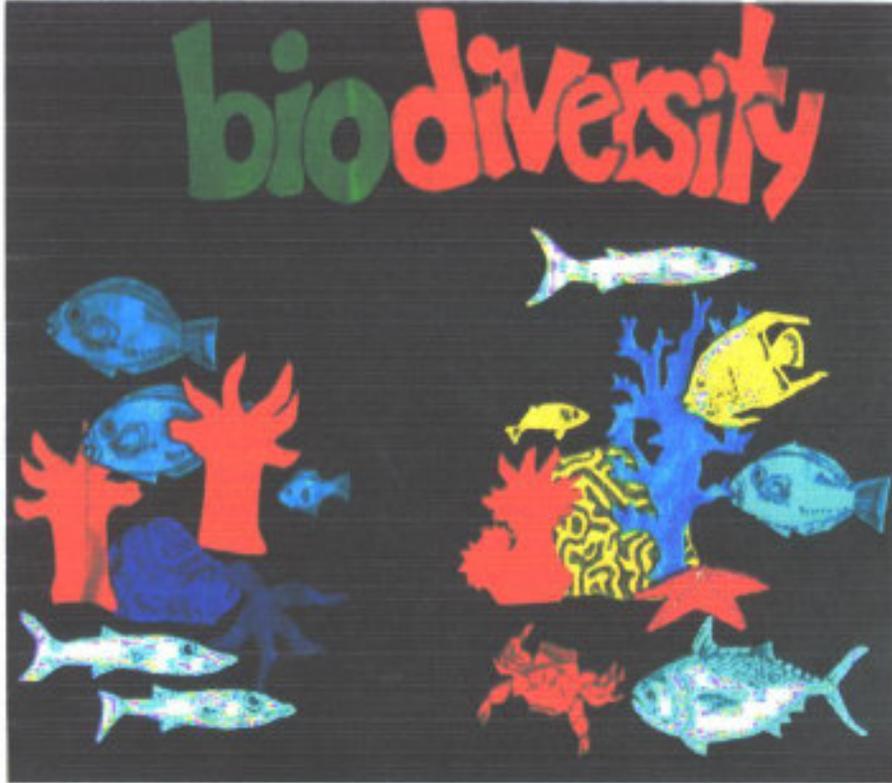


MATCH THE SKETCH
A FUN WAY TO LEARN OUR MARINE ENVIRONMENT
Teachers Manual



Martha McManus

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FOREWORD

Match the Sketch is a fun way to learn about the wonderful marine environment we have in our doorsteps. It is an interactive way to learn by simple simulating exercises using color coded pieces of marine organisms printed in water proof paper that are cut out to isolate each of the individual marine organisms and situations. Teachers and students will be able to get a better feel of our marine ecosystems and marine organisms and also what happens to them when there is destructive and irresponsible behavior on our marine systems.

There are five lessons that will allow students to understand the basics of coral biology and the importance of biodiversity. The first two lessons tell the basic story of what coral biology is and what biodiversity is. The third lesson tells the story of the life cycle of an important group of fish that are targeted by the Live Reef Food Fish (LRFF) Trade. The fourth lesson is on the movement of money in the LRFF Trade and the fifth lesson looks at what happens to the marine systems when destructive fishing practices are used.

The lessons and accompanying materials should be able to make learning fun, informative and hopefully influence responsible behavior.

Paul Lokani
Director - Melanesia Program
Papua New Guinea and Solomons.

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INSTRUCTIONS

Materials Needed

Scissors, blu tac, envelopes or folders

About the presentation of visual aids

The awareness presentation materials are sealed in plastic covers with 14 different sheets of paper containing drawings on corals, fish, fishing techniques, etc. Each drawing either has a number or a letter labelled on it for convenience. For example the word “bio” is also referred to as #52, or the “polyp gut” as letter “C”. It is important not to cut out or erase the numbers or letters on the drawings because they are purposely there to help you locate and use them where appropriate. The drawings form the basis of Coral Biology, Biodiversity, the Life cycle of the LRFF Trade Fish Species, Movement of Money in the Live Reef Food Fish (LRFF) Trade, and Destructive Fishing Practices presentations, collectively.

A guide on how to cut and put together the presentation is outlined below.

Coral Biology Presentation

1. Cut out the word “bio” (#52) and “logy” (#54).
2. Cut out the reef scene which consists of Coral Skeleton (#1), Coral Polyps (#2, #3, #4, #5, #6, #7, and #8), soft corals (#55 and #56), and a Stoney Coral (#57).
3. Cut out the polyp that is made up of the following letters. Letters “A” for the polyp body, “B” for the tentacles, “C” for the polyp gut, “D” for the limestone cup, “F” and “G” for the connecting side polyps. “E” for the zooanthellea algae (colour polyp), “G2” and “2F” for the connecting side polypys (colour side polyps).
4. Cut out the Sun (#58)

The Coral Biology presentation is divided into two parts. It covers (i) what corals are, the two types of corals, and (ii) what a polyp is, how the coral polyp gets its food and how the coral reef is built.

Based on this break up, there should be two envelopes or folders for these two parts. The word “bio” (#52), “logy” (#54) and the coral scene (#1), #2, #3, #4, #5, #6, #7, #8, #55, #56, and #57) form the first part of the presentation, which goes inside one envelope or folder. The make-up of an individual polyp which consists of the letters “A, B, C, D, E, F, G and G2, 2F,” plus the sun “#58” forms the second part of the presentation, which goes into a seperate envelope or folder. This stops confusion and unnecessary loss of time causing boredom.

In this way, it is much easier and more convenient to go through the presentation, knowing which, when and where a visual aid, (drawing) should be used. When presenting, it is better to use blu-tac for sticking each drawing on the wall or board. It sticks to any surface easily and can be removed easily also.

The same step should be followed for the other presentations. Things to consider are the presentation break-up, how many envelopes or folders so as to separate the drawings for convenience.

If these steps are followed, you will go through the parts separately, thus presenting with ease as you go along. Now let us look at the rest of the presentations.

Biodiversity Presentation

For this presentation you will see that it is made up of four parts, (i) What is “bio”? (ii) What is “diversity”? (iii) What is biodiversity? Its importance and (iv), The dependence between corals and fish.

So you will need four separate envelopes or folders to contain each part.

The first envelope should contain the word “bio” (#52), and #60, #62, #59, #57, #63, #64, and #71. In this part you are trying to make your audience understand the meaning of bio by putting up the above numbered drawings and visually defining it. Thus, #60, #61, #62 do not belong to bio whilst the rest fit into bio.

The second envelope should contain the word “diversity” (#53) then #18, #32, #33, as one fish group and #34, #63, #64, #65 as the other. Here you are trying to compare the two groups of fish to see which of them defines diversity.

The third envelope should contain the two connected words “biodiversity” which of course is the core of this presentation. Again another comparison between two reefs to make the audience better understand biodiversity. The two separate reefs contain #67, #71, #56, #26, #31, #63, #30, #64, #65, #66, #57, #55, #27, #29, #68 and #69. From this comparison the audience should know the importance of biodiversity.

The last envelope should contain the corals #1-8, #55, #56, #57, and fish #18, #19, and #63. This last part talks about the dependence between corals and fish, which emphasises the fact that corals and fish always go together.

Lifecycle of the LRFF Trade Fish Species

This presentation is divided into four stages, which you will go through three times in a circle - thus forming a lifecycle.

The first envelope should contain #18, #19, and #20 which is the first stage called the Spawning Aggregation - 1.

The second envelope contains #21, #22, #23, #24, and #25, they're the first Planktonic Stage - 1.

The third envelope has #26, #27, #28, #29, #30, #31, and this is called the Settlement Phase - 1.

The last envelope will contain #32, #33, and #34. This is the Adult Phase - 1.

This lifecycle will be completed three times, so following Spawning Aggregation - 1 will be Spawning Aggregation - 2 (second time to go through the lifecycle again) and then finally Spawning Aggregation - 3 (the last time to go through the lifecycle). This is the same for the rest of the other stages.

