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**LECTURES**

**ON**

**FISHERIES**

**GIVEN BY MR. H. VAN PEL  
OF THE SOUTH PACIFIC COMMISSION  
NOUMEA, NEW CALEDONIA**

**at**

**KUKUM, GUADALCANAL  
BRITISH SOLOMON ISLANDS PROTECTORATE**

**on**

**19th - 23rd January, 1960**

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PROGRAMME

Monday - 18th January

Whole day                      Fishing with draglines and handlines with  
2 motorboats, East of Honiara.

Tuesday - 19th January

1. 0930 - 1030              Fish preservation
2. 1100 - 1200              "              "
3. 1400 - 1500              Fishing material and ordering it.

Wednesday - 20th January

1.                      Fish preservation
2.                      "              "
3.                      Longline, line-fishing, bait.

Thursday - 21st January

1.                      Fish preservation
2.                      "              "
3.                      Fishtraps (fixed and bottom).

Friday - 22nd January

1.                      Fish preservation
2.                      "              "
3.                      Nets (Gill-barrage - cast-lift-nets)

Saturday - 23rd January

1.                      Trochus (biology and protection)
  2.                      Fresh water fish (culture, ponds, lakes).
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19th January - 10.05 a.m.

At the request of the Government, I am giving some lectures and practical demonstrations on fish preservation and different kinds of fishing gear and in case I am not clear in my English, please ask and I will explain to you again. Everywhere in the world they are asking for help from international organisations, for instance F.A.O., U.N.E.S.C.O., and W.H.O. which are all agents of the United Nations, and in this part of the world there is an international organisation called the South Pacific Commission. The S.P.C. belongs to six countries - Australia, England, France, Holland, New Zealand, and the United States. In small countries they do not have every kind of expert so when they need one they ask for one from the S.P.C. or the United Nations.

The S.P.C. have three branches - one is the economical section which gives help and education in agriculture, fisheries and the campaign of the rhinoceros beetle; the second is health; and the third is a social section. For instance, at the moment here in Honiara there are 4 officers, 2 for making a good printing school, there is a lady here who is collecting information to open a school in health education; and then myself this week, to give some information to the agricultural officers here, and last week I was finding out a place for a fisheries training centre. We shall have this year, a boat building course in Auki which will last two years, for Melanesian students and perhaps next year we shall have a training course for fishermen.

We are now having a training course on fisheries, I am going to tell you about fish preservation, fishing, equipment, etc., so that you can go back to your islands and tell the people there all that you have learnt.

When I tell you about fish preservation if it does not apply to your own island please ask me questions, as every country has its own problems; for instance, when I was travelling 4 years ago in the Southern Solomons where I was giving education in fish salting and fish smoking, one of the leaders of an island said that what I had been telling them was very important but on his island there was lots of rain and did I have a special type of fish preservation for a wet climate; and there are other islands where they have a lot of trouble with flies. However we have a simple type of fish preservation for every island.

The S.P.C. have booklets - "Fish Preservation Simplified" of which we have sold about 4,000 copies and are having to print more - another is called "How to look after Fish Nets" - and the third is "How to look after a Fish Pond".

You will see in the programme at the end of the week that I shall be telling you something about the living conditions of the trochus shell, and in the second lecture about fish cultivation, in ponds and in lakes. I have heard from one of the Agricultural Officers that many people here do not know how to maintain a fish pond.

This is just a short talk to tell you what we are doing - if there are any doubts in your minds about anything I tell you, please ask me questions.

Are there any islands already salting fish ?

Mr. Russell - only drying.

Mr. Van Pel - I know, for instance, from Malaita you are cooking crabs in bamboos, you have seen them ? How long can you keep them ?

Student - They can only be kept for a week or two: we also cook fish the same way, in small pieces.

Mr. Van Pel - Do they do anything to the fish like salting it ?

Student - No, only cook it on the fire.

A list of names of those present was then taken and Mr. Van Pel and students went to the demonstration shed.

Fred Ani'i	Ag. Assistant	Malaita
Nelson Niolo	Fisheries Assistant	Eastern district
Joel Nagu	Field Assistant	Western "
Wilson Vuria	" "	Central "
Wilfred Bina	" "	Eastern "
Michael Buna	" "	Malaita
Philip Saunga	" "	Central "
Dudley Fakaia	" "	Eastern "
Stewart Duty	" "	Central "
Frederick Lui	Co-operative Asst.	Central "
Mr. M.J. Russell	Agricultural Officer	Malaita
Mr. A.J. Van der Loos	Asst. Inspector of Produce & Stock	Gizo
Mr. D.J. Meadows	Agricultural Officer	Ysabel
Mr. M.A. Foale	Agricultural Officer	

#### Demonstration

Mr. Van Pel said that the intention this morning was to salt the fish well and after doing so, to dry it in the sun.

Four Red fish were taken, and the students commenced to cut them.

Mr. Van Pel said to start at the tail, cutting their backs, until you came to the bone, then cut along the bone to the head. They should then cut through the head.

All parts with blood in them should be taken out - the gill too. In some countries the gill was not taken out but this tended to make the fish heavy so the gill should always be taken out. It was also not necessary in small fish to cut out their eyes, but in big fish it was. The big back bone should then be cut out but not too deeply.

When the back bone was taken out, because the fish were big and fresh, several cuts into the very fleshy parts would have to be made, so that the salt would penetrate. The fish should then be turned over and more cuts

made on the other side.

If a Parrot fish is being used, the scales must all be taken off because the salt cannot penetrate them, but in most other fish this is not necessary.

Mr. Van Pel then asked the students to open up the fishes stomachs to see whether they had eaten any bait - they had eaten some.

Mr. Van Pel said that salting could be done two ways. The first is to just rub the salt over the fish in such a way that you have one part salt and two or three parts fish - this way you use rather a lot of salt but it is an easy way for instance, if you are in a canoe.

The second way is to pickle it and this is the best way for the Solomons. We will now put salt in the fresh water and I will show you when the brine is ready for pickling.

When the salt has been put in, you put a sweet potato in the water and if it floats the pickle is good. You can also take a piece of fish, and if it floats then again the pickle is good. If it does not float, then you must keep adding salt until it does.

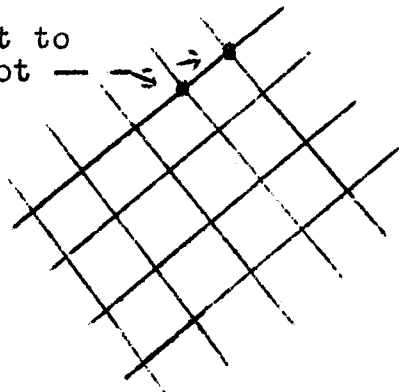
It is much cheaper to use salt water first of all because then so much salt would not be needed for the pickling. In salt water there is more than 3% salt. You then put the fish in the tin, skin to skin and flesh to flesh. When all the fish is in the tin you then put in some more salt and put a heavy stone on top. Then put a sack over it and put it in a place where the dogs cannot come.

19th January - 2.20 p.m.

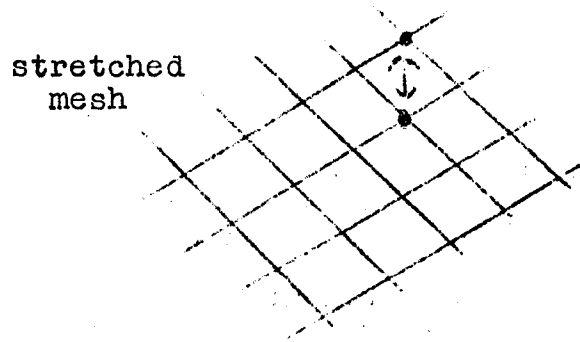
Mr. Van Pel - Most fishing nets and lines used now are made of cotton or from nylon and I can tell you that during the last two years, nylon has become No. 1, and now from the factory, cotton and nylon nets are made but 80% will be nylon - this also applies to fishing lines. Yesterday we used nylon lines because it is a certain thickness and is much stronger and here in the tropics you do not have to dry them and they don't deteriorate. You have to be careful you do not put them on iron spools because then they deteriorate.

I will now tell you how to order fishing nets -

knot to  
knot -

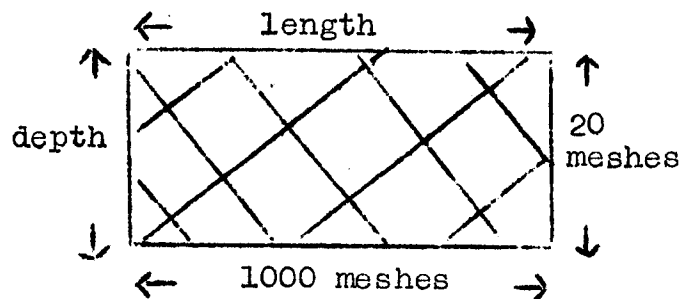


This is a piece of net - you can order a fishing net in Australia, New Caledonia or England. You must give the net size which must be correct because in many countries they count from knot to knot.



