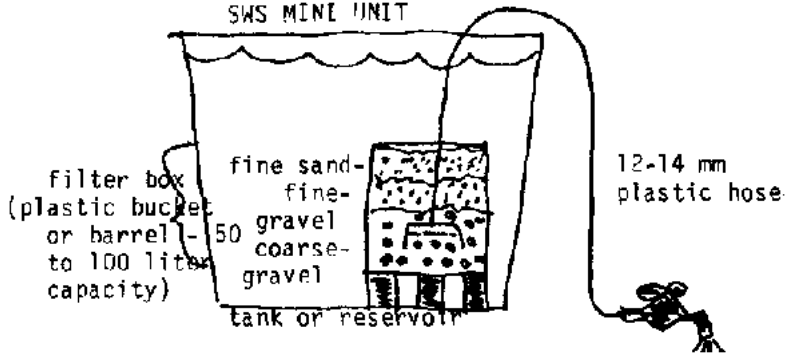
II. B. The SWS mini unit is used in situations requiring only small volumes of water or where it is not possible to use an existing gravel bed.

1. Any strong plastic bucket or barrel (50-100 liter capacity) may be used to contain the filter.

2. Layers of fine sand (5 cm layer on surface), fine gravel (2 to 5 mm) and coarse gravel (15 to 20 mm) serve as the filter medium

3. The mini unit is not involved in the abstraction process.

4. The mini unit has a capacity of approximately 1000 liters/hour.



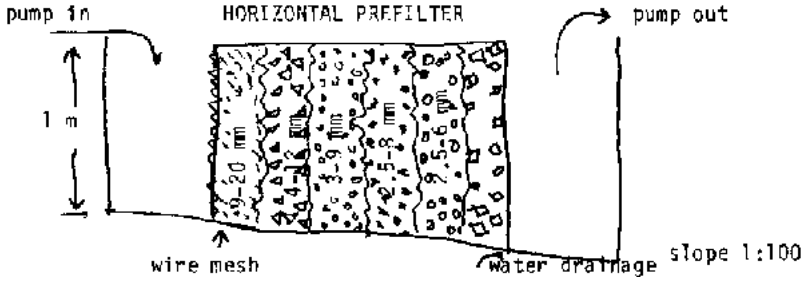
SWS mini unit

C. A horizontal prefilter is used to prevent the clogging of a filtering system by inorganic materials.

1. Because it is horizontal, the prefilter allows both coarse crushed stone and gravity to remove large organic and inorganic materials.

2. Approximately 60-7% of solid matter is removed by the prefilter.

3. The prefilter/filter combination has been shown to remove much but not all of the non-fecal coliform organisms present in untreated water.



Horizontal prefilter

D. The upward flow sand filter involves relatively simple preparation, assembly and operation at a very low cost.

1. A 44-gallon drum will make a filter able to treat 230 liters (50 gallons) per hour.

2. The top of the drum is removed, trimmed to fit inside the drum and pierced with 2 to 3 mm holes at 5 cm intervals all over.

3. The drum is pierced to fit the inlet pipe, drain pipe and delivery pipe (optional - water may simply be removed from the filter drum as needed).

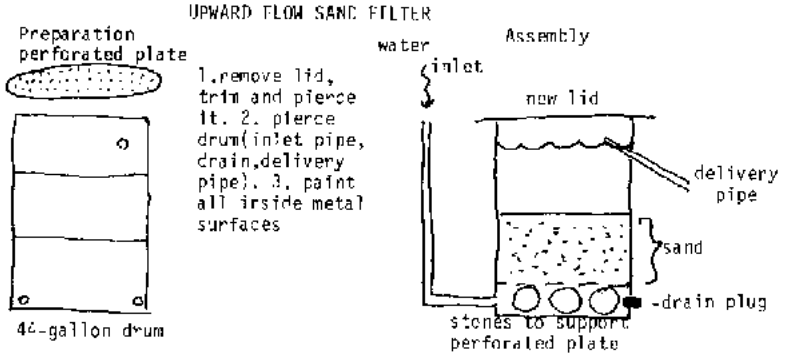
4. All the inside metal surfaces of the drum are painted with bituminous paint to prevent rusting (alternative - cement slurry).

5. The filter is assembled as shown in the diagram and a 25 to 30 cm layer of 3 to 4 mm grade sand is added.

6. Water is allowed to filter at up to 230 liters per hour.

7. The filter should be backwashed occasionally by stopping the flow, removing the drain

plug and allowing the dirt to flow out.



Upward flow sand filter

Sources:

- **Appropriate Technology Sourcebook, Volume I. Darrow and Pam. 1978.**
- **Appropriate Technology Sourcebook, Volume II. Darrow, Heller and Pam. 1981.**
- **More Other Homes and Garbage. Leikie, Masters, Whitehouse and Young. 1981**
- **Report on Second Regional Consultancy Low-Cost Water Filtration. Cansdale. 1979.**

- Marilyn Berry , PCV Sierra Leone

Session T-34: Community analysis - Part II

Time: 7:30 PM

Goals:

- **For trainees to explore the 14 social cybernetic subsystems on the community level**
- **For trainees to share their learnings about the community that they have lived in for the last four weeks**

Overview:

In the session which introduced trainees to the 14 social cybernetic sub-systems they wrote their own autobiographies: it is essential for trainees to see themselves as a system before they can begin to see a community as one. In community analysis - Part II, trainees take a look at their last four weeks living in the community and at how much they know (or don't know) about the community.

Procedures:

Time	Activities
15 Minutes	1. Trainer assigns 1 sub-system to each trainee. The trainee lists on newsprint all information he/she has learned about the community. An additional sub-system is assigned to those trainees finishing up early.
	2. Each trainee reports out his/her sub-system. Trainees as a group add additional information to the newsprint.
Sub-Systems Kinship Maintenance Affinity	Birth, sex, marital status, ethnic groups, habitation, migration, family, relatives, demography, population. Health Hygiene, infirmity, hospitals, campaigns, nursing, pharmacy, medicine, dentistry, sanitation, public health, mortality. Consumers, bars, stores, hotels, diets, food/drink, clothing, warehouse, malnutrition. Friendship, love, hate, association, clubs, unions, coops, federations, societies, solidarity, integration.
Leisure	Tourism, holidays, games, free time, music/songs, diversions, sports, hobbies, exhaustion, relaxation.

Communications	Trips, transportation, accidents, languages, newspapers, broadcast stations, telecommunications, networks.
Education	Culture, teachers, didactics, research, study, school, library, education, academics, teaching.
Ownership	Public/private property, possessions, assets, wealth/salaries, rich/poor, distribution of wealth, stock market GNP.
Extra Ag-IND-ART	Manufacture, enterprises, firms, specialists, departments, arts, technologies, farming, energy, extractive industry.
Religious	Creeds, beliefs, participation, churches, ministers, rites, congregations.
Security	Police power, combativity, defense, attacks, crimes, violence/war, armed forces, military operations, fear.
Administrative	Public power, planning, political parties, bureaucracy, regime, public administration, government.
Judicial	Laws, justice, rights, duties, courts, codes, legal process, jurists.
Status	Prestige, respect, merit, competition, privilege, titles, excellence, elites, "who's who", nobel prize, monuments.

Trainer's Note

He have used this model because it is all inclusive of social sub-systems used in social planning in the Americas. You may wish to use a shorter version called KEEPRAH, Holistic Model, developed by Phil Donohue and used in the early 1960's at Peace Corps Training Center, Escondido, California.

1 1/2 Hours	3. Trainer now states that if you were doing a community analysis, you would formulate a series of questions under each sub-system, then try to find the answer to the question

	by going into the community and seeking information Ask the group to break into small groups of 5 or 6, and brainstorm questions in each area: for example, write these examples on flip chart as follows: Kinship (This has to do with family patterns, relations and organization)
	1. How big are families?
	2. Is the mother or the father the decision maker, land owner, bread winner, etc.?
	3. Who raises the children? etc.
Education	1. What is the average grade that children achieve in school?
	2. Are there schools? Etc.

Trainer's Note

You have several choices here. Each group may do all sub-systems or may select one or more then share results with the other groups.

30 Minutes	4. Bring the group together. If appropriate, share questions. If not appropriate, move on to asking people how they plan to find out the answers to their questions. Hint: There are several methods of gathering data and the group should try out a variety of ways: sitting in one place and watching what goes on (flow analysis); asking questions; looking for anything written if it exists; conducting a non-threatening interview; observations, etc. Each person should think about how he/she is going to gather data. Stress that each person must keep notes and write down findings in their journals.
10 Minutes	5. Trainer closes session with short wrap - up on how inter - realted the 14 sub-systems are. Change cannot be made in one without changing or affecting all of the others. Cultural change takes a long time; PCV's need to analyze the possible impact on all systems when interventions are made.

Trainer's Note:

Newsprint reflecting data collected and questions should be saved for Community Analysis III Session T-37.

Session T-35: Fish handling and care III - Cleaning and processing on the fishing boat

Time: 7:30 AM

Goals:

- **For trainees to be introduced to procedures used while on fishing boat for cleaning of fish**
- **For trainees to understand the importance of icing fish after cleaning**

Overview:

In this session local fisherman describes how fish are cleaned at sea, the reasons, the process, and disposal of fish viscera at sea. Trainees learn about icing of fish.

Exercises:

1. Lecturette by local fisherman on fish cleaning at sea.
2. Iced fish in transit.

Materials:

- **Flip chart paper, markers, tape, newsprint of tables for ice usage**

Trainer's Note:

You will need to look around to find which fisherman's fish are in really good condition when they arrive at the pier. We were very fortunate -the fisherman we used followed our presentation format and used newsprint drawings

EXERCISE 1 - Lecturette: Cleaning and Processing of Fish At Sea

Goals:

- **For trainees to have contact with local expert**
- **For local expert to transfer knowledge about fish cleaning and processing at sea**

Overview:

This session is a preparatory session for trainees as they will be cleaning fish and processing fish at sea during training. By using a local fishing expert, trainees have a chance to interact with community member and ask questions based on information they are receiving.

Procedures:

Time	Activities
1 Hour	1. Local fisherman gives lecture on fish cleaning and processing while at sea, using newsprint diagrams to show techniques.

Trainer's Note:

You will want to go over outline for session with lecturer, and you may have to assist in the drawing of newsprint diagrams.

Lecturette should include the following items. a. cleaning and gutting of fish. b. proper

icing procedures. c. disposal of viscera at sea.

15 Minutes	2. Trainer encourages trainees to ask questions after lecture. Trainers should also be prepared to surface through questions items that may have been overlooked or not mentioned by lecturer.
10 Minutes	3. Trainer now wraps up session and leads into next exercise.

EXERCISE II - Iced Fish in Transit

Goals:

- **To acquaint trainees with formulas in which to determine rate ice melts**
- **For trainees to be able to accurately determine the amount of ice needed to chill fish while fish is in transit**

Overview:

In this exercise simple tables are introduced that will allow trainees to be able to estimate the amount of ice needed to keep fish chilled while in transit. During future session trainees will need to determine proper icing amounts.

Procedures:

Time	Activities
30 Minutes	1. Technical trainer gives following lecture with Table 1 and Table 2 posted on newsprint.

Table 1. shows the weight of ice needed to chill 10 kg. fish from various starting

temperatures at 0°C.

Table 1. Weight of ice needed to chill 10 kg. of fish

Starting temperature of fish (°C)	Weight of Ice (kg)
30	3.8
25	3.1
20	2.5
15	1.9
5	0.7

The necessary amount of ice is diminshed by 81.5% when ice-packing fish at 5°C instead of 30°C.
obviously, to store or distribute fish at 0°C, more ice has to be used than what is required for simply cooling it down. However, the advantages in chilling the fish before they are packed, are to reduce the amount of ice required during the journey, and to reduce spoilage before dispatch.

It is not easy to estimate how much extra ice is needed to keep the fish chilled in transit. This depends on the length of the journey, the side temperature, and the degree of protection given the cargo by insulation and refrigeration of the transport vehicle or container. The position of the boxes in the load will also affect the amount of heating it is subjected to. For example, a box on the floor of the truck needs more ice than one in the middle of the load.

Table 2 gives a rough estimate of the amount of ice melted in two different sizes of wooden box by heat from outside. When the box is surrounded by others, the meltages may be only half or a quarter of these amounts.

From Table 1 and 2 it is easy to calculate the amount of ice needed in a box of fish.

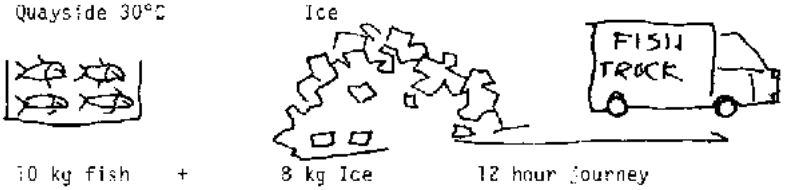
Table 2. Melting time of ice in a simple wooden box

Outside Air Temperature	Weight of Ice melted in 12 hours	
	in a 10 kg box	in a 40 kg box
30°C	4.0 kg	9.2 kg
25°C	3.5 kg	7.8 kg
20°C	3.0 kg	6.4 kg
15°C	2.5 kg	3.0 kg
10°C	2.0 kg	3.5 kg

Let us consider a couple of examples:

Example 1. The chilling practice of the port merchant is poor. The fish start the journey at 30°C. The country is a tropical one; the outside air temperature is 30°C. How much ice is needed in the 10 kg box for a 12 hour journey?

A. For chilling fish (Table 1) 3.8 kg
B. To make up for melting by outside air temperature (Table 2)
3.8 kg Ice + 4 kg Ice = 7.8 kg Total amount of Ice



Figure

If the journey, instead of 12 hours, would last 24 hours, the amount of ice would have been 11.8 kg.

15 Minutes	2. Trainees are asked to record in their journals Tables 1 and 2 for their own use In the future.
30 Minutes	3. Technical trainer wraps up the fish handling and care segment by reviewing all sessions. Links to introduction to fish preservation on following day.

Session T-36: Weather for the mariner special project

Time: 4 PM

Goals:

- **For trainee for whom this is a special project to expand on communication/technology transference skills**
- **To provide trainees with basic information about weather**
- **For trainees to become aware of the importance of weather to the fisherman both when at sea and on shore**

Overview

This session is a special project for one of the trainees. Trainee will continue to report on the weather for the remainder of the training program.

Trainer's Note:

It's important that the trainee restrict his presentation to information and resources

'appropriate' to the small-scale fisherman in less developed countries, (i.e. the barometer and how it works may not be the best topic for the presentation).

Procedures:

Time	Activities
1 Hour	1. Trainee presents lecturette on weather patterns, cloud formations, and weather danger signals. An example follows.

Weather for the Mariner

"How is it possible to expect mankind to take advice when they will not so much as heed warnings."
--J. Swift 1667-1745

My favorite quote is: "The Price of Safety is constant vigilance"
--Author unknown

Together they offer a sound formula for success and safety on the ocean. The formula would be thus:

Constant vigilance and knowledge of warnings = safety at sea. There is nothing smaller than a boat at sea. Boats and ships somehow shrink considerably when the weather worsens. Distances to be travelled stretch to the end of the universe and time becomes the existential dilemma.

It has been said many times and places that a boat or ship starts sinking the minute it is launched. Whether they sink, are skuttled, or are dismantled, the boats life is affected in no small degree by the condition of the seas it has travelled. The sea is mindless and moldable. It is mostly a reactionary element and it reacts positively with the weather.

There is, of course, 100% weather everyday. The good weather is taken for granted by nearly everyone and quite often so by the successful fisherman.

You are not a successful fisherman if you do not tie your boat up to the dock for an equal amount of time that you untie it to go to sea. If all other variables (mechanical, collision, etc.) are controlled, the one that the mariner cannot control is the weather.

Local Knowledge

There are many, many names for the one ocean. Her, there, and beyond are a few important ones. A good, or at least adequate, analogy is to compare the "one" ocean with the human body. The mind is yours of course. If you are floating, proudly, on the outstretched palm of your left hand does it matter that the right big toe was just crushed by a stone? However, if you normally hung out in the vicinity of the right instep and happened to consciously look up and see a stone falling you would try to get at least to the knee if not further. In this instance the left inner ear would be ideal.

This is the essence of local knowledge. Hurricane "Bula" will not be significant to you if it is eight thousand miles away. On the other hand if you are twenty miles to sea and the wind goes from a balmy eight (8) knots at 10:00 AM to a fresh, crisp 25 knots by 2:30 PM, it will no doubt cross your mind that there must be an easier way to earn a living.

Local knowledge is acquired, primarily, in two ways; (1) Personal experience and (2) the experience of others. It goes without saying at length, that a mariner new to an area should acquire as much information as possible about local weather phenomena before untying the dock lines.

As a "new" mariner/fisherman it should be noted that unless you are at the open-information sharing level your fellow mariner/fishermen are quite often willing to let you leave the harbor to live the sequel to "The Longest Day." This will go into your "personal

experience" file and, since you made it back, you will have gained a degree of respect from the others in the "business."

Ask, look for yourself, ask again, evaluate all information about the conditions and then if it reasonably seems right, do it. There is also the event that will take that degree of respect from others away and that is always being the last boat on the fishing grounds.

It might occur to you the question, "How might produce and aggressiveness live so close together?" The answer is simple: they must. The fisherman most often chooses and enjoys his way of making a livelihood. All fishermen are aware that an element of risk is involved and make it a part of their "business" to daily (and more often) check the "weather" so that they minimize the risk element. There is no other way but to make it your business as well if you are to be a mariner.

'WX"
on all VHF (marine wand) radios can be found the symbols "WX". This indicates the weather frequency. It is an "international" frequency as such and it will give projections of swell height, visibility, air temperature as well as notices to mariners pertaining to adverse weather. It is normally updated every six (6) hours. All effort should be made to obtain this basic information. It is more regional in scope and should be used in conjunction with local knowledge.

The following tables and graphics are taken from Weather for the Mariner. 1977. William J. Kotsch, R.A. U.S.N. (retired).

For our purposes it is overly comprehensive at first glance. The reader should, however, avail him/herself of the manuscript at an early date if possible. The examples used here are only bits and pieces of a much bigger puzzle, the weather. Have an on-going educational process in mind when you attempt to master the weather: It is loaded with surprises even for the experts. Good luck to you all and good fishing!

-- Fred Gibson, PCV Papua New Guinea

BeauFort No.	Knots	M.P.H.	Description
0	0-0.9	0-0.9	Calm - sea like a mirror
1	1-3	1-3	Scale ripples - no foam
2	4-6	4-7	Light breeze - small wavelets
3	7-10	8-12	Gentle breeze - large wavelets white harier
4	11-16	13-18	Moderate breeze - small waves
* 5	17-21	19-24	Fresh breeze - mod. waves - spray
6	22-27	25-31	Large waves - foam crests
7	28-33	32-38	Moderate gale - heaped sea
8	34-40	39-46	Fresh gale - streaked waves
9	41-47	47-54	Strong gale - high streaked waves
10	48-55	55-63	Storm/whole gale - very high waves/white sea
11	56-63	64-73	Violent storm exceptional high waves
12	64 +	74 +	Hurricane/typhoon

* Anything behond this in a small craft is hazardous

Table 3. Partial BeauFort Wind Scale

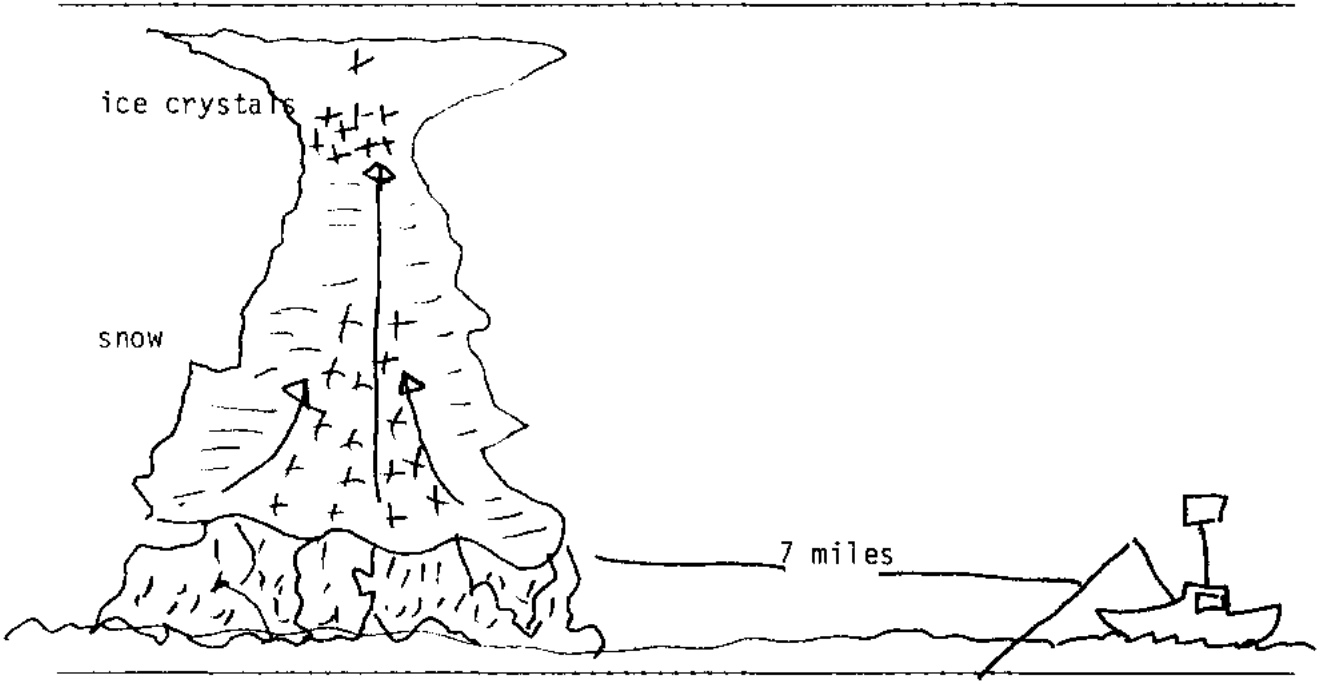


Table 4. Schematic of a Thunderstorm, including the distribution of electric charge

1. Lightning flash observed at 4:25:10 PM 2. Thunderclap heard at 4:25:45 PM 3. Divide (sec.) time interval by 5 4. 35 = 755. You are approximately 7 miles from storm

Session T-37: Community analysis - part III interview skills - spatial relationships

Time: 7:30 PM

Goals:

- **For trainees to learn how to prepare for an interview**
- **To learn the actual steps In interviewing**
- **To plan an interview**
- **For trainees to understand the importance of knowing their community on a personal level**

Overview:

In the session on Community Analysis Part II, trainees took a look at the data they have gathered in the last four weeks of living in the community where training is being conducted and at how much they know about the community. In this session trainees have an opportunity to hear from a community member familiar with the community to validate some of trainees learnings and to clarify some data that may be confused or misconstrued by trainees. Trainees explore the process of interviewing, learn how to plan for an interview and conduct the interview in order to obtain data or verify data they have already obtained.

Materials:

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

Procedures:

Time	Activities
45 Minutes	1. Community member goes over 14 social sub-systems and data collected by trainees in previous Community Analysis session listed on newsprint. Community member goes over data, validates and/or clarifies trainees' learnings or general assumptions.
30	2. Community member asks trainees to each draw a map of the community putting in key

Minutes	2. Community member asks trainees to each draw a map of the community, putting in key places and residences of community members with the names of key people, their titles, and locations also placed on map. Community member goes over each map with the group pointing out the importance of knowing the names of people who work and live in these places. For maps with very little information, trainer suggests to trainee that he/she draw up a street map when they get to their new communities, and ask colleague or friend to help fill it in. Newsprint showing incomplete or misunderstood data is gone over, and trainer leads into interviews.
15 Minutes	3. Trainer now introduces guideposts and suggestions for interview preparation and implementation posted on newsprint.

Guideposts and Suggestions For Interview Preparation and Implementation

Preparing for the interview:

1. Decide what is to be accomplished.

2. Know the interviewee as much as possible.

3. Make appointments.

4. Practice taking the interviewee's point of view.

5. Know your own personality, prejudices, filters.

6. Plan thoroughly:

A. Prepare the environment
1) Comfortable and private
2) Free from distractions and interruptions

B. Prepare whatever aids you will need for the interview.
1) Gather necessary and relevant data
2) Prepare a checklist of points to cover

C. Plan the opening of the interview.
1) Opening remarks to build rapport
2) Clarify the "why" and "what" of the interview
3) Make sure that the opening is consistent with the objectives of - the interview

D. Choose a strategy. Consider your objective and the situational factors to determine whether your strategy should be:
1) Directive, in which you get or give specific information a. It is highly structured; interviewer follows outline or plan closely and has tight control of the process b. Closed questions are used frequently c. Interviewer does most of the talking
2) Non-directive, in which interviewer is encouraged to talk freely
a. Assumes that person will say what is on his/her mind
b. Listening skills are important
c. Non-authoritarian; interviewer has a purpose, but no rigid outline
3) A mixture of directive and non-directive

E. Plan the close of the interview.
1) Review or summarize to avoid misunderstanding
2) Agree on the next step, or action plan; set up a report-back process

Interviewing:

7. Establish a relationship of confidence.

8. Establish appropriate atmosphere.

9. Help the interviewee to feel at ease and ready to talk.

10. Listen.

11. Allow enough time.

12. Don't waste time; don't "dawdle".

13. Keep control of the interview.

14. At the close of the interview, watch for additional information or new leads in the casual remarks of the interviewee.

30 Minutes	4. Trainer now refers to the incomplete data from newsprint previously generated by trainees. Trainees are asked to identify community person they feel they could interview and obtain pertinent date from. Trainer now introduces the interview planning guide and each trainee plans his/her interview. Interview planning guide is posted on newsprint.

Interview Planning Guide

WHO is to be interviewed? (Know as much about him/her as possible.)

WHAT do you already know about the interviewee?

WHERE did you get the information?

WHY are you interviewing him/her?

From your perspective, the desired result is: (Having completed this interview, I should know...)
From the interviewee's perspective, the desired result is: (Having completed the

interview, he/she should know...)

WHAT information do you need from the interviewee in order to meet your desired objective?

1.
2.
3.
4.

WHAT do you plan to do with the information received from him/her?

WHEN do you plan to hold the interview?
WHERE

WHAT is on your checklist of important points to cover?

HOW do you plan to organize question topics?

HOW do you plan to word some of your most important questions?

WHAT strategy do you plan to use in this interview?

HOW do you plan to open the interview? (remarks, clarifying objectives) HOW do you plan to close the interview? (review, next steps)

WHAT questions do you expect from the interviewee?

15 Minutes	5. Trainees are instructed to conduct an interview the following day, or no later than the day after that, as there will be follow up.

Session T-38: Introduction to fish preservation

Time: 7:30 AM to 9:30 AM

Goals:

- **To acquaint trainees with various fish preservation techniques using salt as a curing agent, natural air drying, hot and cold smoking**

Overview:

This session introduces the fish preservation sessions. Fish drying, salting and smoking are closely intertwined. This session is involved with salt usage. After this session fish will be ready to be used in drying and smoking sessions.

Materials and Equipment:

- **Flip chart paper, markers,**
- **Container designed for drainage of brine, weights for lid of container, brine solution, rock salt, fish (previously cleaned in Session T-35)**

Procedures:

Time	Activities
20 Minutes	1. Technical trainer gives lecture on fish preservation using following outline:
	Why is there a need for fish preservation?
	a. storage for future use
	b. taste, culture, habit

	c. marketability
	d. spoilage
	e. health
	Types of preservation
	a. salting
	b. brine solutions (sugar, salt)
	c. natural air dry
	d. solar air dry
	e. hot smoking
	f. cold smoking
	g. pickling
30 Minutes	2. Technical trainer gives trainees instructions for preparing brine. Trainees prepare brine and soak fish cleaned in previous sessions.
30 Minutes	3. While fish are soaking in brine solution technical trainer gives directions for salting fish using wet method/dry method:
	a. Step by step
	Step 1 - one part salt-three parts fish too much salt may burn fish too little allows fermentation
	Step 2 - thin layer of salt on bottom of containers enough to completely cover bottom
	Step 3 - arrange fish, skin side down scatter thin layer of salt
	salt heavy over thickest portion of fish
	Step 4 - finish filling containers with alternate layers of fish and salt top layer is skin side up
	Step 5 - brine will drain away in dry salting place a loose cover over top of container

	weighted down with rocks brine will make itself
	Step 6 - keep container covered and off ground to protect from insects
	Step 7 - keep container in cool place
	Step 8 - let fish stay in solution from 2 days to a week dry salting goes farther when weather is warm large fish must stay in solution longer
	Step 9 - remove fish, wash thoroughly in clean, fresh, strong brine solution 3-4 cups salt to 1 gallon water drain 15-20 minutes fish is now ready for either drying or smoking
30 Minutes	4. Trainees remove fish from brine solution and using wet/dry method, salt fish. Fish will be ready for future smoking and drying sessions the following week. Trainer links to smoking and drying sessions.

Trainer's Note

There should be time allowed for discussion of techniques. Trainers need to resist taking part in salting of fish.

Preparation of salt brines for the fishing industry
by Kenneth S. Hilderbrand, Jr., Extension Seafood Technologist, Oregon State University

Oregon State University Extension Marine Advisory Program A Land Grant / Sea Grant Cooperative
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The use of salt brine for refrigerants and fish curing is common in the seafood industry. It is important to understand a few basic principles In order to make and use brines properly. This bulletin attempts to point out some basic concepts and principles and provides some charts which are useful to anyone who uses brines frequently.

PROPERTIES OF SALT BRINE

When added to water, salt lowers the freezing point of water by a known and predictable degree, making it useful as a secondary refrigerant (freezing solution). Figure 1 shows the relationship of a brine's freezing point to its concentration of salt Note that the lowest freezing point obtainable in a salt-water mixture is about -6°F at 23.3% salt. This is called the eutectic point and any concentration of salt above or below this point will result in a solution with a freezing point higher than -6°F. Table 1 gives specific data on freezing point, concentration, and relationships useful in preparing salt brines.

PREPARING SALT BRINES

After selecting the desired brine concentration for any desired purpose, use Table 1 to determine how much water and salt are needed. Column 2 in Table 1 gives freezing points while Column 3 is computed in percent salt by weight. Salometer degree (°SAL) is a useful way of describing and measuring brines and is explained later under "MEASURING SALT SOLUTIONS."

An easy way to prepare a brine solution of any given strength is to refer to Column 4 in Table 1 and then add the proper amount of salt per gallon of water. Salt will increase the volume of the solution, however. Thus, if an exact quantity of brine is needed, use Columns 5 and 6 to determine the weight of salt and volume of water needed to make a gallon of brine at the desired concentration.