Basically what we are trying to achieve here is that the LRFF Trade fish has its own special lifecycle and we need to be very careful when harvesting them so we don't upset the balance of this circle because it can destroy the entire fish populations. As a result of this threat, we need to make wise plans about managing them, which is the focus of this presentation. Hence, we need to make an effective awareness presentation as a means of contributing to the management of this delicate fish species.

The Movement of Money in the Live Reef Food Fish (LRFF) Trade.

This presentation is quite short, it has less numbers of drawings compared to the others so it will need only one envelope.

Basically, its all about the small amount of money the local fishermen earns compared to the huge amount paid for the fish in Hong Kong.

The single envelope should contain #40, #41, #42, #47, #43, #44, #45, #46, #48, #49, #50, and #51, which talks about the amount of money paid in percentages between the local fishermen and the other players namely the exporter, wholesaler and the restaurants. Also how the LRFF Trade destroys the reefs and the fish populations.

Destructive Fishing Practices

This presentation has three parts, (i) The coral scene and fish (ii) the NEVER USE METHODS and (iii) other fishing techniques.

One envelope should contain the coral scene and fish, #1-8, #26, #30, #35, #34, #31, and #23. The point here is that this scene in its beauty can be destroyed as a result of destructive fishing techniques and unwise use of other methods.

The second envelope will contain the NEVER USE METHODS. There are two; Poisons #10 and Dynamite #12 (#16 & 17 denotes DO NOT or prohibited to be placed on poisons and dynamite). Stress the fact that ANYWAY they are used, they're always destructive, and that they should NEVER BE USED.

The last envelope will contain another group of techniques, #13, #14, #18 #19 and #15. These techniques can be destructive or healthy, so it all depends on how they are used. Point out the fact that it is up to the fishermen to harvest in a healthy way.

CORAL BIOLOGY

You will need pieces: #1-8, #52, 54, 55, 56, 57, 58 and A-G

1. The meaning of biology...

biology = "bio" means life . Put up "bio"

"logy" means the study of something. Put up "logy"

biology = the study of living things

coral biology = the study of the life of the coral

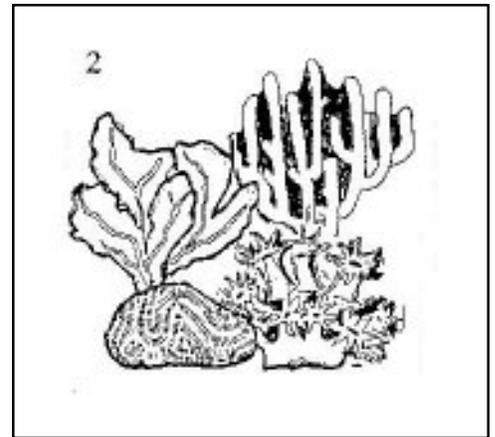


2. Before you begin talking, put up # 1-8, #55, #56 and #57 to make a reef scene.

Many people think coral reefs are just rocks but they are much more than that. They look like big colored stones but they are actually bones covered in tiny animals called polyps.

Polyps are in the same family as jellyfish and sea anemones. These tiny animals work together in large groups to make the coral structures that we see.

There are two types of corals, stoney corals and soft corals.



3. Let's look at soft corals first.

Remove stoney coral, #1-8, and #57.

Soft corals make their skeleton inside their body.

Their skeletons are made of materials called gorgonin which is similar to our fingernails. Soft corals are also called "gorgonian" corals.

They grow in colonies of long, thin branches which can move with the water's current.

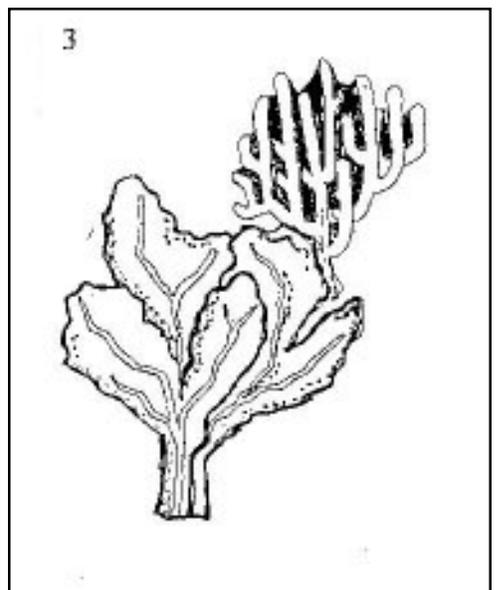
While soft (gorgonian) corals do not build reefs, they have important jobs in the reef system.

They serve as hiding and resting places for animals.

They also produce sand.

The largest groups of soft corals are found in the Caribbean Ocean.

Clear board by removing all objects.



CORAL BIOLOGY

5. Put up stone #1 and add polyps # 2-8.

Now let's look at the other type of coral.

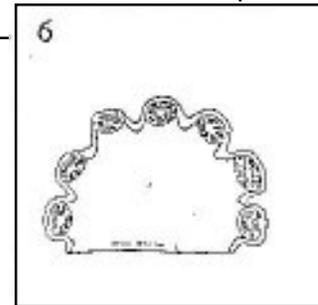
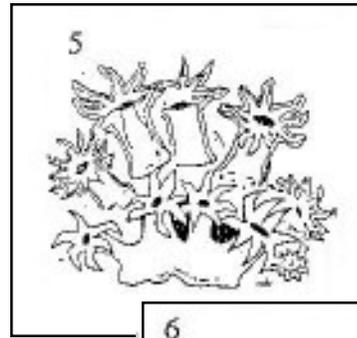
Stoney corals are the ones that build the coral reefs.

Stoney corals do not have a skeleton inside their body like you and I do. Instead they build a skeleton on the outside of their body for protection.

They build this skeleton by taking calcium carbonate out of the seawater. The calcium carbonate hardens into limestone cup where the coral polyp lives. Our bones are also made of calcium and are similar.

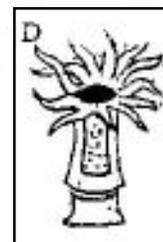
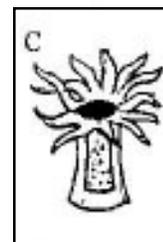
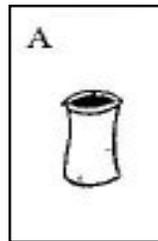
6. Remove all polyps leaving only the stone.

So this beautiful coral is actually a limestone base with polyps living in it. If all the polyps die then we are left with only white limestone base, just a dead stone.



7. As you read the lines below, add each piece of the polyp by following the letters in the box.

- A) An individual polyp is a tube-shaped body. The mouth is at the top. Point to the black opening.
- B) The mouth is surrounded by tentacles.
- C) The mouth leads into the gut inside.
- D) This whole bit sits on inside a hard bone-like cup made of calcium. Put this under the polyp

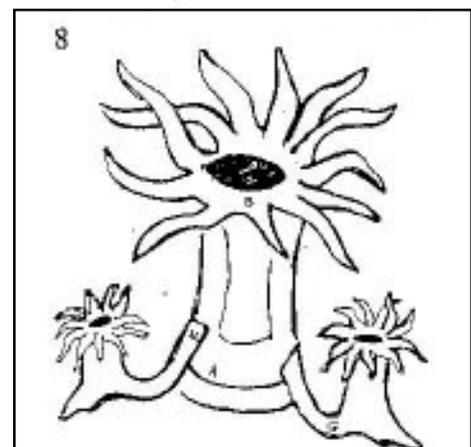


8) The polyps cover the surface of the base and they extend their bodies to connect with each other. *Put up F and G.*

In this way they share everything - what they feel and even their food.

Although each polyp is able to live on its own, they connect and live together as a community.

You can see evidence of this connection. If you gently touch just one polyp it will pull in its tentacles. Polyps around it will pull in their tentacles also.