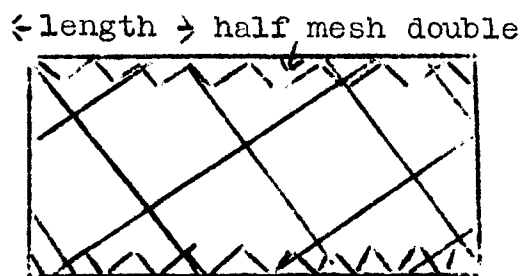
It is better to say I would like to have a fishing net of a measurement of 1" from knot to knot. You can also have the same mesh but you have to say 2" stretched mesh.

Last year in the Cook Islands, a man ordered a net in Japan, a 2" mesh, and he only received half the size he had in mind. So these two factors are very important.

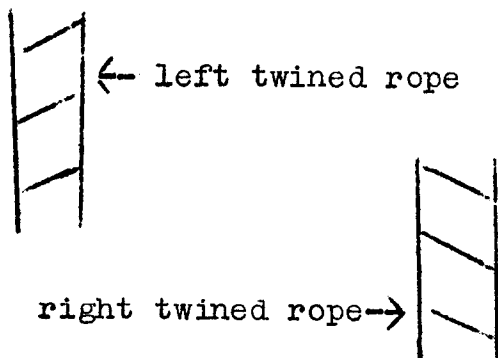


You then have to tell how deep and what length the net is. These nets are made from machines and the nets are coming out of the machines as illustrated.

Nowadays, all the modern machines make the nets as illustrated. You now know how to order the length and depth of a net.



You can have a reinforcement along the length side of the net which is called a half mesh double. You may have it both sides. Sometimes you may like a full length double meshes.



Some people prefer left twined rope and others prefer right twined rope. This piece of rope twined this way, is called left twined rope.

If it is this way, then it is called right twined rope.

The left twined rope is usually a faster twined. So you make your order for a net or a rope, you have mentioned, left twine or right twine. The thickness of the rope is very difficult.

Now I have to tell you something about the numbers. I could advise when you order lines, that you mention the diameter, but the British system is so that when there are 840 yards in one lb. of twine that is No.1; and No. 12 is 12 x the length in 1 lb. which means 12 x 840 yards in 1 lb, but I advise you and I think it is better not to tell too much about this because even in Europe it is too complicated and I have seen people order the wrong nets and lines. If they had only mentioned the diameter of the rope then it would have been much clearer. If you have to order twines or yarns, you say the thickness in diameter, then you have also to say what knots you would

like to have in your nets. Mostly the fishermen's knot is used, if you mentioned that name you would receive a net with the same knots as these. Another knot is called the Chinese knot, I would not advise you to order this kind of knot because it slips. Only order knots with the name, fishermen's knots - this is about cotton.

Now we come to a more difficult matter and that is nylon. When you order nylon nets, you have to mention from what denier it is made. Mostly 250 denier is used with fishing nets and the Americans use 210. When you want a nylon twine of 250 denier, that means there are 9000 meters in  $\frac{1}{4}$  kilo, that means when they say a rope is 250 denier you have about 1000 yards in about 9 oz. This nylon rope measurement is very complicated and I advise you when you order it, also mention the diameter.

I should advise you to write it down, nylon rope 250 denier, then you will have about 1000 yards in about 9 oz. Also when you order fishing nets made of nylon, just mention the same as I have said about cotton, only you have to mention how many threads of nylon you will have in one rope so if you have one rope 3 strands of 3 threads each, then you have to order a rope 250 denier 3 x 3. Then they know in the factory what you like - a rope of 3 threads twisted together in 3 threads so making 9 threads.

Remember this, when you have a nylon net or nylon lines, never put them in hot water because some people were tanning them. It is dangerous - you can do it with cotton but not with nylon.

Are there any questions about this ? No ? Remember nylon is called a synthetic material - there are many different names for it.

Tomorrow I will tell you more about fishing nets, what kind you can use here and how they are made. This afternoon because one of the Agricultural Officers asked me how to order this, I told you all about it.

Mr. Russell - where can you order these nets from ?

Mr. Van Pel - You can ask the South Pacific Commission, they will give you different addresses of places to get nets. I think it is best to get them from Australia because it is the nearest place but you could also get them in New Caledonia but they are more expensive there. Another thing is you have a boat connection with Sydney but not with New Caledonia.

If you have cotton fishing nets here, you will keep them for a long time if you make the nets brown - you can do this with the bark of the mangrove tree. The bark of the old mangrove you skin it off, and you rinse it in fresh water for 1 day then you boil it for 2 hours; you put your net in it, let it stay for a night in the water then dry it, then put it in the water again for another night and take it out and dry again. If you do this once a month your fishing lines and nets will last a lot longer than they would if they were white. The name of this is tanning.

Student - How much would a net of this size cost, Mr. Van Pel has not mentioned any specific cost ?

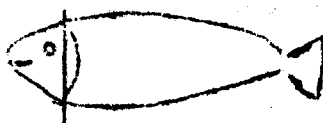
Mr. Van Pel - I could not mention any specific cost because it depended such a lot on many things. I will work out the cost now for you - the size I have been talking about would cost you about £5 Aust. in Sydney, that is for a 2" mesh. When a mesh is 4" it is cheaper.

Mr. Russell - Is it cheaper to make mesh lines oneself ?

Mr. Van Pel - Not really because by the time you had employed labour then it would be more expensive; if you made the nets yourself it would not though.

When you order a net it is always good that you should specify the type of mesh, and what the water is like, whether it is clear or shallow etc.

Now you have a gill net to catch a fish, you always make the size of the net of the gill net, around the gills of the fish like this:



not like this:



If you have a fish of say 6" round then your mesh size of the gill net will have to be 3", you take the circumference around the fish and divide it by two.

Mr. Russell - can you tan nylon ?

Mr. Van Pel - You can but it only covers it, it does not preserve it. A nylon net should not be put in hot tannin but in cool tannin.

Mr. Russell - Could you not just put a net into the mangrove swamp and leave it there to tan ?

Mr. Van Pel - I don't think so, I think I prefer cooked bark to mangrove swamps.

This morning we salted the fish, it will stay all night in the brine now. Tomorrow morning if there is sun, we will dry it for 3-4 days. Then the fish is dry and you can keep it for a long time and it is advisable to keep it in a dark place as it will keep longer. The question came up, if you have this dry salted fish, how can you eat it. You will cook it, the dried fish is much too salty to eat it as it is.

You must put the salted fish into fresh water so that the salt will come out, then boil it in fresh water, then change the water, and boil it again for 20 minutes, after that you can eat it. You can eat it with rice, potatoes or taro. You can fry this fish, mostly you fry it dry in oil. When you eat fried fish you eat it in small quantities so that it will be alright.



Mr. Van der Loos - can you use the brine again?

Mr. Van Pel - you can use the brine again for other fish. Mostly when you put other fish in, you add just a little salt, you can use it 3 times. Any longer will make the quality of the fish no good. It is cheaper to use this brine than just putting salt on the fish (dry salting) because you can use this again.

In a dry country you can keep a salted fish for 5 months or longer; in a wet country where it rains, you can keep it for 3 months but every 14 days when it is a dry day with sun, you should put your fish into the sun for just  $\frac{1}{2}$  an hour then put it away again. It depends on what fish it is, if it is an oily fish, it will not keep so long but here you do not get many oily fish.

When this salted fish is dry it will have about 50% protein. You are perhaps thinking the protein will disappear when it is salted, but it does not. Your protein from salted dried fish is nearly the same as from fresh fish.

- There are many methods of drying fish but not many simple ones. This week you will salt, dry and smoke fish, and cook fish dry. There are more methods but you cannot use them here. You can 'can' them, freeze them, but here on the islands you cannot do so, so I am telling you of the other ways this week.

The question was asked why a potato floated in the brine this morning. When one gallon of potatoes and one gallon of salted water is taken, the salted water is heavier than the potatoes so that when the potatoes were put in they floated.

Student - Are there any poisonous fish in the Solomons ?

Mr. Van Pel - There are but not many.

20th January - 2.00 p.m.

We will repeat now what we did this morning, so that you can make some notes :

We cooked sharks and snapper this morning and we call that making dried fish flakes. We cleaned it well and then put it into about 2 gallons of water, with the water of 2 coconuts; we filled the pot full with fish, then we boiled the sharks for half an hour. After that we put the shark meat on corrugated iron sheets, took the skin off and the bones out, cut the meat into small pieces and then started drying with a small fire under it. You may not have a big fire otherwise the fish will burn and stick to the sheets. You can do it in the sun with a small fire under it and you can do it also in a copra drier.

Tomorrow morning the fish flakes will be ready if we have a small fire in the copra drier all night.