Be sure to mix thoroughly

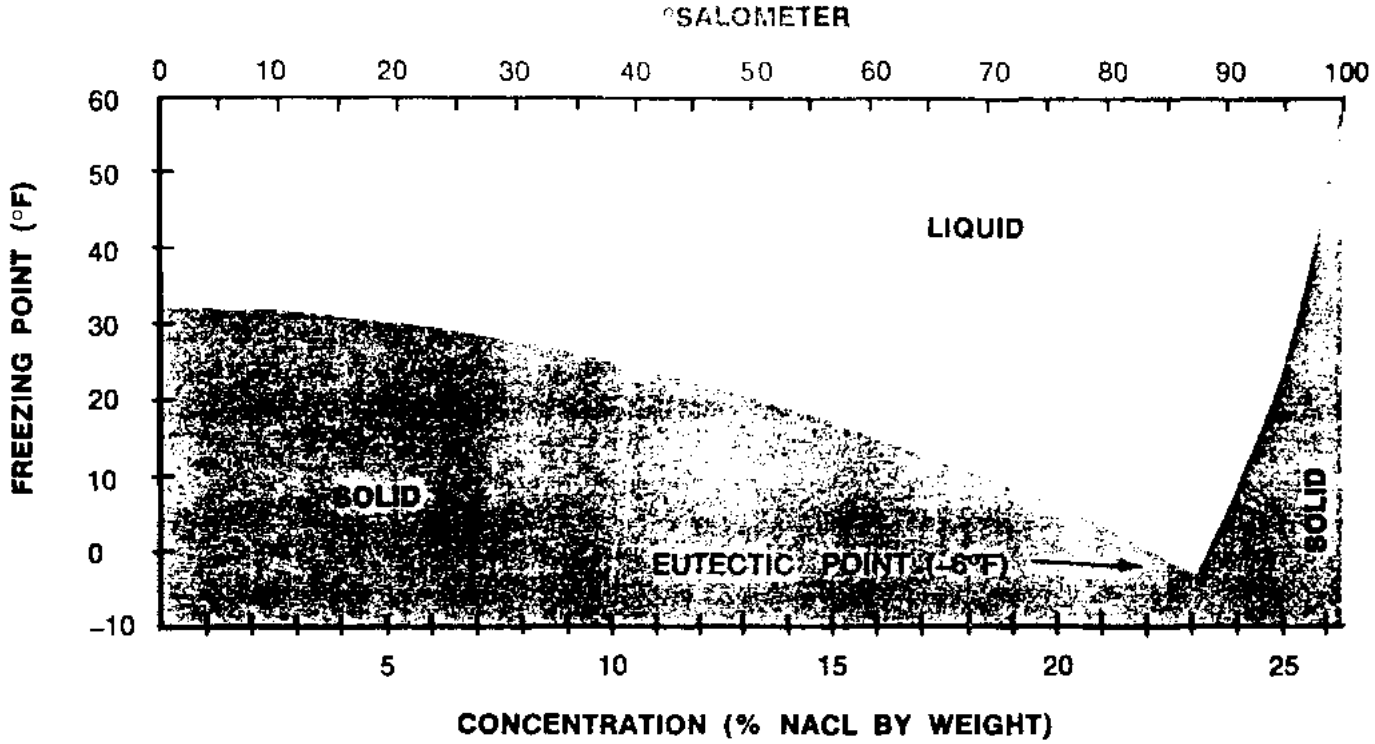


Figure 1. Freezing point of salt brine mixtures.

EXAMPLES

About twenty (20) gallons of brine are needed at 15.8% sat (60°SAL) to brine salmon for smoking. If it isn't necessary to have exactly 20 gallons, simply find 60°SAL (15.8% salt)

in Column 1 and note that 1.568 pounds salt/gallon of water (Column 4) is needed. Put 20 gallons of water in a tank and dissolve 31 1/3 pounds of salt (20 gallons x 1.568 pounds salt/gallons water).

The result will be a solution which has exactly 15.8% salt by weight (60° SAL). It will be found, however, that the resulting solution is more than 20 gallons; it will be more like 21 gallons. This increase in volume is usually insignificant; if precision is needed and an exact quantity desired, use the data in Columns 5 and 6.

For example, if exactly 500 gallons of 88° SAL brine (-5.8F freezing point) is needed for a brine freezing tank on board a vessel, Column 5 in Table 1 will show that each gallon is SAL brine needs 2.279 pounds of salt and .904 gallons of water (Column 5). Adding 1140 pounds of salt (500 gallons x 2.279 pounds salt/gallon brine) to 452 gallons of water (500 gallons x .904 gallons water/gallon brine) would give exactly 500 gallons of brine at 88° SAL (23.3%) with a freezing point of -5.8°F.

MEASURING SALT SOLUTIONS

Although careful attention to proportions will give good control of salt concentration in brine, the best way to be sure is to measure it. Sometimes, after a brine has been used and possibly diluted, it is useful to be able to measure its concentration.

Figure 2 shows the basic tools used to measure salt solutions. These may be purchased at most scientific supply houses for about $15. A salometer is a device that measures brine density saturation (26.4% salt at 60°F) on a convenient scale of 0 to 100. Each °SAL would therefore represent about .26% salt by weight as fully saturated brine contains about 26.4% salt.

To read a salometer, place it in a vessel, like the graduate cylinder shown in Figure 2, and allow it to float. The depth that it floats measures the brine concentration. Readings are

taken by noting the point on the scale where the salometer emerges from the surface of the brine solution. These readings in °SAL can then be used with Table 1 to obtain data such as freezing point and percent salt by weight.

The thermometer is used to determine the temperature of the brine as it is being tested with the salometer. If the temperature varies more than a few degrees from 60°F, then a correction factor should be used for accurate work.

A rule of thumb states that for every 10°F the brine is above 60°F, one degree salometer should be added to the observed reading before using Table 1, which is standardized for 60°F. For each 10°F the brine is below 60°F, one degree salometer should be subtracted from.

(1) Salo-meter Degrees	(2) Freezing Point Deg. F.*	(3) Percent Sodium Chloride By Wt.	(4) Pounds Salt Per Gallon Of Water	(5) Pounds Per Gallon of Brine		(6) Gallon Water Per Gal. Of Brine	(7) Specific Gravity	(8 Sa me Deg
				NaCl	Water			
0	+32.0	.000	.000	.000	8.328	1.000	1.000	
2	+31.5	.528	.044	.044	8.318	.999	1.004	
4	+31.1	1.056	.089	.089	8.297	.996	1.007	
6	+30.5	1.586	.134	.133	8.287	.995	1.011	
8	+30.0	2.112	.179	.178	8.275	.993	1.015	
10	+29.3	2.640	.226	.224	8.262	.992	1.019	1
12	+28.8	3.167	.273	.270	8.250	.990	1.023	1
*14	+28.2	3.695	.320	.316	8.229	.988	1.026	1
16	+27.6	4.223	.367	.362	8.216	.987	1.030	1
18	+27.0	4.751	.415	.409	8.202	.985	1.034	1
20	+26.4	5.279	.464	.456	8.188	.983	1.038	2
22	+25.7	5.807	.512	.503	8.175	.982	1.042	2
24	+25.1	6.335	.563	.552	8.159	.980	1.046	2
26	+24.4	6.963	.614	.600	8.144	.978	1.050	2

28	+23.7	7.391	.665	.649	8.129	.976	1.054	2
30	+23.0	7.919	.716	.698	8.113	.974	1.058	3
32	+22.3	8.446	.768	.747	8.097	.972	1.062	3
34	+21.6	8.974	.821	.797	8.081	.970	1.066	3
36	+20.9	9.502	.875	.847	8.064	.968	1.070	3
38	+20.2	10.030	.928	.897	8.047	.966	1.074	3
40	+19.4	10.558	.983	.948	8.030	.964	1.078	4
42	+18.7	11.086	1.039	.999	8.012	.962	1.082	4
44	+17.9	11.614	1.094	1.050	7.994	.960	1.086	4
46	+17.1	12.142	1.151	1.102	7.976	.958	1.090	4
48	+16.2	12.670	1.208	1.154	7.957	.955	1.094	4
50	+15.4	13.198	1.266	1.207	7.937	.953	1.098	5
52	+14.5	13.725	1.325	1.260	7.918	.951	1.102	5
54	+13.7	14.253	1.385	1.313	7.898	.948	1.106	5
56	+12.8	14.781	1.444	1.366	7.878	.946	1.110	5
58	+11.8	15.309	1.505	1.420	7.858	.943	1.114	5
60	+10.9	15.837	1.568	1.475	7.836	.941	1.118	6
62	+9.9	16.365	1.629	1.529	7.815	.938	1.122	6
64	+8.9	16.893	1.692	1.584	7.794	.936	1.126	6
66	+7.9	17.421	1.756	1.639	7.772	.933	1.130	6
68	+6.8	17.949	1.822	1.697	7.755	.931	1.135	6
70	+5.7	18.477	1.888	1.753	7.733	.929	1.139	7
72	+4.6	19.004	1.954	1.809	7.710	.926	1.143	7
74	+3.4	19.532	2.022	1.866	7.686	.923	1.147	7
76	+2.2	20.060	2.091	1.925	7.669	.921	1.152	7
78	+1.0	20.588	2.159	1.982	7.645	.918	1.156	7
80	−.4	21.116	2.229	2.040	7.620	.915	1.160	8
82	−1.6	21.644	2.300	2.098	7.596	.912	1.164	8
84	−3.0	22.172	2.372	2.158	7.577	.910	1.169	8
86	−4.4	22.700	2.446	2.218	7.551	.907	1.173	8
88	−5.8	23.338	2.520	2.279	7.531	.904	1.178	8
88.3[b]	−6.0[b]	23.310	2.531	2.288	7.528	.904	1.179	8
90	−1.1	23.755	2.594	2.338	7.506	.901	1.182	9
92	+4.8	24.283	2.670	2.398	7.479	.898	1.186	9
94	+11.1	24.811	2.745	2.459	7.460	.896	1.191	9
95	+14.4	25.075	2.787	2.491	7.444	.894	1.193	9
96	+18.0	25.339	2.827	2.522	7.430	.892	1.195	9
97	+21.6	25.603	2.865	2.552	7.417	.891	1.197	9
98	+25.5	25.867	2.906	2.585	7.409	.890	1.200	9
99	+29.8	26.131	2.947	2.616	7.394	.888	1.202	9
99.6	+32.3	26.285	2.970	2.634	7.386	.887	1.203	9
100[c]	+60.0[c]	26.395[c]	2.987	2.647	7.380	.886	1.204	10

Table 1: sodium chloride brine tables for brine at 60°F

The above table applies to brine tested at 60°F. For other brine temperatures the observed salometer readings must be converted before using them in the table. For practical purposes, add one degree salometer for each ten degrees above 60°F and deduct one degree salometer for each ten degrees below 60°F. ^ Approximate salinity range for sea water.

a Temperature at which freezing begins. Ice forms, brine concentrates and freezing point lowers to eutectic. b Eutectic point. For brines stronger than eutectic, the temperatures shown are the saturation temperatures for sodium chloride dihydrate. Brines stronger than eutectic deposit excess sodium chloride as dihydrate when cooled, and freeze at eutectic. c Saturated brine at 60°F.

the observed salometer reading. For instance, if a salometer reading was observed to be 80°SAL in a brine which was 40°F, the corrected salometer reading would be 78° SAL (subtract 1°SAL for each 10°F below 60°F).

IMPORTANT POINTS TO REMEMBER

Dissolving salt: Finely ground salt such as canner's salt or table salt dissolves much taster than coarsely ground salt (rock salt). It is essential that all salt added is dissolved if a solution is to have the proper strength.

Salt dissolves much faster in hot water than in cold water. It may take days for salt to dissolve in a brine freezer at 0°F.

Salt dissolves much slower as the salt concentration increases. The last bit of salt in a 90°SAL solution may take a long time to dissolve.

Agitation greatly increases the rate at which salt dissolves. A layer of salt on the bottom of a tank may take days to dissolve if left undisturbed.

In summary, try to dissolve salt in a warm, well agitated container or tank and make sure it is all dissolved before using it or measuring its concentration.

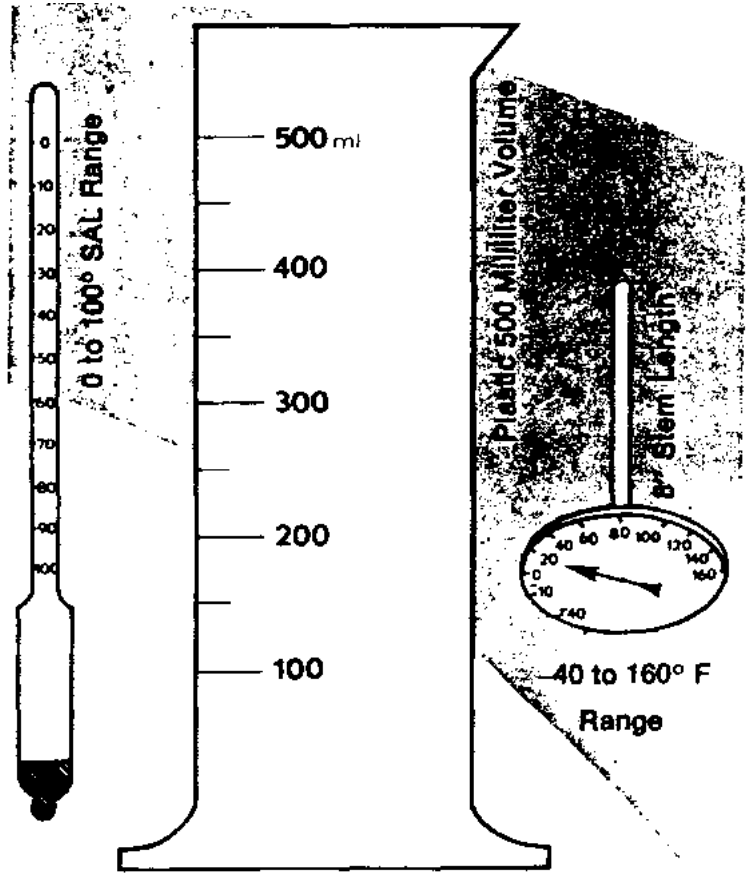


Figure 2. Equipment for measuring salt concentration in brine. Left, salometer; center, graduate cylinder: right, dial thermometer.

Brine refrigeration: Always make up a brine to be used for refrigeration so that its freezing point is well below the temperature you want to maintain. If you don't, it may freeze to the refrigeration coils or heat exchanger surfaces as they usually run 5 to 10°F colder than the operating temperature of the brine.

Using sea water for brines: Sea water may contain as much as 3 to 3.5% salt (12 to 14°SAL), which is equivalent to about .3 pounds of salt per gallon. Take this into consideration when making brine from sea water and deduct it from the amount of salt needed to make up a brine.

Adding salt to existing brines: If you want to increase the concentration of salt in a brine (decrease its freezing point), be sure to measure its strength and estimate its volume first. Then use the data in Table 1, Columns 5 and 6, to calculate how much more salt needs to be added.

Appendix. - Metric/customary conversion factors (approximate) for the units cited in this bulletin

To convert to multiply by		
liters	gallons	0.26
gallons	liters	3.78
kilograms	pounds	2.20
pounds	kilograms	0.45
grams per liter	pounds per gallon	0.0083
pounds per gallon	grams per liter	118.8
degrees Celsius (formerly Centigrade)	Fahrenheit	9/5, then add 32

degrees degrees Fahrenheit	degrees Celsius	519, after subtracting 32 01 - 79/3M

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-39: Ice box construction - special group project

Time: 10 AM to 2 PM

Goals:

- **To make trainees aware of the importance of ice to fishing**
- **To acquaint trainees with basic construction and design of fish boxes**
- **Introduce the "marine fisheries ice box" to**
- **Trainees to build on technology transfer skill**

Overview:

This session is done as a special group project. The trainee leader responsible for the initial design will have a team of trainees ready to construct a workable ice box. He/she will present a detailed plan and have all materials ready for execution of project.

Materials and Equipment:

- **Marine plywood (treated), polystyrene, bronze nails or screws, woodworking tools (hammer, wood hand saw, rasp screwdriver, wood plane, level, tri-square, sand paper, paint brushes, fiberglass resin and fabric, acetone)**

- **Flip chart, pens, Ice (cubed, block)**

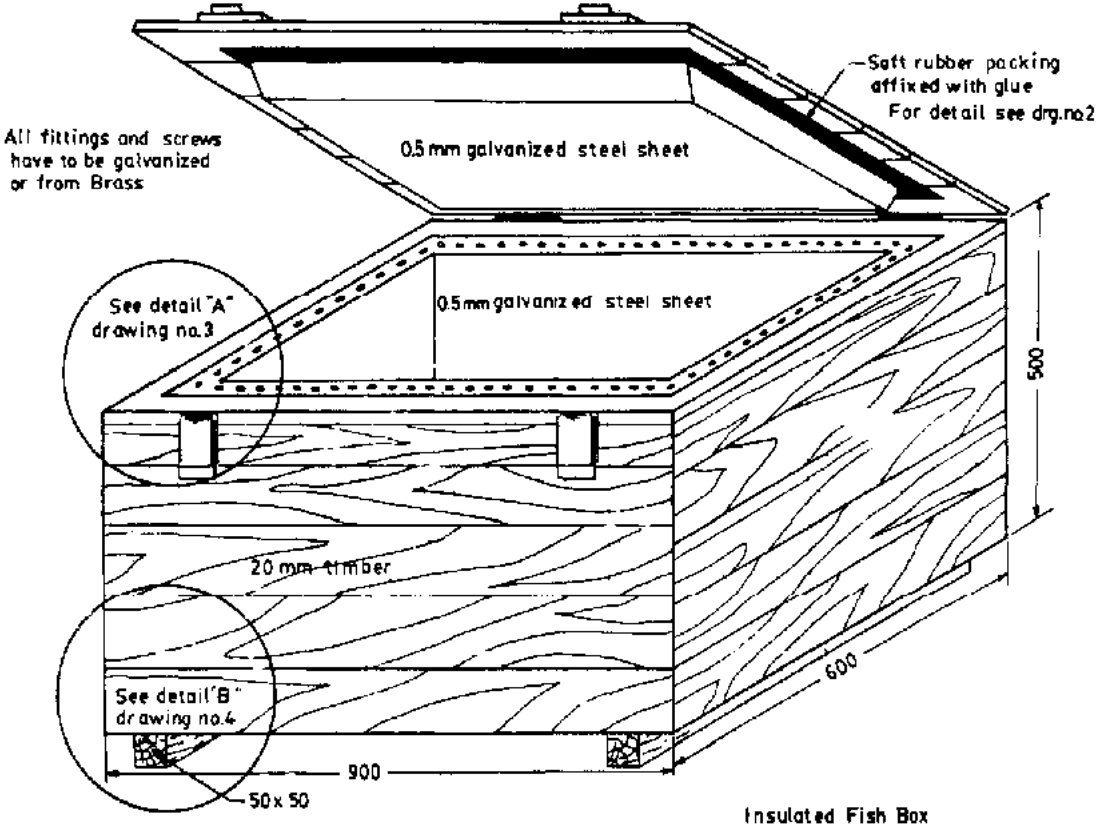
Trainer's Note:

The amount of time necessary for this project necessitates early involvement of the group. An icebox 3/4 finished will furnish enough of the construction details so that the remaining time (3 hours approximately) can be spent in construction.

Procedures:

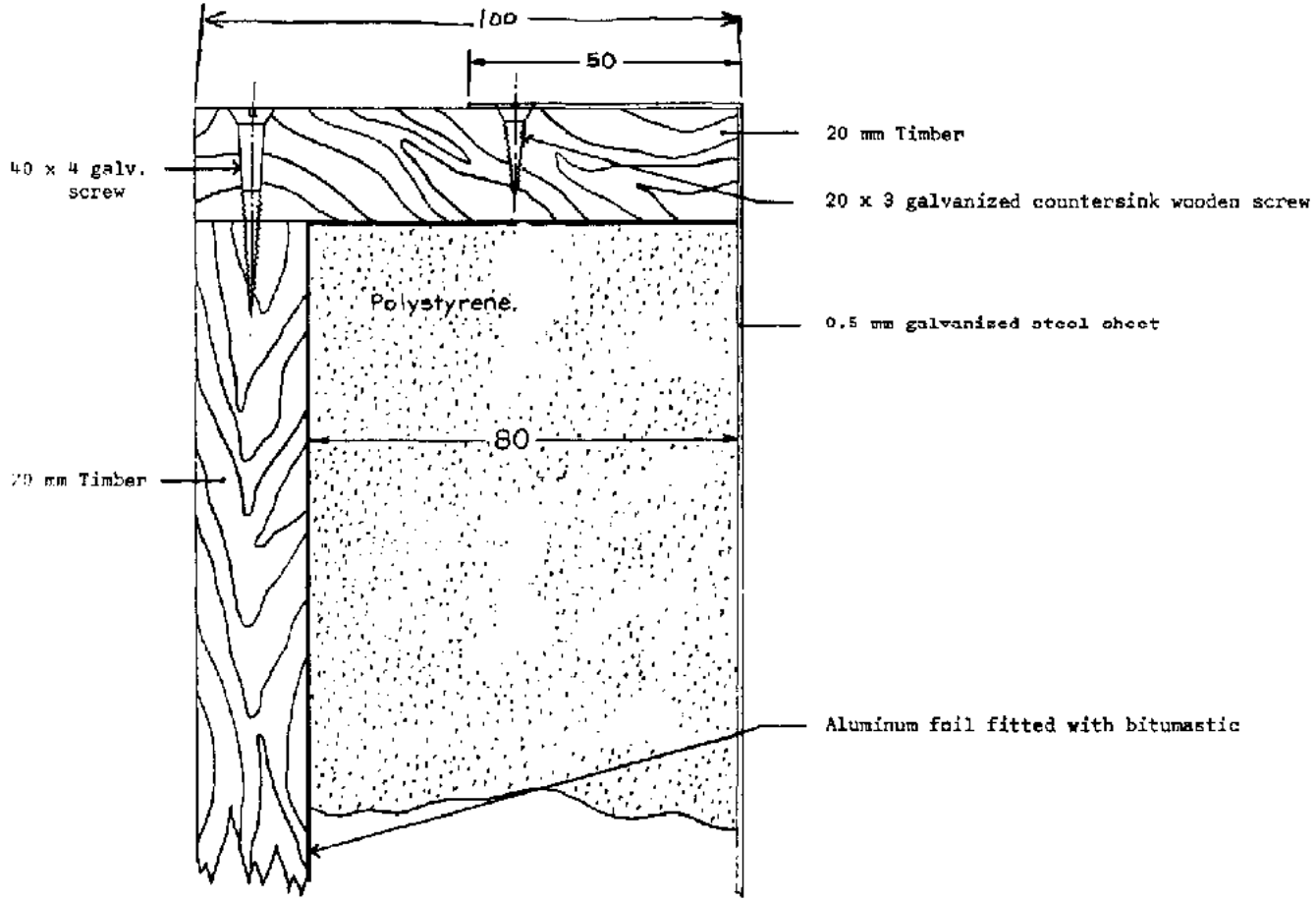
Time	Activities
15 Minutes	1. Trainee gives lecturette covering Introduction to Ice:
	a. importance of ice
	b. minimizes changes in marketability waste, food spoilage
	c. Slowing down of destructive process, care in handling, hygiene, cooling
15 Minutes	2. Trainee gives lecturette covering basic construction and design of fish boxes:
	a. basic construction, gluing, taping, screws vs nails
	b, design, insulation, framing, waterproof
	c. fiberglass techniques, resins, fabric
2 Hours	3. Group project leader introduces partially completed

2 Hours	3. Group project leader introduces partially completed
30 Minutes	"marine fisheries ice box" to trainees. Trainees complete construction after trainee leader goes over plans.

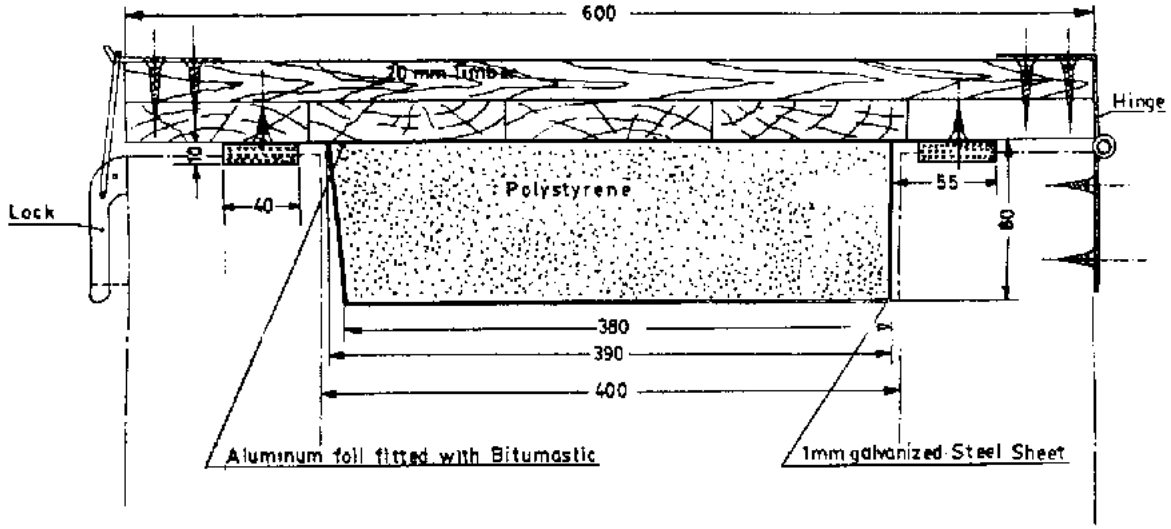


Insulated Fish Box

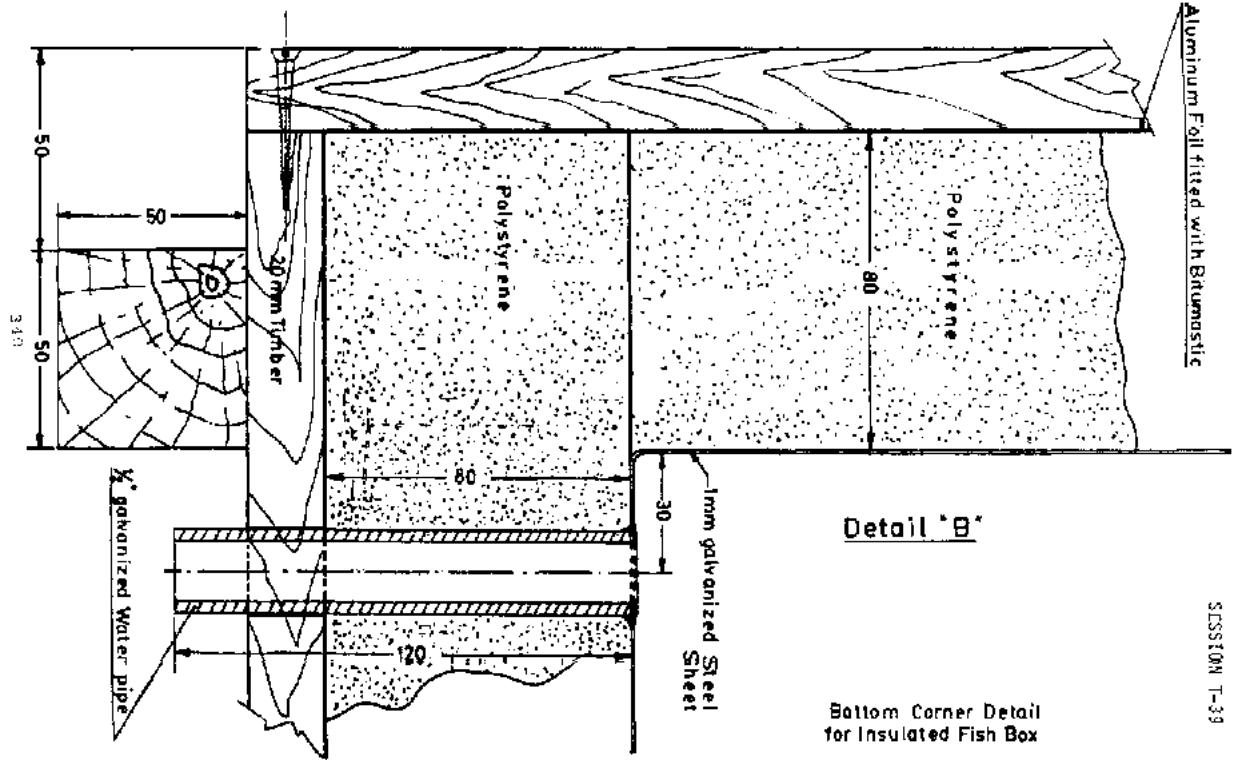
Insulated Fish Box



Corner Detail for Insulated Fish Box



Lid for insulated Fish Box



Bottom Corner Detail for Insulated Fish Box

Session T-40: Problem analysis

Time: 2 Hours

Goals:

- **Using same social cybernetic sub-systemsas used in Session 37, trainees do problem analysis**
- **Explore possible solutions measuring each solution for impact on 14 social sub-systems**

Overview:

Building on the previous session on community analysis, trainees should analyze problems using the 14 social cybernetic sub-systems to discover resources, patterns, and see how possible solutions affect other segments of the community. They may also discover possible support for solutions. In this session, trainees work further with the 14 social sub-systems to see how each problem and each solution impacts on subsystems other than the one with the original problem.

Procedures:

Time	Activities	
1 1/2 Hours	1. Trainer describes the following	a. problem identification
	problem-solving system to group	b. information gathering
	(place on newsprint).	c. Pre-conclusion (hypothesis)
		d. diagnosis
		e. brainstorming
		f. decision making
		g. planning

		h. Implementation stages
	Trainer now gives the following directions:	a. We are going to give you some problems we have identified.
		b. You will check problems with 14 sub-systems to see how many are affected.
		c. You will come to some preconclusions and will have to include some assumptions on your part.
		d. You will diagnose the problem.
		e. You will brainstorm for possible solutions.
		f. You will decide on one solution and once again see how solutions will affect other sub-systems.
		g. You will decide how your solution could get implemented.
		h. Try to look at what steps would have to be taken in implementation and what other sub-systems might be involved.
	You will list all steps taken on newsprint. At the end of this exercise you will describe to the group your process. Each group will have a different problem on which to work.	
	2. Group now describes on newsprint the problems and process they used as a group.	
	3. Trainer summarizes, emphasizing that there is no way to affect just one sub-system with a solution, just as there is no problem that effects just one sub-system. In addition, most development projects that fail - no matter how large or how small - do so because of insufficient information gathering prior to the decision-making planning and implementation steps.	

Trainer's Note:

For this session, the group was divided into groups of three and by country. With the start

of week five trainees need to begin team-building with their own country group, as well as begin preparing emotionally for separation from friends going to other Peace Corps countries.

Problem 1

A group of fishermen come to ask your support in forcing a small fleet of government owned Tuna bait boats away from their tribal waters. It seems that the fishing has suffered a great deal since the bait boats first appeared three months earlier off tribal waters. The fishermen decided to come ask your assistance after one of them heard you speak about fisheries conservation during one of your recent workshops.

As it turns out after initial research on your part, the Department of Fisheries is promoting the capture of skip jack Tuna and sends its fisheries recruits out on the boats to assist in locating bait fish for the Tuna operation.

Problem 2

After six months of hard work in developing an interest in better fishing and marketing techniques, your project is going full speed. Seeing this success your counterpart is getting nervous and realizes he is going to have to spend more time on the project than anticipated, or else look very bad. He is planning a trip to headquarters to complain about you and suggest that you be changed to another site.

Problem 3

The head political person in town wants to start a sea cucumber project. He asks the PCV for advice and help in the project. At first it sounds like a good extension project, but it becomes clear that he intends to utilize the cash from the project for his own benefit and not for the community, and only wants the PCV as free labor to supervise the workers.

Session T-41: Fish silage - Special project

Time: 7:30 AM

Goals:

- **To make trainees aware of the need to utilize all fish waste materials**
- **To acquaint trainees with the various utilization techniques now possible for fish silage**
- **To build technology transfer skills**

Overview:

This is a special project session. The trainee who is responsible presents a design for construction of a fish silage cooker. Trainee will also describe the various operating components of manufacturing fish silage.

Materials and Equipment:

- **Fish offal, carcasses, five gallon steel drum, propane stove/fire pit with fire, ladle, strainer for oil, flip charts, markers**

Trainer's Note:

It is important to allow for collection of fish offal prior to session. Two weeks collection of fish offal should fulfill needs. It is important for trainee to initiate cooking of offal prior to class as process is time intensive.

Procedures:

Time	Activities
1 Hour	1. Trainee gives lecturette using the following outline:

	a. introduction to fish silage
	b. uses of silage:
	- animal feed
	- bio-gas production
	c. production techniques
	d. actual demonstration of silage production
	The following is a sample lecture on the use of fish silage.