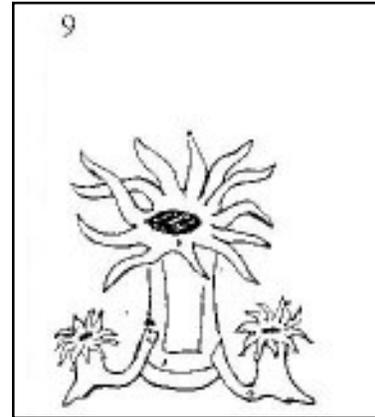
CORAL BIOLOGY

9) Coral polyps have two (2) ways to get food.

One way is to feed at night. Then they stretch out their tentacles to gather food. Point to tentacles.

The tentacles have small stinging cells which shoot poison spears into small animals drifting in the water. Then the tentacles pull these small animals into the mouth of the polyp. Point to the mouth.

These tiny, drifting animals are so small that we can't see them. They are called zooplankton.



10) The second way that corals get food is from an algae called "zooxanthellae". Algae is a tiny, tiny plant.

Put color polyp, "E" on top of middle polyp.

Put color side polyps, G-2 and 2F on top side polyps.

The zooxanthellae algae have a special relationship. The algae lives inside the coral. Because the algae is a plant it can make food from the sunlight. It shares this food with the coral polyp.

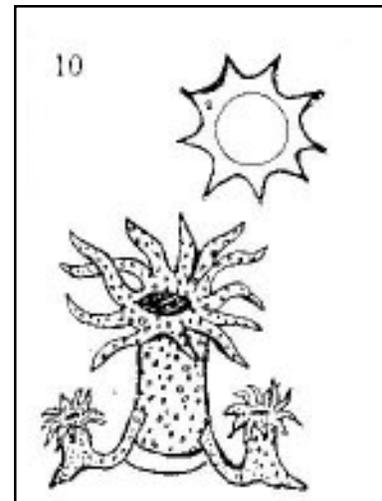
Zooxanthellae must live in clear, shallow water so they can get a lot of sunlight. *Add sun #58.*

This means the stony corals too, must live in clear, shallow water, so its partner, the zooxanthellae algae stays happy and healthy.

ASK:

What do you think will happen if ground is washed into the water when it rains and makes the water very cloudy?

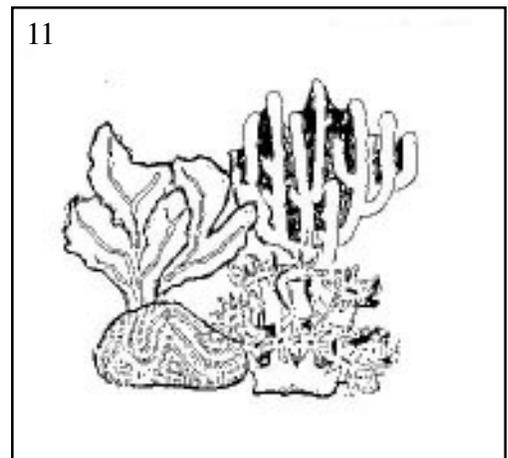
ANSWER: The zooxanthellae cannot get sunlight so it dies, then the corals cannot get enough food so they die too.



11) When the stony coral community is healthy, they grow and reproduce more polyps and then die.

They leave their limestone skeleton and the new polyps build their skeleton on top the dead one. This is how the coral reef is built.

As you tell this, put up all the corals again like the first reef picture. # 1-8 and # 55, #56, and #57.



BIODIVERSITY

What is it? Why is it important?

Today you will learn a new word that is often used when talking about environmental issues. This is a big word so we will break it into two (2) parts to make it easier to learn.

The first part of the word is “bio”. *Put up bio #52.*

Bio means living things like plants and animals.



Let's look at a group of things and see if all of them fit into the “bio” group. Put up shoe #60, chair #61, truck #62, tree #59, coral #57, fish # 63.

With younger students, remind them that living things must eat and drink water.

Ask students to tell you which things do not belong in this group. As they name the objects, remove them.

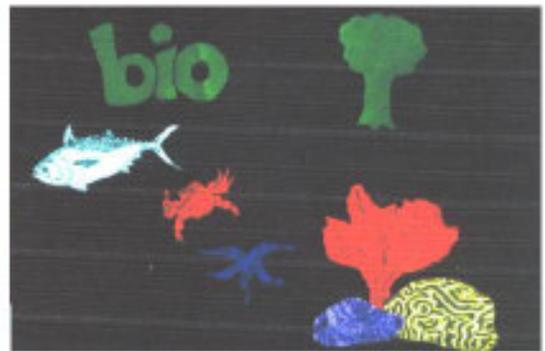
As objects are removed, make comments to assist understanding such as:

“Right, shoes are not alive. You didn't have to feed your shoes this morning did you?”



Good. Now we know that “bio” means living things such as plants and animals.

For this basic lesson don't try to discuss complicated things that were alive but aren't now - like timber.



BIODIVERSITY

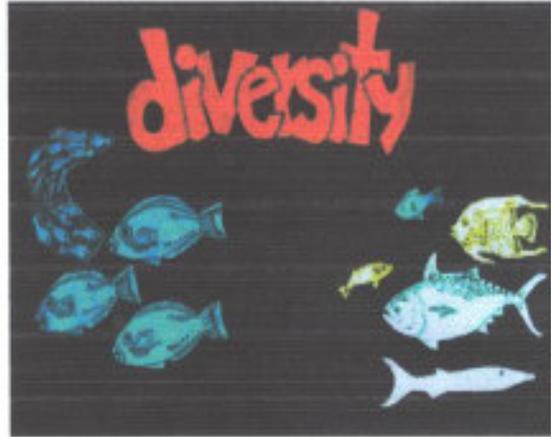
The second part of our word is “diversity”.
Diverse means different. Diversity means differences between things.

Look at these two (2) groups of fish. Which one shows diversity?

Yes, the group on the right has different types of fish.
How many different types?
Count with students - Five (5) different types of fish.

The group on the left has how many different types of fish? *Count - only one (1)*

The group of blue fish shows zero (or no) diversity. The fish in this group are all the same.



Now we can put the two (2) pieces of the word together. Biodiversity means differences between living things.

Sometimes we see a high amount of biodiversity.
Sometimes we see a low amount of biodiversity.

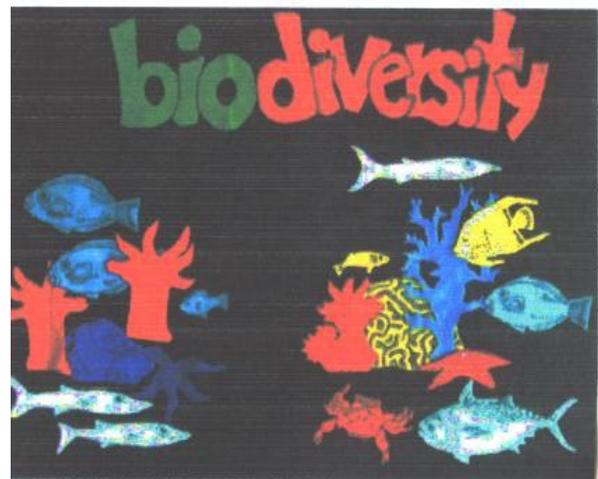


BIODIVERSITY = GOOD HEALTH

Biodiversity is important. Scientists have found that places with high biodiversity are healthier than those with low biodiversity. Areas of high biodiversity are stronger and can survive better when bad things happen like cyclones, oil spills, pollution, and destruction by people.

Look at these two reefs. Which one is the healthiest one? Why?

*Help students count the different animals and plants in each group. Higher biodiversity = greater health. The group on the right has more **different types** of living things.*



BIODIVERSITY

We need to help our environment keep its biodiversity for two (2) reasons:

1. High biodiversity means a healthy area.
2. Each species depends on other species for survival.

PLANTS AND ANIMALS DEPEND ON EACH OTHER

In our human communities, we depend on each other. We need doctors and nurses when we get sick. We need fishermen and gardeners for food.

