

Processing sea cucumbers into beche-de-mer:

A manual for Pacific Island fishers



**Processing sea cucumbers into
beche-de-mer:
A manual for Pacific Island fishers**

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Contents

Background	1
Commercially important sea cucumber species in the Pacific	2
Ecological role of sea cucumbers	7
Responsible practices for collecting sea cucumbers	8
Beche-de-mer markets and consumption	9
Handling and processing methods	11
Why take extra care with processing sea cucumbers?	11
Postharvest handling at sea	14
Gutting	16
Salt curing	19
Cooking	23
Smoke curing	30
Drying	31
Additional information	33
Examples of well- and poorly-processed sea cucumbers	33
Storage of dried product	38
Selling your product	39
Notes	41

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Purpose of this manual

This manual is designed for sea cucumber fishers in Pacific Islands. The species depicted in this manual are ones commonly fished in Pacific Islands.

'Processing' is used in this manual to mean all of the steps to transform the fresh sea cucumbers into the dried form, which is called 'beche-de-mer'. Processing includes cutting, salting, cooking, smoking and drying the sea cucumbers.

The price given to fishers for dried sea cucumbers depends on the species they are selling, how big the individuals are and how well they have been processed. This is because Asian consumers want to buy products that look nice and have an attractive appearance and taste when cooked. So, prices in Asian markets are high for the well processed sea cucumbers and much lower for ones poorly processed.

Many fishers are not aware of the best methods for processing sea cucumbers into beche-de-mer. As a result, they may get low prices from buyers.

There are many different ways that sea cucumbers can be processed to obtain a good quality. This manual provides best practice methods that can be applied by fishers using resources in their own villages.

Background

Commercially important sea cucumber species in the Pacific

There are more than 1000 species of sea cucumber but only 20, or so, species are commonly exploited in Pacific Islands. Each species has a local name and a scientific name, of which the first word is the genus and the second is the species.

The value of each species when dried will depend on the species, the size of the product, and the quality of the processing (colour, smell, texture). These aspects are explained later in this manual. The photographs of dried sea cucumbers in this section represent well processed product.

Values are expected selling prices from fishers to buyers in Pacific Islands, depending on the product size and quality of processing.



Common English name:
Sandfish
Scientific name:
Holothuria scabra
Selling price dried:
US\$16-45 per kg



Common English name:
Golden sandfish
Scientific name:
Holothuria lessona
Selling price dried:
US\$16-45 per kg



Common English name:
White teatfish
Scientific name:
Holothuria fuscogilva
Selling price dried:
US\$45-85 per kg

Background



Common English name:
Black teatfish
Scientific name:
Holothuria whitmaei
Selling price dried:
US\$25-65 per kg



Common English name:
Prickly redfish
Scientific name:
Thelenota ananas
Selling price dried:
US\$25-65 per kg



Common English name:
Surf redfish
Scientific name:
Actinopyga mauritiana
Selling price dried:
US\$25-40 per kg



Common English name:
Stonefish
Scientific name:
Actinopyga lecanora
Selling price dried:
US\$25-55 per kg



Common English name:
Deepwater blackfish
Scientific name:
Actinopyga palauensis
Selling price dried:
US\$25-55 per kg

Background



Common English name:
Hairy blackfish
Scientific name:
Actinopyga miliaris
Selling price dried:
US\$25-55 per kg



Common English name:
Deepwater redfish
Scientific name:
Actinopyga echinites
Selling price dried:
US\$25-65 per kg



Common English name:
Leopardfish
Scientific name:
Bohadschia argus
Selling price dried:
US\$12-25 per kg



Common English name:
Curryfish
Scientific name:
Stichopus hermanni
Selling price dried:
US\$8-55 per kg



Common English name:
Greenfish
Scientific name:
Stichopus chloronotus
Selling price dried:
US\$25-65 per kg

Background



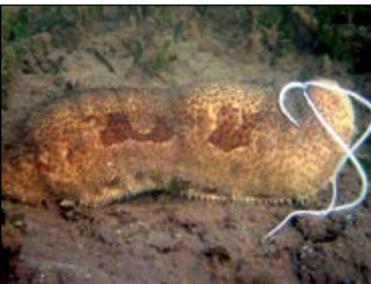
Common English name:
Dragonfish
Scientific name:
Stichopus
monotuberculatus
Selling price dried:
US\$10-15 per kg