Fish Silage Uses of Fish silage: Direct uses, Oil, Biogas, Fertilizers

Direct Uses:

I. Bait

A. Chum Bag = plastic bag with perforations to distribute odor to surrounding area. Guts and unused fish are placed in here.

B. Cut Bait = noncommercial species and guts are cut and distributed over bow.

II. Animal Feed

A. Direct Administration

1. Fish guts (offal) have a good consistency for livestock and are high in nutrients. Livestock tend to develop a fishy taste.

B. Mixed with meals

1. Cereal meal is added. When solar dried by itself fish offal loses nutrients since they are hydroscopic and are lost in evaporation.

C. Mixed with acids

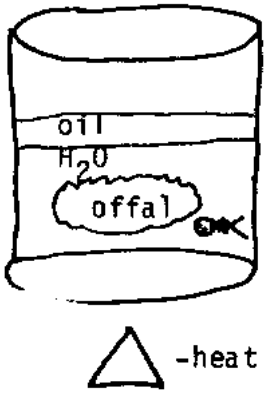
1. Formic acid (or other acid) is added to offal to lower ph. This stimulates proteolitic enzyme activity which helps digest fish oils. Also postpones microbial invasion.

III. Miscellaneous

A. Commercial Cheese making

1. Digestive enzymes in fish stomach is similar to rennin which is found in the rumen of cattle. Rennin helps to curdle milk for cheese making.

Fish Oil Production:



Water is high in nutrients, offal is a good fertilizer after oil production 50% of volume of

container is water offal added should be l/2 the water content

Water and offal are heated. Offal should be finely chopped to facilitate oil exchange. After mixture has boiled for about 20 minutes, remove heat and allow to cool. Oil should form a layer on the top which can be spooned off and filtered.

Uses for Fish Oil:

1. Cooking oil - makes a good cooking oil when fresh but tends to spoil rapidly.

2. Fuel oil - good use for stale cooking oil, burns well in lamps and oil stoves.

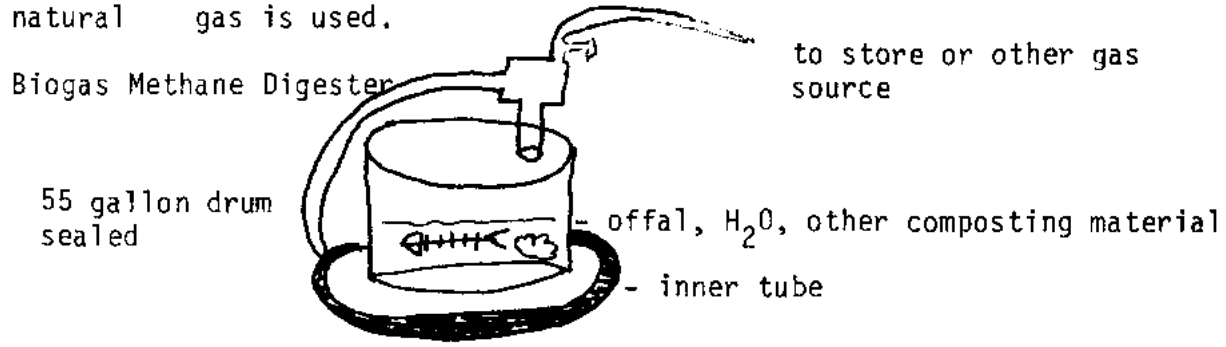
3. Oil based pesticides - 20% less than petroleum based pesticides. Also: Attracts beneficial predator insects, reduces shock from spraying, reduces spraying frequency.

4. Lubricants - used like any oil to increase lubrication and also a good metal protector.

5. Fertilizers - by-product of oil production water is high in nutrients and offal, makes a good fertilizer

Biogas Production:

Biogas is the by-product or decay of organic matter under anaerobic conditions. Biogas consists of methane (principle element), CO , Hydrogen Sulfide, N2 and CO. It is a valuable energy source where any other type of natural gas is used.



Biogas Methane Digester

Offal and other organic matter is place in 55 gallon drum and sealed. Within two-three days fermentation is pretty well along. Oxygen present in system should be bled off of gas to insure that no oxygen is present. The inner tube acts as a pressure regulation device. Burner units can range from simple bamboo pieces to very complex units.

Biogas Products:

Gas - Biogas - combustible gas Liquid-Scum - fertilizer Supernant - biologically active layer Solid Digested slurry - fertilizers Inorganic sediment - fertilizers

Uses for Biogas:

Raw materials for chemicals, carbon tetrachloride, etc., Heating Fuel, Cooking Fuel, Internal combustion fuel 1) cars, 2) boats

Fish Silage vs Fish Meal

	Silage	Meal

	Silage	Meal
Capital Cost	Low	High
Processing Skills	Unskilled	Skilled
Smell	None or pleasant	Greater problem
Transport	Expensive (bulky)	Cheap (light weight)
Marketing	Unknown product	Established channels
Storage Facilities	Plastic container	Packing material and dry storage room
Capacity required	none	Big capacity

References:

The Mother Earth News - Handbook of Homemade Power by the Staff of the Mother Earth News 1974 Bantom Books A Chinese Biogas Manual, edited by Arlane Von Baren, Science Publishing House, 1976, China Fishery in Japan, Yamaha Motor Co., Ltd, printed in Japan

Intermediate Technology and Alternative Energy Systems for Small Scale Fisheries - by David B Thompson, South China Sea Fisheries Development and Coordinating Program, Manila, Philippines, November 1979
--Alan Friedlander, PCV Tonga

Session T-42: First aid afloat

Time: 8:30 AM

Goals:

- **For trainees to become aware of the need for proper safety precautions at sea**

- **To acquaint trainees with simple procedures in emergency treatment of wounds, burns, heat exhaustion/stroke and infections**

- **To provide a guide to a properly stocked medical kit for the marine fisheries volunteer**

Overview:

This session is devoted to medical emergencies encountered by fishermen. The marine fisheries PCV will be out of reach of medical assistance a good deaf of the time. This session covers emergency first aid only.

Procedures:

Time	Activities
1 1/2 Hours	1. Trainer gives lecture and demonstrates techniques. Where possible have trainees practice demonstrated techniques. The following areas should be covered:
	a. Survival in water: One of the dangers faced by fishermen is falling into the sea or being swept overboard by a wave, particularly at night. If you fall into the sea, air trapped in your clothes will keep you afloat for a short time. But as air bubbles dissipate the weight of your clothes will drag you down deeper into the water making it difficult to keep afloat and breathe. Discard your seaboots or shoes and outer garments as quickly as possible. Footwear is best removed in a face-under-water position, one knee at a time being drawn up nearly to the nose so each boot or shoe can be removed. Clothes should be removed while you are treading water or in a floating position. If you are wearing a heavy overcoat shed it first, then remove lower garments. Clothes that have to be pulled up over the head should first be gathered up under the armpits then taken off with the head tipped forward. Alternatively withdraw one arm from the garment, then the head, then the other arm. If a person is rescued from the water unconscious, artificial respiration must be applied immediately. See section on artificial respiration.

	b. Burns and Scalds: Knowing how to treat burns and scalds quickly and effectively can save a lot of pain and can reduce the danger of later infection. For superficial burns there is reddening of the skin and minor blister formation: Treatment - Wash copiously with cold water for up to 20 minutes. Sea water will do if fresh water is not readily available. Apply ice if it is available. Apply a sterile dressing or the cleanest material available and bandage firmly to exclude air and reduce risk of infection. Burnt tissue swells, so be prepared to loosen the bandage if it becomes uncomfortable. Deep Burns: Remove or cut away clothing over the burned area but leave clothing that is stuck. Wash liberally with cold water. Cover burned area with sterile cloth or cleanest material available and bandage firmly, loosening if it becomes uncomfortable. Cover large burns with sheet or towel. Do not apply any lotions, ointments or oil dressings. Do not prick blisters. Obtain medical assistance immediately. If the casualty is thirsty or if there is a long delay getting medical help give him small amounts of tea, providing he is conscious. When medical aid is not readily available, treat patient for shock. Sunburn: Prolonged exposure to the sun can result in painful burning. The most simple treatment is to apply clean cloth soaked in cold water. Treatment - rest in a cool place, give plenty to drink, if sunburn is serious and there is severe blistering seek medical help. Sunburn is best prevented by gradual exposure to the sun. Creams or lotions with ultraviolet screening oil may be helpful as preventive measure. Chemical or corrosive burns: Treatment - Wash off chemical immediately with large volume of water, plunge head in bucket of water if necessary. Remove contaminated clothing, but avoid contaminating yourself. Obtain medical help immediately. Eye injuries caused by chemicals should be flushed with water for 20 minutes or up to one hour if medical care is not readily available.
	c. Bleeding: A severe gash can result in a hemorrhage. There are several types of hemorrhage:
	Arterial - Bleeding from an artery. This comes in spurts
	associated with the heart beats and the blood is red.

	Capillary - Bleeding from the capillaries. Small in amount and flows with a gentle ooze.
	Venous - Bleeding from the veins. There is a continuous flow and the blood is dark in color.
	Treatment of serious cases - If bleeding is profuse or a dressing is not readily available grasp the sides of the wound and firmly squeeze them together.
	Apply firm pressure with hand or fingers to the bleeding point. This method will tend to increase risk of infection but is justified when the hemorrhage is severe. Watch for shock and do not apply warmth. Normal treatment - Apply pressure to wound by placing large thick dressing over it, then bandage firmly. Do not remove dressing as this will dislodge blood clot which will form and lead to further hemorrhaging. A tourniquet must not be used. Rest patient. Elevate bleeding part if necessary with patient lying down. If bleeding continues, do not remove first dressing and bandage. Place additional ones on top.
	d. Wounds and infection: Infection cannot be prevented at time of injury but keep a wound as clean as possible afterwards. Treatment - Clean and dress the wound using maximum care to avoid infection. Avoid use of antiseptics except those specially recommended. Wash the wounds outwards; do not swab from side to side. To do so will carry bacteria from skin to wound. Handle all wounds gently. Watch for and treat any signs of fainting.
	e. Fainting: This can be caused by a nervous shock, an injury, standing still for a long time or sudden change in position, or from a hemorrhage. Treatment - If the casualty is in a sitting position and cannot lie flat, press his head down between his knees. If he can lie down, raise his legs and lower his head. Encourage deep breathing if he is conscious. Loosen clothing around neck, chest and waist. Ensure plenty of fresh air. Reassure the patient. If the patient is unconscious ensure breathing by keeping airway open (tilt head back). f. Shock: This is brought about when a state of collapse occurs. It can result in death if left uncontrolled. It can be caused by loss of blood, loss of serum following burns or through heart failure. Treatment - Start first aid immediately. Ensure plenty of fresh

	air. Control any bleeding. Relieve pain by 1) covering wounds, 2) splinting fractures. Do not give fluids to the patient if he is unconscious, or if there is a risk of immediate operation; he feels sick; or there is an internal injury. Do not give alcohol or attempt to warm body up (that can cause shock to worsen). Seek immediate medical care. G. Shark attack: Treatment - Immediate control of the hemorrhage. Attempt this in the water if practical by pressing hard right into or just above the spurting point with the fingers. As soon as the casualty is ashore or on board lie him flat with head down. Pack the wound with any available clothing. Maintain pressure until a firm bandage is applied. Elevate the injured part if possible. Summon medical aid. Do not move the casualty without medical advice. Transport and handling must be gentle to avoid worsening the shock. H. Marine stings: Marine creatures may inflict their stings by: injection of venom through puncture wounds; contact with tentacles bearing stinging cells. Treatment - Clean the wound with water. Remove any foreign bodies. Immerce the part in hot water. Treat for shock. Stings from Tentacles: Pour methlylated spirits or other alcoholic spirits over the area of the sting. This destroys undischarged sting cells. If no alcohol is available spread dry sand over the sting. Scrape off remaining tentacles. Do not rub the area...this causes more venom to be absorbed. Severe Stings: Keep the casualty at rest. Treat for shock. Sustain respiration. Sustain circulation. Send for medical aid.
	I. Sprains: A sprained ankle or wrist is another occupational hazard for fishermen. Treatment - Rest the joint in the most comfortable position. Apply ice packs or cold compresses to the joint. In the case of an ankle, remove socks. Firmly bandage the joint. Remember that a sprain can easily be confused with a fracture. If a fracture or dislocation is suspected get medical help immediately. J. Fumes and Gases: A fisherman can be overcome by fumes or gas aboard his vessel. Treatment - Make sure the rescuer does not become the next casualty. Put on protective equipment immediately. Rescue must be carried out with extreme care, preferably by a person trained in rescue procedure. Get the casualty into the fresh air. If breathing is failing or has stopped start artificial respiration. Remove any contaminated clothing. Wash contaminated skin thoroughly. Treat for shock.

Seek medical aid. Coral Cuts: Treatment - Clean cuts and scratches thoroughly with fresh water or open sea water (rather than lagoon). Cover with clean dressing and avoid exposure. Seek medical help if they do not heal quickly. Salt Water Boils: Treatment - Clean thoroughly with fresh plain water. Apply a non-soluble cream and protect from sun and exposure. K. Removing embedded fish hooks: Hooks embedded in the hand are one of the many occupational hazards faced by fishermen. Treatment - The most common method is to force the hook outwards until the point pierces the skin again. Then break or file off the barb and draw the curved part of the hook along the track of entry. This method can be extremely painful unless a local anaesthetic is ad ministered, but this is not normally within reach of the first aider. Another method is to flick the embedded hook out with a piece of string. String is made into a loop, the ends are wrapped firmly around the manipulator's right index finger, and the loop, some 18 inches long, is placed over the shank of the embedded hook. The fish-hooked finger is placed upon a firm surface, the eye pointing to the left of the manipulator, who then grasps the eye and shank with the thumb and index finger of his left hand which rests upon the patient's hand. He holds the shank rigid and depresses it. This disengages the barb and is painless, provided that the hook is not moved sideways. As a trial the string is slowly straightened out horizontally in the plane of the long axis of the shank. After the trial run the manipulator with the tip of his left third finger holds the central point of the loop of string against the juncture of the hook with the patient's finger. The manipulator's right hand is brought back to the hook and suddenly jerked away again, with full follow-through, in the same direction as in the trial run, spinning the hook back out of the finger without enlarging either the track or the hole of entry. For hooks larger than a size 1 whiting hook, a double loop and a loop length of 24 to 30 inches is used. L. Artificial respiration: Decide quickly the method of artificial respiration. Those who have been taught the Schafer, Holger-Nielson or Silvester methods of resuscitation will know what to do. The easiest and best known method is the mouth-to-mouth system. Mouth-to-mouth treatment - Lie casualty on his back, kneel beside head. Check mouth and throat and make sure they are clear of foreign matter. Remove false teeth. Hold head in both hands, one hand pressing downwards and

	backwards, the other pushing lower jaw upwards and forwards. Open your mouth wide and take a deep breath. Seal your lips around casualty's mouth. Pinch nostrils between your thumb and forefinger. Breathe out firmly into casualty's mouth and watch the chest rise. It should be similar to that in normal inspiration. Then remove your mouth. Allow chest to collapse. If the victim is an infant inflation should be gentle and at the rate of 20 times a minute. Time is vital, the first three or four inflations should be given as quickly as possible. For continued artificial respiration, inflations should be at the rate of 10 per minute. If chest does not fill with air, check the airway and check air seal of your mouth over that of patient. Mouth-tonose treatment - Where the mouth-to-mouth system cannot be used because of an obstruction or damage to the mouth - mouth-to-nose should be used. This method is often used in drowning cases. With the casualty on his back, kneel beside him. Position the head as for mouth-to-mouth. Take a deep breath and seal your lips widely on the casualty's face around his nose. Make sure your lips don't obstruct the nostrils. Close the casualty's mouth by placing your thumb on the lower lip. Breathe out and watch the chest rise. Remove your thumb, part the casualty's lips and allow the chest to collapse. Rate of inflation is the same as mouth-to-mouth. Points to Note: Air must pass in and out of the casualty's lungs. The chest must be seen to rise and fall or the expirations be heard. The head must be positioned correctly throughout. An airtight seal should be maintained during the operator's exhalation into the casualty's nose and mouth. The operator must turn his face away from the casualty's face to watch the chest and to take in fresh air for the next application. When the casualty starts to breathe again, the operator should continue with assisted breathing but he should try to keep In time with the patient's own attempts. Recovery is often accompanied by vomiting. Turn casualty on side with one arm underneath going through to the back, and face resting on the other. This assists with the breathing and allows any discharge to be easier. When the patient has recovered, obtain medical assistance, remove wet or contaminated clothing, promote warmth by blanket cover to prevent pneumonia. In certain emergencies breath can be given to a casualty who is still in the water, provided you can open an airway.
15	2. Trainer emphasizes the seriousness of injuries at sea. Discusses what first aid supplies

Minutes	trainees feel should be taken with them on upcoming fishing trip and the contents of first aid kits they should have as PCVs.
5 Minutes	3. Trainer concludes session by linking to upcoming fishing trip and appointing trainee to be in charge of assembling medical kit.

Session T-43: Exploratory fishing trip I - Preparation

Time: 10:30 AM

Goals:

- **To allow trainees time to organize and prepare for the next day's trip**
- **To acquaint trainees with the necessary details essential to preparation**

Overview:

This session is the preliminary to session 47. The organization of the fishing trip is much too large a task for one individual. Also, the trainees need to be made aware of the time factor involved in preparing for a fishing trip, and the actual work making sure all is ready. By organizing the trainees into teams - food preparation, fish gear, fish processing, handling and care and miscellaneous - and making them responsible for the actual preparation, a better understanding of the role of a small-scale fisherman is achieved.

Materials:

- **Flip chart, markers, tape**

Procedures:

Time	Activities

1 Hour	1. Technical trainer gives fishing trip preview. Trainer
15 Minutes	should have "check-off list" prepared ahead of time to assist in the preparation procedure.
	A. Departure time: early enough to travel to fishing grounds, fish and return.
	B. Type of fishing for trip:
	- handline (session T-22)
	- deep line (session T-24)
	- long line (session T-27)
	- nets (session T-4)
	C. Personal gear to bring:
	- PFD
	- proper clothing
	- gloves
	- hat
	- sunglasses
	- tennis shoes
	- knife
	D. Food to prepare:
	- protein types
	- fruit
	- water
	E. Fishing gear to prepare: (see session T-21)
	- extra hooks, lines, hardware

	- extra hooks, lines, hardware
	- fishing tools, pliers, clubs
	- trolling gear
	- hand lines
	- deep line gear and reels long line gear and reels
	- nets if involved in net fishery
	F. Fish processing, handling and care preparation: (see sessions T-29, T-32, T-35)
	- buckets
	- scrub brushes
	- knives
	- ice box (see session T-39)
	- ice (see session T-39)
	G. Miscellaneous preparation:
	- first aid kit (see session 42)
	- hand cloths for cleaning tool kit for fish boat engine
	- sun screen lotion
	- sea sickness medication
	H. Assigning of groups to prepare:
	- food
	- fishing gear
	- fish processing, handling and care
	- miscellaneous
5	2. Technical trainer produces check-off list and wraps up session by underlining the

Minutes	importance of preparation to successful fishing trip.

Session T-44: Individual interviews/net mending

Time: 2:30 PM to 5:30 PM net mending 20 to 30 minutes per person for interview

Goals:

- **To give each trainee individual time with trainers**
- **To give feedback to each trainee on their progress**
- **To review assessment dimensions**
- **To introduce cutting and mending of nets**
- **To have trainees practice net mending**

Overview:

In this session trainees are once again given formal feedback by the staff, based on staff consensus. Trainees are asked if they have feedback for staff. Personal concerns that trainees may have are checked for. Cutting and mending are introduced by technical trainer at beginning of session.

Materials and Equipment

- **flip chart, markers, pens; nets, twine, needles**

Procedures:

Time	Activities
20 Minutes	1. Trainees are given brief demonstration of net cutting and mending by technical trainer. They will practice this technique for rest of session.
2 Hours 30	2. The following format is recommended for this week's interview:

Minutes	
	o Any concerns you want to talk about.
	o How much time outside of classroom is spent on:
	- your special projects,
	- your group special projects,
	- pacing yourself?
	o Where are you in your decision to go to?
	o Anything you want to say to staff?
	o We have the following feedback for you

Cutting and mending

Cutting out

ID a piece of netting each knot always has four bars leading to it, never three or two unless it is on the edge of the netting, and never five under any circumstances. When the starting knot is tied the twine on the needle forms the lourth her to the knot. On half mesh, pick up and side knots, the twine on the needle forms one her as it is brought to the knot and another as it leaves alter the knot is tied. In the finishing knot the twine on the needle forms one bar as it is brought to the knot and tied.

Therefore, when cueing out a hole, preparatory to mending it, the knot to which the starting knot is to be tied must have three bars leading to it, only one of the normal four bars being cut away (Fig. 28). All the other knots tied in mending the hole, except the finishing knot, must be tied to a knot with only two bars ;leading to it, requiring two bars to be cut away. The finishing knot is tied to a knot with three bars leading to it, so only one bar is cut away.

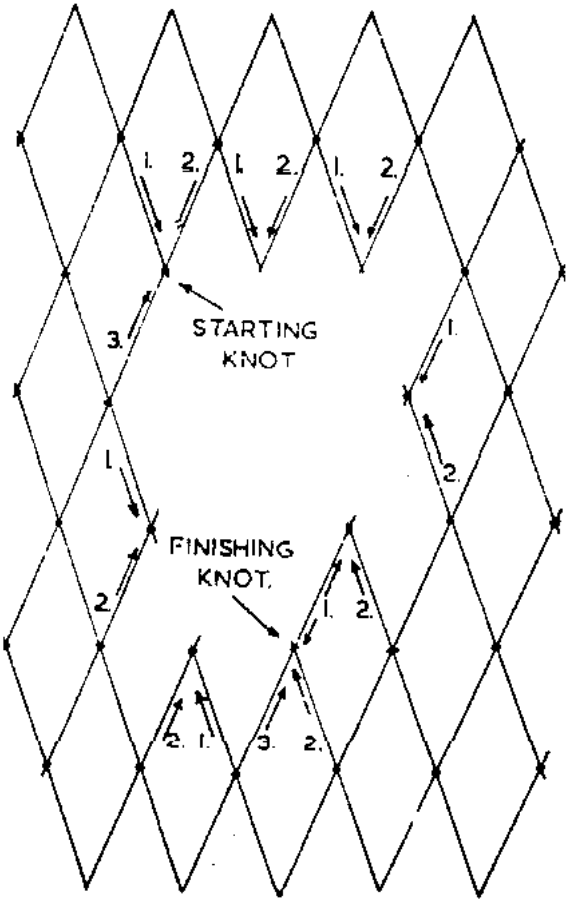
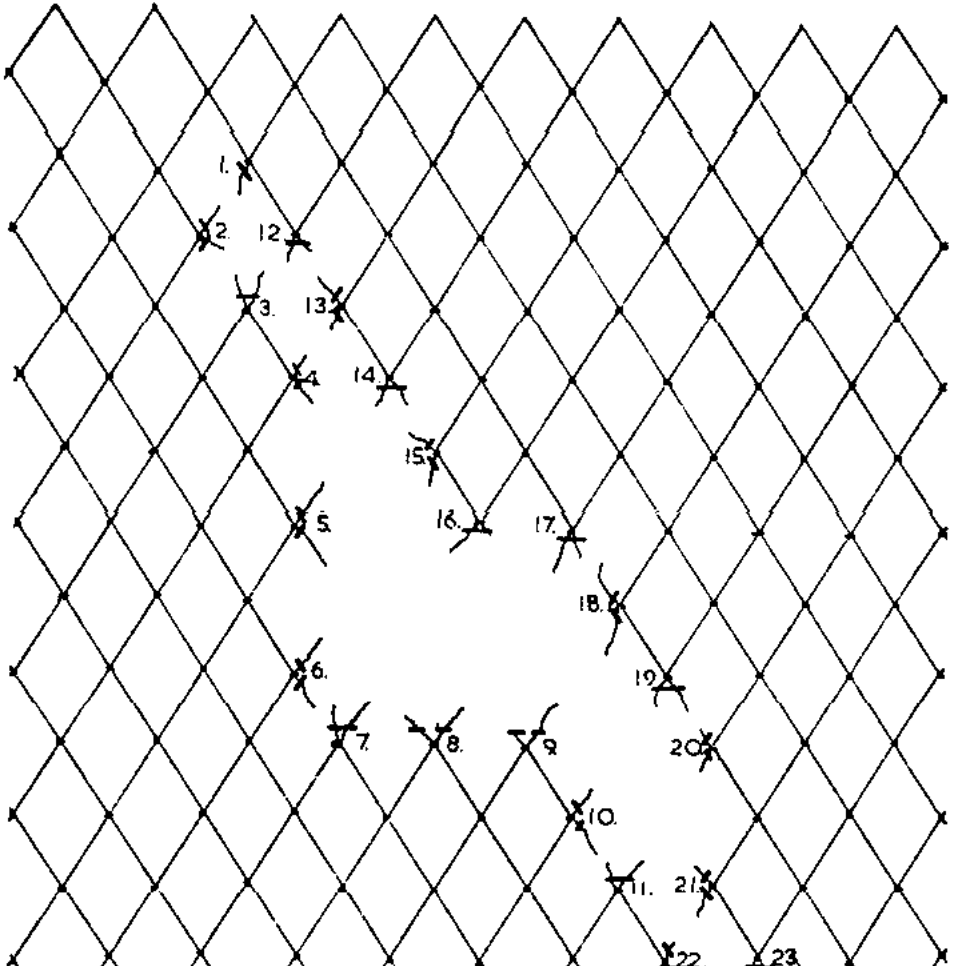


Fig. 28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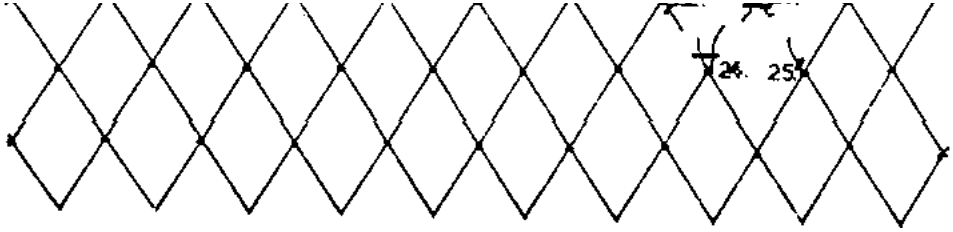


Fig. 29

The procedure for cutting out i. therefore:

1. Arrange and support the net 50 that it is pulling in the right direction with the rows of knots in line (Photo 1). Select the starting knot at the highest point of the hole (Fig. 29-1) and cut away one bar, !leaving three bars to the knot.

3. Work down the left hand side o the hole cutting away two bars from each knot, leaving two bars (Fig. 29-2 to 11) to within a few meshes of the bottom of the hole.

4. Starting at the top again, immediately to the right of the starting knot, work down the right band side of the hole, cutting away two bars from each knot and leaving two bars (Fig. 29-12 to 21) to within a few meshes of the bottom of the bole.

5. Cut two bars away from each remaining knot alternately on the left then the right hand side of the hole (Fig. 29-22 to 24) until a finishing knot ([fig. 29-25) remains, when only one bar is cut sway.

The hole is then ready for mending. With large holes or rips in the net it is often easier to cut out on each side for the first five to 10 meshes from the starting point. Mend this in then cut out a further section and mend it in, so progressing from cutting to mending until the job is completed.

Mending

Mending is a straight forward procedure once the hole has been prepared by cutting out. However, there arc five simple rules to follow and it is essential that the mender does not deviate from them.

1. With the exception of the starting and finishing knot, every knot formed must complete a mesh with four equal sides. (Fig. 30 and 31, half mesh knot; Fig. 32 side lino.; rig. 33 pick up knot.) When the starting knot is made no mesh is formed; when the finishing knot is made two meshes are formed.

2. Each half mesh row, whether moving from right to left or left to right across the hole, must be completed before the next is started.

3. Each change of direction across the hole, at the end of each row, is made by progressing to a side knot.

4. With one exception, after making a side knot the next knot will be a half mesh knot (Fig. 34), a pick up knot followed by a half mesh knot, (Fig. 35) or a finishing knot.

5. A side knot cannot follow a side knot on the same side of the hole (Fig.. 36). This would entail progressing down the hole by a full mesh (two rows) instead of the specified half mesh (one row).).

The exception to rule 4 is when only one bar of a mesh is needed to join the two edges of the hole. Side knot then follows side knot but each successive knot is on the opposite side of the hole and each involves a change of direction (Fig. 37).

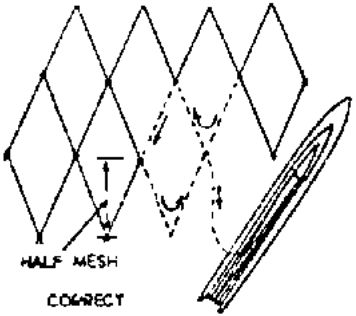


Fig. 34

Fig. 34

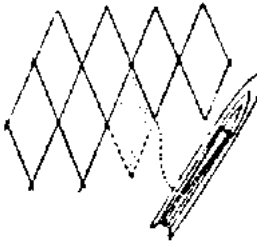


Fig. 30

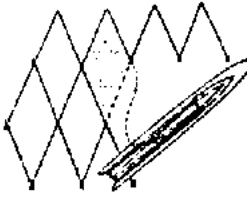


Fig. 31

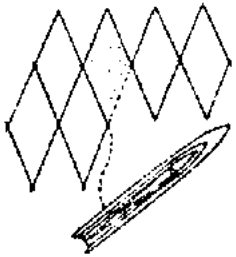


Fig. 32

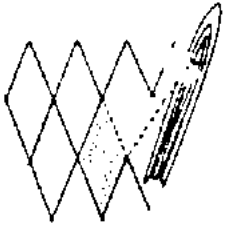


Fig. 33

Figs. 30-33

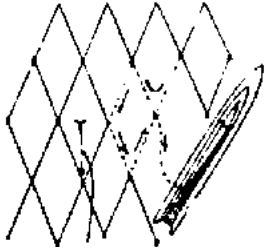


Fig. 35

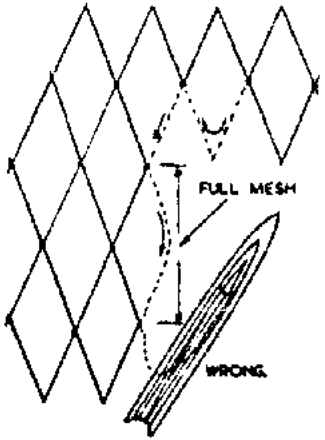
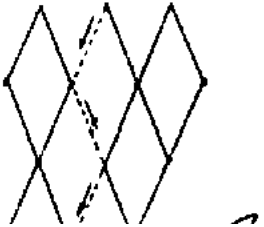


Fig. 36



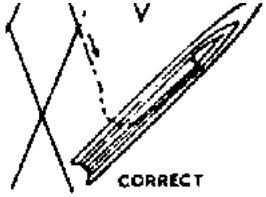


Fig. 37

Figs. 35-37

Fig. 38 shows a .simple mend in which all the knots are used The curved arrows indicate that a half mesh (two bars) is formed to complete a mesh. Moving from left to right from the starting knot 1, two meshes are completed with half mesh knots at 2 and 3. these are followed by a side knot 4; the direction is changed to right to left and a pick up knot made at S. Half mesh knots arc made at 6 and 7 on the loops left when knots 2 and 3 were made. Eight 8 is a side knot followed by a change of direction to a risk up knot 9, a half mesh knot 10 then the finishing knot 11.