Can you name some other jobs that we depend on others to do? *Ask students to answer.*

Examples: *We need mothers and fathers to take care of children.*

We need teachers to educate everyone

We need carpenters to make our shelters.

Each type (species) of animal and plant has a job too.

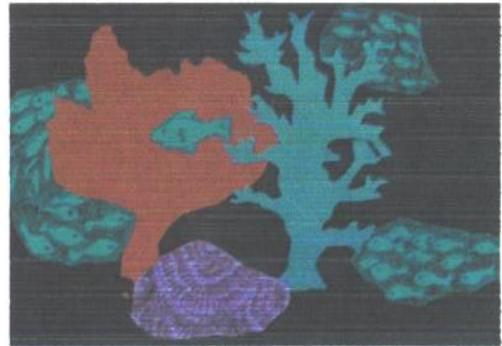
They depend on each other for many things like food, cleaning and protection.

When we take one group of animals or plants out of an area we are affecting other living things in that area. We don't always know the job of each species so we don't know what will happen if we remove them from an area. Sometimes removing one species may cause two to three other species to die out. If we kill off one species, we don't know what effects this will have on the other plants and animals.

One example of this dependence is corals and fish
Put corals on board. # 1-8, #55, #56, and #57

Baby fish live in the corals where they can hide from big fish.
Also they can easily find food around the corals. *Add the small fish. # 18, #19.*

Coral reefs serve as "nurseries" for baby fish to grow up safely, here they can hide and find food.

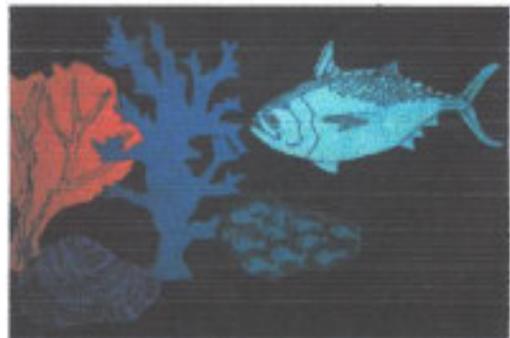


Add fish #63

In the coral reefs, the baby fish can survive to grow big.
Without the coral reefs, the little fish wouldn't survive and we would not have the big fish that we like to eat.

If we take away the corals - *remove them from board.*
Then the small fish have no place to hide or get food.
They will die or be eaten. *Take away the small fish.* If there are no small fish to grow into big fish then that is the end of the story!

Take away the big fish and the board is blank.



LIFE CYCLE OF THE LIVE REEF FOOD FISH SPECIES

NOTE to Presenters: This picture and this story will happen in a circle. You will work around the circle three times. As you read through the story, each phase is numbered so you know which cycle you are doing.

You will need pieces # 18 -# 34, and four arrows.

INTRODUCTION

In order to make wise plans about managing a living resource like fish, we must understand the life of the fish. How the fish is born, grows, reproduces and how much time this requires are all important to our planning.

The fish species that are wanted by the Live Reef Food Fish Trade have a special lifecycle. If we do not plan carefully, we can upset the balance of this circle and destroy entire fish populations. Many of these fish live to be very old for fish that makes them hard to replace.

I want to share with you some information that scientists know about these special fish.

The lifecycle may vary slightly between species but generally they follow a pattern and timing that is the same.

Let's begin with the birth of a fish.

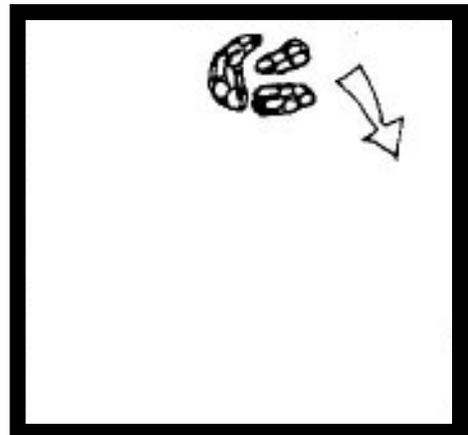
SPAWNING - 1

Large numbers of fish come together and "spawn". This means they lay eggs and the eggs are fertilised. This gathering of many fish is called a "spawning aggregation".

Add fish groups # 18, # 19, # 20.

Conditions must be right for the eggs and sperm to come together, and then they must be carried by the current. If they are not carried away, the big fish will eat them.

If all goes correctly, the spawn are carried out to the open water....*Add arrow.*



PLANKTONIC STAGE 1

For the next 10 - 20 days, the fish are so tiny that we can't even see them. They are just little dots floating in the currents. This is called the planktonic stage.

Add fish dot groups, # 21, # 22, # 23.

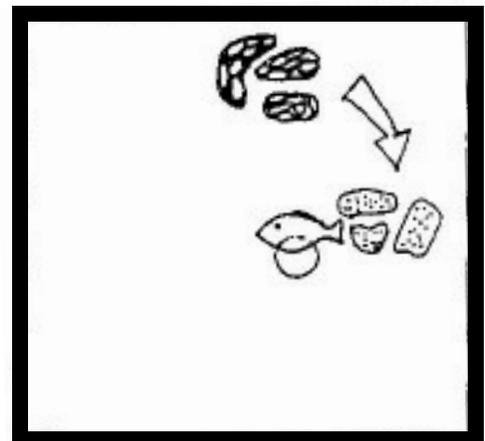
If we could see them, they would look like this.

Add planktonic fish # 24.

The tiny fish has its food attached to its body. It floats on the currents and eats this stored food that came from its egg.

Point to the bubble attached to the fish.

They swim sometimes but mostly they are carried by the currents.



LIFE CYCLE OF THE LIVE REEF FOOD FISH SPECIES

SETTLEMENT PHASE-1

Soon the tiny fish has eaten up all the egg. Remove # 24 and then replace with fish # 25.

Now he needs a place to get food. He also needs a place to hide because he is growing up to be a delicious bite for someone. He is now about 5cm long. Add arrow.

The baby fish may go to the reef, *Add # 26 and # 27.*

Or the mangroves, *Add # 28 and # 29.*

Or beds of seagrass. *Add # 30 and # 31.*

All three of these places give the little fish good hiding places and a rich variety of foods.



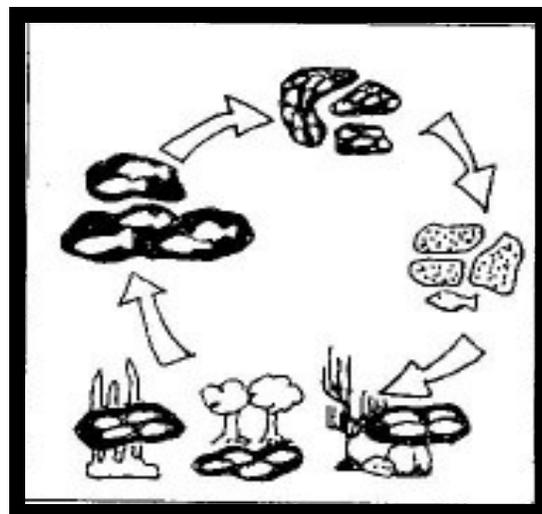
ADULT PHASE -1

In the next 5-8 years the fish grows to maturity. He is an adult now- if he were a person he could vote. *Add third arrow and adult fish groups #32, #33 and #34.*

During his time as an adult, the fish will hang around the reefs where there is lots of food and many places to hide.

Eventually, when he is 5-8 years old, he will see other fish of his species moving to the spawning area. When he sees this he will go with them to spawn, also.

Add 4th arrow to complete the circle.