Common English name:
Brown sandfish
Scientific name:
Bohadschia vitiensis
Selling price dried:
US\$8-20 per kg



Common English name:
Elephant trunkfish
Scientific name:
Holothuria fuscopunctata
Selling price dried:
US\$6-8 per kg



Common English name:
Chalkfish
Scientific name:
Bohadschia marmorata
Selling price dried:
US\$8-18 per kg



Common English name:
Snakefish
Scientific name:
Holothuria coluber
Selling price dried:
US\$8-16 per kg

Background



Common English name:
Lollyfish
Scientific name:
Holothuria atra
Selling price dried:
US\$4-15 per kg



Common English name:
Reef lollyfish
Scientific name:
Holothuria atra
Selling price dried:
US\$6-15 per kg



Common English name:
Pinkfish
Scientific name:
Holothuria edulis
Selling price dried:
US\$4-8 per kg



Common English name:
Amberfish
Scientific name:
Thelenota anax
Selling price dried:
US\$8-18 per kg



Common English name:
Flowerfish
Scientific name:
Pearsonothuria graeffei
Selling price dried:
US\$3-5 per kg

Ecological role of sea cucumbers

Sea cucumbers crawl on sand and reef surfaces eating fine food particles mixed with sand and silt. They digest bacteria, dead algae and micro-organisms and excrete cleaned sand.

So, sea cucumbers are important on reefs for recycling food material left on sand. The urine from sea cucumbers can help algae and corals to grow.

Some sea cucumbers bury into sand. In doing so, they stir the sand so that it stays healthy.

Sea cucumbers are eaten by a wide range of animals, so they are important to reef food chains. Some fish, starfish, crabs, turtles and sea birds eat sea cucumbers, especially young and small ones.

Harvesting too many sea cucumbers will mean fewer sea cucumber babies being produced. Reef sand could become dark and there may be fewer nutrients for algae and corals to grow.



Background

Responsible practices for collecting sea cucumbers

Sea cucumbers are fished in all Pacific Island countries, but some countries do not allow the products to be exported.

You should follow the regulations in your country for harvesting and selling sea cucumbers. The regulations will help maintain sea cucumber populations for you and future generations.

Best practice rules:

- ✓ Collect only the large animals of a species. Leave the small ones so that they can grow big and be collected in following years.



- ✓ Use only your hands to collect sea cucumbers. Don't damage corals or seagrass.
- ✓ Take only the number of sea cucumbers you need. Leave some to reproduce new sea cucumbers for future years.



- ✓ Leave the rare species to preserve good biodiversity on the reef.
- ✗ Do not fish at night nor use SCUBA if those practices are banned in your fishery.

Beche-de-mer markets and consumption

Once sea cucumbers are cooked and dried, they are called 'beche-de-mer'.

Most of the dried sea cucumbers exported from Pacific Islands go to Chinese dried seafood markets. The main destination is Hong Kong, but much of the products are transported to inland Chinese markets. Other export destinations for Pacific Island sea cucumbers are Taiwan, Korea and the United States.

Asian consumers like dried sea cucumbers that are straight, without damage to the skin, have a dark colour (for dark species), mild odour and are not covered by salt. Prices will be high if the products have these characteristics.



Background

Sea cucumbers are luxury seafoods. In Asian stores, they sell at high prices. They are sold by weight alongside sharkfin and other dried seafood.



Chinese consumers eat sea cucumbers in dishes with sauce for special meals. They are one of the important seafoods for Chinese festive meals.



Handling and processing methods

Why take extra care with processing sea cucumbers?

The price that buyers will get for sea cucumbers exported to Asian markets will be higher if the animals are well processed. This means that the buyers should also give you higher prices for the sea cucumbers if you have handled and processed them well.

Dried sea cucumbers should have a clean, unbroken and appealing form.



Processing them more carefully will take you and your family members more time. But you can then make more money from the animals that you collected from the sea.