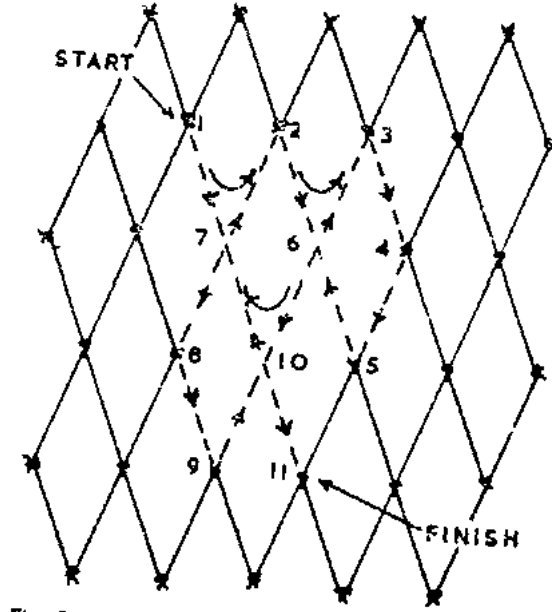
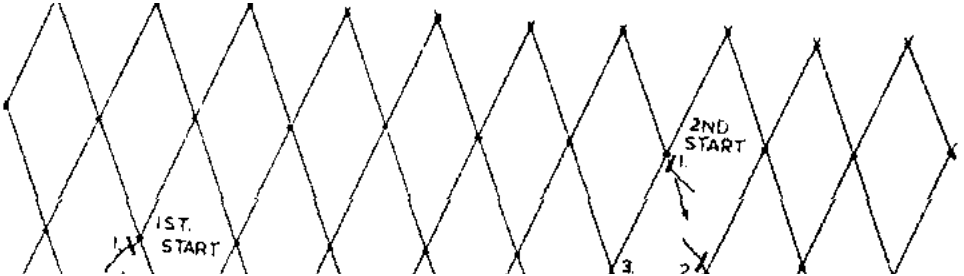


Fig. 39

Fig. 38



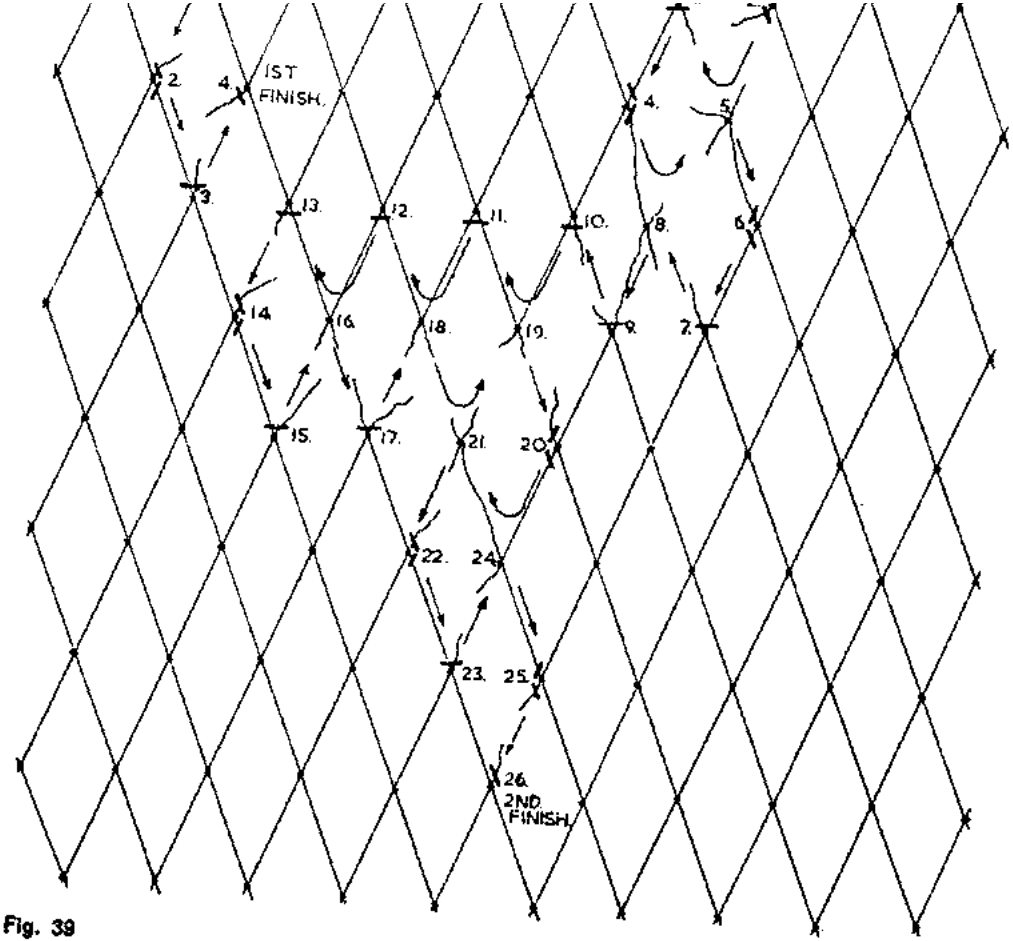

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Fig. 39

Fig. 39

Session T-45: Star charting special project

Time: 7:30 PM

Goals:

- **To acquaint trainees with proper observation techniques when viewing celestial bodies**
- **To familiarize trainees with major star bodies and procedures on locating and identifying them**
- **To utilize technical transfer and presentation skills**

Overview:

This session is to be presented by a trainee as a special project. By focusing trainees on the practicality of star charting and its present day application in small-scale fisheries, in case the fishing vessel is disabled, etc. There is a need to identify traditional styles and technologies. The PCV focuses on the practicality of star charting and present day small scale fishing applications.

Materials:

- **Flip chart, pens, guide to star gazing**

Procedures:

Time	Activities
10 Minutes	1. Introduction to star charting

	A. overview of traditional navigation techniques(see reference)
10 Minutes	2. Major celestial bodies
	A. planets) northern hemisphere
	C star gazers) southern hemisphere
25 Minutes	3. Identification of celestial bodies (rest of presentation to be out of doors to bring realism into session)

Trainer's Note

You will have to provide star map of your location to trainee.

Session T-46: Navigation and seamanship

Time: 8:15 PM to 9 45 PM

Goals:

- **To acquaint trainees with basic navigation systems utilized by small-scale fishermen**
- **To familiarize trainees with simple navigation devices and their proper usage**
- **To introduce to the trainees the navigational chart**

Overview:

The purpose of this session is to provide trainees basic navigation skills. In the following session (47), when trainees are on a fishing vessel, they should have a rudimentary knowledge of navigation, be able to distinguish direction and understand the navigational chart.

Materials and Equipment:

- **flip chart, markers, compasses (hand held), local navigation charts**

Procedures:

Time	Activities
20 Minutes	1. Introduction to navigation
	A. Charts
	B. Basic Tools
	C. Currents and Tides
20 Minutes	2. Introduction to compass usage
	A. Bearings and deviation
20 Minutes	3. Chart usage
	A. Local/inshore navigation
	B. Off-shore
	C. Nautical mile measurement
	D. Tool usage
20 Minutes	4. Navigation of a fishing vessel
	A. Steering the course
	B. Understanding bearings
	C. Use of the navigation chart
10 Minutes	5. Celestial (See session 45)

Trainer's Note:

This session is a preliminary to the fishing trip, session 47. It is important that this session be held prior to the first fishing trip. If the trainer does not feel competent in navigation, an outside resource person should be brought in to assist in the session.

Session T-47: Small scale fishing trip I

Time: 4:30 AM to 4:30 PM (approximately 12 hours)

Goals:

- **To allow all trainees the opportunity to utilize skills learned in formal and special project sessions**
- **To acquaint all trainees with proper small-scale fishing techniques: trolling, hand-line, deep-line and long-line**
- **To give all trainees the opportunity to navigate a small-scale Diesel fishing vessel**
- **To give all trainees the opportunity to operate and be responsible for a small Diesel marine engine**
- **To allow all trainees the opportunity to follow fish handling and care techniques with fresh caught fish**
- **To give trainees opportunity to experience deep sea fishing on a small-scale fishing vessel**

Overview:

This session is held at sea. The trainees will practice techniques previously learned. They will have the experience of using different types of fishing gear, and processing fish at sea.

Materials and Equipment:

- **Personal floatation devices (PFD), fishing gear, food for X people, ice for fish, fish handling and care equipment, fillet and cleaning knives, drinking water, first aid kit, radio am/fm for weather, blankets for seasick trainees**

Trainer's Note:

Very important to utilize boats which are appropriate to small-scale fishery. The trainer should offer guidance, but not interfere with the trainees. If the trainees have been properly trained up to this point, very little input is needed other than suggestions for safe handling of more dangerous species, i.e., shark, barracuda. A team system for fishing and navigating is helpful and allows fuller use of the trainees time and makes them responsible for their actions on board the boat. It is prudent to have the operation/owner of the boat along on the session.

Procedures:

Time	Activities
12 Hours	1. Technical trainer does very little during this session which includes the following:
	a. fishing trip
	- trolling with shava-shava to the fishing grounds
	- handline
	- long-line reel
	- deep-line reel

	- nets
	b. navigation (see session 46)
	- chart course
	- compass orientation
	- helmsmanship
	c. Diesel
	- maintenance; oil, water
	- power systems, shaft
	d. fish handling and care
	- cleaning of fish
	- proper icing techniques

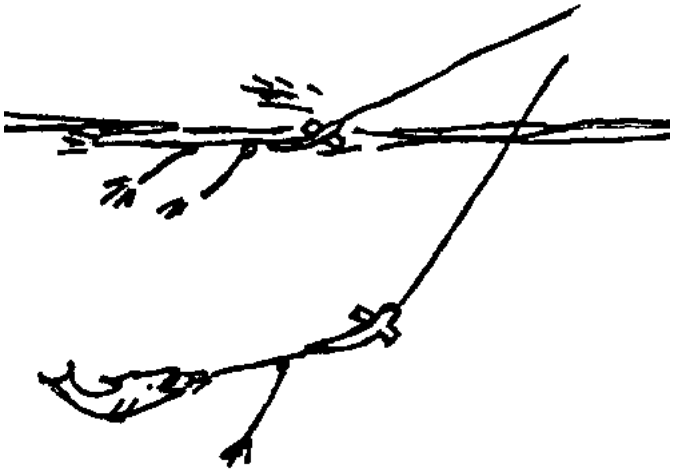
Trainer's Note:

For many trainees this will be the first time they have been at sea in a small fishing vessel. If the sea is rough you can expect some trainees to become seasick.

SHAVA SHAVA "The Artificial Bird"

Figure

Shava Shava skips across top of water when trolled from behind boat. When a fish strikes the lure the Shava Shava is pulled the water surface.

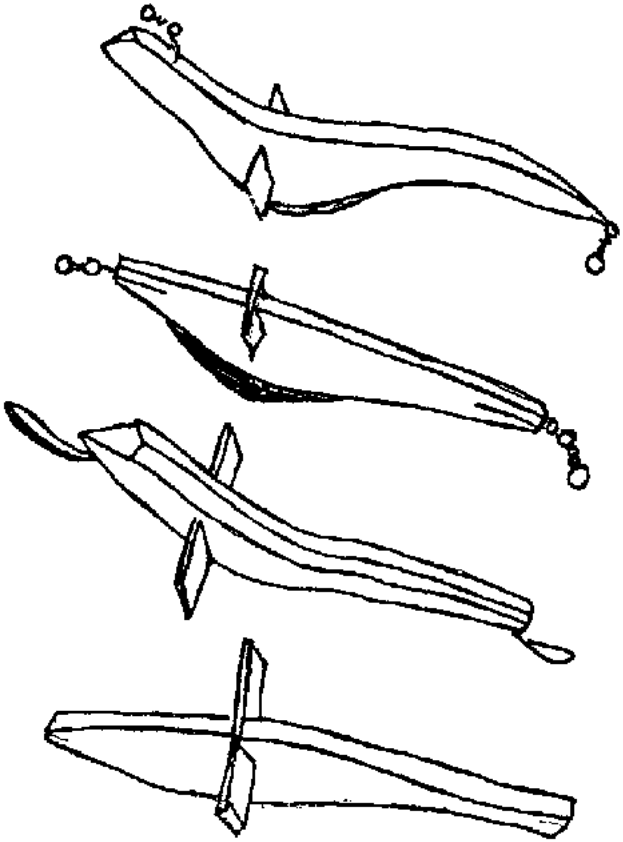


Figure

Shava Shava body of single piece of wood with wooden wing

Size varies, but is approx. 16-20 inches with a wing span of approx. 6-8 inches.

Four variations:



Figure

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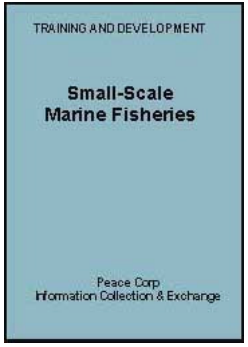


Small-Scale Marine Fisheries - A Training Manual (Peace Corps, 1983, 631 p.)

- **Week 5: Training**
  - ***(introduction...)***
  - **Session T-48: Small-scale fishing - fishing trip assessment**
  - **Session T-49: Salt making - special group project**
  - **Session T-50: Tropical sea birds special project**
  - **Session T-51: Poisonous and toxic fish - special project**
  - **Session T-52: Audiovisual and lesson plans**
  - **Session T-53: Salt making industry: field trip**
  - **Session T-54: Corrosion control special project**
  - **Session T-56: Solar fish drying**
  - **Session T-57: Fish smoker special project**
  - **Session T-58: Charcoal making special project**
  - **Session T-59: Metric system special project**
  - **Session T-60: Team building**
  - **Session T-61: Introduction to basic refrigeration and ice making with field trip**
  - **Session T-62: Individual interviews and net mending**
  - **Session T-63: Support systems**
  - **Session T-64: Processing field trip**
  - **Session T-65: Special project - seaweed farming**
  - **Session T-66: Culinary skills and fish nutrition special group**

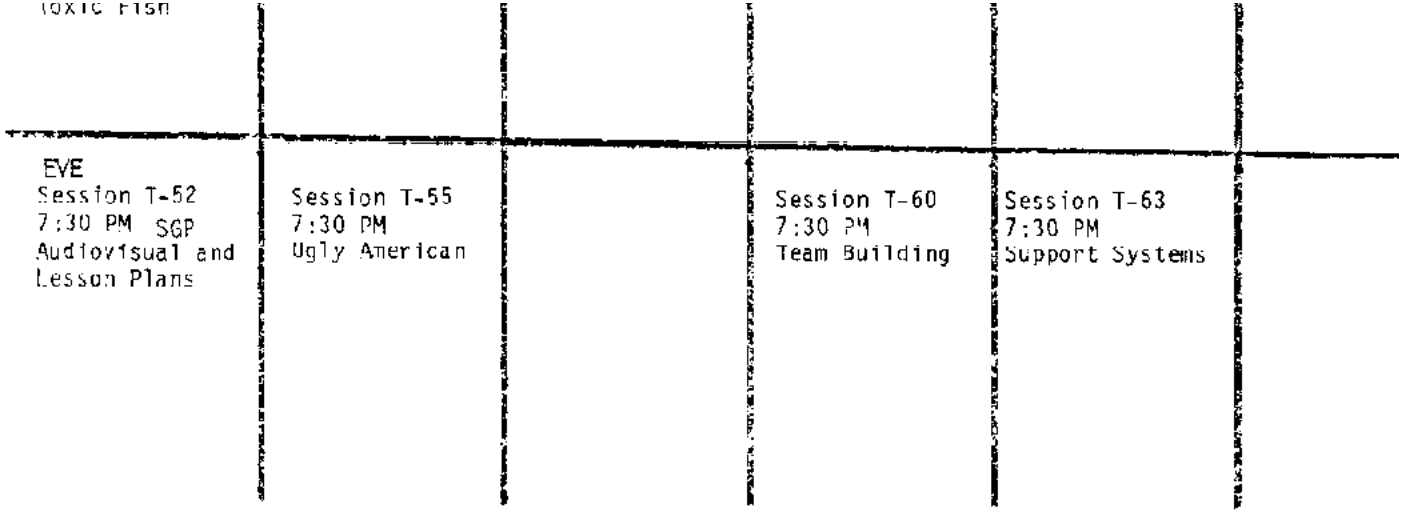
project

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

Week 5: Training

WEEK 5 SESSIONS T-48 THRU T-66

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
AM Session T-48 7:30 AM Small-Scale Fishing Fishing Trip Assessment Session T-49 10:00 AM SGP Salt Making	Session T-53 7:30 AM Salt Making Industry Field Trip	Session T-56 7:30 AM Solar Fish Drying	Session T-57 7:30 AM SGP Fish Smoker	Session T-61 7:30 AM Introduction to Basic Refrigeration and Ice Making Field Trip	Session T- 7:30 AM Processing Field Trip Session T- 8 AM SP Seaweed Farming Session T- 11 AM SGP Culinary S & Fish Nut
PM Session T-50 4 PM SP Tropical Sea Birds Session T-51 5 PM SP Poisonous and Toxic Fish	Session T-54 4 PM SP Control		Session T-58 4 PM SP Charcoal Making Session T-59 5 PM SP Metric System	Session T-62 2:30 PM Interviews and Net Mending	



Week 5, Sessions T-48 Thru T-66

Session T-48: Small-scale fishing - fishing trip assessment

Time: 7:30 AM

Goals:

- **For trainees to formally assess their fishing trip**
- **To make trainees aware of the need for maintenance of fish gear and possible improvements of fish gear for future trips**
- **For trainees to work on gear repair, line quality and hook sharpening, etc.**

Overview:

In this session trainees look back over fishing trip and discern which learnings were reinforced from previous sessions. They rate their skill level and through self assessment decide areas they need skill improvement. Trainees look over gear and make necessary repair to gear and generally ready gear for next trip. They examine which preparations were beneficial to trip and which could have been done differently to have been more beneficial.

Materials and Equipment:

- **Flip chart, markers, tape, fishing gear used on trip**

Procedures:

Time	Activities
30 Minutes	1. Technical trainer has trainees list on newsprint those aspects of fishing trip that went well, and what made them go smoothly. On another piece of newsprint trainees list aspects of fishing trip that could have gone better, and what could be done to remedy problems on future trips.
20 Minutes	2. Trainees are asked to get into pairs (preferably with someone they worked together with during fishing trip). Trainees are asked to give each other feedback about skills. Trainees ask other trainees to help them improve skills which trainees feel they need to work on. Trainees are reminded that they can use feedback positively as well as negatively. Feedback should be limited to aspects of fishing trip.
40 Minutes	3. Technical trainer now reviews:
	a. pre-planning
	- food

	- food
	- fish gear
	- fish preparation/handling
	b. fishing trip
	- trolling
	- lure
	- hand line
	- deep line
	c. navigation
	- boat handling
	d. Diesel
	- premaintenance
40 Minutes	4. Trainees check fishing gear and ready it for next trip. Trainer wraps up session.

Trainer's Note:

Closure would be more appropriate immediately after fishing trip session, however after 12 hours at sea (and some sea sickness) trainees are just not up for processing of their fishing trip session.

Session T-49: Salt making - special group project

Time: 10 AM

Goals:

- **To acquaint trainees with the various methods of salt making**
- **To make trainees aware of salt making methods from sea water**
- **To construct and demonstrate a small-scale salt evaporator**
- **To provide technology transfer skills to trainees**

Overview:

This is an ongoing group exercise in salt making. Though the initial session is primarily concerned with introducing the concept of salt production and building a model salt evaporator, the actual manufacture of salt will take place during the remainder of the training.

Materials and Equipment:

- **Flip chart, markers, wood nails, woodworking tools, plastic liner (.006 mil), clean sea water**

Procedures:

Time	Activities
20 Minutes	1. Trainee leader for whom this is a special project gives lecturette covering the following aspects of salt and salt making.
	a. Various salt usages
	- refrigeration and brine
	- food preservation: salting, drying, smoking
	b. Antiseptic effect of salt
	- osmosis effect in water
	- prevention of spoilage

	- prevention of spoilage
	- longer shelf life
	c. Simple salt making
	- evaporation of sea water solar, cooking
	- evaporation process
	d. Demonstration process
	- site selection
	adequate sunlight, protection from wind
	e. Construction
	- dig evaporation pond
	- build structure
1 Hour 30 Minutes	2. Trainee leader now has team construct and set up evaporation box. Evaporation Box Construction
	a. finish box
	b. plastic liner
	c. collect clean sea water

Trainer's Note:

1. Trainee group should prepare all construction materials ahead of time.

2. If the importance of salt making as a viable cottage industry is not brought out by trainee leader, trainer should bring it up.

The following is a sample lecturette given by trainee leader during pilot program.

SALT MAKING

Summary:

1. What is salt used for (in general, in fishing communities)?

2. Some simple methods for making salt from seawater

3 . Demonstration small-scale salt evaporator

General uses for salt:

1. Food preservation

2. Spices in cooking

3. Health (greater need for salt in hot climates)

4. Refrigeration (use of brine as a secondary refrigerant to lower freezing temperature)

5. Industrial uses: soap, bleaching powder, dyes, pottery, fertilizer

Main uses for salt in small-scale fisheries:

Refrigeration - A concentrated brine solution can be used as a secondary refrigerant to lower the freezing temperature of water. This temperature will vary, depending on the concentration of salt in the brine. The lowest temperature which can be reached is -6° F at a brine concentration of 23.3% salt (by weight).

Food preservation - Salting, especially in conjunction with smoking and drying, retards bacterial growth and subsequent spoilage of fish, giving preserved fish a longer shelf life.

Why is salting not more frequently used in small-scale fishing communities?

Problems often exist with cost and availability of salt. Despite the abundance of natural resources (seawater), coastal communities often import salt from hundreds of miles away. Thus, the establishment of small-scale salt making operations can be a very worthwhile investment for a fishing community.

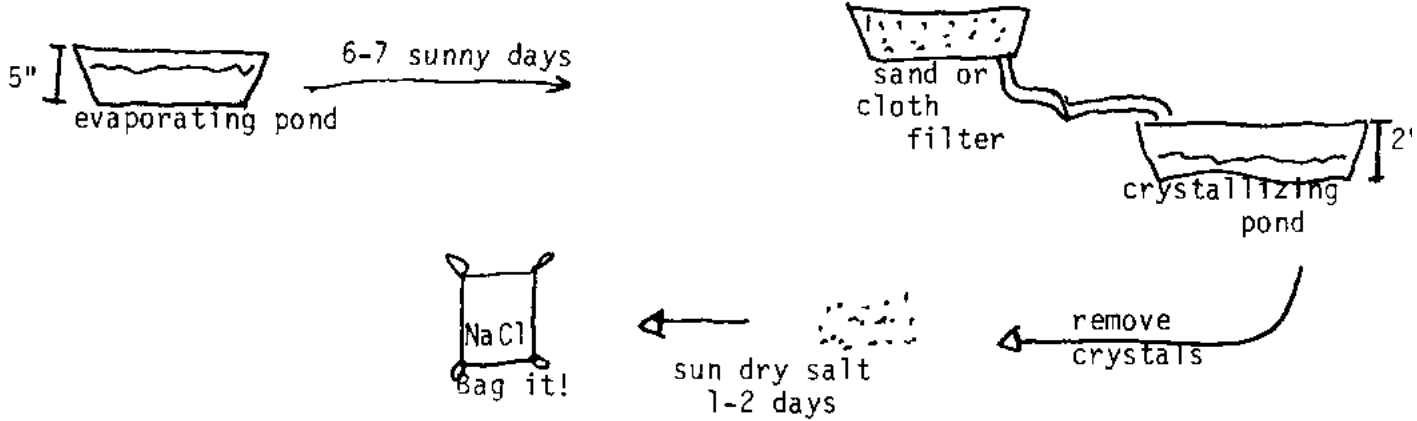
Methods for small-scale salt making:

All salt making at the simple level in which we are interested involves evaporation of seawater, leaving coarse salt crystals. This can be done by solar evaporation or wood fired cooking.

Solar Methods - Ponds - Shallow ponds dug near a salt water source are frequently used as salt evaporators. In the Philippines, fish culture in the wet season alternates with salt production during the dry season. Where a sandy substrate is available, a pond may be shaped in sand and then lined with plastic to hold water. Bamboo Halves - Also from the Philippines, this technique utilizes a preconcentrated brine set out in shallow bamboo troughs to crystallize. The seawater is first concentrated by leaching it for several days through a sand filter. This makes the process somewhat more laborious, but where bamboo is readily available, it may be a practical technique. Structures lined with plastic - For our demonstration project, we chose to build a wooden box and line it with plastic, since sites for pond digging were not available. This provides a permanent structure which can be moved if necessary, though costs for materials will be higher than with the above methods.

Cooking Salt - Most methods which produce salt by cooking give a refined table quality salt, as opposed to the coarser grade salt produced by solar evaporation. The basic method entails boiling a concentrated brine (sometimes made from impure or 'dirty' coarse salt) until only fine salt crystals remain. Note: When using salt in fish processing,

be aware that impurities in the salt can affect the final product, eg. color, taste, etc. For instance, concentrations of copper and iron can cause a yellow and brown discoloration in the salted product. Bacterial molds adapted to high concentrations of NaCl can cause spoilage of salted fish. These bacteria can be killed by pre-heating salt at 100°C for 15-30 minutes before use in processing. The following diagram illustrates a basic two-step salt making process for a pond or other evaporation container:



Figure

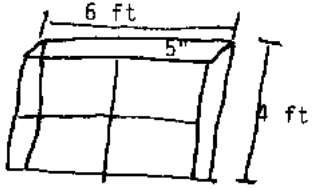
1) Clean seawater sits in an evaporation pond at approximately 5" depth until it evaporates to a more concentrated brine solution. The rate of evaporation will vary depending on weather conditions: air and ground temperature, amount of sunlight, rain, etc. An example from a demonstration project in the Philippines found that with an atmospheric temperature of 26°C-29°C and a ground temperature of 40°C52°C, daily evaporation is 12-15% of seawater for a six square foot surface area at 2" depth. 2) The brine solution is run through a sand or fine cloth filter to remove dirt or impurities, then

put into a crystallization pond at no more than 2" in depth 3) If the brine in the crystallization pond is not agitated and there is adequate sunlight, salt crystals should begin to form. The salinity will be about 200% at this point. 4) Remove salt crystals by hand, let dry in the sun for 1-2 days. 5) Crystallizing ponds should be cleaned after use especially if a white slurry remains. This contains carbonate and sulfate crystals which are sharp and not desirable in the pond or salt crystals.

Demonstration Project:

The following categories were considered in planning a demonstration salt maker: 1) site, 2) design, 3) materials and construction, 4) maintenance.

1) Three important aspects to consider when choosing a site are: proximity to and availability of clean sea water, protection from wind, good exposure to sunlight for most of the day. Due to the lack of open sandy areas near the shore for digging a pond, it was decided to build a box evaporator and line it with plastic. Originally, a small corner on the cooperative grounds was to be used for the site. Later, this was changed to the flat roof of the storeroom as this would be out of reach of curious onlookers, children, etc. The roof also has a two foot ledge which shelters the site from wind. 2) The design was taken from a project model done in the Philippines: One simple wooden box 4 ft x 6 ft divided into four compartments: two evaporation ponds and two crystallizing ponds.



Figure

3) Materials used were low grade plywood for the base, 2 x 5" lengths for the evaporation pond edges and 2 x 3" for the crystallizing pond edges. Gauge six plastic was originally intended for the lining, but as this could not be obtained, doubled garbage bags were used. These were stapled in place. (Seawater was obtained in buckets with a boat outside the bay, as this was thought to be cleaner.) 4) Maintenance included covering the pond with a sheet of plywood during heavy rainstorms, measuring the depth each day to gauge evaporation rates, and filtering and harvesting salt at the appropriate stage.

References:

- **"A Study on The Viability of Salt Making in Polyethelene Plastic Material For Small Scale Industry'' by Simeon N. Aypa, Bureau of Fisheries and Aquatic Resources, Manila, Philippines**

- **"Salt: A Growing Major Crop of Pangasinan". Countryside Banking. April 1980**

- **"Preparation of Salt Brines For The Fishing Industry" Kenneth S. Hilderbrand Jr., Oregon State University Extension Service January 1979**

- **"Intermediate Technology and Alternative Energy Systems For Small-Scale Fisheries". David B. Thompson, South China Seas Fisheries Development and Coordinating Program, Manila, Philippines November 1979**

Session T-50: Tropical sea birds special project

Time: 4:00 PM

Goals:

- **To acquaint trainees with the identifying characteristics of tropical sea birds**

- **To learn how to identify families of birds at sea**
- **To make trainees aware of special uses for sea birds in fishing and navigation**

Overview:

This session is a special project for one of the trainees. Trainee acquaints other trainees with sea bird identification as a way to gain useful information for navigation and better fishing. Sea bird identification also gives insight into ecological problems. In future PCVs will be able to use sea bird identification to assist local fishermen in more efficient fish capture.

Materials:

- **Flip chart, markers**

Procedures:

Time	Activities
1 Hour	1. Trainee for whom this is special project gives lecturette using the following example outline used during pilot program.
	2. Trainees should make an attempt to identify sea birds in the surrounding area.