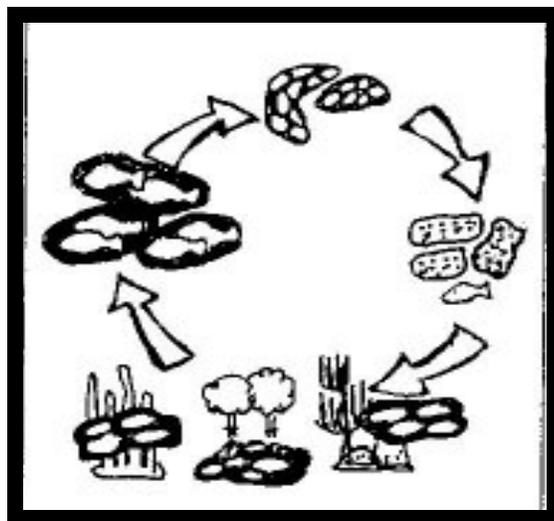


SPAWNING AGGREGATION - 2

Adult fish will spawn about three times a year. Often their spawning is linked with certain times of the moon. Many fishermen know about this behavior so they go to these special spawning places to catch fish.

When they are catching fish only for their families this is not a big problem. But when they are fishing for the Live Reef Food Fish Companies, they are taking all the fish they can.

If we pull out many fish during spawning, we know many of them have not yet made eggs. *Remove one group of spawning fish, # 20.*

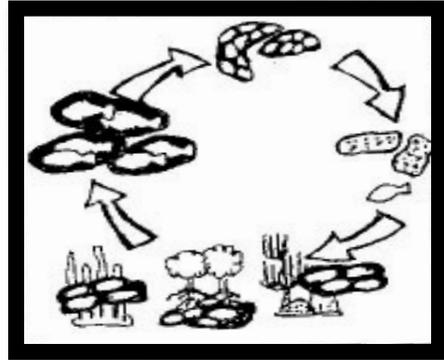


LIFE CYCLE OF THE LIVE REEF FOOD FISH SPECIES

PLANKTONIC STAGE - 2

You can see that if there are less fish spawning, it means less baby fish will be produced. So the numbers of planktonic fish will go down.

Remove one group of planktonic dots # 23.



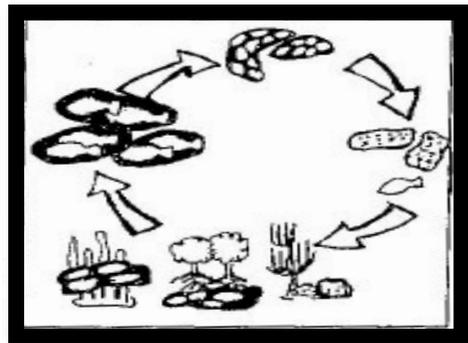
SETTLEMENT STAGE -2

And so that means less of the little fish moving into the reefs, the mangroves, and the seagrass beds,

Remove one group of little fish, # 27.

There are less of them to grow into big fish.

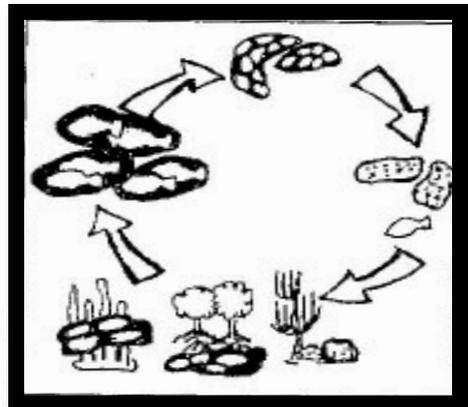
Also there are less of them to feed the other species that need them to live.



ADULT STAGE - 2

And of course, as you know, less little fish means less big fish.

Remove one group of adult fish, # 34.

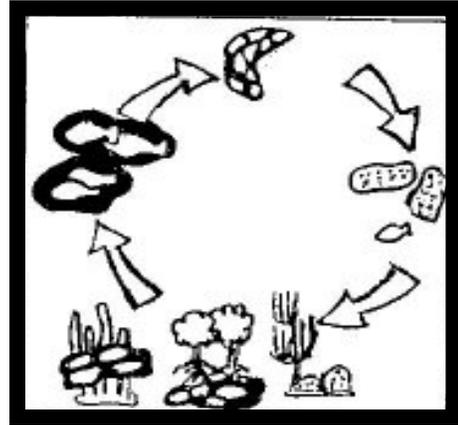


LIFE CYCLE OF THE LIVE REEF FOOD FISH SPECIES

SPAWNING AGGREGATION - 3

You can see what will happen next,

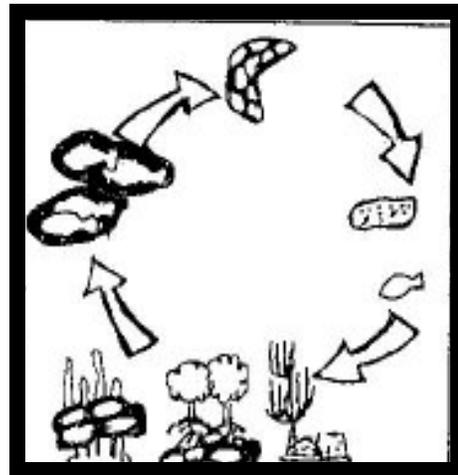
Less adults to spawn.....*Remove spawning group, # 19.*



PLANKTONIC STAGE - 3

Means less planktonic fish produced.

Remove planktonic dots group, # 22

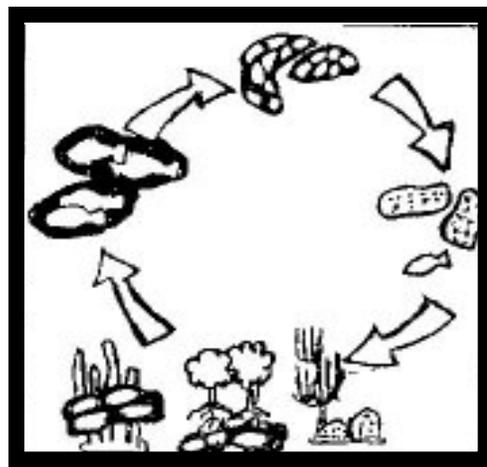


SETTLEMENT STAGE - 3

Less planktonic fish floating around in the open sea means

.....less little fish in the settlement stage, settling in the mangroves, reef, and seagrasses.

Remove little fish group, # 29.

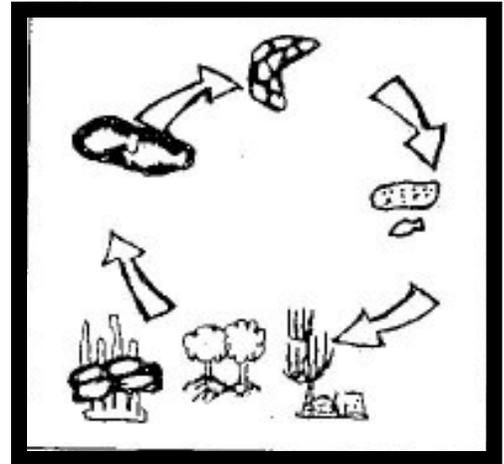


LIFE CYCLE OF THE LIVE REEF FOOD FISH SPECIES

ADULT STAGE -3

And you know that less little fish means less big fish.

Remove big fish group, # 3.



SPAWNING AGGREGATION -3

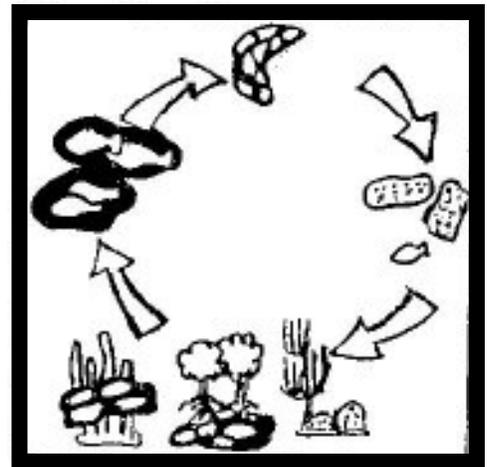
We can see where this is going and it looks like after seven or eight years we might have a problem of no fish at all.

Maybe we could stop fishing this year and let the fish reproduce so they won't be finished completely.