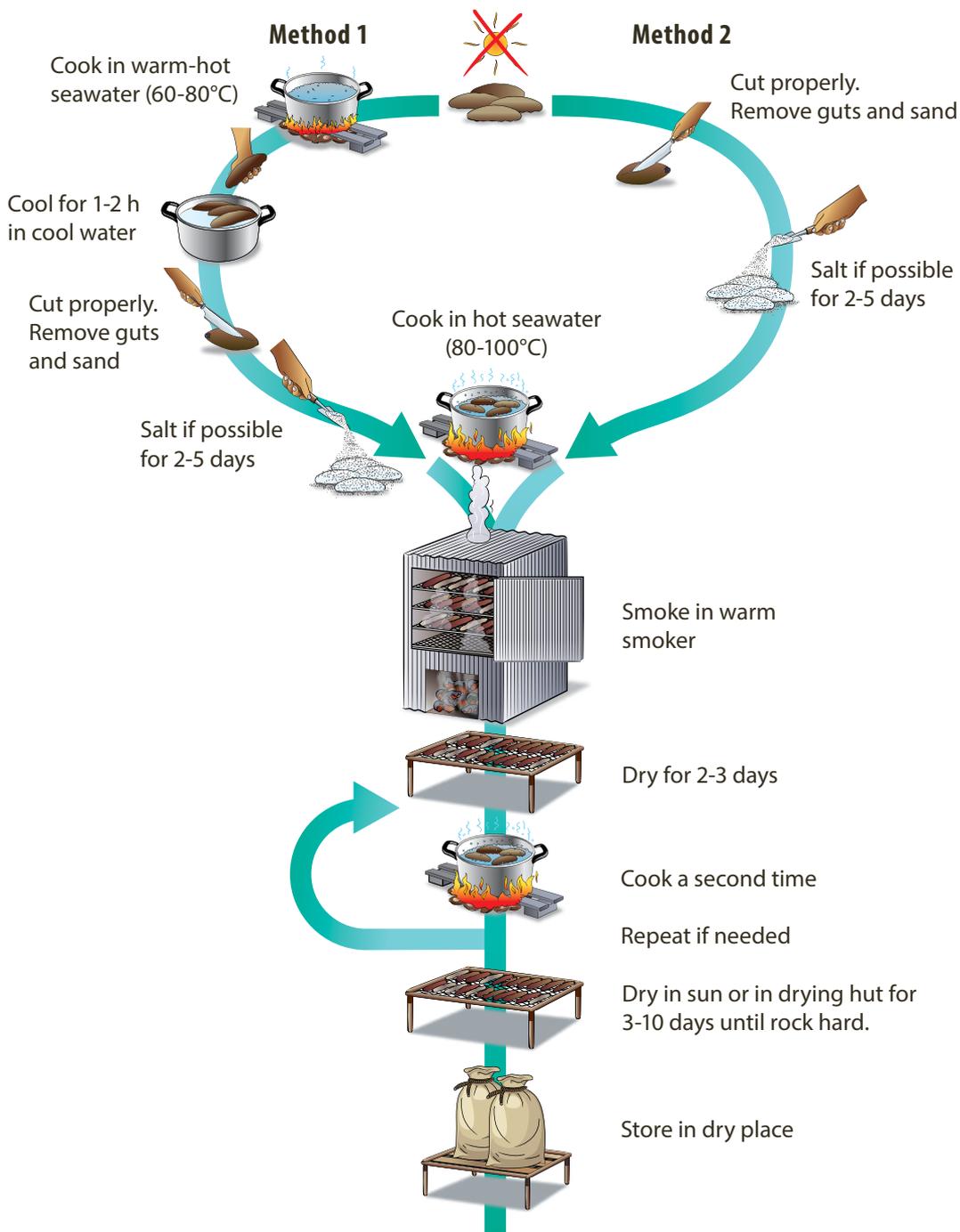
The higher prices for well processed animals may mean that you do not have to go fishing so often to make the same amount of money from selling sea cucumbers.



Handling and processing methods

Summary of processing methods

Take care to not damage animals



Handling and processing methods

What equipment will I need?