Tropical Sea Bird Identification

Importance of Seabird identification

1. Indicators of land

2. Indicators of fish

3. Indicators of health of environment

4. General knowledge

Important characteristics for bird identification at sea

1. Silhouettes - most times will only get a glimpse of bird

2. Size - length of bird from bill to tail and wingspread

3. Shape - relative proportions of head, neck, body, appendages

4. Colors - not so important, most seabirds are black, white, grey or brown

5. Patterns - very important. i.e., dark cap, eye spot, dark or light eyebrow, light collar, rump, dark "M" pattern on mantle, wingtip, underwing pattern, breast, tail, wingband

6. Bill shape - long, short, heavy, slim, hooked, pointed

7. Bill color - helps indicate species

8. Foot and eye color - only good at close range

9. Voice

10. Flight - glide or soar, fly rapidly with stiff wings, or slowly with flexible wings, hover, light and buoyant or heavy and sluggish rapid, deliberate, leisurely, how high, just above waves, above horizon or high over masthead

11. Feeding habits

12. Flocking

13. Habitat - distance off shore

14. Distribution

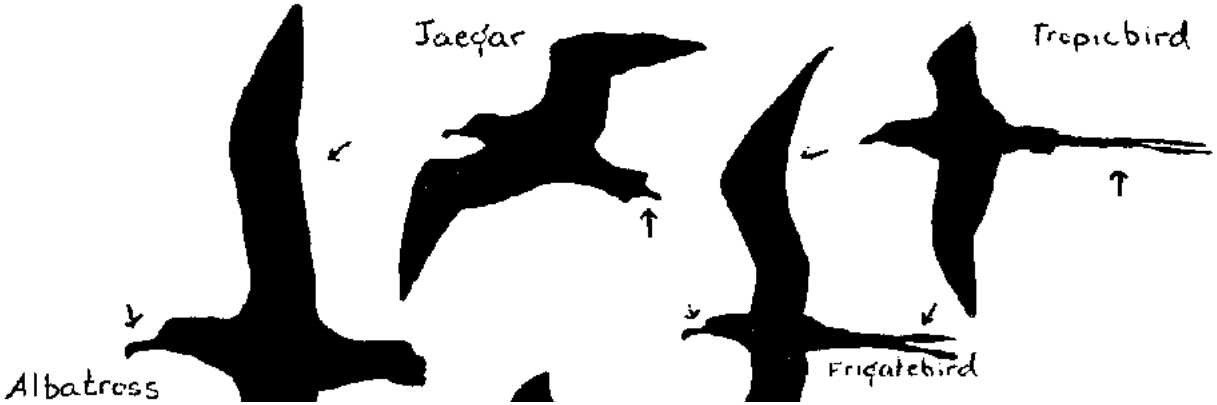
Seabird Identification

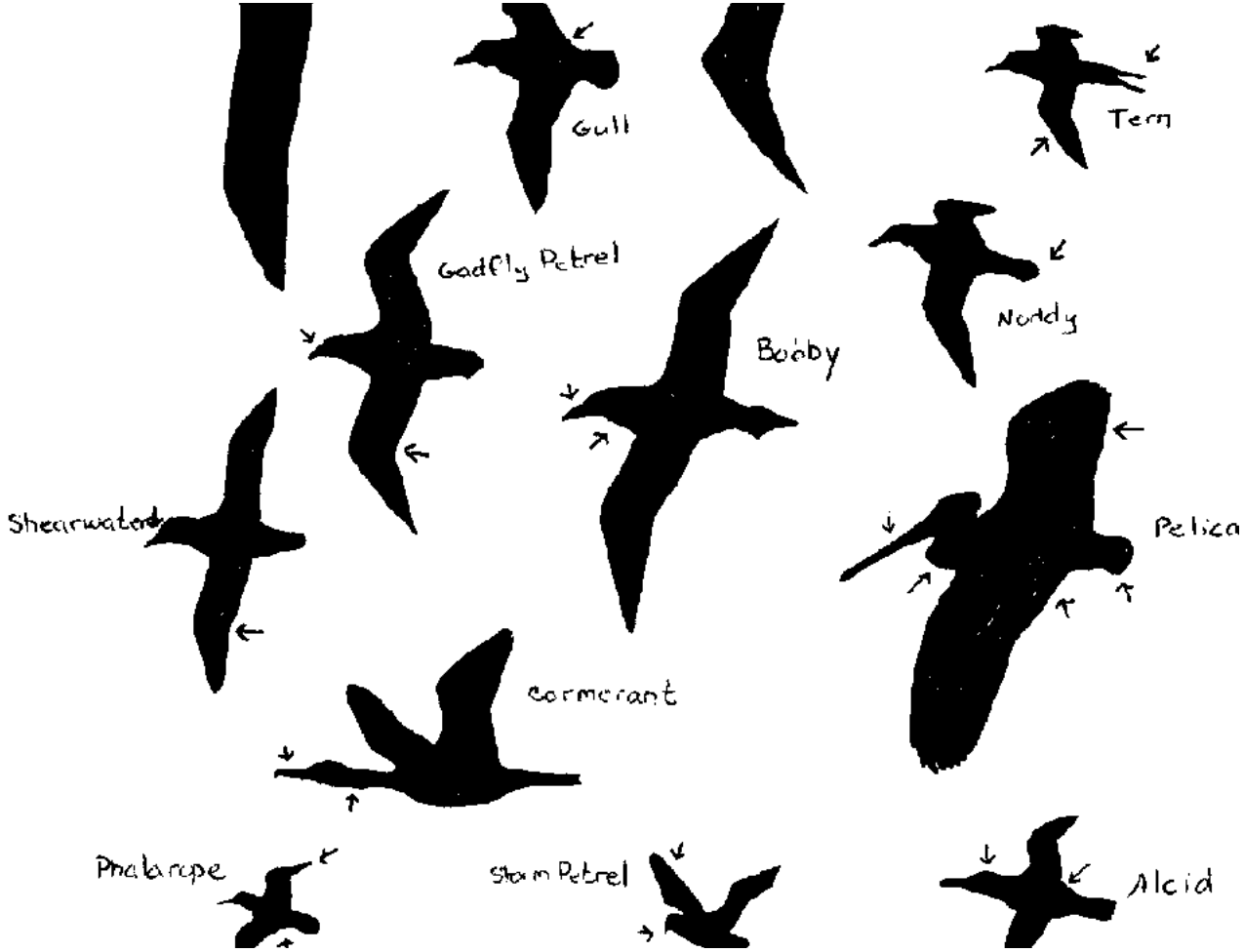
Albatross Diomedeidae: Hugh, largest seabird, long, narrow wings, conspicuous bill, soars and glides. Ship followers.

Jaeger	Stercorariidae: Brown or gray and white. White flash at base of flight feathers, pointed wings, bent at wrists. Elongated central tail feathers.
Tropic Bird	Phaethontidae: Elongated central tail streamers, long wings, pelagic.
Gull	Larinae: Long wings, stocky body. Powerful buoyant flight. Ship followers.
Frigate Bird	Fregatidae: Mainly black, deeply forked tail, slender body, hooked bill, never land on water - feathers not waterproof. Pirates - force others to disgorge their catch, males all black, red throat patch inflate, females black with white throat.
Tern	Sterninae: Small, slim body. Long wings, forked tail, pointed bill, related to gulls, flock indicates fish.
Noddy	Sterninae: Contrasting colored cap, slim body, long wings, wedge shaped tail.
Booby	Sulidae: Large pointed bill, large head, long pointed wings and tail, throat patch, long neck, black and white or brown and white, brightly colored feet, legs, and bill, indicate fish.
Gadfly Petrel	Procellariidae: Long wings, bent at wrists, heavy hooked bill, erratic flight, highly pelagic, all dark or dark with white underparts. Wedgeshaped tail, tubular nostrils.
Shearwater	Procellariidae: Long, narrow wings, fully extended, slim hooked bill, all dark or dark

	with white underparts, paired tubular nostrils
Cormorant	Phalacrocoracidae: Long hooked bill, long neck and tail, rounded wings, black, flight pattern V, submerge to escape, float low in water, prefer shallow offshore water.
Pelican	Pelicanidae: Huge, heavy body, broad wings, head folded on breast, flaps slowly, white, distensible throat pouch, never far from land, head drawn in while flying.
Alcid	Alcidae: Short narrow wings, heavy body, large head, conspicuous feet. Small body, black and white, fly low over water, escape by submerging, become airborne with difficulty.
Storm Petrel	Hydrobatidae: Very small, long rounded wings, flits over waves, "butterfly flight", pelagic , nostrils united into one tube.
Phalarope	Phalaropodidae: Very small, slim bill, pointed wings, pelagic, lobed feet, breeding plumage chestnut, fly low over water.

- Margie Hulsair, PCV Sierra Leone




Gull
Tern
Godfly Petrel
Noddy
Booby
Shearwater
Pelican
Cormorant
Phalarope
Storm Petrel
Alcid

Birds

Session T-51: Poisonous and toxic fish - special project

Time: 5:00 PM

Goals:

- **To acquaint trainees with marine fish which are poisonous to eat**
- **To acquaint trainees with marine fish which are dangerous and/or toxic to touch**
- **To introduce simple remedies and/or treatments for marine fish poisoning or toxicity**
- **To provide technical transfer and workshop skills to the trainee presenting the session**

Overview:

This session is presented by a trainee for whom this is a special project. Poisonous fish and other marine life can be dangerous. Harmful marine life is more prevelent in tropical waters than in temperate waters. There is a need to be able to identify those fish which are potentially harmful to the PCV in the field.

Materials:

- **flip chart, markers**

Procedures:

Time	Activities
45 Minutes	1. Trainee presents lecturette on ciguatera, the symptoms and possible treatment. Also covers fish which carry toxins, bacterial toxicity and fish dangerous to the touch as well as venomous fish. Following is an outline presented by trainee during pilot program.

POISONOUS AND TOXIC FISH

Fish which are poisonous to eat:

Ciguatera - Ciguatera is a general term for fish poisoning with a common group of symptoms resulting from a not well understood toxin. Over 300 species of fish have been associated with ciguatera, especially those occuring in reefs and shallow water areas and around islands, usually within 35° of the equator. It has been suggested that the toxin may originate with a benthic alga and some correlation is seen with fish at higher levels of the food chain such as snapper, barracuda, groupers, and surgeon fishes. Poisoning occurrences can vary with season and locality.

Symptoms, which can begin from within 4 hours to 30 hours after a meal, include tingling of lips, tongue and throat followed by numbness, nausea, abdominal cramps, diarrhea, metallic taste in mouth and temperature confusion. More severe symptoms include muscular weakness, dizziness, pallor, insomnia, exhaustion and muscle pains. The death rate is 10% or less.

Treatment varies according to symptoms present, as there is no single antidote.

Other Toxic Organisms - In general, viscera, ovaries and liver of all species will have a higher concentration of any toxins present in the fish. The livers of sharks, seals and

whales are poisonous due to high levels of vitamin A. Turtles also have been reported to cause poisoning similar to ciguatera, though this is not a common occurrence.

Bacterial Toxicity - The largest proportion of illnesses caused by eating fish and shell fish result from bacterial toxicity. Direct causes are polluted waters, and indirect causes are secondary contamination during processing.

Food poisoning occurs with greater frequency in warm water and in warm climates. Be very careful about eating raw seafood, especially raw invertebrates. If purchasing shellfish or crustacea, make sure the animals are alive when purchased. Shellfish can be decontaminated by placing them in a bucket of clean seawater for 24 hours.

Type E Botulism is commonly associated with seafood and usually is contracted from raw or improperly processed seafood. Be especially careful of fish or fish roe which is fermented, smoked or held in vinegar. Heat (cooking) will kill the type E Botulism.

Parasites, though occuring in the majority of cases in fresh water organisms, also exist in marine forms and certainly will be found in some estuarine species. Again, they are usually contracted from insufficiently cooked, raw, or improperly processed seafood.

Fish which are poisonous to touch:

- Jellyfish, Portugese Man 0"' War - causes skin irritations, welts; allergic reactions include an asthma like reaction. Treatment: urine, green papaya, hard liquor, isopropyl alcohol, followed by dilute ammonia or saturated baking powder solution.

- Urchins - sharp spines with barbs lodge in feet or arms and break off. Treatment: remove spines if possible, clean and watch carefully for infection.

- Stingrays - are common in shallow coastal waters, burrow in sand. The rapid action of

the spine causes injury or laceration plus injection of venom. Treatment: irrigate wound with clean salt water, soak wound in hot water (the venom is sensitive to heat) for 30-90 minutes, later apply antibiotics.

- Corals, Sponges, Hydrozoans - some of the above cause stings similar to those from jellyfish; sponge spicules lodge in skin - do not handle; "Fire coral", actually a hydrozoan, causes skin irritation, corals are sharp and can cause cuts. Treatment: remove pieces of coral, wash with hydrogen peroxide and treat with antiseptics.

Bony Fishes:

Stonefish - Stonefish are the most dangerous poisonous fish of the Indo-Pacific. They live in warm shallow waters, in crevices of rocks and corals and are well camouflaged. Stepping on any of the numerous spines which inject venom into the victim causes excruciating, immediate pain, sometimes delirium and death. Treatment: an antivenom exists, developed in Australia.

Scorpion Fishes - These fish occur in all oceans and all have one or more venom glands. They camouflage themselves in weedy habitats and if stepped on, cause extremely painful stinging which can last months. Hypotension and impairment of respiration can occur. Treatment: no antivenom exists, seek medical attention, try applied heat to detox poison.

Porcupine Fish - These fish are related to puffers and the spines erect when disturbed. The toxin can cause respiratory failure and a fall in blood pressure. Treatment: no known antidote.

Others:

Moray Eels - Bites from morays can be severe, are easily infected, and the eel will usually not let go. Treatment: irrigate wound, clean, watch for infection.

Sea Snakes - Of 50 species of sea snakes, many are widely distributed geographically. Some are aggressive, some docile, and the fangs are located far back in the snake's mouth. Most bites result from handling nets at night. Only a small prick occurs with no pain; within 5 minutes to 8 hours muscles ache, are stiff, tongue is thick. A small proportion of bites are fatal. Treatment: antivenom exists for some species - try to capture the snake and seek medical attention.

A general rule is to be careful! Medical help may not be readily available.

References:

- **Australian Venomous and Poisonous Fishes. R.V. Southcott M.D. D.Sc. 1975. Pub. by R.V. Southcott, Mitchem, South Australia 5062**
- **Fish and Shellfish Hygiene. Report of a WHO expert committee convened in cooperation with FAO, WHO technical series No. 550. Geneva 1974.**
- **Fish Poisoning in the South Pacific. Dr. R. Bagnis. 1973, South Pacific Commission, Noumea, New Caledonia**
- **Dangerous Marine Organisms of Hawaii. Athline M. Clark 1978. University of Hawaii Sea Grant Marine Advisory Program.**

- Rebecca Hoff, PCV Sierra Leone

Session T-52: Audiovisual and lesson plans

SPECIAL GROUP PROJECT

Time: 7:30 AM

Goals:

- **To show trainees that lesson plans can facilitate the planning, preparation and presentation of instructional activities, i.e. workshops and meetings**
- **To acquaint trainees with various audiovisual aids appropriate to Third World settings**
- **For the trainee assigned the special project to build on communication/technology transfer skills**

Overview:

This session is a follow-up to Session 28, Communication Through Illustration. Audiovisual aids and well planned and presented workshops are key elements of successful extension services.

Procedures:

Time	Activities
30 Minutes	1. Trainee assigned the special project gives a lecture on audiovisual aids and lesson plans. Emphasized are materials appropriate to Third World settings, such as grass matting or banana leaves for bulletin boards, home made chalk boards, etc.
1 3/4 Hours	2. Trainee divides the group into small groups of 4 and 5 to prepare a lesson plan for any topic using the attached format. Small groups report out on their lesson plan and then present the lesson.
15 Minutes	3. Trainee draws closure to the session by linking back to previous sessions on extension, community analysis and WID and stressing the importance of workshops and audio visual aids, as non-formal educational tools.

References

- **Visual Aids: A Guide for Peace Corps Volunteers**
- **Peace Corps Audiovisual Communications Handbook**
- **Forestry Training Manual**

Following model presentation taken from pilot program.

AUDIOVISUAL AIDS AND LESSON PLANS

I. Audiovisual aids are instructional materials which utilize the senses (seeing, hearing, tasting, touching, smelling) to communicate an idea or to convey a need for action.

A. Audiovisual aids facilitate learning by "attacking" the learner from additional angles. (Make sure that the message is the same from all angles.)

B. Audiovisual aids may be divided into five categories: printed materials, presentation boards, three-dimensional materials, active aids and electrical materials.

Category	Examples	Materials Used
Printed Materials	leaflets, booklets, posters, flip charts, charts and graphs, maps, story boards, pictures, flash cards, wall newspapers	paper, newspaper, cardboard, plywood, ink, natural pigment, charcoal, chalk, stencils, ditto machine, off set or letter press printing
Presentation Boards	bulletin boards flannel boards chalk boards	wallboard, plywood, pegboard, wall of building, blanket stretched between two trees, banana leaf or grass matting, corrugated cardboard, wire screening, bamboo, palm fronds, thorns or bamboo splinters (tacks), rough-weave blanket or burlap over plywood, yarn, sand and glue backing, plywood or oilskin covered with flat, dark paint, chalk
Three-Dimentional Materials	puppets models multi-media exhibits	wheat or cassava paste over news paper, jams, paint, dye, socks, wood, metal, clay, plaster of paris, bamboo, plywood, pegboard, grass matting, heavy string or rope, wire, plastic clothsline, fishnet, screening
Active Aids	plays or skits, characterizations, games, demonstrations, field trips	people, props, transportation, existing structures or projects, nature
Electrical Materials	films, slides, tape recordings, public address, radio spots	projectors, films, slides, tape recorders, tapes, intercom systems, radios

Table

C. The use of audiovisual aids involves planning, preparation and presentation.

1. Planning

a. Identification of needs/audience analysis

1) The need to know and the need to change must be derived from the value system of the audience.

2) The problems and solutions addressed must be acceptable to the audience.

3) The group affiliation, age level, occupational, educational, cultural, social and language backgrounds of the audience must be identified.

b. Statement of objectives

1) Objectives should address the knowledge, skill or attitude change desired of the audience.

2) Objectives should be stated specifically and should indicate the process by which they will be evaluated.

c. Presentation strategy

1) The objectives should define how best to meet them.

2) The type of audiovisual aid to be used is selected based on the objectives.

d. Selection of information

1) The objectives should indicate the content necessary to accomplish them.

2) The content to be used is selected based on the objectives

e. Organization of information

1) A content outline is developed and then specific details are added (treatment).

2) The content must be arranged so that it is attractive, interesting, understandable and easy to follow.

2. Preparation

a. Base the A-V aid on one or two simple ideas presented in a simple, straightforward manner. (Simplicity is an asset!)

b. Be neat and use basic principles of color and design.

c. Be careful in your selection of symbols and your representation of them. (Things don't look the same and aren't seen the same - visual perception - all over the world.)

d. Have some members of the intended audience assist you in the preparation of the A-V aid; their involvement will make it more effective.

e. Evaluate effectiveness in advance by asking some members of the intended audience appropriate questions relating to planning, preparation and presentation.

1) What would you say was the purpose of this material? Why?

2) What are the main points made?

3) What other points are made?

4) Is there something that might not be clear?

5) Is there something that might be added to make this material more understandable?

3. Presentation

a. If included in a presentation, make sure that the A-Y aid is appropriate to its context.

b. Make sure that the A-V aid is visible to all members of the audience and that their attention is focused on it when it is being used.

c. If not included in a presentation, locate the A-V aid so that it will be seen by as many members of the intended audience as possible.

d. Evaluate.

1) Who saw the A-V aid?

2) Were the objectives met?

II. Lessons plans are forms which facilitate the planning, preparation and presentation of instructional activities (i.e., audiovisual aids, workshops, presentations, formal and informal meetings).

PRESENTATION PLAN

Name: Marilyn Berry	Place: Association of Fishermen
Subject: Presentation Plans Audience Peace Corps Trainees	Date: November 9, 1982 Time: 7:30 PM
Special Considerations:	Prerequisite Learning:

What occupational, cultural, educational and social considerations may affect the audience's understanding and acceptance	What knowledge, skill or attitude must the audience have prior to the presentation? of the presentation?
Objectives:	Materials:
What knowledge, skill, or attitude will the audience have after the presentation?	What materials will be used during the presentation?

Presentation Strategy: How will the objectives be accomplished? What information will be presented? How will the information be presented? In what order will the ideas be presented? What questions will the audience be asked to answer? What techniques will be used to reinforce the ideas presented?

Evaluation: Have the goals been accomplished? What aspects of the presentation contributed to the accomplishment of the goals? What improvements should be made?

References:

- **Peace Corps Audiovisual Communications Handbook. Pett, editor.**
- **Visual Aids: A Guide For Peace Corps Volunteers. 1977.**

- Marilyn Berry, PCV Sierra Leone

PRESENTATION PLAN
Name:_____ Place:_____
Subject:_____Date: _____
Audience:_____Time:_____
Special Considerations: Prerequisite

Objectives: _____ Materials:

Presentation Strategy:

Evaluation:

Session T-53: Salt making industry: field trip

Time: 7:30 AM

Goals:

- **To allow trainees opportunity to view a small-scale salt making operation**
- **To make trainees aware of the possibilities of income generation on the community level a salt making system**
- **To acquaint trainees with the entire salt making process from start to finished product**

Overview:

This session is important in that it combines key areas of the training - fish preservation and income generation. The field trip is short four hours of walking through a salt making processing facility. The availability of industry personnel to answer questions is also an important facet of this session. Generally, the industrialization of salt making is on a larger scale than the PCV will be dealing with; however, the salt making process will be the same - except on a smaller level. Tie into SP on salt making, Session 49.

Materials and Equipment:

- **Transportation for trainees, trainers**
- **Sunglasses due to salt glare, cameras, notebooks**

Procedures:

Time	Activities
20 Minutes	1. Technical trainer gives brief orientation to the salt making industry to be visited.
	a. salt making process
	b. facility
	c. economics of salt making
	Technical trainer reminds trainees of the interview techniques they have practiced previously and gives a few minutes for trainees to form questions that they might want to ask while on field trip.
3 Hours	2. Tour of salt making facility
	a. salt ponds
	b. dike system
	c. plant facility
30 Minutes	3. Upon return technical trainer processes the experience of the field trip. Questions that were asked are reviewed, interview techniques are critiqued by trainers

Trainer's Note:

A preliminary trip to facility to arrange field trip with the facility personnel is a must. A follow-upletter giving exact dates and times is advised.

Session T-54: Corrosion control special project

Time: 4 PM

Goals:

- **For trainees to become aware of the proper cathodic protection for boats in salt water**
- **For trainees to become conversant with various methods and techniques available for protecting boats**
- **To enable trainee assigned to build on communication/technology transfer skills**

Overview:

This is a special project session. This session points out the basics of corrosion and the various methods to protect vessels from corrosion.

Materials:

- **flip chart, markers, corroded objects for demonstration**

Procedures:

Time	Activities
1 Hour	1. Trainee for whom this is a special project gives presentation on corrosion covering the following:
	a. types of corrosion
	- galvanic
	- stray-current
	b. preventing
	corrosion
	c. factors influencing the proper amount of zinc
	d. overprotection

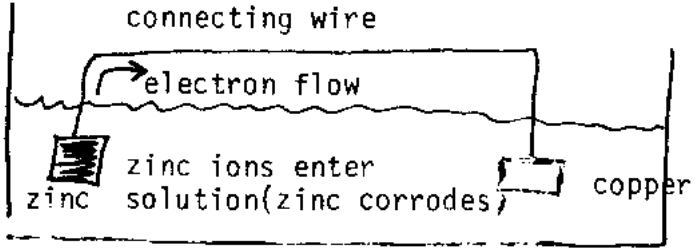
	e. placement of zincs
	The following presentation is from the pilot program.

CORROSION CONTROL

Any action, chemical or biological, which breaks down the integrity of a vessel is corrosion. Fighting corrosion is never an inexpensive proposition. The costs in time and money are often high but are borne out when you consider the monetary value of your vessel and the personal value that you attach to your life.

Electrochemical corrosion occurs in boats by an electrolytic reaction of two metals ~ with salt water acting as an electrolytic solution. The more easily reactive or lower value metal will corrode first due to the current or charge set up between two unlike metals. Any water will carry the charge but salt water is a much more potent electrolytic solution than fresh water. Salt water speeds up corrosion.

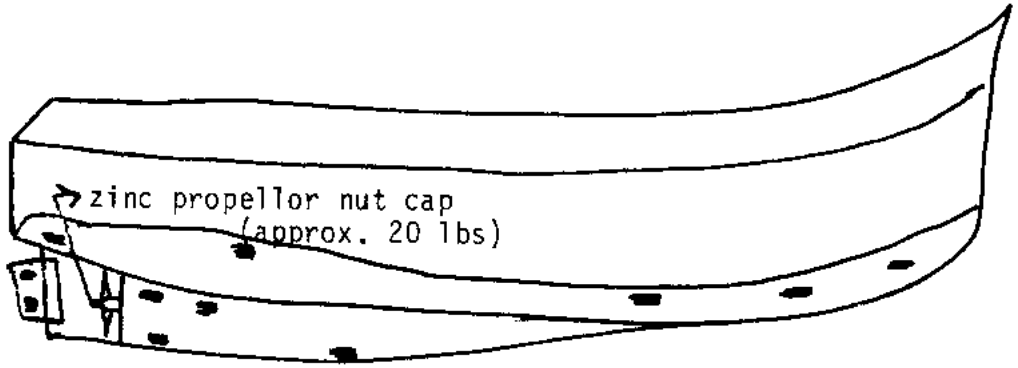
What we do on boats is use a lower value metal, usually zinc, as a sacrificial metal. As the zinc corrodes it provides electrons to other higher value metals (brass, copper, steel) to prevent the loss of their electrons. When there is no zinc remaining, copper, the next higher value will start to corrode away, acting as a sacrificial metal.



Figure

Zinc anodes (referred to as zincs) are the most common form of maritime defense against electrolytic corrosion. Zincs are usually cast around an iron bar, to guarantee a tight clean fit. This bar is then bolted or welded in place below the waterline of a vessel. On wooden boats all metal fittings usually have their own zincs. Those which cannot hold their own zinc are connected to a nearby zinc by a piece of copper wire tightly fixed. It is important to fix zincs tightly to the metal. They protect so that corrosion doesn't form between the two metals and reduce the effectiveness of the system.

Common practice is to concentrate a higher number of zincs to the after part of a vessel. This gives added protection to the rudder and the propeller. From the point of view of navigational safety it is "desirable" to protect both.



Suggested placement of zinc on each side of a 65 foot shrimper. Each bar represents 11.5 lb anode.

The amount and placement of zincs on a hull is often decided by the use of charts and by

guesstimation. The following chart gives some good basic ideas of recommended amounts of zinc to be used on vessels, but it is essential that the amount of zinc be checked and tailored to each individual vessel. These amounts are based on recommendations for ships underway (5 knots or better) when a boat sits in mooring and has very little current, or sits in water with less salinity it doesn't need as much protection.

Hull Material	22ft Doryor Cruiser OB or IOB	32 ft Inboard Trawler	32 ft Auxiliary Sailboat	40 ft Trawler	48 ft Trawler or Combination	58 ft Combination	78 ft Dragger
Wood or Fiber Glass	2-4	18-28	4-7	40-60	50-75	65-100	105-160
Steel or Ferro-Cement	20-30	70-105	45-65	110-165	160-235	230-345	405-610
Aluminum	0-15	30-45	10-20	55-80	80-120	120-185	225-340

Table

These figures are general. They assume differences in amount of equipment on board. When paint is patchy or flakey more protection is necessary to counteract the larger area of metal exposed to saltwater. To use this chart you would check the zincs on your hull when it is slipped. If they are 50% to 80% disintigrated after a year in the water you have adequate protection. If they are gone you have been operating without protection and have widespread problems.

A more scientific method to measure the protection of zincs is done in the water. This calls for measuring the electrical potential of the hull relative to a reference electrode. Here zinc is added until the following measurements are recorded on a silversilver chloride reference electrode:

steel hull - 0.85
Aluminum hull - 0.95
Copper sheathed - 0.65

There are inherent dangers in overprotecting a boat. Over zincing can damage wood or aluminum hulls and blister paint on all types of hulls. Over protecting releases hydroxide ions by electrochemical reaction on the surface of protected metals. These hydorxide ions form lye which eats into wood and aluminum.

The simplist check for "over protection" is to look inside your boat for white deposits around thru-hull fittings. The deposit could be salt. If it has a bitter taste you probably have lye and need to remove zincs immediately. Flush off lye with vinegar and keep your eyes on the area in the future.

Another serious type of electrical corrosion is stray electrical current. Loose or corroded connections, frayed insulation, or undersized wiring all allow electricity to escape along steel plates or wooden planks. (Wood always contains some moisture to help pass along electrical currents.) This leads to rapid desintigration of zincs.

This isn't the last of your electrical problems. Large metal objects on your vessel can have different charges, leading to a flow of current and a loss of metal. The best defense against this problem is called "bonding". This means wiring all large metal objects on a vessel together to equalize their voltage and keep them from corroding.

Fiberglass and wooden vessels are "bonded" by running a copper rod or wire along the length of the hull. All metal objects such as stacks, winches, masts, coamings, engine blocks, stoves, appliances and stays are securely grounded to these copper rods so that built-up current can flow to the zincs. In steel hulled vessels it is only necessary to connect these fixtures to the hull.

Electrical corrosion is a major problem to protect against and very expensive to repair if it does major damage. Corrosion by marine life organisms is another major problem. There are two forms of marine organism corrosion, surface and internal.

Surface barnacles and weed grow on the hull and slow the boat drastically. A clean bottom is a big fuel money saver. Marine organisms can also grow unevenly on the hull due to differences of lighting angles and different grades of anti fouling paint being used on the hull. This can affect the handling of your vessel.

While the organisms are wet they clean off the bottom much easier than after they dry. Thus a boat that sees a lot of use is usually cleaner than one that is moored for months on end. The best protection against a build-up of weed is a good healthy coat of anti-fouling or bottom paint.

Bottom paint usually contains a suspension of copper. As with all paints it is applied to a clean, salt free, dry surface. After the boat is placed in the water the copper is slowly released and acts as a poison to kill organisms which try to lodge in imperfections, cracks, and crevasses on the hull. It usually works effectively for six months to a year and must then be reapplied because the copper has all been released.

When bottom paint is applied it should dry enough to bond with the hull but never enough to totally dry. The copper makes the paint disintegrate and flake off if it dries completely. Check your paint and put the boat back into the water six to twelve hours after you finish painting. (Check the tides and finish painting six to twelve hours before you put your boat back in the water.)

The second major category of marine organisms detrimental to wooden boats are marine borers. The major tropical borer is the toredo navalis. Toredo is found throughout the tropics. It has shells at the head which chew a passage thru wood while the siphons hang out the tail end of the organism. When toredo enters wood it only makes a hole 1/16 inch

in diameter so it is very hard to identify on the surface. As it bores into wood, the hole increases in diameter and the worm grows in length. Toredos grow into a diameter of 1/2 inch and a length of one to two feet. The best defense is a good coat of bottom paint.

The most effective cure is to remove the wormeaten plank and replace with a new plank. There are always effective half measures as well since it isn't always possible to replace a plank immediately.

Toredo can live in water with a salinity as low as five parts per thousand (sea water is normally thirty to thirty-five parts per thousand). Leaving your vessel in flowing fresh water, upstream from the tidal estuaries for two weeks should kill toredo in your planking. The lack of salt in the water kills them.

When you find tiny holes, heating them with a blow torch identifies them as worm holes As the flame heats the area you will see a spurt of water erupt as from a small water pistol. Now that you have found and possibly killed the worm, you want to guarantee yourself of its demise. Insert a piece of stripped, small gauge copper wire into the hole and plug with a small epoxied driven wooden plug. The copper acts as a poison to kill young organisms and the plug keeps them from getting adequate supplies of fresh water while guarding from further invasion.

Now that we have discussed hull corrosion and maintenance we are ready to come above decks. There are four major categories in the open salt air: 1) rusting of iron members, 2) dry rot and moss on exposed wood, 3) checking, splintering and cracking on exposed wood, and 4) solar disintegration of manmade fibers.

1. Rusting of iron members: Iron rusts due to exposure to moisture which causes oxidation. Much shipboard iron is galvanized, which provides a bit of protection. Non galvanized iron should never be exposed to moisture or air. It should be sealed as well as possible. To preserve iron fixtures it is first necessary to have a clean surface. Existing

rust does not hold a coat of paint Step 1. Chip rust pockets and scrape off loose paint. After chipping out major pockets with a hammer, wire brush with lots of elbow grease. Step 2. Surfaces with coatings of grease will not bond paint so it is necessary to remove with soap and water. Step 3. Acid etch to prepare the surface to accept paint. Most commercial etches contain a high percentage of dilute phosphoric acid (about 15% acid) so phosphoric acid diluted works well. This removes the last bits of rust from the metal surface. Step 5. Flush with fresh water (never salt) to remove last bits of residue from surface. Step 6. Apply protective coating to dry surface. There are two types of paint being used today on ships. The best, most expensive and hardest to obtain is epoxy resin paint. This is a two stage paint where a hardener is added to the paint before applying. It is usually applied over a special epoxy resin undercoat. The more traditional system calls for a red lead undercoat followed by two coats of marine grade (or any) external enamel paint.

On shipboard there are many articles which cannot hold a coat of -taint due to banging, chafing and flexing. These are traditionally protected by a coating of flexible tar. Many steel structures are bedded to a deck where water would seep in and are very hard to remove and clean. Therefore, when they are attached they are coated with tar and bedded on a piece of tar impregnated felt. Flexible cable and stays are brushed down periodically with a mixture of tar and diesel or oil to give a thin flexible coating.

2. Dry rot and moss on exposed wood: Work decks cannot be painted well because of the tackle, chain and cases that are constantly dragged across them. Wooden decking has a special problem from fresh water. It impregnates the wood and causes moss to grow, thus breaking down the integrity of the wood grain. This is where that most corrosive element, salt water, saves the mariner. Exposed wood is flushed and scrubbed with salt water. The water keeps the wood from drying out and cracking while the salt kills fresh water mosses which would otherwise harm the planking.

3. Checking, cracking and splintering of exposed wood surfaces: Where possible wood surfaces should be covered. This keeps the wood from cracking. First make sure that wood is clean and splinter free. Wash with fresh water to remove salt and allow paint to bond. There are now preparations to preserve wood from rot. Here in Puerto Rico you can get Metal-Ex which is painted into the wood before painting. After this thoroughly dries, apply two or three thin coats of an enamel paint. Thin coats ensure bond and flexibility of the paint so it doesn't weather off so rapidly.