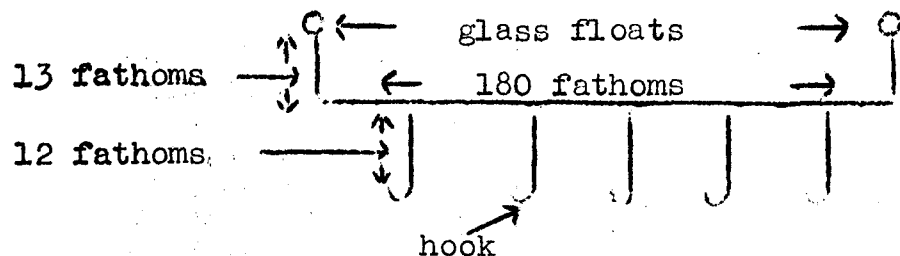
With other fish we have only to boil them for 20 minutes because shark meat is tougher and it must be cooked longer than other fish.

These fish flakes when they are dry should be kept in bottles or in tins, bamboo tubes, paper bags, plastic bags etc. You can keep them for a very long time but mainly in bottles and tins; you can keep them for at least one year. I have fish flakes made in Malaita, put in a jam jar and kept for 4 years and they are still in good condition. In times when you have more fish then you can make fish flakes and during bad weather when you cannot fish, you can make good fish cakes - one spoon of fish flakes is sufficient for one adult person a day. We cook this fish in fresh water and coconut water but you can also do it in sea water or fresh water only.

Besides this we were also drying red snapper in the sun but when we saw there were too many flies, we put them in the copra drier so that the fish will be artificially dried. This dried fish in this copra drier, I estimate will be ready in two days, but this fish can be kept for 2-3 months but you have to keep it in a dark place and when you have a great quantity of fish you have to staple it, then place it skin on skin and white flesh on white flesh.

Now I will tell you something about tuna fishing around these islands. There are many Japanese fishing boats fishing around your islands and mainly in the south of the British Solomons, south of San Cristoval. One of the best fishing places for Albacore in the world was here. Albacore is a tuna with white meat - all other tuna has red meat.

The most expensive tuna, called Albacore, has white meat and has long fins; besides Albacore you have yellow fin Tuna which has yellow fins with red meat and you have big eyed tuna. Japanese fishing around these islands bring tuna to the New Hebrides where they have a freezing store and the fish is frozen there and every two months they send the fish to the United States. Now I will explain to you how the Japanese catch these tuna. They have very long lines made of cotton and the last year or so, of nylon and these cotton lines are a little thicker than this which I am holding, and they also have glass floats - I think you will have seen the glass floats :



You have a long line with many sections of 180 fathoms and this line hangs in the sea and is supported by the glass floats. From the glass floats there is a line of 13 fathoms. On the long line they have hook lines and these hook lines are 12 fathoms and they have a hook on the end. On the end of the line is a steel wire because when the tuna or shark bite if they were cotton the line would be cut. The whole of the 180 fathoms is called one basket.

The Japanese are fishing with 300 baskets of line and every line is 180 fathoms which means you have more than 50 miles of length of line. The hook is always this shape -



They fish with bait they bring from Japan and that bait is a kind of Herring. The best bait is Sauri. Sauri is a round Herring. You can also use Mullet or a kind of horse Mackerel you have here. The best bait are round fishes not flat fishes. A good catch from 100 hooks is 7 tunas. Now you see this is 13 fathoms and this is 12 fathoms, the total is 25 fathoms, but you must not think that every hook is on a depth of 25 fathoms because the middle hook is deeper than the end ones. Sometimes it is 60 fathoms. When they put the lines overboard the ship is running at full speed and allows only 5 hours to put out the lines and it takes sometimes 12 hours or more to take the lines in and this line here illustrated is taken in by a winch. When the line is taken in every line here is taken off the main line.

As I told you, in the New Hebrides they bring the tuna in, freeze it and send it to the United States. In American Samoa they bring fish in to 'can' them in tins. These are very important for American Samoa, these fisheries make \$6,000,000 - about 200 women and 100 men work in the fisheries.

So you must remember south of the British Solomon Islands is one of the best fishing grounds for Albacore. The Americans call Albacore the chicken of the sea and sell it in tins. They say it has a similar taste to chicken.

Mr. Russell - how many hook lines have one basket ?

Mr. Van Pel - Five. They only put 5 because they like every hook at a great distance. When you have the lines too near the tuna will get mixed up with a tuna on the next line. The Japanese don't like them too close together because it will slow down the speed of the boat, winch, etc. If you are fishing on a small scale, say 30 baskets, you could use 10 short hook lines.

Student - When do you put out the lines ?

Mr. Van Pel - mainly in the evening and sometimes at night they sleep for say 3 hours then begin to take up the line again.

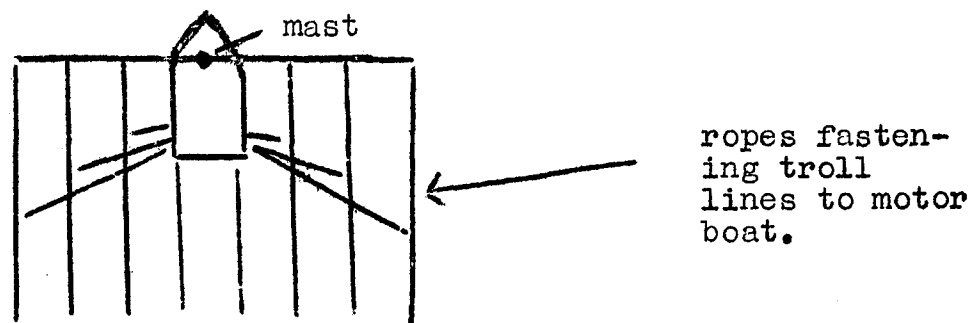
The last line that went from the boat stays a couple of hours and the first line perhaps 12-15 hours. Often you get sharks but when there is a place with many sharks, they move to other places because the sharks have no great value for them. The main thing is tuna.

Mr. Meadows - When the hooks are a long while in the water, don't the sharks take a lot of tuna ?

Mr. Van Pel - that often happens and there are only heads of tuna left. Most sharks are near islands and most tuna are in the deep sea but often near shallows because there is usually lots of food for them there.

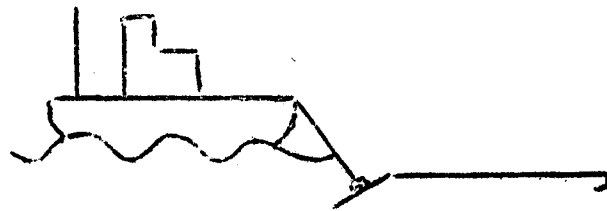
Last week we only got one fish trolling but when you have cloudy skies it is good for fishing with trolling lines. When you fish from motor boats you can fish with 8 troll lines. We had only 2 troll lines.

Motorboat with 8 lines



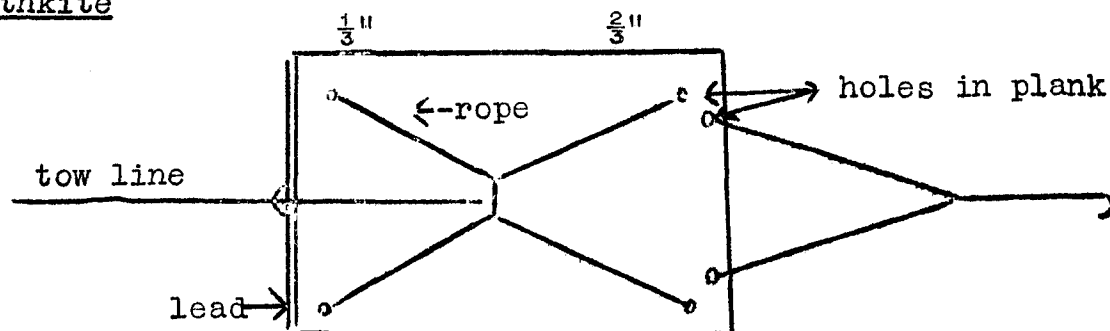
If you were to do it commercially as they do in New Caledonia then you would use 8 lines. On the outer troll lines they have a small line to the boat so that they can pull the fish in, should there be one on the line. On the line you must have a wire or copper line so that if you catch a big fish, it will not cut the line. You can use artificial bait or flying fish that is near the surface.

When you are fishing below you have a wooden plank (Depthkite) and on the plank you have a troll line. This method is more efficient than on the surface. In good weather the food for small fish goes down - by food I mean Plancton. You can barely see it with your eyes. When the sun is shining they like to go down and on Plancton fish feed - like flying fish and Mackerel and on them the big tuna feed. You therefore have a bigger chance that tuna will take your hook this way :



The plank is made like this :

Depthkite



The connecting point is 1/3rd of the plank. At the end there is a piece of lead, so that the plank will sink correctly in the water. When the boat goes along then the plank will go down into the deep water. A good speed for troll lines is six knots. Our boat was doing five knots. You can also do 7-8 knots but the best is six. At night you do not catch fish - just when it gets light or dark is the best time, a sunny day is not good for fishing but a cloudy day is.