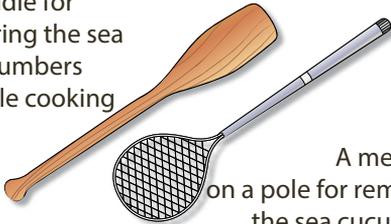


A sharp knife



A large pot or a 200 litre (44 gallon) drum cut in half and thoroughly cleaned

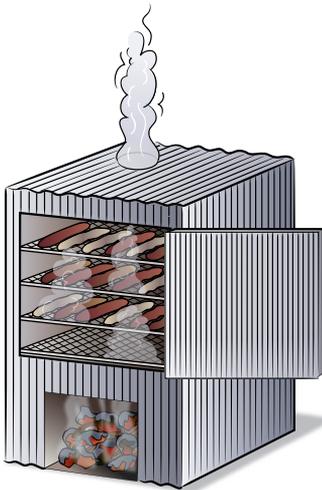
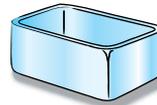
A wooden paddle for stirring the sea cucumbers while cooking



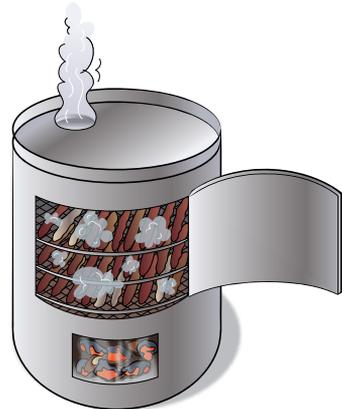
A mesh net on a pole for removing the sea cucumbers once they are cooked



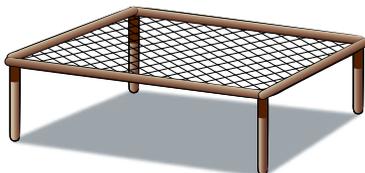
Medium-coarse salt and a plastic or fibreglass container in which to salt the animals



A smoke oven (optional)



Drying racks in the sun



Large plastic sacks for storing the sea cucumbers once fully dried



Sticks for holding teatfish open and twine for closing them up again



Handling and processing methods

Postharvest handling at sea

Sea cucumbers should be kept cool in the boat or in a bag in seawater. If you put them in the boat, keep them shaded!



Try not to stack too many on top of one another, as this may cause them to become damaged.

- Put **black teatfish** and **white teatfish** together.
- Put all **blackfish** species (*Actinopyga*) together.
- Put **prickly redfish** alone or with **surf redfish**.
- Keep **curryfish** separate from other species

Be careful not to allow the skin to be damaged or broken!

Some sea cucumbers will begin to fall apart if they become hot or too dry. Keep these species in a drum of fresh cool seawater in the shade in the boat and change the water often.

Handling and processing methods



Curryfish



Amberfish



Greenfish

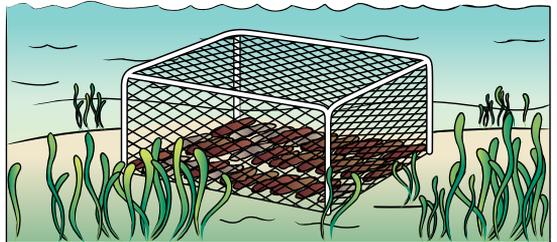
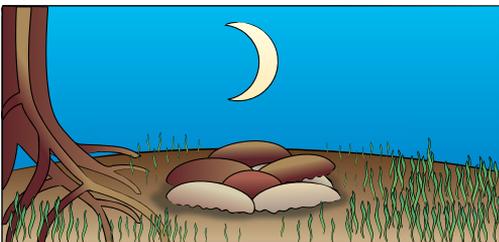


Dragonfish

For **curryfish**, **amberfish**, **greenfish** and **dragonfish**, it is best to keep the animals in cool or cold seawater by putting ice in the seawater or put the animals onto ice directly until it is time to cook them. Leave the gutting until just before cooking them or their flesh will disintegrate. **Teatfish**, **prickly redfish** and **tigerfish** can also be kept on ice, if possible.



You should cut and cook the sea cucumbers soon after you get back to shore. If you cannot cook them straight away on the same day, leave them somewhere in the sea overnight with a good supply of fresh seawater or in a drum full of seawater.