4. Solar disintegration of man-made -fibers This is the easiest of all to guard. The beauty of man-made fibers at sea is that they don't shrink or rot when wet. On the minus side, sunlight causes them to deteriorate. Therefore, nylon, tryalene end polypropaline nets, fibers, sails and cases should be covered from sunlight as a protection and to extend their life.

Bill Yost, PCV Sierra Leone

References:

- **Corrosion Control, Bonding of Boats, Oregon State University by Edward Kolbe, Burce Mate, Robert Jacobson**
- **Cathodic Protection for Boats in Saltwater, Oregon State University. Nov. 1979**
- **Metrics**
- **Weather for the Mariner, William J. Kotsch, 1377 Naval Institute Press**
- **Preserving food by drying, Manual M-10, Peace Corps Information Collection and Exchange**

Session T-55: The ugly american

Time: 7:30 PM

Goals:

- **To acquaint trainees with the elements of effective development work**
- **To have trainees explore why effective development work is time taking, patient work**
- **To have trainees understand the importance of community involvement**

Overview:

Trainees are given chapter 18 of The Ugly American titled "The Ugly American and the Ugly Sarkhanese." This particular reading points out the necessity for clearly thinking out your project as a development worker. Moves into the absolute necessity for community involvement in a project. Emphasizes the need for ownership of project by community members.

Procedures:

Time	Activities
20 Minutes	1. Trainer passes out reading, asks trainees to spend next 20 minutes reading and underlining elements they see as important in development work.
15 Minutes	2. Trainees are asked to form small groups of 5 or 6 and to list on newsprint the elements which they decide are the most important to them as Peace Corps volunteers. They briefly share these lists with large group. Trainer should point out any elements which they have missed.
15 Minutes	3. Trainees are asked to go back into small groups and list traits the "Ugly American" exhibited which they would wish to emulate. Once again they share lists with large group.

20 Minutes	4. Trainees are now given copies of Chapter 19, "The Bent Backs of Chang 'Dong," asked to read the material and make observations about Emma's behavior that they could apply to their own Peace Corps service. Trainer suggests that trainees may want to write these observations in their own journals.
10 Minutes	5. Trainer asks for any observations that anyone may want to make. Trainer now gives short talk on the learnings over past two weeks - summarizing the role of the extensionist, the need for community analysis and the necessity for setting realistic goals for oneself as a PCV.

Materials:

- **flip chart paper, marker, copies of "The Ugly American and The Ugly Sarkhanese" and copies of "The Bent Backs of Chang 'song " for each trainee**

THE UGLY AMERICAN AND THE UGLY SARKHANESE

Two weeks later Atkins and his wife left by plane for Sarkhan. Emma, a stout woman with freckles across her nose was, in her way, quite as ugly as her husband. She was hopelessly in love with Atkins, but had never been able to tell him why adequately.

She did not blink when Atkins told her they were going to Sarkhan. She told Homer that she'd be pleased to move into a smaller house where she could manage things with her own hands, and where she wouldn't need servants.

Two weeks later the Atkins were living in a small cottage in a suburb of Haidho. They were the only Caucasians in the community. Their house had pressed earth floors, one spigot of cold water, a charcoal fire, two very comfortable hammocks, a horde of small, harmless insects, and a small, darkeyed Sarkhanese boy about nine years old who apparently came with the house. The boy's name was Ong. He appeared promptly at six each morning and spent the entire day following Emma around.

Emma Atkins enjoyed herself in Sarkhan. She learned enough of the language so that she could discuss with her neighbors the best places to buy chickens, ducks, and fresh vegetables. She learned how to prepare beautifully fluffy rice seasoned with saffron. She liked working in her house, and it was a matter of some pride to her that she was as good a housekeeper as most of her neighbors.

Homer Atkins kept busy with his man-powered water pump. The idea had developed very slowly in his mind. What was needed was some kind of efficient pump to raise the water from one terraced paddy to another. Lifting water in the hilly sections consumed enormous amounts of energy. It was usually done by a pail, or by a cloth sack, attached to the end of a long pole. One man would lower the pail and swing it up to the next terrace where another man would empty it. It was a slow and cumbersome method, but the Sarkhanese had been doing it for generations and saw no reason to change. Atkins had decided that there was no sense in trying to talk them out of an obviously inefficient method unless he could offer them a more efficient method to replace it.

He solved two-thirds of his problem. A simple pump needed three things. First, it needed cheap and readily available piping. He had decided that the pipes could be made out of bamboo, which was abundant. Second, the pump needed a cheap and efficient pump mechanism. This had taken longer to find, but in the end Atkins had succeeded. Outside many Sarkhaese villages were piled the remains of jeeps which had been discarded by the military authorities. Atkins had taken pistons from one of these jeeps and had replaced the rings with bands of cheap felt to make a piston for his pump. He then cut the block of the jeep in two; he used one of the cylinders as a suction chamber, and the other cylinder as a discharge chamber. With a simple mechanical linkage the piston could be agitated up and down, and would suck water as high as thirty feet. The third problem, which Atkins had not yet solved, was the question of what power could be applied to the linkage.

In the end Emma gave him the answer.

"Why don't you just send off to the States for a lot of hand pumps like they use on those little cars men run up and down the railroads?" she asked one day.

''Now look, dammit, I've explained to you before," Atkins said. "It's got to be something they use out here. It's no good if I go spending a hundred thousand dollars bringing in something. It has to be something right here, something the natives understand."

"Why, Homer," Emma said, "with all that money you've got in the bank back at Pittsburg, why don't you give some of it to these nice Sarkanese?"

Atkins looked up sharply, but saw at once that she was teasing him. He grunted.

"You know why. Whenever you give a man something for nothing the first person he comes to dislike is you. If the pump is going to work at all, it has to be their pump, not mine,"

Emma smiled fondly at Homer Atkins. She turned and looked out the window. A group of Sarkhanese on bicycles, as usual, were moving in toward the market places at Haidho She watched them for a few moments, and then spun around, excitement in her eyes.

"Why don't you use bicycles? There are millions of them in this country and they must wear out. Maybe you could use the drive mechanism of an old bicycle to move the pump."

Atkins looked at Emma and slowly sat up straight. He slapped his hand against his knee.

"By God, I think you've got it, girl," he said softly. "We could take the wheels off an old bike, link the chain of the bike to one large reduction gear, and then drive the piston up and down with an eccentric "

Atkins began to walk around the room. Emma, a slight grin on her face, returned to her

charcoal fire over which she had a fragrant pot of chicken cooking. In a few moments she heard the rustle of paper and knew that Atkins was bent over his drawing board. Two hours later he was still drawing furiously An hour after that he went to a footlocker, took out a half-dozen bottles of beer, and brought them back to his work table. By dinner time he had drunk them all and was whistling under his breath When Emma tapped him on the shoulder and told him that dinner was ready, he swung around excitedly

"Look, baby, I think I've got it," he said, and began to explain to her rapidly, interrupting himself to make quick calculations on a piece of paper. When she finally got him to sit down, he ate so fast that the chicken gravy ran down his chin. He wiped his chin with his shirt sleeve and made sure none of the gravy got on his precious drawings. Emma Atkins watched her husband fondly. She was proud of him, and she was happy when he was happy. Today she felt very happy, indeed.

"Stop drinking beer, Homer Atkins," Emma said, grinning. "You'll get drunk. And then you'll forget that it was my idea about the bicycle."

"Your idea?" he yelled in astonishment. "Woman, you're crazy. I was thinking about that all along. You just reminded me of it."

But then he went back to the locker, brought back two bottles of beer, and blew suds at her when he filled her glass.

Two days later Atkins had a working model. Not a single item in the crude pump would have to be imported. He had calculated that there was probably enough scrap around the countryside to make a couple of thousand pumps. What he had to do now was to get a couple of pumps actually in operation, to see how they worked. At this point Emma Atkins demonstrated her diplomatic skills.

"Now look, Homer, don't go running off like a wild man," Emma said softly. "You've got a

good machine there. I'm proud of you. But don't think that just because it's good the Sarkhanese are going to start using it right away. Remember the awful time that you had getting trade unions In America to accept earth-moving equipment. These people here are no different. You have to let them use the machine themselves and in their own way. If you try to jam it down their throats, they'll never use it."

"All right, Mrs. Foster Dulles, you tell me what to do," Atkins said. He knew she was right and he was grateful to her. "You tell me how I ought to approach the Sarkhanese."

Emma calmly explained her plan to Homer. He realized that she had been thinking of this for some time. It was an intricate, beautiful plan, and he wished that some of the stuffed-shirts in the American Embassy could hear his wife talking.

The next day he put into operation Emma Atkins' grand strategy.

He drove in his used jeep to the tiny village of Chang 'song, a community of one hundred souls, living in fifteen or twenty houses. The village was set precariously on a steep hill sixty miles outside of Haidho. The soil there was rich; but the backbreaking, time-consuming process of lifting water up seven or eight levels--even though the differentials were small-had always made Chang 'song a poor village.

Atkins politely asked the first person he met in Chang 'song where the home of the headman was. He talked to the headman, a venerable man of seventy five, without an interpreter. It was not easy, but he could tell that the headman was pleased that Atkins was making the effort to talk his language. With infinite courtesy the old man sensed what words Atkins was searching for, and politely supplied them. The conversation moved along more rapidly than Homer had expected it would.

Atkins explained that he was an American and that he was an inventor. He had an idea for a pump to lift water. He, Atkins, wanted to develop and patent this pump and sell it at a

profit. What Atkins wanted the headman to find was a Sarkhanese worker with mechanical skill. Atkins said he would pay well for this man's time and skill; if he was able to help with the pump, he would become half-owner of the patent. The old man nodded gravely. They then began a long, complicated, and delicate negotiation over the matter of how much the native mechanic should be paid. Atkins understood all of this quite well--it was just like negotiating with a trade union organizer in the States. Each man knew that he would eventually have to compromise; and each took pleasure in talking the whole thing out. In the end Atkins got the services of a mechanic for a price which he knew was just slightly higher

than the going rate. Both the headman and Atkins were satisfied. They shook hands, and the headman left to bring in the mechanic. Atkins reached in his shirt pocket, took out a cigar, and lit it with pleasure. This would, he thought, be fun.

When the headman returned he brought with him a small, stocky, heavily-muscled man whom he introduced as Jeepo. The headman explained that the name was not a native name. He was called Jeepo because of his reputation as a famous mechanic in the maintenance and repair of jeeps. Atkins didn't listen too closely to what the headman was saying. He was studying Jeepo, and he liked what he saw.

Jeepo looked like a craftsman. His fingernails were as dirty as Atkins', and his hands were also covered with dozens of little scars. Jeepo looked back steadily at Atkins without humility or apology, and Atkins felt that in the mechanic's world of bolts and nuts, pistons and leathers, and good black grease he and Jeepo would understand one another.

And Jeepo was ugly. He was ugly in a rowdy, bruised, carefree way that pleased Atkins. The two men smiled at one another.

"The headman says you are a good mechanic," Atkins said. "He says that you're an expert on repairing jeeps. But I must have a man who is expert at other things as well. Have you

ever worked on anything besides jeeps?"

Jeepo smiled.

"I've worked on winches, pumps, Citroens, American and French tanks, windmills, bicycles, the toilets of wealthy white people, and a few airplanes."

"Did you understand everything that you were working on?" Atkins asked.

"Who understands everything that he works on?" Jeepo said. "I feel that I can work with anything that is mechanical. But that is only my opinion. Try me."

"We'll start this afternoon, "Atkins said. "In my jeep outside is a heap of equipment. You and I will unload it and we'll start at once."

By the middle of the afternoon they had assembled most of Atkins' equipment on the edge of a paddy on the second level of the village of Chang 'Dong. Twenty-five feet of bamboo pipe had been fastened together; the bottom of the pipe was put into a backwater of the river that flowed by the village. The top piece of the pipe was fitted by a rubber gasket to the crude pump which Atkins had designed. Above the pump was the frame of a used bicycle with both of its wheels removed. Jeepo had done the assembly entirely by himself. Atkins had made one attempt to help, but Jeepo had gone ahead on his own, and Atkins realized that he wanted to demonstrate his virtuosity. By late afternoon the assembly was ready.

Atkins squatted calmly in the mud waiting for Jeepo to finish. The headman and two or three of the elders of the village were squatting beside him. Although they were externally as passive as Atkins, he was aware that they were very excited. They understood perfectly what the machine was intended for; they were not sure it would work.

"Sir, the mechanism is ready to operate," Jeepo finally said quietly. "I'm not sure we can get suction at so great a height; but I'd be pleased to turn the bicycle pedals for the first few minutes to test it."

Atkins nodded. Jeepo climbed aboard the bicycle and began to pump slowly. The chain-drive of the bicycle turned with increasing speed. The crude pipes made a sucking noise. For several seconds there was no other sound except this gurgle. Then, suddenly, from the outflow end of the pump a jet of dirty brown water gushed forth. Jeepo did not stop pedaling nor did he smile; but the headman and the other elders could not restrain their excitement about the size of the jet of water that was being lifted to the second rice terrace.

"This is a very clever machine," the headman said to Atkins. "In a few minutes you have lifted more water than we could lift by our old methods in five hours of work."

Atkins did not respond to the man's delight. He was waiting to see how Jeepo reacted. He sensed that Jeepo was not entirely happy or convinced.

Jeepo continued to pump at the machine. He looked down at the machinery, noted some tiny adjustments that had to be made, and called them out to Atkins. When the small paddy was full of water he stopped, and swung down out of the bicycle seat.

"It is a very clever machine, Mr. Atkins," Jeepo said quietly. "But it will not be a sensible machine for this country."

Atkins looked steadily at Jeepo for a long moment, and then nodded.

"Why not?" he asked.

Jeepo did not respond at once. He moved silently around the mechanism, twisting a bolt

here, adjusting a lever there; then he stood up and faced Atkins.

"The machine works very, very well," Jeepo said. "But to make It work a person would have to have a second bicycle. In this country, Mr. Atkins, very few people have enough money to afford two bicycles. Unless you can find another way to drive the pump, or unless your government is prepared to give us thousands of bicycles, your very clever device is a waste of time."

For a moment Atkins felt a flush of anger. It was a hard thing to be criticized so bluntly. For a hot, short moment, Atkins calculated how many bicycles his three million dollars would buy; then, with the memory of Emma's tact in his mind, he put the thought aside. He turned back to Jeepo.

"What happens to old bicycles in this country?" he asked. "Aren't there enough of them to serve as power machines for the pumps?"

"There are no old or discarded bicycles in this country," Jeepo said. "We ride bicycles until they are no good. When a man throws his bicycle away, it's too old to be used for one of these pumps."

For a moment the ugly American faced the ugly Sarkhanese. When he was younger, Atkins would have turned on his heel and walked away. Now he grinned at Jeepo.

"All right, Jeepo, you say you're an expert mechanic. What would you do? Am I simply to give up my idea-or can we find some other way to give power to the pump?'

Jeepo did not answer at once. He squatted in the shallow rice-field, his khaki shorts resting in three inches of mud. He stared fixedly at the improbable machine. For ten minutes he said nothing. Then he stood up and walked slowly to the machine. He turned the pedal and held his finger over the rear-drive sprocket of the wheel as if to test its

strength. Then he walked back and squatted again.

The headman looked once at Atkins and then talked in a sharp voice to the elders. The headman was embarrassed at Jeepo's arrogance, and he was saying that the entire village of Chang 'Dong would lose face by this ridiculous performance. Jeepo's ears became slightly red at the criticism, but he did not turn his head or acknowledge that he heard the headman's words.

Atkins felt like laughing. The headman and the elders reminded him very much of the diplomats to whom he had talked for so many months in Phnom Penh. He was quite sure that Jeepo had an answer for these comments, and he was also sure that it was not a political or personal answer, but technical. Atkins squatted down beside Jeepo, and for fifteen minutes the two men sat quietly on their heels studying the machine. Atkins was the first to speak.

"Perhaps we could make the frame of the bicycle out of wood and then we'd only have to buy the sprocket mechanism," Atkins said in a tentative voice.

"But that's the part of the bicycle which is most expensive," Jeepo said.

For perhaps another ten minutes they squatted motionless. Behind him Atkins could hear the shrill voices of the headman and the elders. Although they were attempting to maintain their dignity and manners, it was clear to Atkins that they were trying to find a way to apologize to him and to smooth the whole thing over. It never occurred to Atkins to talk to them. He and Jeepo were hard at work.

Once Atkins walked to the mechanism, turned the pedals rapidly, held his finger on the sprocket gear, and looked at Jeepo. Jeepo shook his head. He understood the mechanical question that Atkins had asked and was giving his answer. Without exchanging a word they demonstrated six or eight alternative ways of making the pump work, and discarded

them all. Each shake of the head upset the headman and elders profoundly.

It was dusk before they solved the problem, and it was Jeepo who came up with the solution. He suddenly stood bolt upright, walked over to the bicycle, remounted, and began to pedal furiously. Water gushed out of the outflow of the pump. Jeepo looked back over his shoulder at the lower level of the pump, then started to shout at Atkins in a loud and highly disrespectful voice in which there was the sound of discovery. It took Atkins another five minutes to understand fully what Jeepo was proposing.

It was the height of simplicity. What he proposed was that a treadmill be built which could be turned by the rear wheel of an ordinary bicycle fitted into a light bamboo frame. What this meant was that a family with a single bicycle could put the bicicle in the bamboo rack, mount it, and pedal. The rear wheel would drive the treadmill which in turn would drive the pump with an efficiency almost as great as Atkin's original model. When anyone needed to use the bike, he could simply pick it up from the rack and ride away.

"This man has made a very great discovery," Atkins said solemnly to the headman and the elders. "He has developed a way in which a bicycle can be used to drive the pump and still be used for transportation. Without Jeepo's help my idea would have been useless. What I propose is that we draw up a document giving Jeepo one-half of the profits which might come from this invention."

The headman looked at Jeepo and then at the elders. He commenced talking to the elders in a solemn voice. Atkins grasped that the headman had never heard of a binding legal document between a white man and a Sarkhanese. It became clear to him, also, that the headman was determined to drive a hard bargain. After several minutes of consultation he turned to Atkins.

"Do you propose that you and Jeepo will begin to build such pumps?" the headman asked.

"Yes. I would like to enter into business with Jeepo. We will open a shop to build this kind of a pump, and we will sell it to whoever will buy. If the customer does not have the money, we will agree that he can pay off the cost of the pump over a three-year period. But don't get the idea that Jeepo will be paid by me for doing nothing. He must work as the foreman of the shop, and he will have to work hard. Not any harder than I work, but as hard as I do."

One of the elders broke in excitedly. He pointed out that it was very unlikely that a white man would work as hard as Jeepo. He had never seen a white man work with his hands before, and what guarantee could they have that Atkins would work as hard. Another of the elders agreed, pointing out that this looked like the trick of a white man to get cheap labor from a Sarkhanese artisan. Both of the elders were firmly opposed to Jeepo entering into the partnership.

During all of this discussion, Jeepo did not speak. He tinkered with the pump and bicycle mechanism, tightening gears, checking valves, and tightening the bicycle chain, When the two elders had finished talking, he turned around and came through the mud of the rice paddy to where the group was talking.

"I have listened without speaking to what you foolish old men have been saying." Jeepo said, his voice harsh with anger. "This American is different from other white men. He knows how to work with his hands. He built this machine with his own fingers and his own brain. You people do not understand such thing. But men that work with their hands and muscles understand one another. Regardless of what you say, I will enter into business with this man if he will have me."

There was a quick flush of shame on the headman's face. "I think that Jeepo is correct," he said. "This man can be trusted. I will now write up the document which will assure that he and Jeepo share the profits and the work equally."

"And the document should say that neither I nor the American shall license or patent the idea of the pump," Jeepo said. "We will make the idea available to anyone else who can make it. But on the ones we make, we deserve the profit. That is the way of working men."

Jeepo looked at Atkins. Atkins was pleased, and he nodded.

"Also, when we have made some pumps and sold them we will print little books and it will show others how to do it," Atkins said. "We will send it around the whole of Sarkhan, and the village of Chang 'song will become famous for its mechanical skills."

Jeepo and Atkins did not wait for the headman to complete their contract before beginning work. Two days later they had rented a large old rice warehouse on the edge of Chang 'song. In another day they had hired twelve workers. Jeepo and Atkins drove into Haidho, bought used tools and supplies, and carted them back to the warehouse. In a week the plant was in full operation. Over the entrance to the warehouse a small sign written in Sarkhanese said: "The Jeepo-Atkins Company, Limited." Inside the warehouse was a scene of incredible and frantic effort. Jeepo and Atkins worked eighteen to twenty hours a day. They trained the Sarkhanese'; they installed a small forge which glowed red-hot most of the day; they tested materials; they hammered; they swore; and several times a day they lost their tempers and ranted at one another. Their arguments, for some reason, caused the Sarkhanese workmen a great deal of pleasure, and it was not until several months had passed that Atkins realized why--they were the only times that the Sarkhanese had ever seen one of their own kind arguing fairly and honestly, and with a chance of success, against a white man.

Emma Atkins did not stay long in the suburb outside of Haidho. Within a week she had moved their belongings to a small house in Chang 'song. She bustled about her home and through the village, buying chickens and vegetables, and making huge casseroles of rice and chicken. Every day at noon she and several of the village women brought two of the

casseroles to the warehouse and all of the men ate from them. Emma seemed to find it not at all unusual that her husband should be in a tiny hillside village constructing something as outlandish as bicycle water pumps.

Once a technical advisor from the American Embassy called at the warehouse and watched quitely for several hours. The next day the counsellor of the Embassy called. Taking Atkins to one side, he pointed out to him that for white men to work with their hands, and especially in the countryside, lowered the reputation of all white men. He appealed to Atkins' pride to give up this project, Moreover, he pointed out that the French, most experienced of colonizers, had never allowed natives to handle machinery. Atkins' reply was brief, but it was pointed, and the counsellor drove away in anger. Atkins returned joyfully to his work in the warehouse.

At the end of six weeks they had manufactured twenty-three pumps. When the twenty-fourth pump was finished, Atkins called all of the men together. He and Jeepo then faced the group and between them outlined what now had to be done. Jeepo did most of the talking.

"This is the difficult part," Jeepo started quietly. "You have worked hard and well to build these pumps-now you must sell them. Our friend Atkins here says that in America one of the best things that can happen to engineers like yourself is to be allowed to sell what they make. So each of you will now take two of these pumps as samples, and go out and take orders for more. For each pump that you sell you will get a ten per cent commission." one of the men interrupted. He did not understand what a commission was. There was a confused five minutes while Atkins and Jeepo explained, and when they were finished the prospective engineer salesmen were smiling cheerfully. They had never heard of such a proposal before, but it struck them as both attractive and ingenious. When the discussion was over, twelve contracts were laid out on a table; and each of the Sarkhanese signed a contract between himself and The Jeepo-Atkins Company, Limited.

The next morning twelve oxcarts were lined up outside the warehouse. Two of the pumps were carefully laid out on beds of straw on each of these carts. By noon the twelve salesmen had left for all parts of the province.

Now the waiting began. Jeepo, the headman, the elders, and everyone else in the village realized that everything rested on the persuasiveness of the engineer-salesmen and the performance of the bicycle-powered pump. If no orders were placed, Atkins would have to leave, and the excitement of the factory would disappear. In only a few weeks all of this activity had become very important to the people of Chang 'song. The people drifted into the warehouse, and watched Jeepo and Atkins at work, and many of them began to help. The tension grew steadily; and when four days had passed and not one of the salesmen had returned, a blanket of gloom as thick as a morning mist settled over the village.

Then on the morning of the fifth day one of the salesmen returned. He drove at a speed which, for an oxcart, is rare. The ox stumbled and splashed mud in the air, and the salesman beat the animal with gusto and enthusiasm.

As the ox labored up the hill, everyone in the village came to the warehouse to learn what would happen. When the cart, covered with mud, drew to a halt, there was a low murmur. They could all see that the cart was empty. The driver got down from the cart slowly, fully aware of his importance. He walked over calmly and stood before his two employers.

"I have the pleasure to inform you, sirs, that I have done wrong," he began, a grin on his face. "You told me that I should bring back the two samples, but I was unable to do it. I have taken orders for eight pumps. But two of my customers insisted that I deliver the pumps at once. Because their paddies were in desperate need of water and the crops might have been ruined, I reluctantly gave them the pumps. I hope I have not made a mistake."

There was a deep sigh from the crowd and everyone turned and looked at Jeepo and

Atkins. These two squat, ugly, grease-splattered men stared at one another for a moment, and then let out shouts of joy. Jeepo hugged Atkins. Atkins hugged Jeepo, and then Jeepo hugged Mrs. Atkins. Then everyone in the village hugged everyone else. For several hours an improvised party involved the entire village.

The next morning the village was up early, but notes early as Atkins and Jeepo. As the people went down to the warehouse, they heard the clank of hammers and wrenches. They peered into the dim interior of the warehouse and smiled at one another. Atkins and Jeepo were in the midst of a terrible argument over a modification of the pump. Emma Atkins was laying out a huge breakfast in front of the two men, and they were ignoring it as they continued their argument.

THE BENT BACKS OF CHANG 'DONG

Emma Atkins was a simple and straightforward person. She was not a busybody; but she had learned that when she wanted to know something the best way to find out was to ask a direct question. She had been in Chang 'song only two weeks when she asked an unanswerable question.

She was working in her kitchen with two of her Sarkhanese neighbors, trying to make a small guava which grew in the jungle into a jam. The glowing charcoal stove and the sweet aroma of the bubbling fruit gave the kitchen a cozy and homey atmosphere. Emma felt good. She had just finished telling her neighbors about how a kitchen was equipped in America; then through the open window, she saw an old lady of Chang 'song hobble by, and the question flashed across her mind. She turned to the two women and spoke slowly, for the Sarkhanese language was new to her.

"Why is it that all the old people of Chang 'song are bent over" Emma asked. "Every older person I have seen is bent over and walks as if his back is hurting."

The two neighbor women shrugged.

"It is just that old people become bent," one of them answered. "That's the natural thing which happens to older people."

Emma was not satisfied, but she did not pursue the problem any further then. Instead, she kept her eyes open. By the time the rainy season was over, she had observed that every person over sixty in the village walked with a perpetual stoop. And from the way they grimaced when they had to hurry, she realized that the stoop was extremely painful. The older people accepted their backaches as their fate, and when Emma asked them why they walked bent over, they only smiled.

Three weeks after the monsoon ended, the older people in the village began to sweep out their own homes, the paths leading from their houses to the road, and finally the road itself. This sweeping was inevitably done by older people. They used a broom made of palm fronds. It had a short handle, maybe two feet long, and naturally they bent over as they swept.

One day, as Emma was watching the wrinkled and stooped woman from the next house sweep the road, things fell into place. She went out to talk to the woman.

"Grandmother, I know why your back is twisted forward," she said. "It's because you do so much sweeping bent over that short broom. Sweeping in that position several hours a day gradually moulds you into a bent position. When people become old their muscles and bones are not as flexible as when they were young."

"Wife of the engineer, I do not think it is so," the old lady answered softly. "The old people of Southern Sarkhan have always had bent backs."

"Yes, and I'll bet that they all got them from sweeping several hours a day with a short-

handled broom," Emma said. "Why don't you put a long handle on the broom and see how it works?"

The old woman looked puzzled. Emma realized that in her excitement she had spoken in English. She put the question to the woman in Sarkhanese.

"Brooms are not meant to have long handles," the old lady said matter-offactly. "It has never been that way. I have never seen a broom with a long handle, and even if the wood were available, I do not think we would waste it on long handles for brooms. Wood is a very scarce thing in Chang 'song.

Emma knew when to drop a conversation. She had long ago discovered that people don't stop doing traditional things merely because they're irrational. She also knew that when people are criticized for an action, they stubbornly persist in continuing it. That evening Emma had a talk with Homer.

"Homer, have you noticed the bent backs of the old people in this village?' Emma asked.

"Nope, I haven't," Homer said, washing down a bowl of rice with a bottle of beer. "But if you say they're bent, I'll believe it. What about it?"

"Well, just don't say 'what about it'," Emma said angrily. "I'm getting to the age where when my bones get stiff, it hurts. Imagine the agony those old people go through with their backs perpetually bent over. It's worse than lumbago. I've asked them, and they tell me it's excruciating."

"All right, all right, Emma," Atkins said. "What are we going to do about it?"

"Well, the first thing we're going to do is get longer broom handles," Emma said with heat.

However, Emma found that it was difficult to get longer handles. Wood of any kind was scarce in that area, and expensive. The handles the Sarkhanese used for their brooms came from a reed with a short strong stem about two feet long. For centuries this reed had been used; and, centuries ago people had given up looking for anything better. It was traditional for brooms to have short handles, and for the brooms to be used exclusively by people too old to work in the rice fields. But Emma wasn't bound by centuries of tradition, and she began to look for a substitute for the short broom handle.

It would have been simple, of course, to have imported wooden poles, but long ago Homer had taught her that only things that people did for themselves would really change their behavior. With mid-western practicality, Emma set about researching her problem. It was a frustrating task. She tried to join several of the short reeds together to make a long broomstick. This failed. Every kind of local material she used to try to lenghten the broomstick handles failed.

Emma refused to be defeated. She widened the scope of her search, until one day she found what she was after. She was driving the jeep down a steep mountain road about forty miles from Chang 'song. Suddenly she jammed on the brakes. Lining one side of the road for perhaps twenty feet was a reed very similar to the short reed that grew in Chang 'song--except that this reed had a strong stalk that rose five feet into the air before it thinned out.

"Homer," she ordered her husband, "climb out and dig me up a half-dozen of those reeds. But don't disturb the roots."

When she got back to Chang 'song, she planted the reeds beside her house and tended them carefully. Then, one day, when several of her neighbors were in her house, she casually cut a tall reed, bound the usual coconut fronds to it, and began to sweep. The women were aware that something was unusual, but for several minutes they could not

figure out what was wrong. Then one of the women spoke.

"She sweeps with her back straight," the woman said in surprise. "I have never seen such a thing."

Emma did not say a word. She continued to sweep right past them, out on the front porch, and then down the walk. The dust and debris flew in clouds; and everyone watching was aware of the greater efficiency of being able to sweep while standing up.

Emma, having finished her sweeping, returned to her house and began to prepare tea for her guests. She did not speak to them about the broom, but when they left, it was on the front porch, and all of her guests eyed it carefully as they departed.

The next day when Emma swept off her proch, there were three old grandmothers who watched from a distance. When she was finished Emma leaned her long-handled broom against the clump of reeds which she had brought down from the hills. The lesson was clear.

The next day, perhaps ten older people, including a number of men, watched Emma as she swept. This time when she was finished, an old man, his back bent so that he scurried with a crab-like motion, came over to Emma.

"Wife of the engineer, I would like to know where I might get a broom handle like the one you have," the man said. "I am not sure that our short-handled brooms have bent our backs like this but I am sure that your way of sweeping is a more powerful way."

Emma told him to help himself to one of the reeds growing beside the house. The old man hesitated.

"I will take one and thank you; but if I take one, others may also ask, and soon your reeds

will be gone."

"It is nothing to worry about, old man," Emma said. "There are many such reeds in the hills. I found these by the stream at Nanghsa. Your people could walk up there and bring back as many as the village could use in a year on the back of one water buffalo The old man did not cut ore of

Emma's reeds. Instead he turned and hurried back to the group of older people. They talked rapidly, and several hours later Emma saw them heading for the hills with a water buffalo in front of them.

Soon after, Homer completed his work in Chang 'song, and they moved to Rhotok, a small village about seventy miles to the east. And it was not until four years later, when Emma was back in Pittsburgh that she learned the final results of her broom handle project. One day she got a letter in a large handsome yellow-bamboo paper envelope. Inside, written in an exquisit script, was a letter from the headman of exquisit script, was a letter from the headman of Chang 'song.