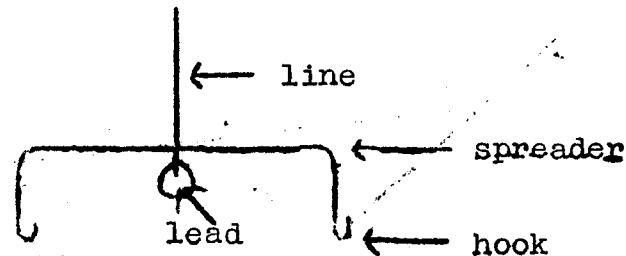
Mr. Van der Loos - what is the size of the plank?

Mr. Van Pel - the plank is about 9" x 5" the size of this book I am holding.

Student - why does the plank go down ?

Mr. Van Pel - the water comes against it, so it goes down.

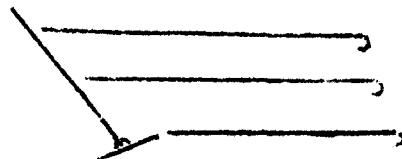
Handline. In many places where they are fishing, they have on the end of the line a piece of lead, and a spreader and two hooks so they can catch two fish at a time:



Again Longline

Student - what is the exact length for the line from the plank to the hook ?

Mr. Van Pel - 4 fathoms plus one fathom wire. You could make the wire 2 fathoms, but 1 is the minimum. Some ships use 3 lines instead of one from the back line:



Mr. Russell - is it necessary to have a winch to pull in the lines ?

Mr. Van Pel - No, you can take it in by hand but if you have a long line, it is easier to use the winch also faster.

Depthkite

Student - How do you know the fish are on the line ?

Mr. Van Pel - If you have a plank of this size and the fish is on it, the plank and the fish will come to the surface. The plank is called a Depthkite.

21st January - 2.25 p.m.

This afternoon I will tell you something about fish traps.

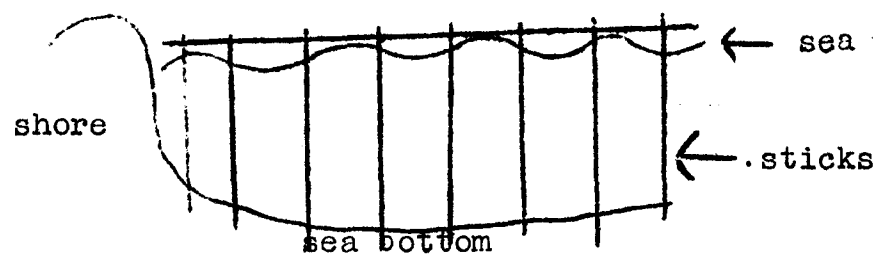
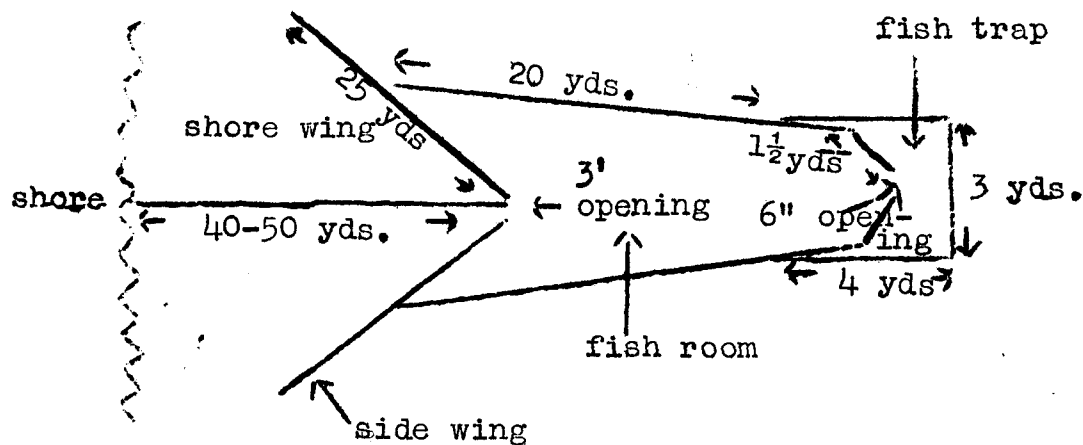
You see fish traps almost everywhere in the Pacific, but I have not yet seen them here. Can anyone tell me if you have seen a fish trap here?

Mr. Russell - there are some in Malaita and some fish traps in San Cristoval.

Mr. Van Pel - I will speak now on fish traps made of sticks and made of bamboo; you can make walls of long sticks and chicken wire.

This is a fish trap seen from the top:

Fixed Trap



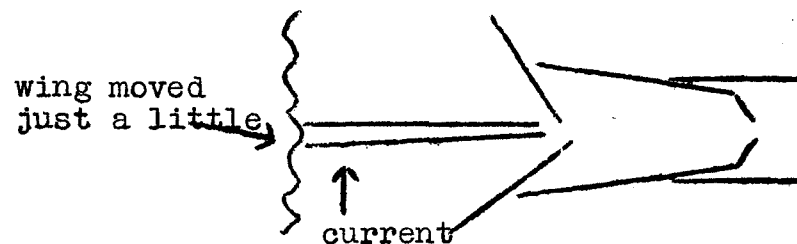
You can use bamboos, mangrove sticks or any other kind of sticks which you have available. On top the sticks are connected with other sticks, and the distance between the sticks is about  $3\frac{1}{2}$  yards.

Along these sticks you can put wire and fix the sticks or put many sticks together and tie them together with rope or loya cane and you can put this mat against the sticks and fix it - the fish will not go through. It looks like this:



For the fish room wings and shore wings you can use the stick mats, but for the fish trap it is better to use chicken wire.

You must make the sticks high enough to come above the water when it is high water, otherwise some fish will go over the wing and escape. When you make this fish trap you must look first where the main current is. If the current is going this way: then the shore wing should be moved a little that way, and the same happens to the other side:



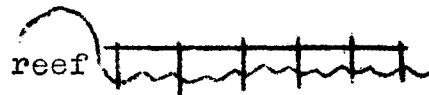
The length of the wing depends on how the floor of the bottom goes, if the bottom goes down gradually you can make the shore wing long but if it is steep then you must make it shorter.

Mr. Van der Loos - is the first opening of 3' a clear opening or are there any spikes?

Mr. Van Pel - No, just an opening.

Before you start fishing you should make a noise in the water so that all the fish in the fish room are driven inside the trap. You must clean the fish trap every week. All kinds of fish are coming in who are swimming along the coast.

Let us say there is a shallow place in the sea, the first wing is not against the shore, it could be a reef:



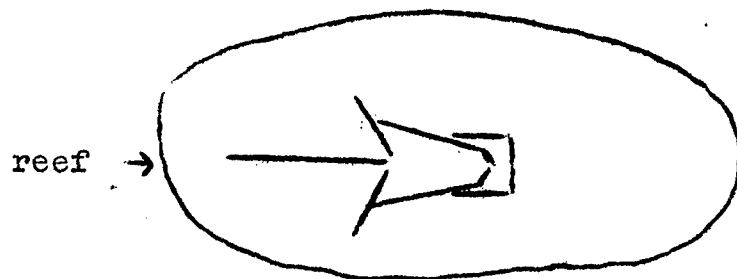
then you can start your wing here.

The sticks you put 2ft. or 1½ft. into the bottom, the sticks near the shore should be about 5' long and the ones at the other end about 7'. Often in the middle of the sticks, there is one at each side to support them. Sometimes if it is a shallow place a second wing is built behind the first trap.

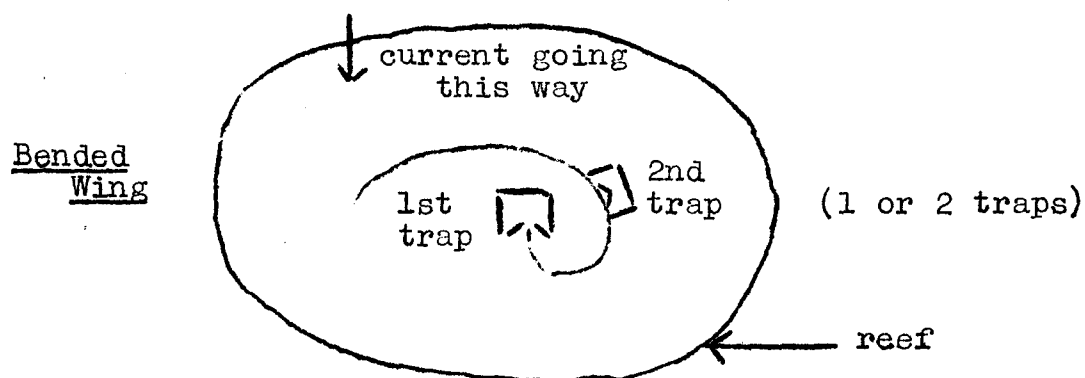
Student - Why do you have to move the shore wing to whichever way the current is going?