Handling and processing methods

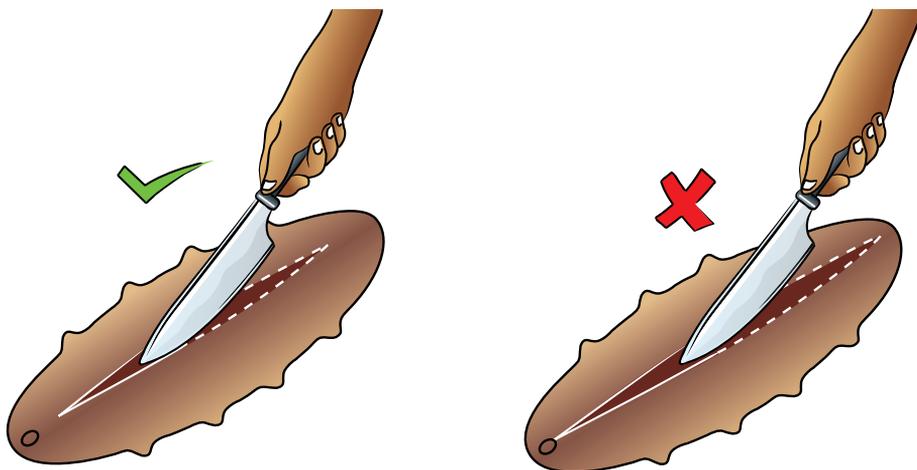
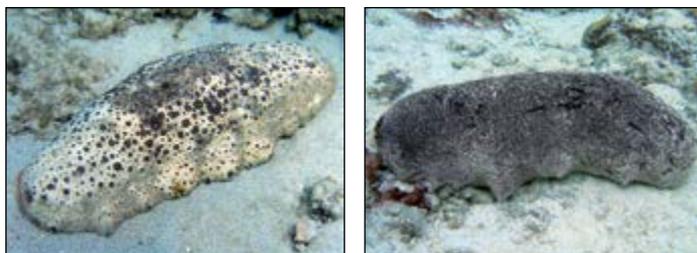
Gutting

General tips:

- ✓ Take care when cutting the sea cucumbers. Asian consumers want a straight cut that is in the right place for each species.
- ✓ Do not cut all the way through the mouth and anus.
- ✓ Generally, smaller cuts are better than long cuts.
- ✓ Make sure that you remove all of the guts. But leave the muscle bands in the animal. Clean out all of the sand in the sea cucumbers.
- ✓ For fishing trips longer than one day, keep the sea cucumbers in salt or on ice (but not frozen) so they do not spoil.

White teatfish and black teatfish

Cut along the back (upper side) of the animal. Make the cut straight. Leave 2–3 finger widths (3–5 cm) uncut before the mouth and anus. Make sure they are flat when you cut them.

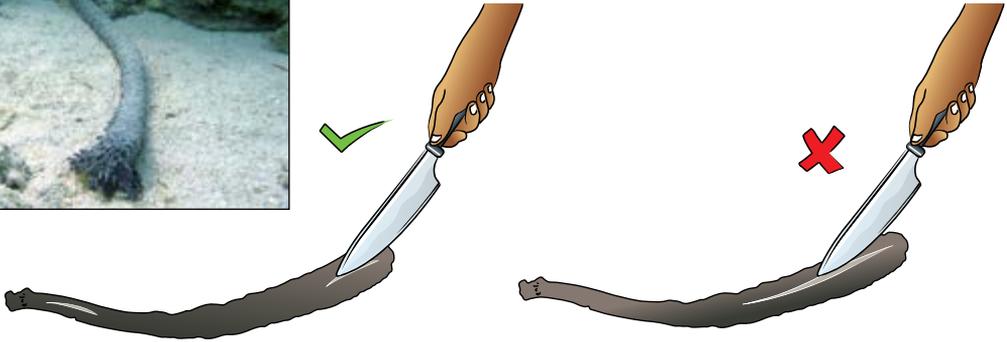


Do not cut all the way from the mouth to the anus!