"What does he mean, 'lucky accident'?" Emma said to Homer. "Why I looked all over for three months before I found those long reeds. That was no accident."

Homer did not look up at her from the letter. He knew that the indignation in her voice was false. He knew that if he looked now he would see tears glittering in the corners of her eyes. He waited a decent amount of time; when he raised his head she was just pushing her handkerchief back into the pocket of her apron.

Session T-56: Solar fish drying

Time: 7:30 AM

Goals:

- **To acquaint trainees with the principles behind various fish drying techniques**
- **To design a simple solar fish dryer**
- **To understand proper sizing elements when designing equipment**

Overview:

This session is important in that the vast majority of fish dried in third world countries are done without benefit of proper hygienic care and handling during the processing phase. A solar drier offers a great deal to the small-scale fisherman intent on producing a quality product. The trainees are given the principals in design, but are "allowed" to offer measurements reflecting their own personal working area needs. This is seen as a problem solving exercise for trainees.

Materials and Equipment:

- **Wood/bamboo, plastic (.006 mil), nails, cordage, screening, flip chart, markers, woodworking tools, salted fish for drying**

Procedures:

Time	Activities
40 Minutes	1. Trainee leader gives brief introduction to drying of fish.
	a. lecture on drying principles
	- reduction of water content
	- bacterial action stoppage
	- cessation of fungal activity

	b. salting of fish prior to drying
	- water content
	- antiseptic quality
	- bacteria growth inhibited
	c. open air drying
	- advantages
	- disadvantages
	d. solar air dryer
	- advantages: increased heat
	- total exclusion of flies, beetles, elimination of maggot infestation
	- weather proof
	e. construction and design
	- simple
	- wood, bamboo frame
	- glass, plastic liner
	- chimney effect
	- need of constant air flow
	- screening
	- intake
	- out-flow
3 Hours 30 Minutes	2. Trainees build their own solar driers. Each trainee will make their own design. However, they will only construct one drier for each five trainees. Technical trainer will choose which design should be built.

FISH PROCESSING - Sun Curing

1. Cleaning

a. cut open back of fish lengthwise
b. remove gills and guts
c. scrub inside clean with coconut husk. (make sure slime and blood is removed)

2. Brining

a. mix 1 lb salt to every 1 gallon clean seawater, in a clean container to make brine solution
b. immerse cleaned fish until all covered with brine solution
c. leave for 2 hours

N.B. When brining use coarse salt

3. Air Drying

a. take out of brine solution and hang in shade tail side up
b. leave for 1/2 hour or until no drip off
c. smear again with salt (coarse) only on flesh - not skin
d. stack neatly open side down in rows in a clean container
e. leave overnight

4. Sun drying

a. shake dried salt out and rinse with sea water
b. place on corrugated iron or shelf open side up to dry in sun
c. cover with netting material to keep flies away

Smoke Drying

1. Cleaning

a. same as for Sun Curing

2. Brining

a. mix 2 lb salt to every 1 gallon seawater in a clean container
b. immerse cleaned fish until all covered with brine solution
c. leave for 2 hours

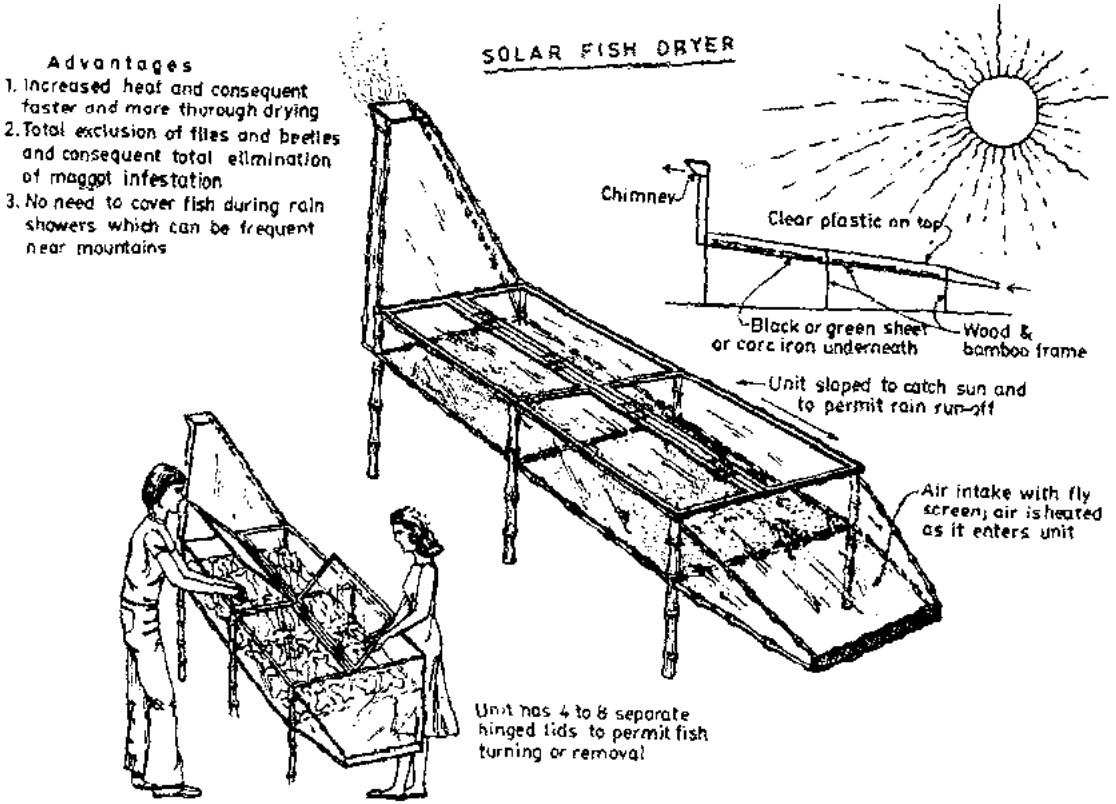
3. Dripping

a. rinse fish in seawater
b. hang tail side up for 1/2 hour to drip to remove excess moisture

4. Smoke Drying

a. arrange skin side down in the smoke drying rack
b. smoke-dry by using fire with a lot of smoke; sawdust is best
c. smoke until nice brown and hard

N.B. Coarse salt can be bought from Burns Philip at $7.50/cwt. (1 cwt. = 112 lbs)



Solar fish dryer

Session T-57: Fish smoker special project

Time: 7:30 AM

Goals:

- **To acquaint trainees with the fish smoking process**
- **To make trainees aware of different fish smoking methods and techniques**
- **To plan and construct a smoker for on-line fish processing and preservation**

Overview:

This is an important session in the fish preservation sequence. The nonrefrigerated fish product in most developing countries is met by the smoking of fish.

Materials and Equipment:

- **Tin roofing or plywood, wood working tools, charcoal, fish, flip chart, markers**

Procedures:

Time	Activities
40 Minutes	1. Lead trainee presents lecturette based on following outline:
	a. three processes in smoking fish
	- salting
	- smoking
	- drying and cooking
	b. types of smoking
	- cold
	- hot
	c. cold smoking
	- temp range 15-30° C

	- temp range 15-30° C
	- not preservation
	- needs refrigeration
	- disastrous for tropics because of spoilage
	d. hot smoking
	- temp range 30°-85° C
	- minimum time l/2 hour at 85°C
	- two processes involved salt application moisture reduction by hot air currents
	e. smoking facilities
	- simple
	- sophisticated
	f. kilns
	- chimney type
	- wood, tin, brick
	g. smoking problems maintaining proper temperature
	- proper air flow
	- rate of humidity
	- smoke intensity
	h. smoking duration
	- overnight
	- two days
	- week
	- humidity

	- size, type of fish
	i. hanging fish for smoking
	- S-shaped hooks round wood sticks
	- square sticks
	- bamboo
	j. fuels
	- hardwoods kwila, mangrove
	- careful of pine, greenwood, casurina, wetwood
	- use no petroleum products
	k. design of a smoker
	- measurements equal volume of fish
	l. construction of a smoker
	m. use of smoker with fish
3 Hours 30 Minutes	2. Trainees build their "own" fish smoker, with only a minimum of design, structural and construction input from the technical trainer.
	The following is a sample of presentation by trainee leader from pilot program.

FISH PRESERVATION - SMOKING

Three processes in smoking: 1) Salting - extracts body liquid, assists in drying process, 2) Smoking flavors fish and darkens flesh. Preserving qualities are improved by the antiseptic action of smoke, 3) Drying and Cooking - wood for heat and smoke used will give cure desired.

Types of Smoking: 1) Cold smoking - 27-54° F (15-30°C). Temperature not enough to cook the fish. Form of curing, not preservation, fish will only keep for a few days. Produces

good flavor. Not used in tropics, temperature and humidity spoilage overtakes cure and ruins fish. 2) Hot smoking 180°F for at least 30 minutes. Flesh is cooked. Heat cooks fish and sets up hot air currents over the fish to conduct heat away. Temperature is controlled either by increasing or decreasing the fire underneath or by altering the height of the racks above the fire. To remove moisture from body tissue in hot smoking: 1) salt somosis extracts moisture from tissue and penetrates cells, 2) hot air currents.

Facilities for smoking: 1) open fire, 2) kilns - chimney kiln constructed from barrel or constructed from brick or metal.

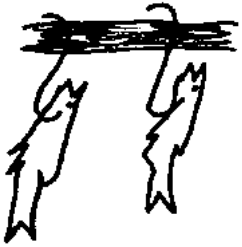
Conditions affecting uniformity of product: 1) weather conditions, 2) size and construction of kiln, 3) type and moisture content of sawdust, 4) experience of smoker operator - turning, removing ones that are near the fire that get done first, then moving down the upper ones.

Complete operation for smoking fish: 1) landing, 2) temperature storage, 3) salting, 4) spitting, 5) smoking, 6) cooking, 7) trimming, 8) storage, 9) market.

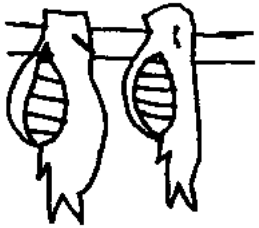
References:

- **"Smoking fish at home-safely" by Kenneth S. Hilderbrand Jr., Extension Sea food technologist, Oregon State University, Extension Marine Advisory Program**

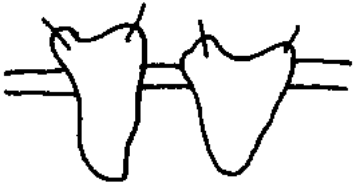
HANGING FISH FOR SMOKING



S-shaped hooks - one end through belly slit. Hang from stick.



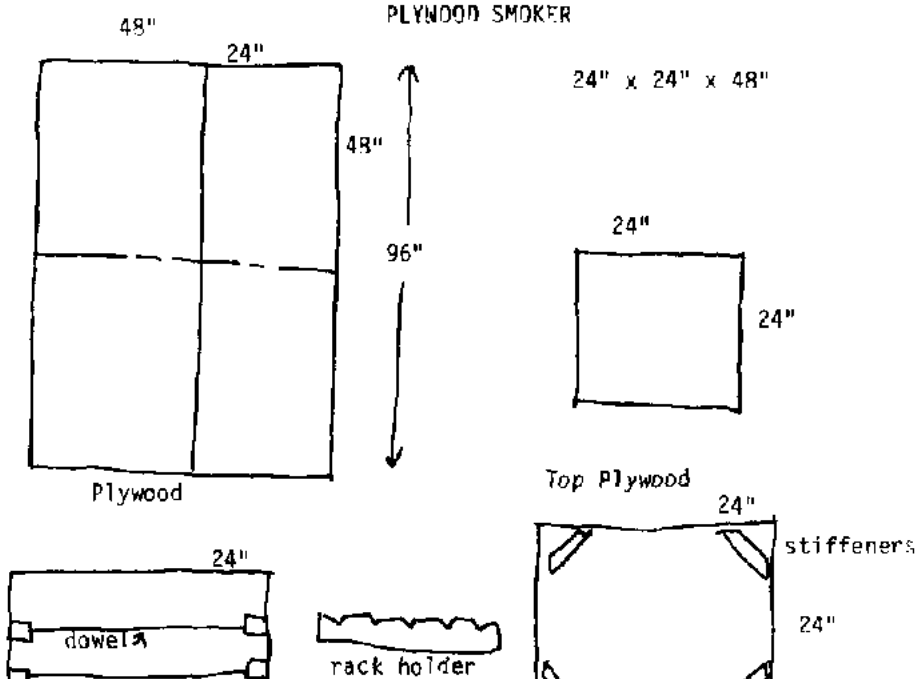
Round wood sticks - under gill flap through mouth, open belly cavity with sticks

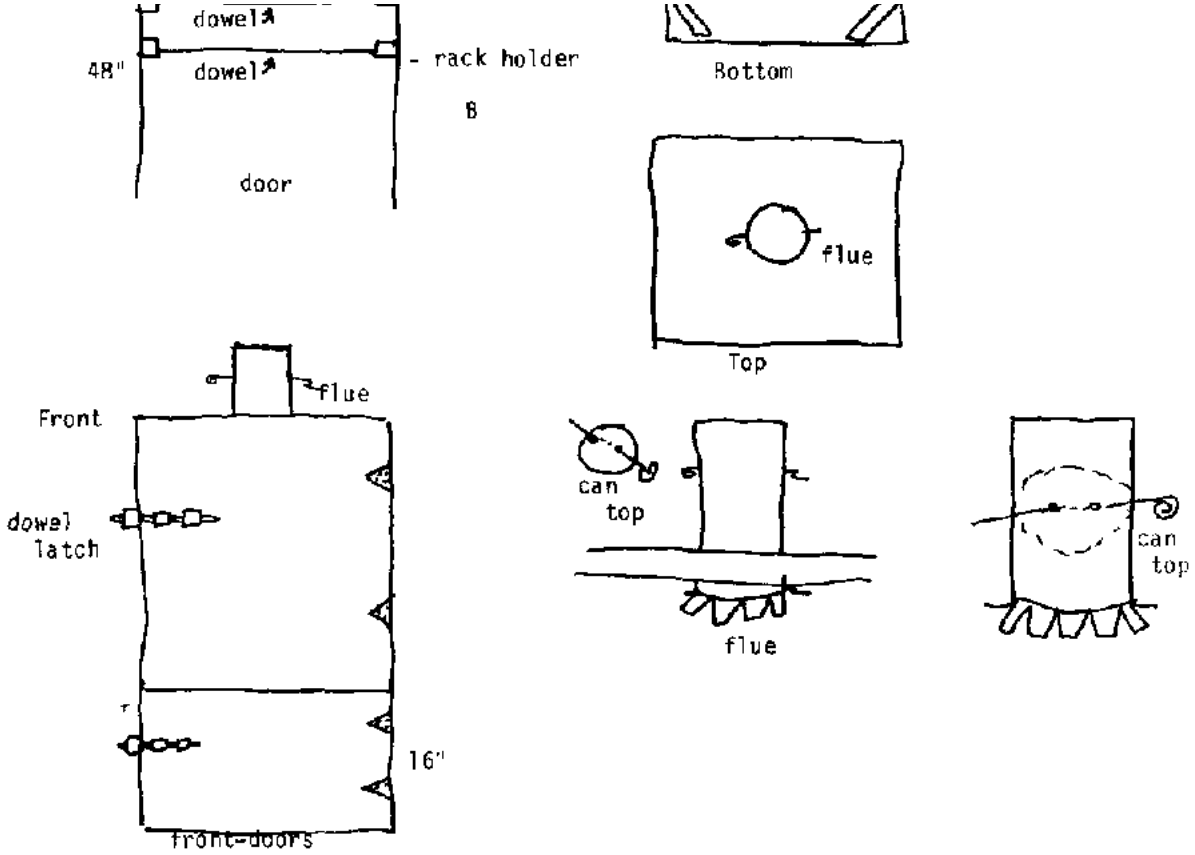


Square sticks with nails driven through fillets. Drive nails through stick pointing up to keep fish secure.

Bamboo sticks

- Margie Hulsair, PCV Sierra Leone





Plywood smoker

Drying the Fish

After brining comes step three, drying the fish. Pat fish dry with a cloth, then place them on a rack in the refrigerator and drain one to three hours. Drying increases keeping quality and promotes development of the ''pellicle," a glossy finish of dissolved proteins on fish surfaces which gives them the desired appearance, retains natural juices, and helps spread smoke evenly.

Building the Smoker

A simple smokehouse may be designed from a large cardboard box, a metal oil drum, a wooden barrel, an old refrigerator, or even plywood The cardboard box is perhaps easiest to obtain; it should be 30 inches square and 48 inches high. Here are the construction directions:

a. remove one end of box to form bottom of smokehouse.

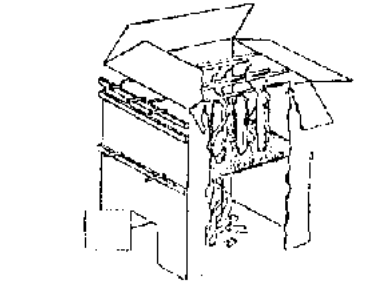
b. unfasten flaps at opposite end so they fold back and serve as a cover.

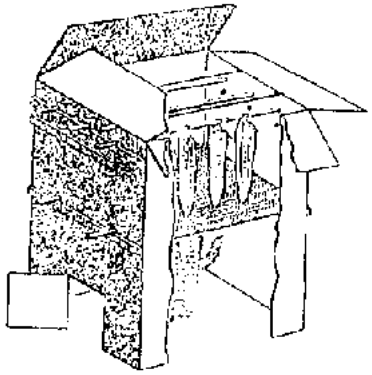
c. strengthen box, if necessary, by tacking 3/4 inch strips of wood on outside of box--vertically at corners and horizontally across sides.

d. cut a door 10 inches wide and 10 inches high in bottom center of one side; make one vertical and one horizontal cut, so uncut side serves as hinge.

e. suspend several rods or sticks (iron or wood) across top of box; cut holes through box, so rods rest on wooden strips; a rack of wire mesh (1/2" or 1/4'' mesh hardward cloth) may replace rods; refer to diagrams below.

Cardboard Smokehoue. Courtesy U.S. Department of the Interior Fishery Leaflet 209.



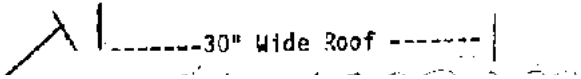


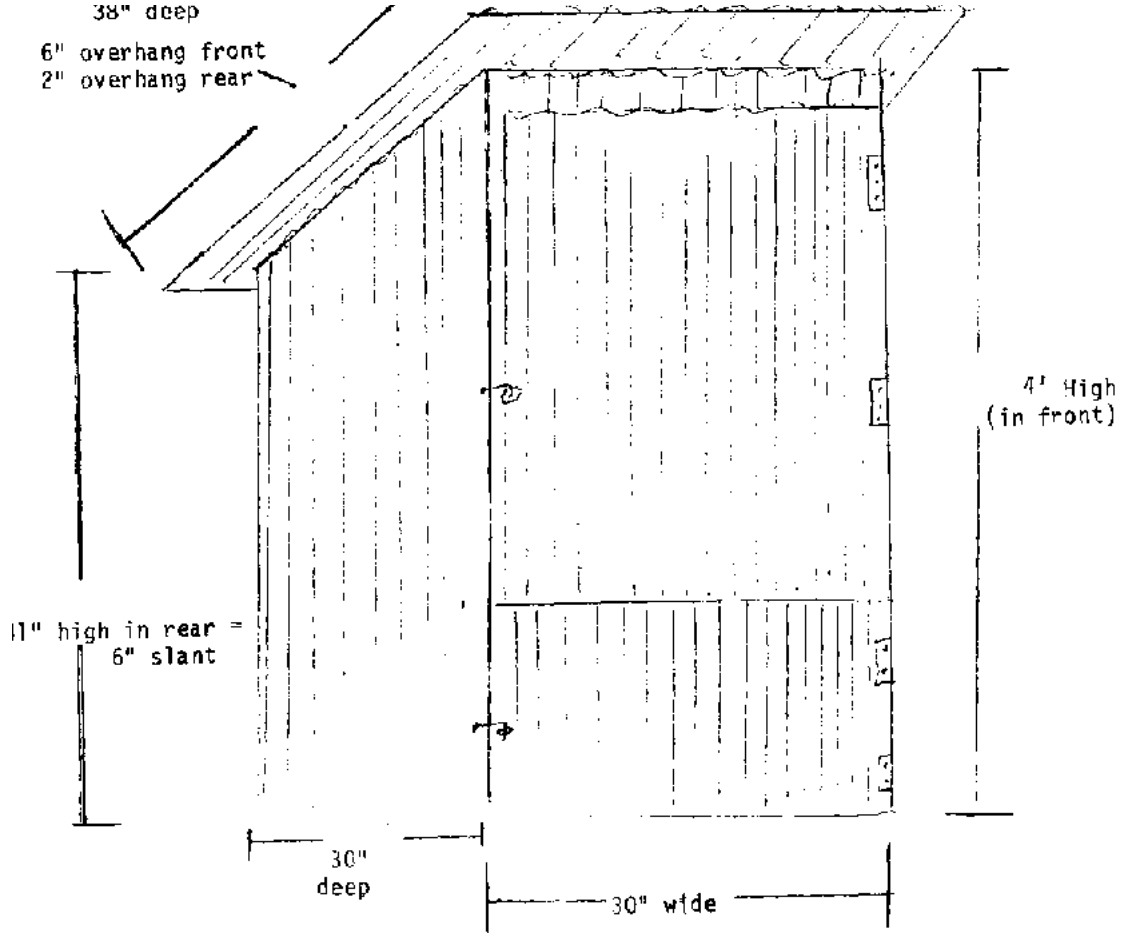
WIRE HOOK

Drying the fish; Building the smoker

"CORRIGATED SMOKER"

(portable)





Corrigated smoker (portable)

Session T-58: Charcoal making special project

Time: 4 PM

Goals:

- **To acquaint trainees with the benefits of charcoal as an easy-to-transport, efficient fuel**
- **For trainees to understand the basic principles of small-scale charcoal making, including the earthmound kiln and the portable kiln**
- **For the trainee assigned the special project to build on communication/technology transfer skills**

Overview:

In most developing countries, firewood is becoming increasingly expensive and difficult to get. In the last session, trainees built a smoker for smoking fish, a technology which requires a prolonged source of heat. In this session, trainees learn that wood converted to charcoal is a much more efficient use of wood as a fuel. Charcoal is relatively simple to make, and certainly much easier to transport than wood.

Procedures:

Time	Activities
5 Minutes	1. After presenting the goals for the session, the trainee assigned the special project asks trainees to give reasons why firewood as a fuel is a problem in developing countries. Trainee lists the reasons on newsprint.
20 Minutes	2. Trainee then gives a brief lecturette on the advantages of charcoal as a fuel, and presents the simple, "how-to" steps in making charcoal. Both the earth-mound kiln and

	the portable kiln are discussed (the trainee presents diagrams of both).
20 Minutes	3. Trainee divides the large group by country into small groups of 3 or 4, and tells each group to list out on newsprint the different ways a charcoal making secondary activity might benefit their projects, i.e., to make smokers more economically feasible for the subsistance fisherman, to free women from the arduous chore of hauling firewood, etc. Groups report out to the large group.
5 Minutes	4. Trainee draws closure to the session by linking back to the session on smokers and links to the special project on alternative source of fuel and energy, including mention of the mudstove, methane digesters, etc.

References:

- **Small-scale Charcoal Making: A Peace Corps Manual for Trainers. July, 1982.**

Session T-59: Metric system special project

Time: 5 PM

Goals:

- **For trainee assigned this special project to build on communication/technology transfer skills**
- **To acquaint trainees with the metric system**

Overview:

In their work as marine fisheries extensionist, trainees need to know the metric system well and be able to do conversions between the two systems with ease.

Materials:

- **Flip chart, markers**

Procedures:

Time	Activities
30 Minutes	1. Trainee assigned the special project compares Fahrenheit scale with the Celsius scale. Conversions between the two scales are practiced. A chart is then presented on "simple conversions": inches to centimeters; mile to kilometer; hectar to acre; cups, quarts, gallons to liters; pounds to kilograms; etc.

METRIC SYSTEM

There are two major systems of measurement used in the world today: The metric system and American Dummy units.

Metric is a decimal system of weights and measurements devised in revolutionary France. It was established that the meter is equal to one ten millionth of the distance from the equator to either pole back before the world became pear shaped.

Decimal measurement of temperature had already been established by the Swedish astronomer Anders Celsius in 1742. He proposed a centigrade temperature scale using 0° as the freezing point and 100° as the boiling point of pure water.

Conversion factors of Fahrenheit to Celsius is fairly simple if you remember that 0°C = 32° F and 100°C = 212° F. Thus 100°C = 212°-32° F or 180. The distance between freezing and boiling is 180°F. Thus 1.8 times the number of degrees Celsius plus 32 = the Fahrenheit temperature.

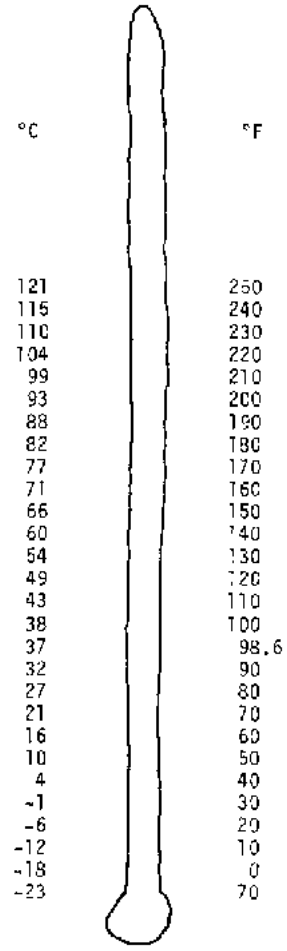
Given 27° C you multiply by 1.8 for a total of 48.6. To this add the 32 degrees below freezing and you have a total of 80.6° F.

The gram - The basic metric wt. was established as the wt. of one cubic centimeter at 4°C (the temp. of water at its greatest density).

Resources:

- **Weather for the Mariner, WM. J. Kotsch. 1977 Naval Institute Press o Preserving food by Drying Manual M-10 ICE**

- Bill Yost, PCV Sierra Leone


°C
°F
121
115
110
104
99
93
88
82
77
71
66
60
54
49
43
38
37
32
27
21
16
10
4
-1
-6
-12
-18
-23
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
98.6
90
80
70
60
50
40
30
20
10
0
70

Temperature conversion

Other Handy Conversions

***within 2%**

Distance

1 in = 2,540 cm
*** 1 cm = .4 in**
***1 yard = .9 meters**
1 m. = 39.37 in
***1 mile = 1.6 kilometers**
***1 k = 5/8 mile**
***1 acre = 2/5 hectare**
***1 hectare = 2.5 acres**

Volume Measurements

100 ml. = 3.4 oz
500 ml. = 17.0 oz
30 ml. = 1 oz
120 ml. = 1/2 cup
240 ml. = 1 cup
480 ml, = 1 pint
960 ml. = 1 quart
3.81 liters = 1 US gallon

Weight

1 lb. = .454 kg.
1 kg. = 2.204 lb.
1 oz. = 28.4 grams
100 grams = 3.5 oz

British and American systems are the same except in volume measures:

British:

1 oz. = 28 ml.
5 oz.(1/4 pint) = 140 ml.
10 oz. (1/2 pint) = 280 ml.
1 pint (20 oz.) = 560 ml.
1 qt. (40 oz,) = 1.1 L.
1 gallon = 4.5 liters
44 British gallon = 55 U.S. Gallon

Barometric Pressure is measured both inches and millimeters

	Inches Mercury		Millimeters Mercury	Millibar
Fair				
	31.00		787.00	1050.0
	30.50		774.7	1032.9
	30.00		762.0	1015.9
Change	29.92	Normal Atmosphere Pressure	760.0	1013.2
	29.50		749.3	999.0
	29.00		736.6	982.0
	28.50		723.9	965.1
	28.00		711.2	948.2
	27.50		698.5	931.3
	27.00		660.4	914.3
Rain				

Barometric pressure conversion

One millibar is 1000 dynes per square centimeter. A dyne is the unit of force in the centimeter-gram-second system of measurement.

One last conversion is for speed through the water 10 knots = 11.5 miles per hour = 18.5 kilometers per hour

Session T-60: Team building

Time: 7:30 PM

Goals:

- **To improve the communication and relationship between trainees who will be stationed in same Peace Corps country**

Overview:

In this session trainees use their feedback skills. This exercise also requires some degree of personal risk taking. At the end of session trainees feel closer to each other and are eager to come together as a team.

Procedures:

Time	Activities	
5 Minutes	1. Trainer makes statement that during this exercise the participants themselves will conduct the time frames Trainers will be available only if they are asked to facilitate one of the dyads interactions.	
2 Hours 30 Minutes	2. Participants make a list being as specific as possible for everyone in	- Things you do or say which make me feel good.
	their group of:	- Things you do or say which make me feel bad.
		- Things I do toward you which make me feel good.
		- Things I do which I regret or make me feel bad.
		- Things I would like us to do more of.
		- Help I think you can give me.
		- Differences and disagreements between you and me are?
		- The source of our disagreement seems

		- The source of our disagreement seems to be....
		- I handle these disagreements by....
		- You handle these disagreements by....
	Each trainee explores the questions with all other trainees in their country group. In cases where there is a problem or difference the following is put in writing by the two parties: - Situation, problem or difference - What I intend to do about it - What I might do in spite of myself - How I would like you to help me.	

Trainer's Note:

At the end of session people will still be engaged in dialogue. Your role is to be sure that everyone shares with everyone else.

Adapted from Cross Cultural Trade-off, by Paul Pedersen

Session T-61: Introduction to basic refrigeration and ice making with field trip

Time: 7:30 AM

Goals:

- **To acquaint trainees with the fundamentals of basic refrigeration and ice making**
- **For trainees to become aware of the refrigeration cycle**
- **To acquaint trainees with refrigerants, compressors, refrigeration systems and various ice making systems**
- **To allow trainees the opportunity to view first hand the various ice making and refrigeration components and to interview refrigeration technicians**

Overview:

This session deals with basic refrigeration and ice making. The PCV in the field will not be a refrigeration specialist and should only be expected to have a basic comprehension and awareness of the refrigeration cycle and the various components in a system. The ability of the PCV to understand the operating principle and functions of components will provide a starting point for further, more in-depth study of the particular model or make of refrigeration equipment used in-country, if required.