Mr. Van Pel - because the current is stronger and whichever way the current is going, it is easier to catch the fish.

Sometimes instead of one fish room there are two - if it is a big trap, but it is better that we only talk about one just now. You can also make this trap on the coral reef:



Here you have a reef near the coast, you can put a fish trap on the reef in which case, whichever way the current is going, you must build the trap. Another kind of trap on the reef you can make this way:



Just a bended wing with one trap. This is a very simple one and it is made in shallow water. Sometimes they have a second trap inside. These traps you can put on sandy bottoms or mud (near rivers) or on the reefs, if it is possible to put the sticks into the bottom.

One thing I have to warn you about when you have a wall along sticks, the lower side of this wall must go near the bottom otherwise the fish will go under it and not into the trap.

I have told you already that every week you should clean the trap because dirty things or sea weed come in with the current and if you do not take it away the water will not be able to pass through the wing or other parts of the trap. Remember just one thing, this wall of the trap, if it is high tide it must be just above the water otherwise the fish will swim out of the trap.

If the current is going faster than two knots then it is no sense to build these traps so you must have a current of  $\frac{1}{4}$ -2 knots but not over.



The best catches in these traps are made in water which is not too clear. For instance, when we went out this week with the boat we stopped the first time near the entrance of the Lunga River; near that entrance you will have good places for fish traps but always when you make a fish trap you should try to make it in an inlet or where the water is protected so that there are no waves; in the open sea you can only make these traps in the good season when the winds are not strong. To build these traps you mostly use a canoe - if it is built near a village you do not need one though, because it is not far away.

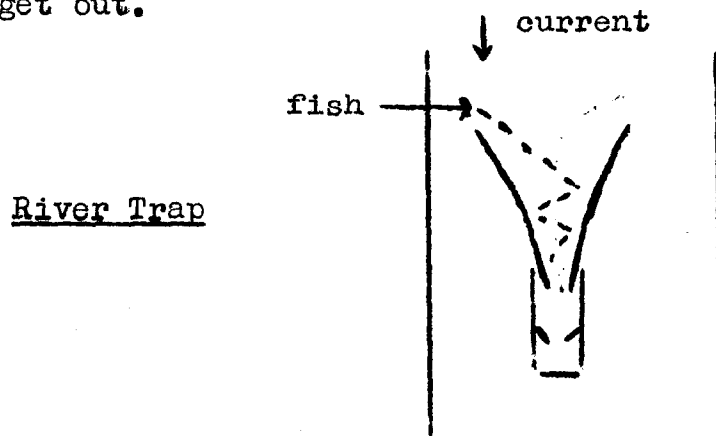
Mr. Van der Loos - how do you take the fish out of the nets ?

Mr. Van Pel - when it is low tide you have a scoop net and you take the fish out because it is small; if it was bigger then you have liftnets.

These you call fixed fish traps when you have these kind that I have shown you - are there any questions ?

Student - Why do the fish not go back through the 3' entrance.

Mr. Van Pel - One wing of the 3' entrance is slightly longer so that when the fish swim round it will miss the opening; they will mostly go into the deeper water though, and then into the smaller trap - they usually swim into deep water when trying to get out.

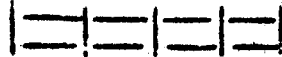


Here again you see two traps - an inner trap and an outer one.

Here you have wings but they are just sticks no walls along it. The right wall for instance you see every yard a stick :



that is just one stick here and one stick there and along the sticks you put other sticks (on the top). Fish are coming in by the pressure of the water which comes between the two wings. In a strong current the fish will swim into the trap but will be afraid to go back out of the sticks. When the current is nearly finished then you can take the fish out. The trap has to be built very strong because the current is very powerful on the trap.



Two lots of sticks must be put on and chicken wire or sticks to make a mat like I have shown you. On the end you must put a support like this :

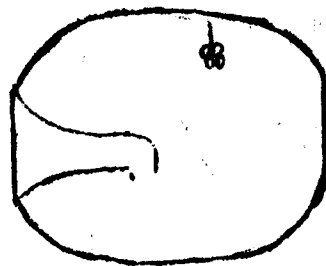


to make it strong. This river trap is also a fixed fish trap. Are there plenty of fish traps in the rivers here?

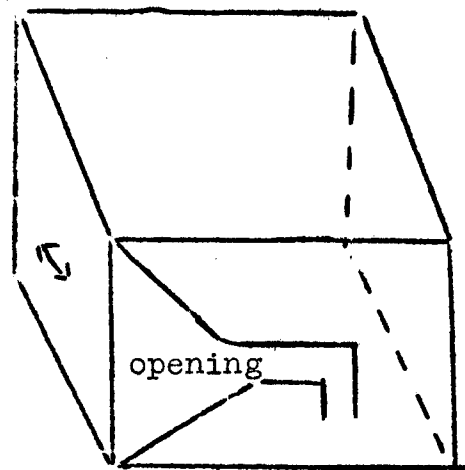
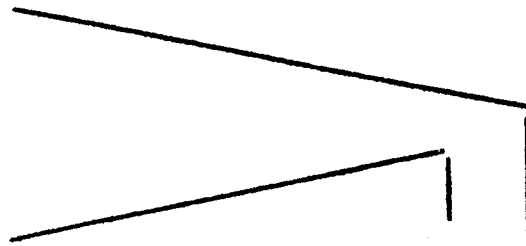
Student - only small ones.

Mr. Van Pel - You can make bottom fish traps which you just put on the bottom of the reef; the opening is shaped like a funnel which the fish can go through but not get out, and the fish trap is a cylinder shape. You can hang a piece of fish inside or a piece of raw sweet potato and the fish will go inside to eat it. Even when there is no bait inside the fish will still go inside. You can make bottom fish traps cylinder shaped or square and they look like this :

Cylinder shaped  
fish trap

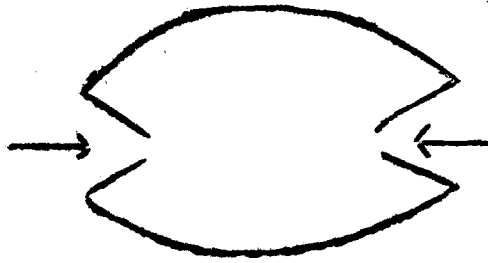


funnel (opening)



square shaped fish  
trap

Even with square and round funnels, the fish will go inside. Sometimes you can have two funnels :



When you are fishing in the reef for instance when you put the trap there, the red fish will enter the fish traps. Now you will see how you can get these traps up. They mostly have a rope on the top of the trap and a floater on top of that. But if you are afraid other people will steal your trap, if it is only 5 or 6 yards deep then you have a line with a hook on it which you let down onto the trap and lift it up. It looks like this:



Sometimes the traps are made this way :

Basket Trap



You see there are three types of fish traps for the sea bottom. The basket kind are used for lobsters but here they will not enter the traps, not many anyway. You can make these traps of split bamboo, from chicken wire or from vines.

Mostly the traps are kept in the sea for two or three days then they lift them. After 1½ months fishing you must bring them ashore to dry them and take off the shells etc.

Student - When a fish gets inside is there anything to stop it from getting out?

Mr. Van Pel - when they go inside they cannot find the way out - often fishermen make a small door on top which they open when they want to take the fish out.

Mr. Van Pel - you have seen traps ?

Student - In Kira Kira - made from loya cane like the barrell shaped ones.

Mr. Van Pel - If you make the traps of vines or split bamboos when the trap is dry you must put stones on the bottom otherwise it will move away with the current.

Student - is it necessary to put food in the fish traps ?

Mr. Van Pel - no, not in the fixed traps, only the ones which are placed on the bottom of the sea. Crabs are a very good bait, just crush them a little bit and place them inside the trap.

22nd January, 1960 - 2.00 p.m.

Before I tell you something about nets we made one mistake when drying fish - the big red fish - after salting we cleaned it in fresh water and this we should not have done. When you do it yourself you are not to put it in the fresh water.

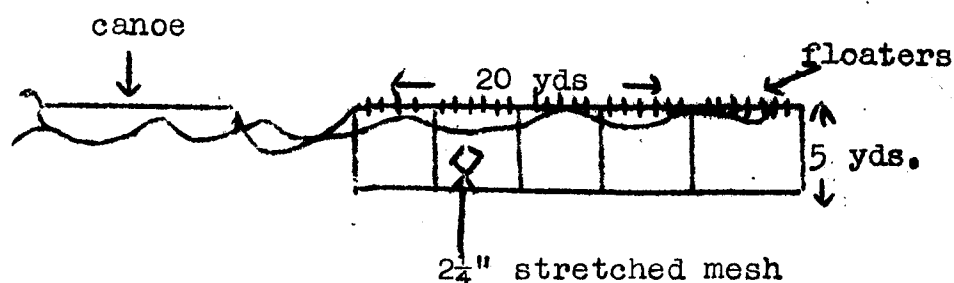
Is there anything you would like to ask about fish preservation ?