You would think that would work, but something strange happens. For some reason, the adult fish will not gather to spawn unless there are enough of them. Somehow large numbers of fish moving to one place tells all the other fish that it is time to spawn. It is like they need encouragement from many others.

If the numbers of fish drop below a certain level, even though there are adult fish out there, they won't spawn.

Remove last spawning group, # 18.



LIFE CYCLE OF THE LIVE REEF FOOD FISH SPECIES

So now there are not enough fish to begin spawning and the circle is broken.

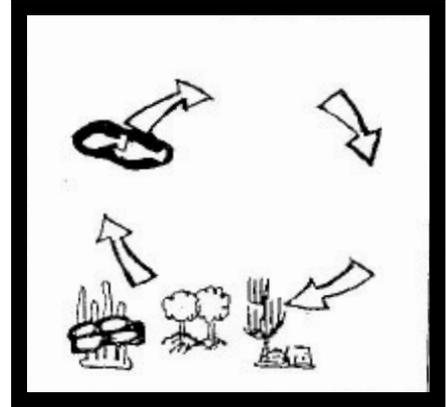
So now we get no baby fish in the planktonic stage...

Remove last planktonic group, # 21, and baby fish, # 26.

and no little fish settling in the mangroves, reefs and seagrasses.

and then remove last little fish group, # 31.

Scientists don't know exactly how low the numbers of fish must go before this happens. We only know that when we fish out the population to a low level we risk eliminating it completely.

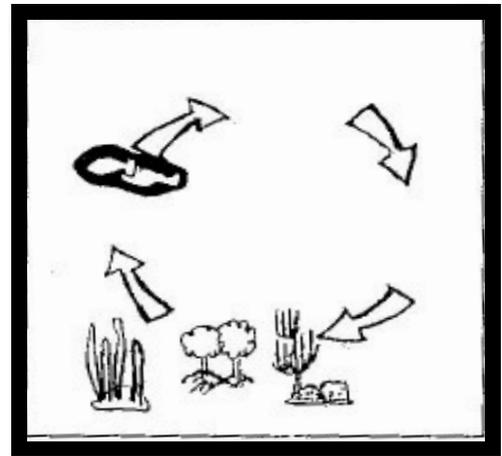


ADULT STAGE - 3 and SPAWNING STAGE - 3

Since there are not enough adults to start the spawning and no new fish are being made, it will only be a short time until they are all finished.

Not only do we, humans lose a valuable resource but what other animals are affected? Who else is depending on these fish? What was this species' place in the life cycle of the reef, the mangroves and the sea?

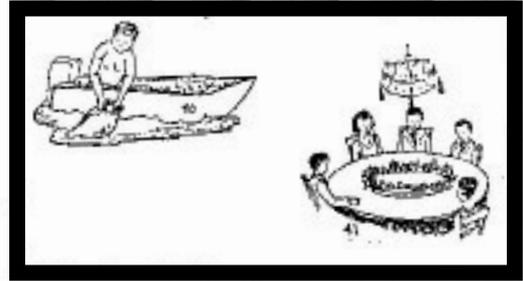
We don't yet know all the answers to these questions but we do know that we have lost a valuable resource that will not come back.



MOVEMENT OF MONEY IN THE LRFF TRADE

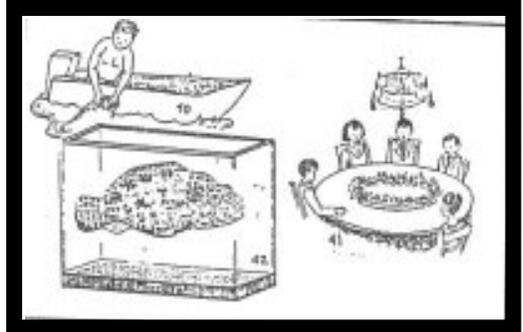
One of the difficulties of the Live Reef Food Fish Trade is the small amount of money that local fishermen can earn compared to the huge amount of money paid for the fish in Hong Kong.

Put up fisherman, # 40 and people at table, # 41.



People of Hong Kong are willing to pay very high prices for a fish in a restaurant because it is a symbol of high status and they want the freshest fish for the best taste.

The fish are kept alive in large tanks until someone chooses it for dinner. Then it is cooked and served immediately.
Move fish out of tank, onto table.

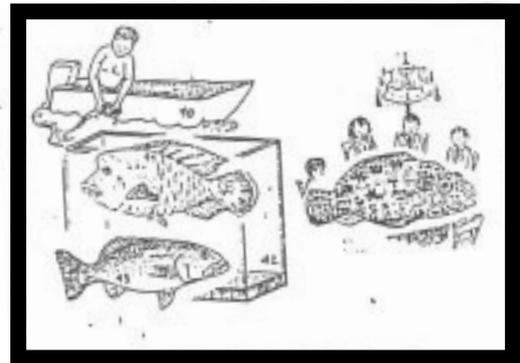


They like the beautiful brightly colored fish best. Also, Live Groupers and Red Coral Trouts represent good luck in Hong Kong and China so they sell for very high prices.

This explains why Coral Trouts
Add coral trout, # 43 onto tank

and the Humphead Wrasse, *Add H. Wrasse # 44 to tank.*

are some favourite species. Unfortunately the Humphead Wrasse is also an endangered species and nearly fished out in many places. Because China is demanding more and more of these fish we may see them finished completely in the next few years.



Leave board as it is for now.

As China's population grows and gains more money, they want to buy more live reef fish. The fish populations around China have been completely finished so they move further away from home to find the special species they desire. That is why we are beginning to see them come to Papua New Guinea and Solomon Islands waters. These operators fish one reef area very quickly and then move onto another. They do not stay in an area long enough to see the negative effects their company has on the area and its communities.

To make a profit from such a big trip to and from Hong Kong, an operator must ship over at least 15 tonnes of live fish. Reefs cannot provide this high amount for very long. So operators must pressure fishermen for more and more fish. Sometimes they encourage destructive fishing methods, like using poisons and targeting spawning aggregations. This increases the profit for the operator but destroys much of the coral reef. So the profits to the local people are only short-term. They make money for a short time, only one to three years at the most, and then they are left with ruined reefs and fish populations that are so low they may not recover.

MOVEMENT OF MONEY IN THE LRFF TRADE

So is this business worth the cost?

Are the local people making enough money by fishing for the Live Reef Food Fish Trade to compensate them for their damaged reefs and reduced or eliminated fish populations? Let's look at who is making how much money...

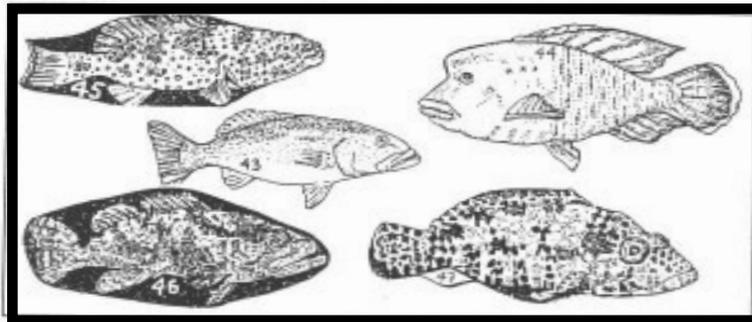
First I must say clearly that prices can be different for different species and during different seasons in Hong Kong. It is very hard to get anyone to commit to a single price. I say this because I may tell you a price now and someone else will say no, it is a different price. If you want to compare prices, then you need to ask is that price for low season or high season? Is that the higher priced species or medium or lower priced species?

To give you an example of what has been paid in the past, here are some prices from the year 2000. These prices were paid during Sept-Oct which is the low season.

As you read each of these put up the picture of that fish, the numbers are listed below.