Materials and Equipment:

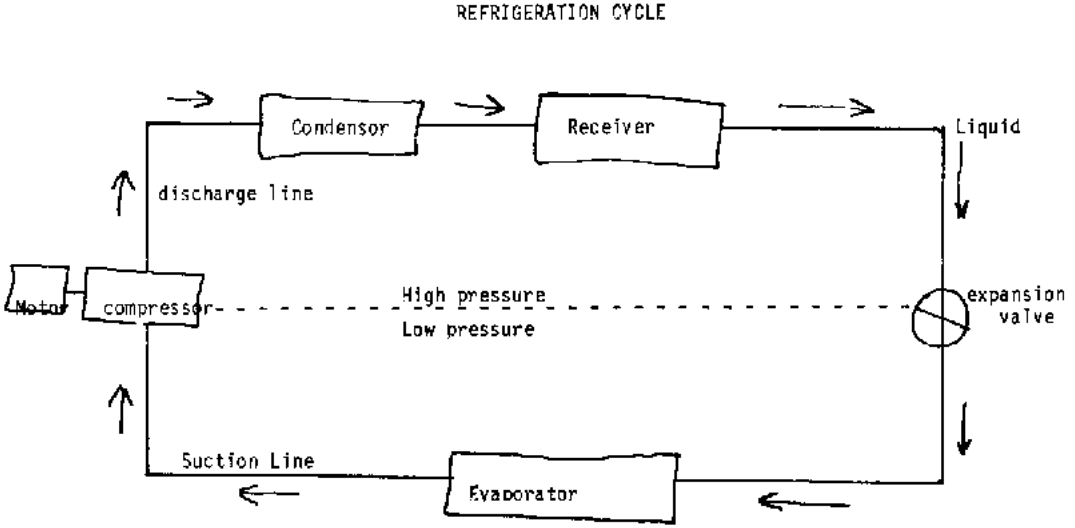
- **Flip chart, markers, freezer/refrigeration models for demonstration**

Procedures:

Time	Activities	
	1. Technical trainer gives overview of what trainees are to look at while on field trip.	
	a. introduction	- refrigeration: what is it?
		- process of removing heat from space or area
		- problems associated with refrigeration
		- thermometers
		- basic systems direct expansion indirect expansion
		- definition latent heat sensible heat
	b. Refrigeration cycle components	- compressor (pump)
		- condensor (receiver tank)
		- evaporator (cooling coils)

		- evaporator (cooling coils)
		- expansion valve (pressure reducing valve)
	c. compressors	- single cylinder
		- multi cylinder
		- reciprocating
		- rotary
		- centrifugal
		- direct drive
		- belt drive
	d. refrigerants	- desirable properties low boiling point safe - non-toxic mixes well
		with oil non-corrosive to metal high latent heat valve ease of liquification at moderate temperatures and pressure
		- toxic refrigerants amonia methyl chloride sulfur dioxide
		- non-toxic refrigerants carbon dioxide calcium chloride freon
	e. freon	- most widely used
		- colorless
		- odorless
		- non-irritating
		- non-flammable
		- chemically inert
		- freon types 12,14,22,502
	f. ice makers	- plate
		- flake
	g. refrigeration cycle	- graphic example

	~~(see Appendix 1)~~	- explanation of cycle
	2. Tour of refrigeration/freezer facility. This is a tour with explicit examples and demonstration. Trainees are reminded of their interview techniques and the need to get the most out of field trip by asking questions.	



Refirigeration Cycle

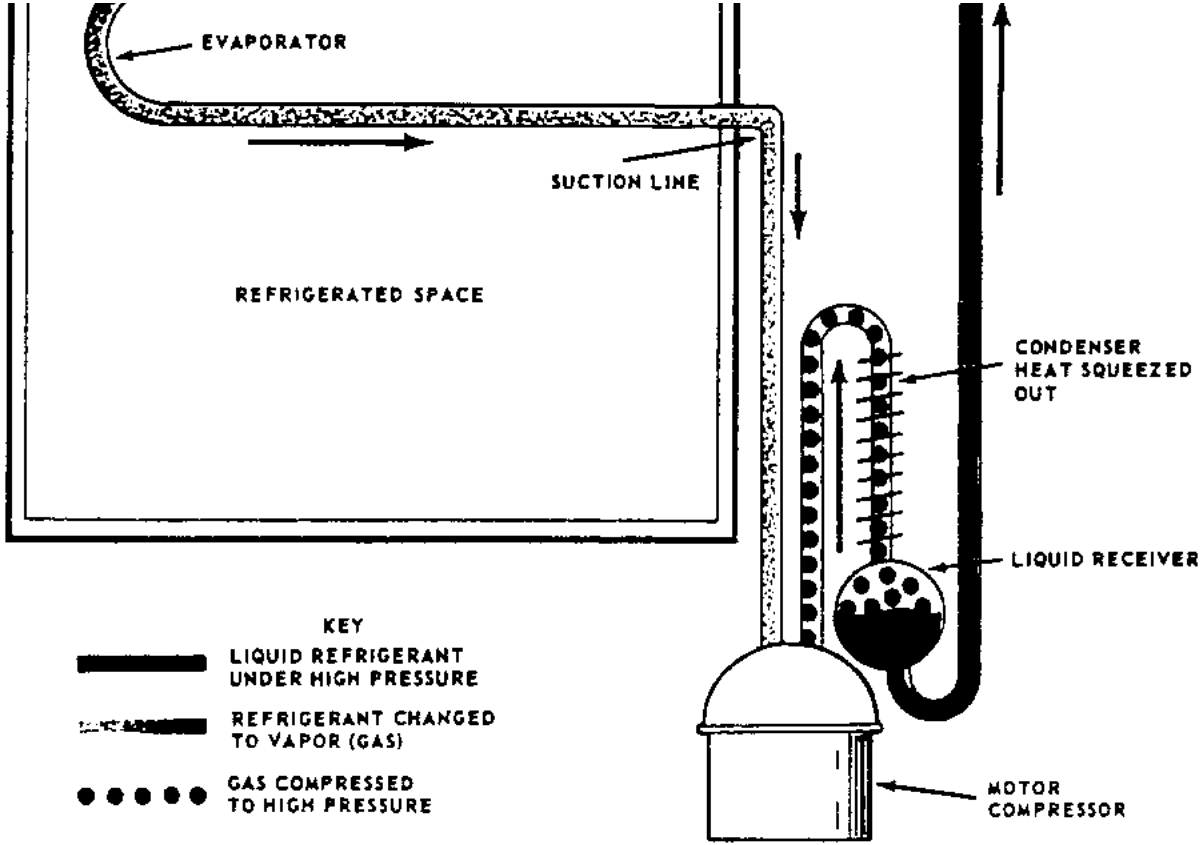
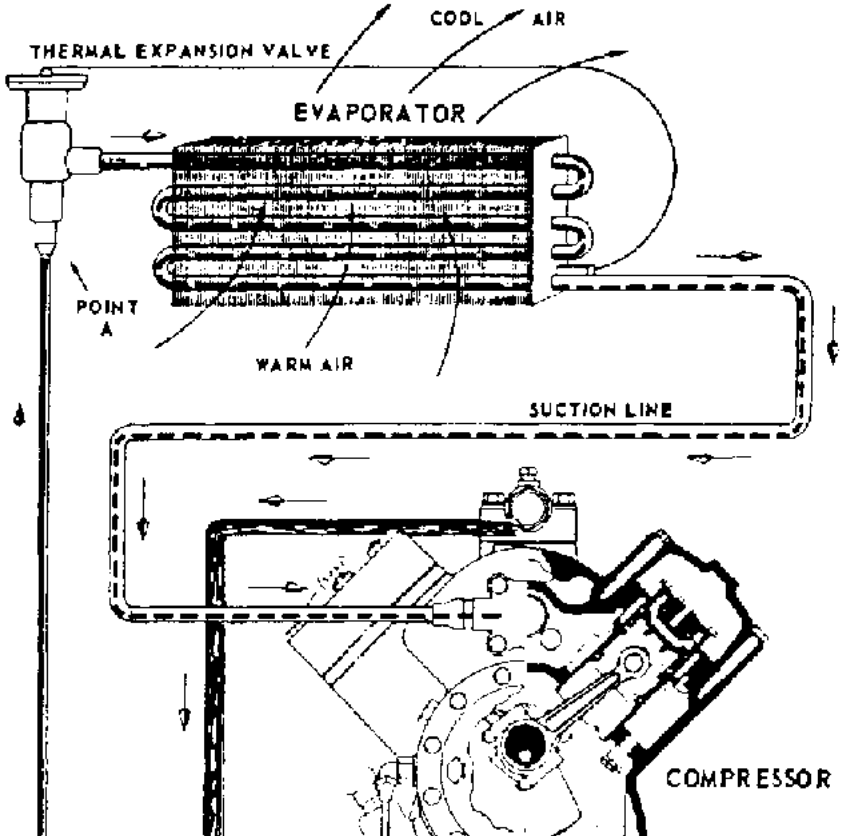


Fig. 1-1. Elementary mechanical refrigerator. In operation, liquid refrigerant under high pressure (solid red), flows from liquid receiver to pr
reducing valve (refrigerant control) and into evaporator. Here pressure is greatly reduced. Liquid refrigerant boils and absorbs heat from evapc
Now a vapor, refrigerant (spotted red line) flows back to compressor and is compressed to high pressure (red dots). Its temperature is g

increased and, in condenser, heat is transferred to surrounding air. Refrigerant cools, becoming liquid again. It flows back into liquid receiv
cooling cycle is repeated.

Elementary Mechanical Refrigerator



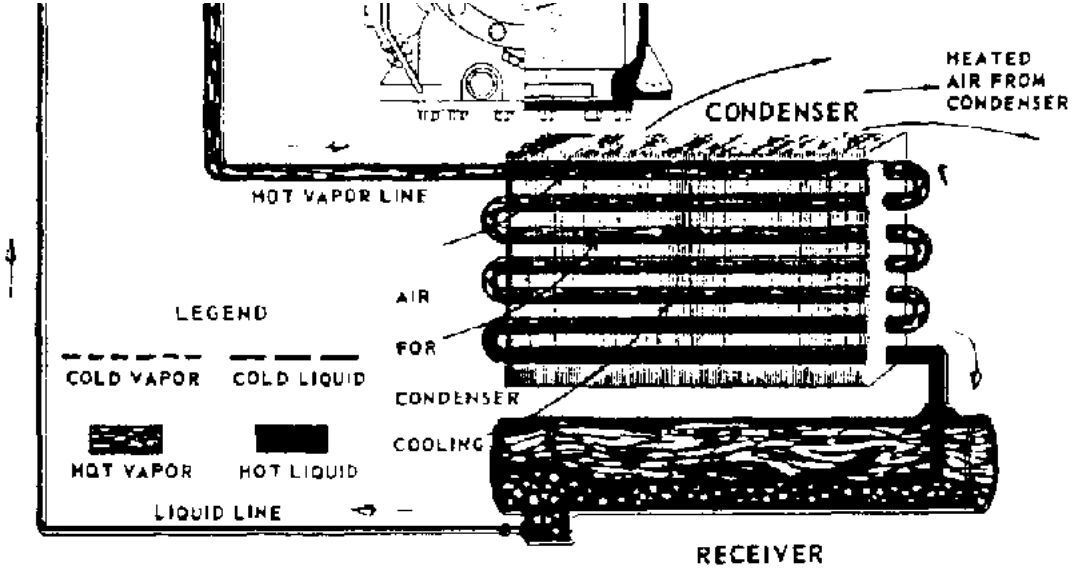
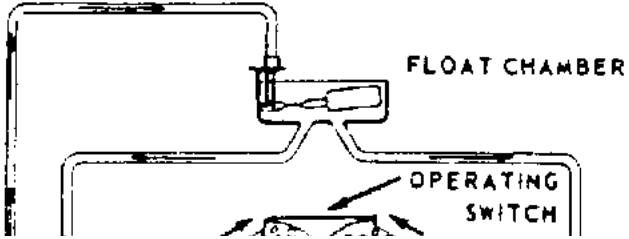
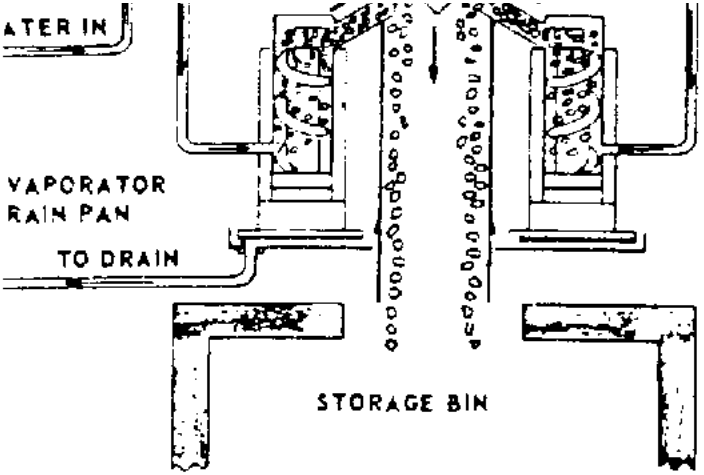


Fig. 12-1. A serviceable commercial system with air-cooled condenser, thermostatic expansion valve and V-type compressor (Carrier Air Conditioning Co.)

Refrigerator





2-69. Automatic flake ice system shows water and ice system. flow is float controlled. When enough ice flakes have been made, operation switch shuts off refrigerating unit and auger motors. (Ross-Temp, Inc.)

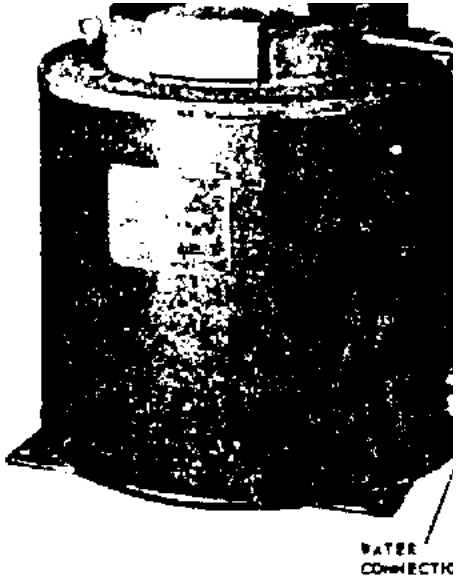
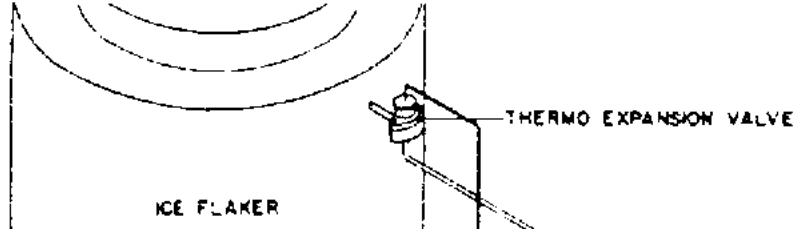
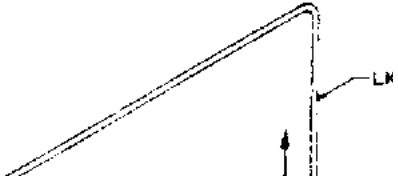


Fig. 12-71 Commercial ice flake maker.





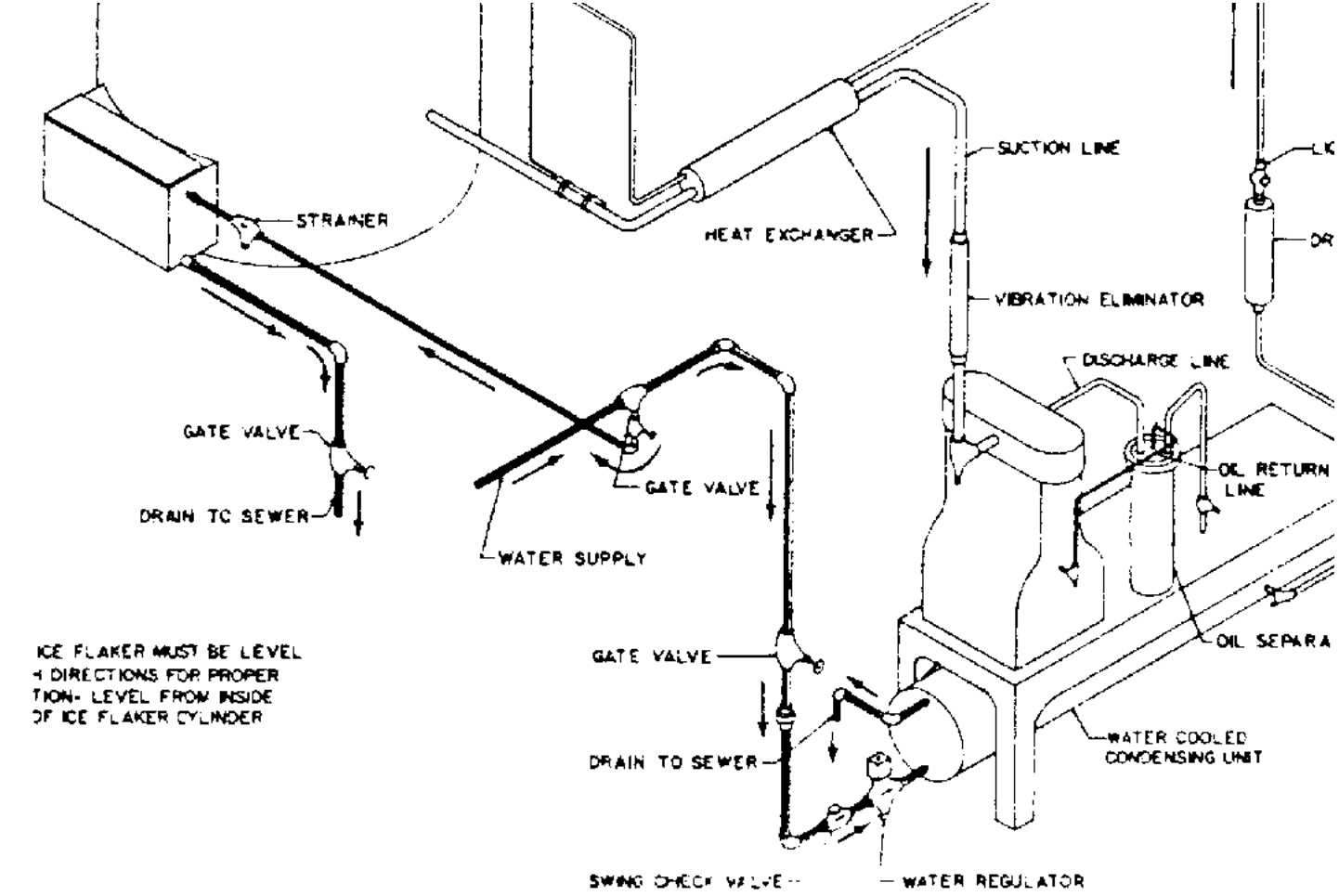

STRAINER
HEAT EXCHANGER
SUCTION LINE
VIBRATION ELIMINATOR
DISCHARGE LINE
GATE VALVE
DRAIN TO SEWER
GATE VALVE
WATER SUPPLY
OIL RETURN LINE
OIL SEPARA
GATE VALVE
DRAIN TO SEWER
WATER COOLED CONDENSING UNIT
WATER REGULATOR
ICE FLAKER MUST BE LEVEL
4 DIRECTIONS FOR PROPER
TION- LEVEL FROM INSIDE
OF ICE FLAKER CYLINDER

Fig. 12-70. Flake ice refrigerating system. Layout diagram provides for efficient operation and access for maintenance service. Water circuit is in red

Flake Ice Refrigeration System

PROBLEMS AND CAUSE	REMEDY
Compressor will not start – no hum.	
1. Open line circuit. 2. Protector open. 3. Control contacts open. 4. Open circuit in stator.	1. Check wiring, fuses, receptac 2. Wait for reset – check curre 3. Check control, check pressu 4. Replace stator or compresso
Compressor will not start – hums intermittently (cycling on protector).	
1. Improperly wired. 2. Low line voltage. 3. Open starting capacitor. 4. Relay contacts not closing. 5. Open circuit in starting winding. 6. Stator winding grounded (normally will blow fuse). 7. High discharge pressure. 8. Tight compressor. 9. Weak starting capacitor or one weak capacitor of a set.	1. Check wiring against diagram 2. Check main line voltage, det 3. Replace starting capacitor. 4. Check by operating manuall 5. Check stator leads. If leads a 6. Check stator leads. If leads a 7. Eliminate cause of excessiv off and receiver valves are op 8. Check oil level – correct bi replace compressor. 9. Replace.

[illegible]	[illegible]
Compressor starts, motor will not get off starting winding.	
1. Low line voltage. 2. Improperly wired. 3. Defective relay. 4. Running capacitor shorted. 5. Starting and running windings shorted. 6. Starting capacitor weak or one of a set open. 7 High discharge pressure. 8. Tight compressor.	1. Bring up voltage. 2. Check wiring against diagram 3. Check operation – replace r 4. Check by disconnecting runr 5. Check resistances. Replace c 6. Check capacitance – replace 7. Check discharge shutoff valv 8. Check oil level. Check bind
Compressor starts and runs but cycles on protector.	
1. Low line voltage. 2. Additional current passing through protector. 3. Suction pressure too high. 4. Discharge pressure too high. 5. Protector weak. 6. Running capacitor defective. 7. Stator partially shorted or grounded. 8. Inadequate motor cooling. 9. Compressor tight. 10. Unbalanced line (three-phase). 11. Discharge valve leaking or broken.	1. Bring up voltage. 2. Check for added fan motor of protector. 3. Check compressor for prope 4. Check ventilation, restrictio 5. Check current – replace pro 6 Check capacitance – replace 7. Check resistances; check for 8. Correct cooling system. 9. Check oil level. Check for b 10. Check voltage of each pha unbalance. 11. Replace valve plate.
Starting capacitors burnout.	

1. Short cycling.	1. Reduce number of starts to
2. Prolonged operation on starting winding.	2. Reduce starting load (insta crease voltage if low – repla
3. Relay contacts sticking.	3. Clean contacts or replace rel
4. Improper relay or incorrect relay setting.	4. Replace relay.
5. Improper capacitor.	5. Check parts list for proper
6. Capacitor voltage rating too low.	6. Install capacitors with recom
7. Capacitor terminals shorted by water.	7. Install capacitors so terminal
Running capacitors burnout.	
1. Excessive line voltage.	1. Reduce line voltage to nc motor.
2. High line voltage and light load.	2. Reduce voltage if over 10 pe
3. Capacitor voltage rating too low.	3. Install capacitors with recom
4. Capacitor terminals shorted by water.	4. Install capacitors so terminal
Relays burnout.	
1. Low line voltage.	1 Increase voltage to not less motor rating.
2. Excessive line voltage.	2. Reduce voltage to maximur
3 Incorrect running capacitor.	3. Replace running capacitor w
4. Short cycling.	4 Reduce number of starts per
5. Relay vibrating.	5. Mount relay rigidly.
6. Incorrect relay.	6. Use relay recommended for

Hermetic compressor service chart

Session T-62: Individual interviews and net mending

Time: 2:30 PM

Goals:

- **The interview goals for this session are the same as in previous interview sessions**
- **To provide trainees with formal instruction in net sewing techniques utilizing the Becket Bend and R and L side knots**
- **To increase speed of sewing and mending nets**

Overview:

Individual interviews continue as in previous weeks. Trainees learn new net mending techniques and knots. Trainees practice net mending to increase speed.

Procedures:

Time	Activities
30 Minutes	1. Technical trainer reviews net sewing and mending skills developed to date. Introduces R and L side knots. Trainees practice.
20 Minutes/	2. Interviews are conducted using format from previous trainee sessions.

Trainer's Note:

If at all possible ask fishermen from community to "drop in" during net sewing session to encourage trainees and possibly transfer new skills to trainees in area of net sewing and

mending.

Session T-63: Support systems

Time: 7:30 PM

Goals:

- **For trainees to look at their support system - personal and professional - over the last year, at the present time, and over the next two years**

Overview:

This session reinforces the learnings of Team Building, session T-60. Trainees need to see their country teams as an important part of their support system - both professional and personal - over the next two years.

Materials:

- **flip chart, markers, journals**

Procedures

Time	Activities	
20 Minutes	1. Trainer asks trainees to define personal support systems and professional support systems. Trainer has an opportunity to discuss with trainees the importance of a "team approach" to their program.	
30 Minutes	2. Trainees record in their	a. Six months ago, who was part of your support system?
	journals the following:	b. Who at the present time?

		c. Any similarities between the two systems?
		d. How are you going to find your support system once at your site.
	3. There is no formal wrap to this session. It is meant to be a reflective time for trainees.	

Session T-64: Processing field trip

Time: 7:30 AM

Goals:

- **To process the Refrigeration and Ice Making Field Trip from the previous session**
- **To review points made by refrigeration technicians about the refrigeration process and ice making/refrigeration components**

Overview:

The previous session in refrigeration and ice making has given all particulars from the principles of operation and component identification to refrigerants. The field trip reinforced this by allowing the trainees the opportunity to interview the refrigeration technicians about problems, designs, etc. This session processes the field trip -- particularly the information gathered, and enables trainees to identify additional areas of refrigeration where they feel they need further information.

Materials:

- **flip chart, markers**

Procedures:

Time	Activities
15 Minutes	1. Technical trainer asks trainees for an overview of the field trip based on the following outline posted on newsprint:
	a. refrigeration systems
	b. ice making facilities
	c. repair facilities
	d. repair tools
5 Minutes	2. Technical trainer asks trainees to brainstorm additional areas where they feel they would like to have more information.
10 Minutes	3. Technical trainer asks where and how they feel they can get this information. Trainees are given assignments to gather data. Trainer gives deadline for assignments the following week.

Trainer's Note:

This is a session in problem-solving. It is important for trainees to recognize that there will be many times when they need information and will have to use various methods to get technical information.

Session T-65: Special project - seaweed farming

Time: 8 AM

Goals:

- **To acquaint trainees with the basic principles of seaweed farming**
- **To acquaint trainees with the nutritive value of seaweed as a food**
- **For the trainee assigned the special project to practice and build on communication and**

technology transfer skills

Overview:

In many areas of the world, seaweed is farmed as a food crop. It is high in nutritive value, particularly in iodine, potassium and other vitamins.

Seaweed farming would be a worthwhile project activity in developing countries where seaweed is already harvested in the wild and consumed by the local population, and if available supplies are insufficient to meet the demand.

Materials:

- **dried seaweed, i.e. Chinese or Korean, flipchart, marking pens**

Procedures:

Time	Activities
30 Minutes	1. Trainee assigned the special project presents a lecture on the nutritive value of seaweed, its uses in cooking, and the basic principles of seaweed farming.
5 Minutes	2. Trainee tells group that in the next session, Nutrition and Fish Culinary Skills, they will all have a chance to sample "dried fish and seaweed soup."
	3. Trainer draws closure to session by linking it to nutrition sessions and to sessions on income generation.

References:

- **Manual on Farming of Eucheuma Spinosum. Gena Products Phil. Inc., P.O. Box 568, Cebu City, Philippines.**

DRIED FISH AND SEAWEED

Dried seaweed	Chinese cabbage
Water	Dried fish
Green Onions, sliced	Soy Sauce Noodles

Use one length of dried seaweed. Place in pot with about three cups of water. Bring water just to boiling point. Remove seaweed. Add vegetables and dry fish to broth. Cook until tender. Soak noodles in hot water for 10 minutes. Drain. Add to soup. Add soy sauce and/or other seasonings.

Session T-66: Culinary skills and fish nutrition special group project

Time: 11 AM

Goals:

- **For trainees working on the group project to build on communication/technology transfer skills**
- **For trainee assigned the special group project to build on leadership, organizational and communication/technology transfer skills**
- **To acquaint trainees with various ways of cooking fish**
- **To acquaint trainees with nutritional information around meal preparation**

Overview:

In the first cooking session, the special group project leader presented general fish

culinary techniques and nutrition. In this second session, the group leader emphasizes the important role minerals play in good nutrition.

Materials and Equipment

- **flip chart, markers, food to be prepared, cooking facilities**

Procedures

Time	Activities
20 Minutes	1. Group leader presents the two recipes to be prepared in the session: fish chowder and fish salad. A chart is then presented with minerals listed and which common foods they are found in. Group leader then points out which minerals will be found in the ingredients for the two recipes.
30 Minutes	2. The three trainees who signed up for this session proceed to prepare the fish salad and the fish chowder, explaining the procedure and useful tips in preparation. Recipes are located prior to session by trainees.
	3. Trainees enjoy the food.

Trainer's Note:

The following is nutritional information that group project leader should impart to other trainees during the session.

NUTRITION

Nutrients - necessary to feed cells, supply energy, supply heat, repair cells, facilitate growth.

Necessary nutrients - protein, carbohydrates, fats, vitamins, minerals.

Functions of nutrients: 1) build and repair body, 2) regulate body processes, 3) furnish energy.

PROTEIN

Sources: Meat, liver poultry, fish, milk, cheese, eggs, dried beans, peas.

Functions: 1) build and maintain all body tissue, 2) regulate acid-base balance of body, 3) formation of body hormones and enzymes, 4) build resistance to disease.

Deficiency symptoms: 1) poor muscle tone and posture, 2) lowered resistance to disease, 3) premature aging, 4) anemia, 5) stunted growth (children), 6) tissue degeneration, 7) slow recovery from illness or surgery.

CARBOHYDRATES

Sources: Sugars, syrups, molasses, flour and flour products, bread, crackers, cereals, potatoes, starchy vegetables.

Functions: 1) furnish heat and energy.

Deficiency symptoms: 1) loss of weight (if calorie intake is deficient).

FATS

Sources: Butter, lard, vegetable shortening, margarine, salad dressings, meat meals, bacon, oils, nuts, cheese, cream.

Functions: 1) furnish heat and energy, 2) carry fat soluble vitamins, 3) supply essential

unsaturated fatty acids, 4) supply spare thiamine (vitamin B1).

Deficiency symptoms: 1) loss of weight (if calorie intake is deficient), 2) abnormal skin.

Mineral	Function	Source
Calcium	good bone and tooth development, prevents rickets if vitamin D is present, blood clotting and muscle action	milk, cheese, eggyolk, dried beans, green vegetables, nuts
Phosphorus	bone and teeth development and nervous tissue	cheese, chocolate, egg yolk, dried beans, peas, peanuts, whole wheat flour, soybean flour and seafood
Iron	making hemoglobin in red blood cells	liver, heart, kidney, raisins, dried fruits, peas, lima beans, whole wheat flour, oats, spinach, onions, cabbage, bulgar wheat
Iodine	production of thyroxin	sea foods, iodized salt, vegetables grown in iodine containing soil
Fluorine	Good teeth and eye tissue	some waters, fruit and vegetables grown in fluorine containing soil
Sodium	blood plasma, lymph and body tissues, aids digestion	salt, baking soda, spinach, cabbage, tomato
Chlorine	same as sodium	salt, lettuce, spinach, cabbage, bananas, beans, corn, seafood

Sulfur	making body proteins	eggs, cabbage, fish, meat, corn, cheese, beans
Magnesium	tissue building - teeth, bone and muscles	greens, cabbage, tomato, lemon, banana, pineapple, wheat, rice, barley

Minerals chart

Potassium	good tissue tone	potato, spinach, beans, tomato, lime, lemon
Manganese	aids in carrying oxygen from lungs to cells	watercress, parsley, egg yolk, some nuts

Minerals chart (continued)

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Vitamin	Function	Source
A	maintains moist covering in eyes, respiratory system, digestive system and urinary system, prevents night blindness	green, leafy vegetables, yellow vegetables, liver, butter, eggs
B_1 Thiamin)	prevents beriberi, keeps nervous system healthy, promotes good appetite and digestion, aids in carbohydrate utilization	milk, eggs, peas, beans, peanut butter, meats, whole grain or enriched cereals
B_2 (Riboflavin)	keeps eyes and skin healthy, general body resistance to disease, nervous system	eggs, pork, cheese, beef, lamb, liver, broccoli, milk, spinach, fresh green peas, green vegetables
Niacin	prevents pellegra, keeps skin healthy, protects health of nervous system, stimulates appetite	milk, lean meats, tomato, green peas, fish, beans, many leafy vegetables, eggs, liver, fish, nuts whole grain cereals
B_{12}	prevents pernicious anemia, keeps number of red blood cells at normal level	liver, green vegetables
C (Ascorbid acid)	prevents scurvy, keeps blood vessels healthy, good bone and teeth formation	fresh vegetables, fresh citrus fruits, tomatoes

Vitamin chart

B_6 (Pyridoxin)	hemoglobin formation, metabolism of amino acids, absence impairs growth	grains, seeds, legumes, liver, milk, egg yolk
E (Tocopherols)	absence causes sterility in either sex, influence growth and healing	vegetable oils, lettuce, beans, rice, corn, meat, milk, eggs
K	promotes normal blood coagulation	green vegetables, tomatoes, vegetable oils, egg yolk

Vitamin chart (continued)

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- Margaret Hul sair, PCV Sierra Leone