Mr. Van der Loos - do you only salt small fish for 20 minutes and big ones for 2 hours ?

Mr. Van Pel - fillets are salted for only 20 minutes and other fish are salted for 2 hours, when it is smoked.

The first thing I have to tell you about nets will be about Gill Nets. You can use gill nets two ways, let us say here you have the surface of the sea, here you have a canoe :

#### Gill Net

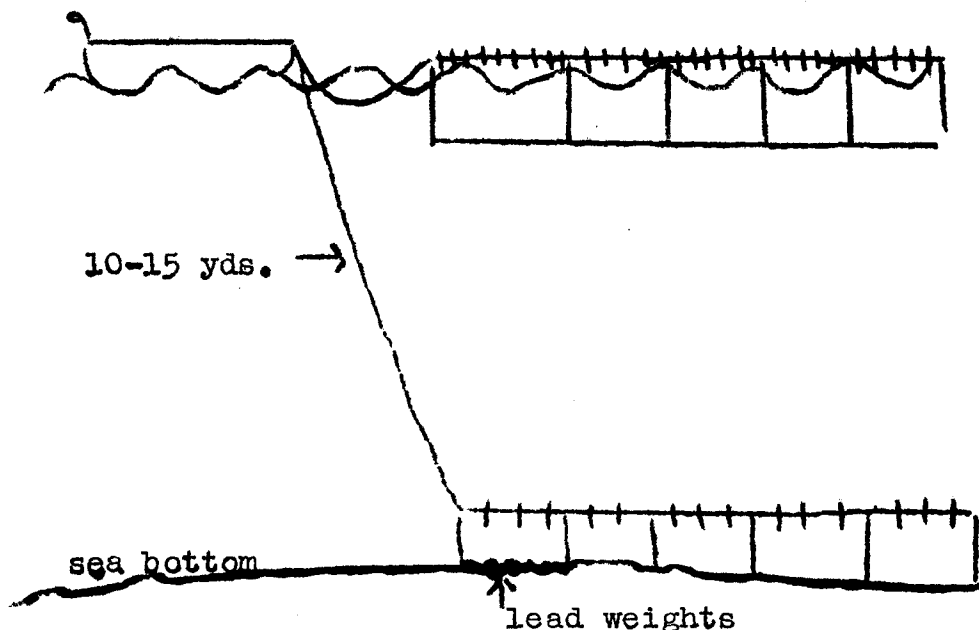


If you have a big canoe you can fish with a floating gill net, you can just hang it in the sea. What you see on the top are floaters. The best fishing with gill nets will be at night, but if the water is not clear you can also fish during the day time.

Here you see 5 nets and they are tied together. Each net is 20 yds. length and depth is 5 yds. The width of the meshes depends on what fish you catch in your district.

When you put the nets out these nets are on the windward side of the canoe and if there is no wind they are on the current side of the canoe. If you are fishing for flying fish you must have a net of  $2\frac{1}{4}$ " with this stretch mesh. The thinner the thread the better for catching flying fish. That is fish with gill nets near the surface of the sea. Of course when you have plenty of big fish near the surface of the sea, your mesh will be bigger.

Now we have the bottom of the sea, the same nets you can use on the bottom but in that case you must have less floaters on top of your net and on the bottom of your net you must have sinkers or small stones, or for instance, Kauri shells. When you put your net on the bottom you can fix the canoe to it but you must never go into the deep water.



Both nets are put near river mouths. The most fish you catch with this floating gill net, will be on dark nights - you catch less when the moon is shining. It is good to lift the net every three hours, take the fish out and put the net in again. The gill nets are made in England and other countries. Do you have gill nets in the Solomons - have any of you seen one?

Student - no.

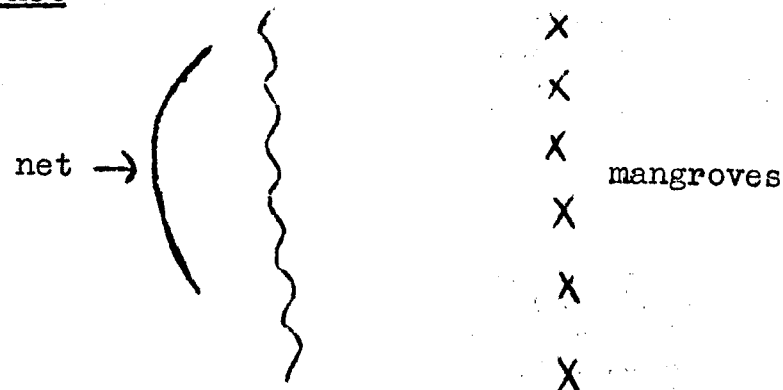
Mr. Van Pel - these nets are used in many countries of the world, the herrings you eat from tins are got in floating nets like these.

Mr. Van der Loos - why should the canoe be on the leeward side?

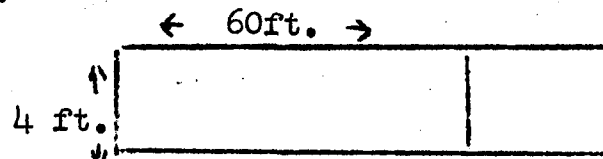
Mr. Van Pel - because the canoe will drift when there is wind or the canoe will drift with the current. Sometimes they have it just across the current.

Now in many places not far from here, for instance, New Caledonia, Queensland, Papua/New Guinea, where they have many mangroves like you have mangroves here, with high tide the fish go between the mangrove trees, when the tide goes out, the fish come out again. So what you do is; here you have mangroves -

Barrage net



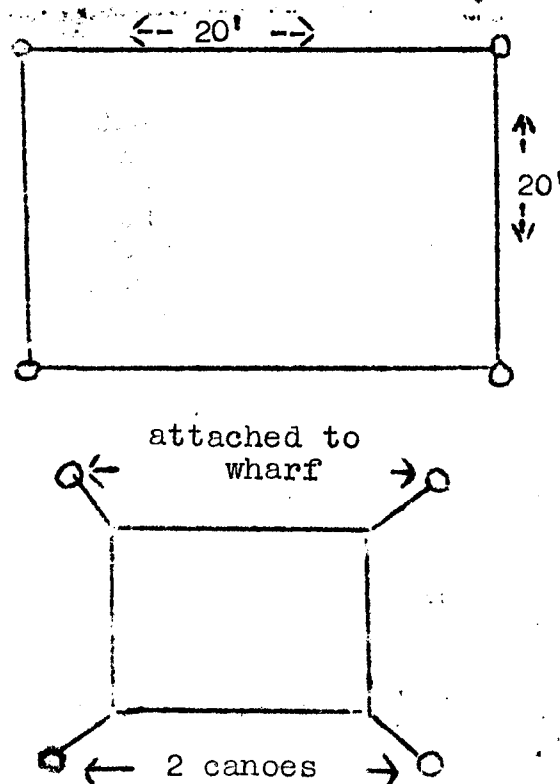
When it is high tide you put a net - also a gill net, as I have told you, but only 4 ft. high and it is made this way :



Say you put many of these nets together, put them outside the mangroves, if it is not too deep. When the tide goes down the fishes go out through the mangrove and cannot swim away because they are caught by the net just outside the mangroves. They catch plenty in New Caledonia this way, for instance Mullet.

The third net is a lift net.

Liftnet



We look on top of the net now, let us say you will catch sardines, as you have many here. You let the net down from 4 canoes but you can do it also with 2 canoes, or near the wharf. Just let your net down when the sardines come; the net is just made square of fine meshes. At night they often use a lamp. They have a lamp burning and the fish come under it and when there is a good quantity of fish you lift the net. Someone wants to ask about this liftnet?

Mr. Van der Loos - what size is it ?

Mr. Van Pel - the size is about the size of this room, 20' x 20' and mesh 1" stretched mesh. Do they use a lift net here ?

Mr. Russell - yes but they use them much smaller.

Mr. Van Pel - and now the last net is a cast net. You have seen one in New Caledonia?

It is not so easy to make it but you can order these cast nets but I think that it would be a good thing if the Department of Agriculture ordered some of these cast nets so there is just one in a District and the Agricultural Officer can show the people what the nets are like. If the people have seen these nets, then the people will be able to make it. You can do it from a canoe, but if you go along the beach, you can also throw the net from there.

It is a very important net the only cost you will have is the net - it is not necessary to have a canoe.

That is all I have to say to you this afternoon about nets. Any more questions ?

Mrs. Thompson - They use these cast nets in the Gilberts, Koraubara would know about them.