Approximately

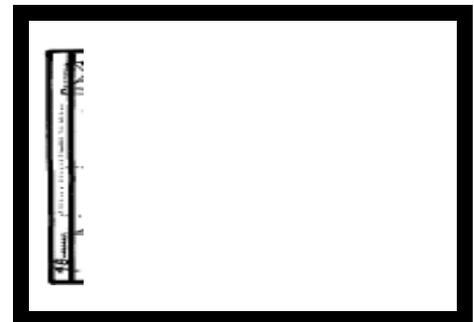
| | | | |
|---|-----|---------------|--------------|
| Plectropomus leopardus (Leopard Coral Trout) | #43 | US \$32.35/k | SI \$ 161.75 |
| Chelinus undulatae (Maori Humpheadwrasse | #44 | US \$46.85/k | SI \$ 234.25 |
| Plectropomus areolatus (Spotted Coral Trout | #45 | US \$19.05/k | SI \$ 97.50 |
| Ephinephelus polyphakadion (Flowery grouper) | #46 | US \$ 18.80/k | SI \$ 94.00 |
| Ephinephelus fuscoguttatus (Tiger grouper) | #47 | US \$ 22.40/k | SI \$ 112.00 |



So how much of this money do you, the local fishermen get?

Records show that the high amount fishermen have gotten is about 2% - 10% of the restaurant price. So here is the fisherman's share.

Put up the smaller note section. #48



MOVEMENT OF MONEY IN THE LRFF TRADE

The exporter who runs the big ship will get 8% of the restaurant price.

Here is his share. Put up next smallest section of note, # 49.



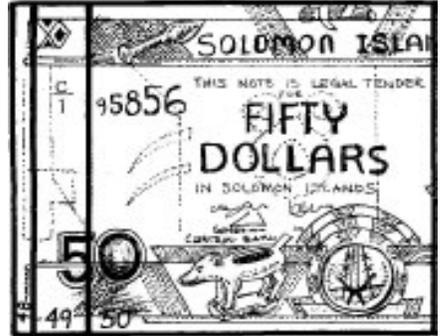
Next in the cue for cash is the wholesalers, they will get the fish from the ship to the city where it will be eaten.

There may be one or several of these buyers who buy and sell the fish on its route to the city.

Altogether they will get the biggest share of the money.

48% of the restaurant price goes to these wholesalers.

Add section of note, # 50.



The last group to make money from these fish are the restaurants themselves. They may get all the rest of the money or they may share with a supplier who delivers the fish to their restaurant.

These last one or two businesses get 50% of the restaurant price.

Add last section of note, # 51.



Leave display board as it is for now.

As we look at the way the price of the fish is divided among everyone, remember that this shows us the percentage that each one gets. Even if the price in the restaurant goes up or down, the percentage will still be the same. The relationship of the fishermen's share to the restaurant's share will be the same.

You need to ask yourselves the following questions before making any agreement with a Live Reef Food Fish Trade company to sell your fish.

Is this a fair share?

People who work in Fisheries Management think the price paid to fishermen should be a minimum of 20% of the restaurant price.

Is it fair share if doing it spoils our reef forever?

Is it a fair share if doing it means we will completely remove certain species of fish from our area?

DESTRUCTIVE FISHING PRACTICES

Pieces needed for this presentation:

1-8, 10,11,12,13,14,15,16,17,18,19,23,26,30,31,32,34,35.

Before you begin talking, put a coral scene on top. Include the stoney coral & polyps, # 1 - 8 and reef # 26, seagrass # 30, and fish # 35, # 34, # 31, and #23.

Some fishing techniques and equipment used with them are always destructive. These should never be used.

Some other techniques can be destructive if they are not used properly OR they can be used in a way that is safe for the environment and resources.

I know you all want to get as much value from your resources as possible for your lifetime and your children's and their children's lifetimes. To do this it is important to use techniques which will allow you to continue harvesting the resource for many years in the future.

Let's talk about some of these techniques.



First we will talk about the techniques which are destructive no matter how you use them. If you care about your resources staying healthy - NEVER USE THESE METHODS!

1. Poisons. These are chemicals and plants which stun or kill the fish. *Add squirt bottle, # 11.*

Cyanide is a very dangerous poison. Others are derris root, "rope", and roteone. *Add vine (rope)*

These poisons not only stun the fish you want to collect, they also kill the coral polyps which build the reef. *Remove 4 polyps, # 2, 3,4 and 5.*

They also kill small fish and other animals and plants which are important in the food chain.

Remove grass #30 and fish #23



DESTRUCTIVE FISHING PRACTICES

Another NEVER USE method is...

2. Dynamite. Dynamite kills many fish you don't want. It is a very wasteful technique. *Add dynamite, # 12.*

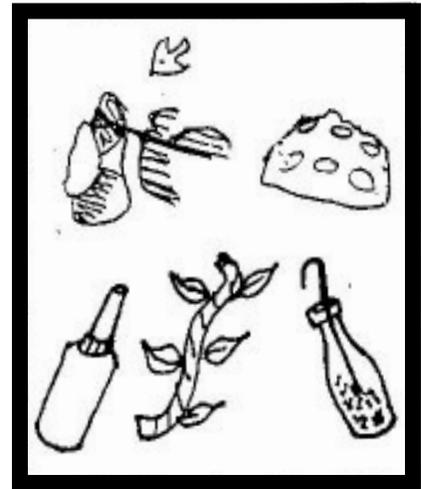
Like poisons, dynamite kills small fish, and other animals and plants that are needed in the food chain.

Remove fish, # 31 and # 32.

Dynamite also destroys the reef structure but it does immediately and not slowly like poisons do. Dynamite breaks the reef apart and kills the polyps.

Remove all remaining polyps leave just the white base and turn reef # 26 on its side.

Dynamite is dangerous to have in your boat or home. Children have been killed and maimed by playing with it -and adults have been too!



Another group of techniques can be used in ways that keep resources and environment healthy. BUT only if they are used wisely.

Remove poison and dynamite, and replace healthy polyps and fish. = Go back to same picture as beginning block.

These methods can be destructive or healthy. It is not the gear which is a problem, it is the person who uses it.

Humans cause problems if they do not use the following gear and methods wisely.



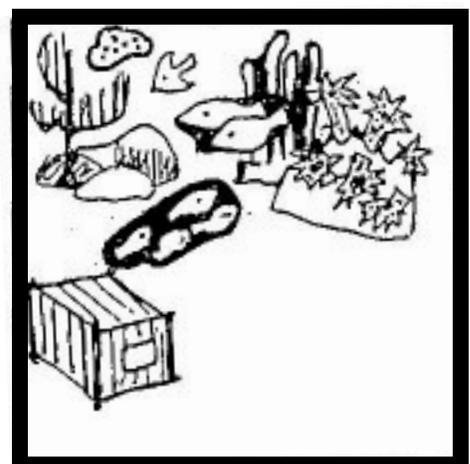
1. Traps can be very destructive to a reef. *Add trap, # 13.*

If you use traps, never set them near the reef itself where they can crash into the corals. This breaks and damages the corals.

Never break off parts of the corals to hide the traps.

Never break off parts of the corals to use as weights for the traps.

Handle your boat, anchor and traps carefully to avoid banging and breaking the corals.



DESTRUCTIVE FISHING PRACTICES

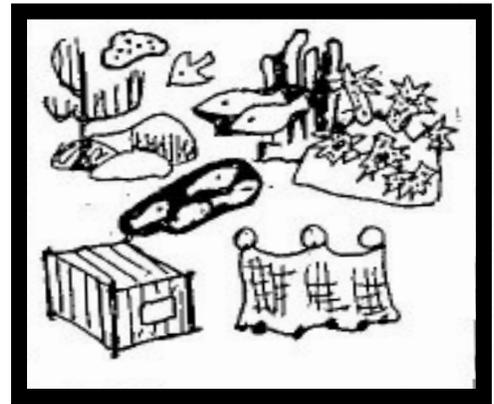
2. Nets can be destructive if not handled carefully.

Add nets, # 14.

Do not drag on top of the corals. This breaks them and kills the delicate polyps.

Nets can also cause “over harvesting”. With a net you catch things you don’t want.

Sometimes you catch more fish than you need. Use a net only when you know you can use the numbers of fish you will catch.