Koraubara - Yes, they have these nets, I do not know how to make them myself, but I think they are very good.

23rd January, 1960 : 9.30 - 10.30 am & 11-12 o'clock

The first lecture we will talk about is the trochus shell - the commercial trochus shell you have in the British Solomons is called Trochus Niloticus - I think everyone knows the trochus. There are also trochus shells here with another name but not so important to sell. The trochus lives in shallow depths of a maximum of about 40 ft. On 40 ft. depths you find the big ones of about 5" size, they look like this:



The biggest trochus is 6". A trochus is a snail which can see and which can move. It can move 60 yds. in a night, perhaps also longer distances and mostly they are moving at night time and during the day time they go under the rocks, so you will not see them easily. I have seen I think in Malaita, I am not sure whether it was in the British Solomons or the New Hebrides, but some people have a round reef in front of a village and at certain times they say we will close the reef because we have taken too much trochus from it:



If both parts are not closed, then the trochus will move over the reef to the unclosed part.

In Trochus you have male trochus and female trochus - do you know how to tell ?

Student - by breaking the shell.

Mr. Van Pel - when it is a male what do you see ?

Student - when it is a creamy colour it is a male.

Mr. Van Pel - Yes, and when it is green it is a female.

That trochus have a size of over 2" - what is the minimum size in the British Solomons ?

Student - 2½".

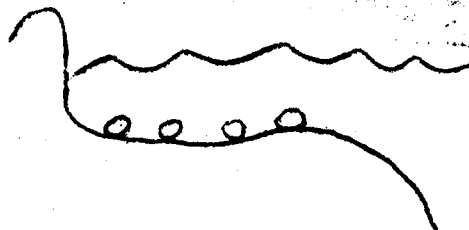
Mr. Van Pel - If you fish continually for trochus at 2½" there would soon be none left. In the first place a young female trochus has not so many eggs as an old female trochus. The old one will have at least 10 times as many eggs as a young one. The first eggs will perhaps not be viable - by that I mean they will not hatch into trochus.

When they put the eggs on the reef the eggs are floating first of all, and after some time, we don't know how long, they settle down so they have a minimum size here of 2½" and I understand all the reefs are closed for trochus shell, I think when they open again they will be 3½" - the trochus has already reproduced more than 3 times. Another thing is not long ago, 4 years ago, we were still thinking trochus has a breeding season because we had read that in publications and reports but now we have been around through the whole Pacific, we have seen they have eggs and spawn the whole year round, so here in tropical countries there is no season. In New Caledonia which is not a really tropical country, because they have a winter, they have eggs all the year but they have good months when spawning is greater than other months. The trochus has



many enemies, the first is the human not only for the shell, but the animal is good for eating.

The living place for trochus is the reef:



You will find most young trochus here in the coral stones. Sometimes at low tide when there is no water, they are still there because they can stay for a while with no water. I took some trochus in boxes with wet sacks on them and they stayed alive for 4 days.

Never put trochus in the sun. You find trochus shell at a depth of 40 ft. - before we thought we could find trochus in even deeper water of say 50 ft. but we found this was wrong.

In the older trochus you often find holes in the shell made by borers because when a trochus is young this layer outside the shell is strong but when it is old it is soft and it is easy for the borers to go in the shell. So when the open trochus season comes again I expect the law will say a trochus must be a minimum size of  $3\frac{1}{2}$ " which means the greatest diameter of the shell is here :



The largest trochus is about 5-6" and is from 7-9 years old. Trochus live in salt water not fresh water but you can understand that sometimes when the rains are heavy, there is some fresh water coming from the shore, if it lasts long they will die. Trochus living in a salinity of 3% salt in the water grows normally but we have seen trochus living near where fresh water is coming in any coral reef, then they are retarded. Someone want to ask anything about trochus ?

Student - what is the name of the flesh of the trochus ?

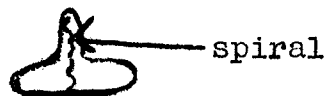
Mr. Van Pel - what we eat we call the trochus meat. The name of the animal inside is a snail.

It lives on scraps from the rocks - fairly short scraps of weeds - the main thing is a small brown weed.

Student - what do they make of the trochus?

Mr. Van Pel - In the first place they make buttons from the trochus - with a big trochus of about 5" they get about 30 buttons cut with a machine. Another thing is, but for which there is no market at the moment, because China is closed, ear hangers which the Chinese ladies like to wear on their ears.

Inside the trochus is a spiral and from that they used to make artificial teeth on the island of Cyprus. I don't think they are making it now because they have so many plastic ones but not long ago they made them.



When they cut buttons from the shell, then you have shell dust and that shell dust they use to reduce the flash of explosives and they use it as fertilizer.

The broken trochus they use for wall decoration.

- |    |                                 |    |                   |
|----|---------------------------------|----|-------------------|
| 1) | Buttons                         | 5) | Fertilizer        |
| 2) | Ear hangers                     | 6) | Wall decoration   |
| 3) | Artificial Teeth                | 7) | The trochus meat. |
| 4) | Flash reduction<br>(explosives) |    |                   |

Mr. Russell - what is the quality of a shell  
2½ - 3"?

Mr. Van Pel - it is good up to 2 - 4½ but after 4½" then the outer layer of the shell becomes soft and the quality of the shell decreases. The strongest buttons you can make of the smaller trochus.

Student - what is the maximum length from the top to the bottom?

Mr. Van Pel - That can be different, in one country the length from top to bottom is sometimes equal to the diameter. When a trochus is young it has a shell this shape:



when it becomes older it grows out at the top to this shape:



From the shell, you never can see whether it is a male or a female, you have to open it - if you open it at the top then you can see. Scientists, who were working on the trochus, opened the top but it died afterwards, even though they had tried to close it up again. They sometimes put a small rivet in here:



so that they can watch the shell, and find out what it has been doing and to where it goes. Sometimes in 1½ years' time the rivet will be covered.

When you find a trochus how do you clean the shell?

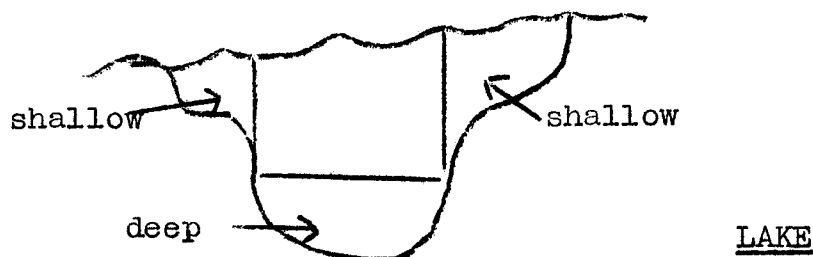
Student - you cook it, take the snail inside, out, you can clean it with a piece of iron or shell.

Mr. Van Pel - in some countries they don't like to cook the shell because it decreases the quality of the shell - don't cook it too long because it is not good for the shell. British Solomons shell is of good quality compared to shell in other countries.

### Fish ponds, lakes

You have all seen fish ponds here in Kukum and I advise you that when you have fish ponds, do not put water plants on the surface of the water. In water there is oxygen, the fish take oxygen from the water through their gills because they have to breathe, they need it in small quantities. But if you have plants on the surface of the water they take the oxygen out of the water. Only plants growing on the bottom of the pond and not on the surface, produce oxygen; and that is only in the day-time, at night these under-water plants take oxygen out of the water.

The more sun on the pond the better - it is good that the rays of the sun should penetrate through the water because there are many many tiny animals, mostly called the plancton, on which the fish feed, therefore never make the pond too deep because if you do, in the deepest part there will never be any food for the fish. The same applies to lakes - a shallow lake is better to produce fish than a deep one. From a deep lake they do not produce much fish.

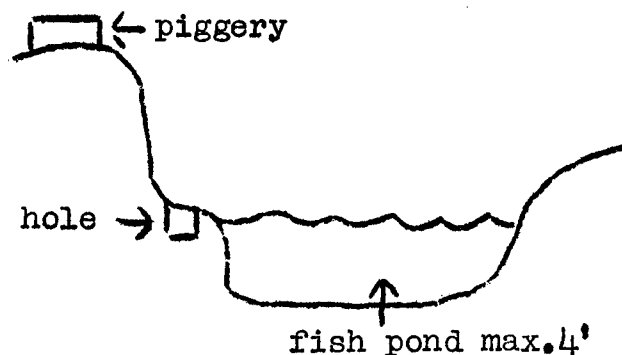


Only in the shallow parts food is produced for fish and down the bottom practically nothing. A shallow lake or pond is the best for fish producing. When you have a clear lake there is not so much in it as a lake of a brown or grey colour. Small fish live on those tiny tiny plants in the water, you can give big fish food like sweet potato or meatmeal but the small ones do not like that, they live on the tiny plants you cannot see with your eyes.