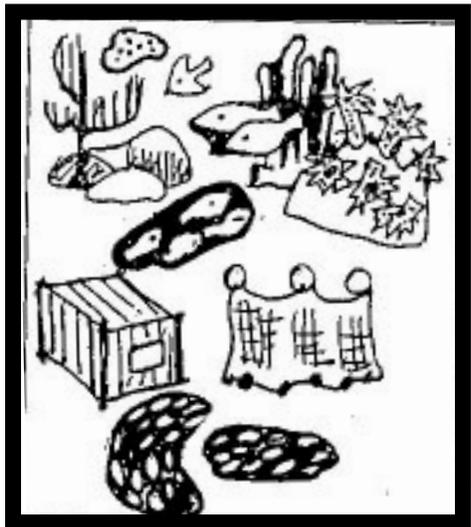
3. Targeting spawning aggregations is another method we must use with extreme caution. *Add fish groups # 18 and # 19.*

Targeting spawning aggregations means catching fish when they come together to mate. This is an easy way to get many fish quickly. I am sure all of you knowledgeable fishermen know how to use this method in your waters.

Targeting spawning aggregations often becomes a problem when it is used for commercial fishing. Then fishermen take every fish, not just fish needed to feed their family.

You can see that if we take every fish when they are mating, in a few years time we will eliminate that fish population.

Target spawning aggregations should not be fished unless it is essential only for subsistence fishing.

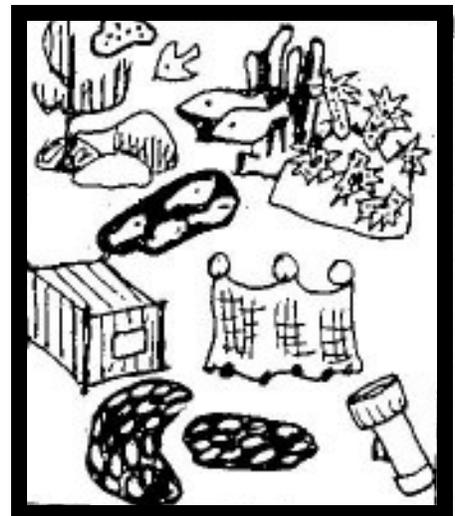


4. Night Diving is a popular method for fishing and harvesting other marine animals. This method is fairly safe for the reef but it makes it easy to overharvest.

Add torch, # 15.

In the old days, we did not have electric torches. It was difficult to catch things at night when they are sleeping. Now the electric torch has given man the advantage and it is easy to collect things sleeping on the reef.

When night diving be careful to take only what you need. Your community may want to limit night diving for subsistence harvesting only.



DESTRUCTIVE FISHING PRACTICES

Remember, these four (4) methods: Point to each symbol as you name them.

- * Traps
- * Nets
- * Targeting Spawning aggregations and
- * Night diving

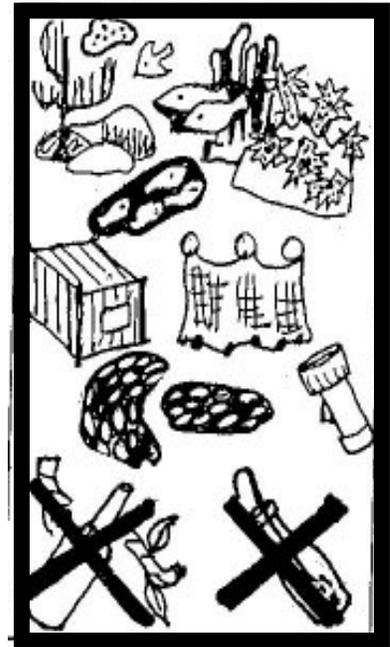
These four (4) methods can be safe if used wisely.
It is up to you, the fishermen, to harvest in a healthy way.

~~~~~  
BUT there are two (2) methods which are not SAFE no matter  
HOW you use them. What are they?

RIGHT! POISONS and DYNAMITES are destructive to the  
reefs and the environment any way you use them.  
*Add squirt bottle and dynamite.*

To keep your reefs and resources healthy...

NEVER use these two methods!*Add red X's , # 16 and # 17 on  
top these two..*



# Additional Instructions

## Biodiversity Presentation

For this presentation you will see that it is made up of four parts, (i) What is "bio"? (ii) What is "diversity"? (iii) What is biodiversity? Its importance and (iv), The dependence between corals and fish.

So you will need four separate envelopes or folders to contain each part.

The first envelope should contain the word "bio" (#52), and #60, #62, #59, #57, #63, #64, and #71. In this part you are trying to make your audience understand the meaning of bio by putting up the above numbered drawings and visually defining it. Thus, #60, #61, #62 do not belong to bio whilst the rest fit into bio.

The second envelope should contain the word "diversity" (#53) then #18, #32, #33, as one fish group and #34, #63, #64, #65 as the other. Here you are trying to compare the two groups of fish to see which of them defines diversity.

The third envelope should contain the two connected words "biodiversity" which of course is the core of this presentation. Again another comparison between two reefs to make the audience better understand biodiversity. The two separate reefs contain #67, #71, #56, #26, #31, #63, #30, #64, #65, #66, #57, #55, #27, #29, #68 and #69. From this comparison the audience should know the importance of biodiversity.

The last envelope should contain the corals #1-8, #55, #56, #57, and fish #18, #19, and #63. This last part talks about the dependence between corals and fish, which emphasises the fact that corals and fish always go together.

## Lifecycle of the LRFF Trade Fish Species

This presentation is divided into four stages, which you will go through three times in a circle - thus forming a lifecycle.

The first envelope should contain #18, #19, and #20 which is the first stage called the Spawning Aggregation - 1.

The second envelope contains #21, #22, #23, #24, and #25, they're the first Planktonic Stage - 1.

The third envelope has #26, #27, #28, #29, #30, #31, and this is called the Settlement Phase - 1.

The last envelope will contain #32, #33, and #34. This is the Adult Phase - 1.

This lifecycle will be completed three times, so following Spawning Aggregation - 1 will be Spawning Aggregation - 2 (second time to go through the lifecycle again) and then finally Spawning Aggregation - 3 (the last time to go through the lifecycle). This is the same for the rest of the other stages.

Basically what we are trying to achieve here is that the LRFF Trade fish has its own special lifecycle and we need to be very careful when harvesting them so we don't upset the balance of this circle because it can destroy the entire fish populations. As a result of this threat, we need to make wise plans about managing them, which is the focus of this presentation. Hence, we need to make an effective awareness presentation as a means of contributing to the management of this delicate fish species.

## The Movement of Money in the Live Reef Food Fish (LRFF) Trade.

This presentation is quite short, it has less numbers of drawings compared to the others so it will need only one envelope.

Basically, it's all about the small amount of money the local fishermen earns compared to the huge amount paid for the fish in Hong Kong.

The single envelope should contain #40, #41, #42, #47, #43, #44, #45, #46, #48, #49, #50, and #51, which talks about the amount of money paid in percentages between the local fishermen and the other players namely the exporter, wholesaler and the restaurants. Also how the LRFF Trade destroys the reefs and the fish populations.

## Destructive Fishing Practices

This presentation has three parts, (i) The coral scene and fish (ii) the NEVER USE METHODS and (iii) other fishing techniques.

One envelope should contain the coral scene and fish, #1-8, #26, #30, #35, #34, #31, and #23. The point here is that this scene in its beauty can be destroyed as a result of destructive fishing techniques and unwise use of other methods.

The second envelope will contain the NEVER USE METHODS. There are two; Poisons #10 and Dynamite #12 (#16 & #17 denotes DO NOT or prohibited to be placed on poisons and dynamite). Stress the fact that ANY WAY they are used, they're always destructive, and that they should NEVER BE USED.

The last envelope will contain another group of techniques, #13, #14, #18 #19 and #15. These techniques can be destructive or healthy, so it all depends on how they are used. Point out the fact that it is up to the fishermen to harvest in a healthy way.