Here you have Tilapia, which is a very strong fish because it can live in fresh water and in sea water. You can put a Tilapia straight away from sea water to fresh water and nothing happens to them - when producing if the water has more than 3% salt in it, the eggs are not viable. When you grow big Tilapia, it is better to grow only males because the males grow bigger; if you have mixed them in the pond then in no time it will be overcrowded, and of course the fish will not grow so big - it is better not to have more than five fish in a square yard of pond. It is easy to see which are males, because they are darker and on the end of the fins, including the tail fin, they have red etches. Now let us say you have a pond ready, you are not allowed to take males to another pond and put them straight away in the new pond because often the males have eggs in their mouths so it is better to put the males first in a drum of water, so that they are there until the eggs are hatched, it will be for about a week, after that you can take them out and put them in the pond.

I have seen a big piggery here and all the excreta is thrown into the pond, there are two ponds here one big and one small.

The excreta should not be put in the pond, because it will rot on the bottom and take all the oxygen out of the water, and if it does that the fish will have to come to the surface to breathe. A hole should be made so:



so that only the liquid from the hole (sump) goes down into the pond and it is not solid. The pond should never be deeper than 4 ft.

We put 92 fishes in a swamp in New Caledonia then they made a dam in the river and the water level was raised 250 ft. then we got an enormous lake and the swamp became one with the lake. We have now thousands and thousands of Tilapia in it and the big ones are now about 1 ft. long. The bigger the lake is the bigger the Tilapia, so if you have a bigger fish pond, you grow bigger Tilapia. You have only one kind of Tilapia here, but in New Caledonia we are trying another kind out, these other kind eat coarser vegetable matter.

The best ponds are ponds which you can drain because a good thing is to have the pond drained, a clean pond reproduces more food than a dirty pond. When you have water in a pond and you have a pH of 7, the water is neutral; when it is over 7 it is alkaline; when it is under 7 it is acid. Tilapia can stay in water with pH 5-8 but other fish need it near 7 or just over it 8-9. When your pH is low the water is acid, so they put in a little lime. When you have a pH of 5 you put in lime and your pH will come up; remember when you fertilise your water too much it is not good.

When you have dykes around your pond, often you will find leakage of your sluice box -- it is always good that you look every week for holes near the sluice box. If you do not stop it, you get big holes and you lose water. Does anything here, birds, eat the Tilapia?

Mr. Russell - Yes, Herrons, and Hawks, we have watched them at Kukum.

Mr. Van Pel - Another good fish for the British Solomons is the carp, I will find out on my next trip in Dutch New Guinea, because they brought carp from Manilla to there, if I think there are carp available and they are good for here, I will tell the Agricultural Section about them. These Chinese Carp are reproducing easily, although there are many other kinds that will not.

If you bring fish from one place to another place, do not put them straight away in the water, because the difference of the temperature in the water can make the fish sick. If you have your fish in a tin, take some water out the pond or the lake and put it slowly in the water in the tin in which you have the fishes, gradually filling up the tin with new water. Before you put them into the pond, take  $\frac{1}{4}$  of an hour refreshing the water and then take them out.

Student - If you take out a male and a female and put them in the pond, how many months will they take to reproduce?

Mr. Van Pel - 3 months for Tilapia.

Student - how do the fish hatch the eggs in the water ?

Mr. Van Pel - Tilapia mate in the bottom of the pond in round holes of about 1 ft. The males force the females to go into the hole, which you call the nest, the eggs are spawned by the female in the hole and the male fertilises them; the female then takes the eggs in her mouth and if there are many, the male will take them in his mouth too, and they will stay in their mouths until they hatch. With other fish, fish eat their eggs, but with Tilapia the eggs are protected because they are in their mouths for 7 days; after 7 days when the eggs hatch the young fish will flee inside the mouth if they are in danger.

Let us say if you have  $2\frac{1}{2}$  million eggs from a cod probably only 4 cods will grow because all the rest have been destroyed between the time they are eggs and small fishes.

In cold water you can see how old the fishes are because they have rings on the scales. The fish have a scale like this:



and when you look in a microscope you see rings on the scale - every year there is a new ring. This only happens in cold waters, there the fish only grow in the summer time. Here in the tropics they grow all the time because there is no cold weather and they do not have rings so you cannot tell how old they are.

Student - How do you tell the difference between a male and a female ?

Mr. Van Pel -



Here you have a Tilapia, when the upper part is blackish it is a male but only you can see it is a male from the black part, it will be red on the edge of the fins and on the tail. Tilapia can take different colours but when it is frightened

or when it is mating the male will have this red colour I have been telling you about. If you put a Tilapia in a white tub they will have light colours and if you put it in a dark tub it will have dark colours. When they are small you cannot tell which is male and which is female, only after they are 2" long.

The young female when it is about 4 months old, lays about 80-90 eggs but when they become older, they lay over 200 eggs.

Mr. Russell - can you make some suggestions as to how to carry Tilapia over the islands, without a high mortality rate ?

Mr. Van Pel - I have seen people carrying fishes in containers and they had a high mortality but if you carry fish in a jeep or a rough vehicle you must take a tin  $\frac{3}{4}$  full with water and cover the surface with grass so that the movement will not splash the water up and kill the fish. Putting grass on top will reduce the movement of the water. If you transport fishes, do not put too many in a container. If you have to transport many, you will have to change the water many times but let me say a kerosene tin filled  $\frac{3}{4}$  with water and when you put 20 small Tilapia in it, you can take them for a great distance.

If you transport not too many fish in it, and put some floating grass on top of the water they will be alright; another thing is do not give them food; it is better to bring the Tilapia over with an empty stomach because of the excreta of the Tilapia in the tin: it will take the oxygen out of the water. Sometimes you can have an electric air pump or a pump with a battery so that at any time, you can put air into the water.

Mr. Russell - How much are the battery pumps?

Mr. Van Pel - About £1 Sterling.

They introduced Tilapia into Papua and they have them in the mountains of 5,000 ft. high, so you see you can raise them also in the mountains. If it is higher than 5,000 ft. they still can live there but you will not have new fishes because the eggs will not become a fish - the temperature of the water there is too low - so you see you may have them in the highlands, the lowlands, in fresh, sea or brackish water. In Hawaii the Tilapia are raised for tuna bait.

Mr. Foale - How long would Tilapia stay alive on the hook if you were using them for bait ?

Mr. Van Pel - For about 10 minutes. In Hawaii they don't have the Tilapia on hooks, when they see a school of tuna, they have the Tilapia in the boat, throw it into the water, then the tuna come and they take their fishing lines and throw them amongst the fish.

They raise Tilapia in very very big fish ponds in Hawaii and they feed them on the crushed roots of pineapple. Any questions ?

Student - when the fish have grown, what is their full size ?

Mr. Van Pel - It depends, I have seen some of 1 ft. but they were mostly in big waters.

Mr. Russell - could you suggest what is the best poison bait for getting rid of crabs because they go in the bunds ?

Mr. Van Pel - the crabs are a problem because they make holes in the dykes but it is not possible to kill the crabs as long as you have fish in your ponds.

Student - why do we like Tilapia more than other fishes ?

Mr. Van Pel - if you raise fishes, you must have some knowledge of the fish - if you are not a good fish farmer and you start straight away with a difficult fish your fish will die. Everyone can raise Tilapia if he is a reasonable man because Tilapia is a strong fish, it is easy to bring them here and they are available at Port Moresby. If we brought over other fish from greater distances, we would have to have proper good ponds for them. In future you will have other fishes. Another thing is you have to be careful with fishponds because of the malaria. The malaria mosquito like to breed in these ponds and these swamps and they prefer water which is not too clear because in that water is food for mosquito larvae. In other places of the world they put mosquito fishes in the ponds. These Tilapia, we have here, are excellent killers of mosquito larvae. I have made trials with mosquito larvae, I have cleaned a pond of the water and taken the fish out, also the beetles and other insects, then filled the pond with water again - in a few days the whole pond was black with mosquito larvae, then I put Tilapia back into the pond, and again after 3 days, the pond was quite clean of the larvae - the Tilapia had eaten them. I have put food in aquaria where there have been mosquito larvae and the mosquito larvae has always been eaten first.

They are better larvae eaters than Gambusia which are mosquito eating fish - these Gambusia are No. 1 in Russia at the moment.

Student - If I see a trochus shell in the deep sea and I do not know how to dive, how do I get it ?

Mr. Van Pel - you cannot get it out because it is not possible to take nets along the bottom because of the rocks and stones - the only way is to dive.

Student - Why do Tilapia put their eggs in their mouths ?

Mr. Van Pel - To protect the eggs, if they put them on the sand and left them, they would be eaten by other fish. It is a custom belong them.

Student - If they have eggs in their mouths  
how can they eat ?

Mr. Van Pel - when they have eggs in their  
mouths, they do not eat. Some fish can be a long time with-  
out food, I have tested them for 6 months and they lived  
without any food and were perfectly alright.

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