Handling and processing methods

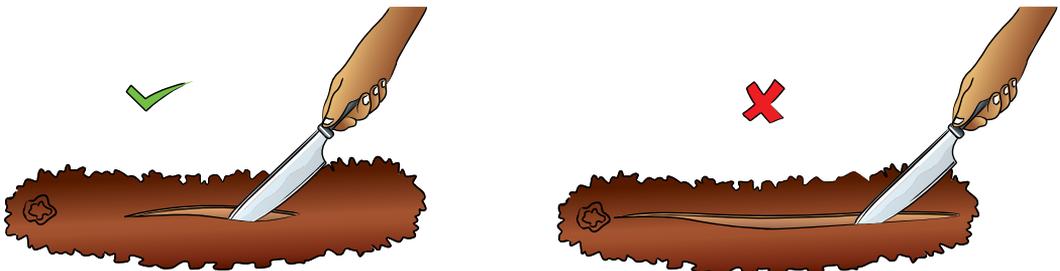
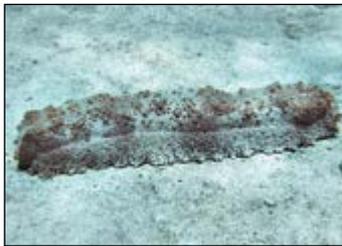
Snakefish

For long species, such as snakefish, you can cut in two places on the underside of the animal. They can be gutted after the first cooking, so that they retain a better shape. Make sure you take all of the sand out!



Prickly redfish, amberfish and elephant trunkfish

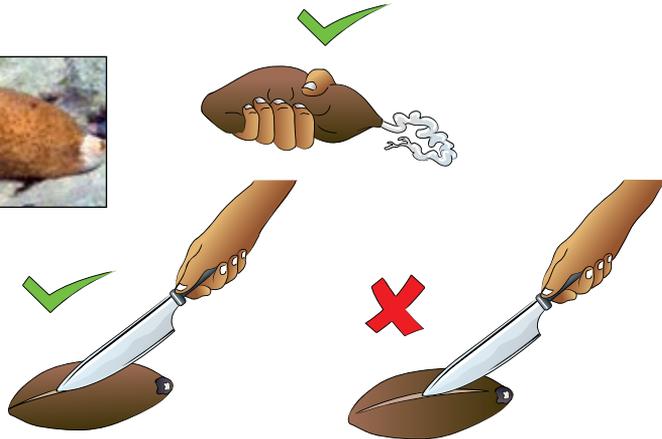
Make a straight long cut on the underside (bottom) of the animal. Leave at least three finger widths (5 cm) uncut before the mouth and anus. For **prickly redfish**, some processors make one or two small cuts, just enough to squeeze out all of the guts.



Handling and processing methods

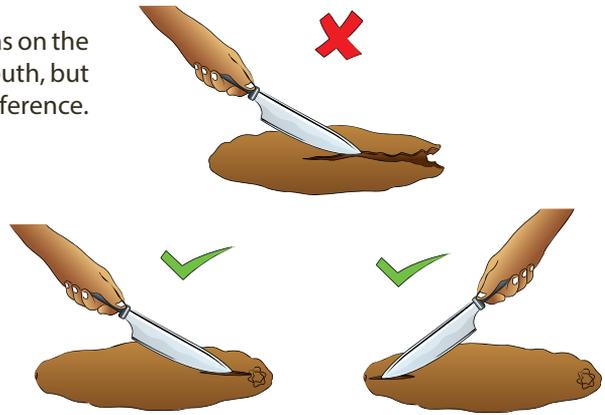
Blackfish and stonefish

You can just squeeze the sea cucumbers so that all of the guts come out and then cook them. But uncut sea cucumbers will be harder to dry properly. Another way is to firstly cook the sea cucumbers in warm-hot water and then make a very small cut near the anus to take out the guts. A rounded, not flattened, shape is desired by Asian consumers.



Other sea cucumbers

Make a small cut of about 2–3 finger widths on the underside of the animal, at the anus or mouth, but not at both ends! Ask for your buyer's preference.



Handling and processing methods

Salt curing

Salt removes water from the body of the sea cucumbers. It will also make the product heavier after it is cooked and dried, which means that you will make more money if the product is sold by weight.

Coarse or medium-grade salt must be used. Fine salt may damage the skin of the sea cucumbers. Coarse salt gives a slow penetration of the salt into the flesh of the sea cucumber, which is desired.



There are two general methods for salting:

Wet salting:

put the sea cucumbers in a drum or sealed box with layers of salt. The sea cucumbers will lose a lot of the liquid from their bodies, so they will bathe in brine at the end. Use at least 1 kg of salt for 3 kg of sea cucumbers. This method is useful if you cannot cook the sea cucumbers immediately after catching them.

Dry salting:

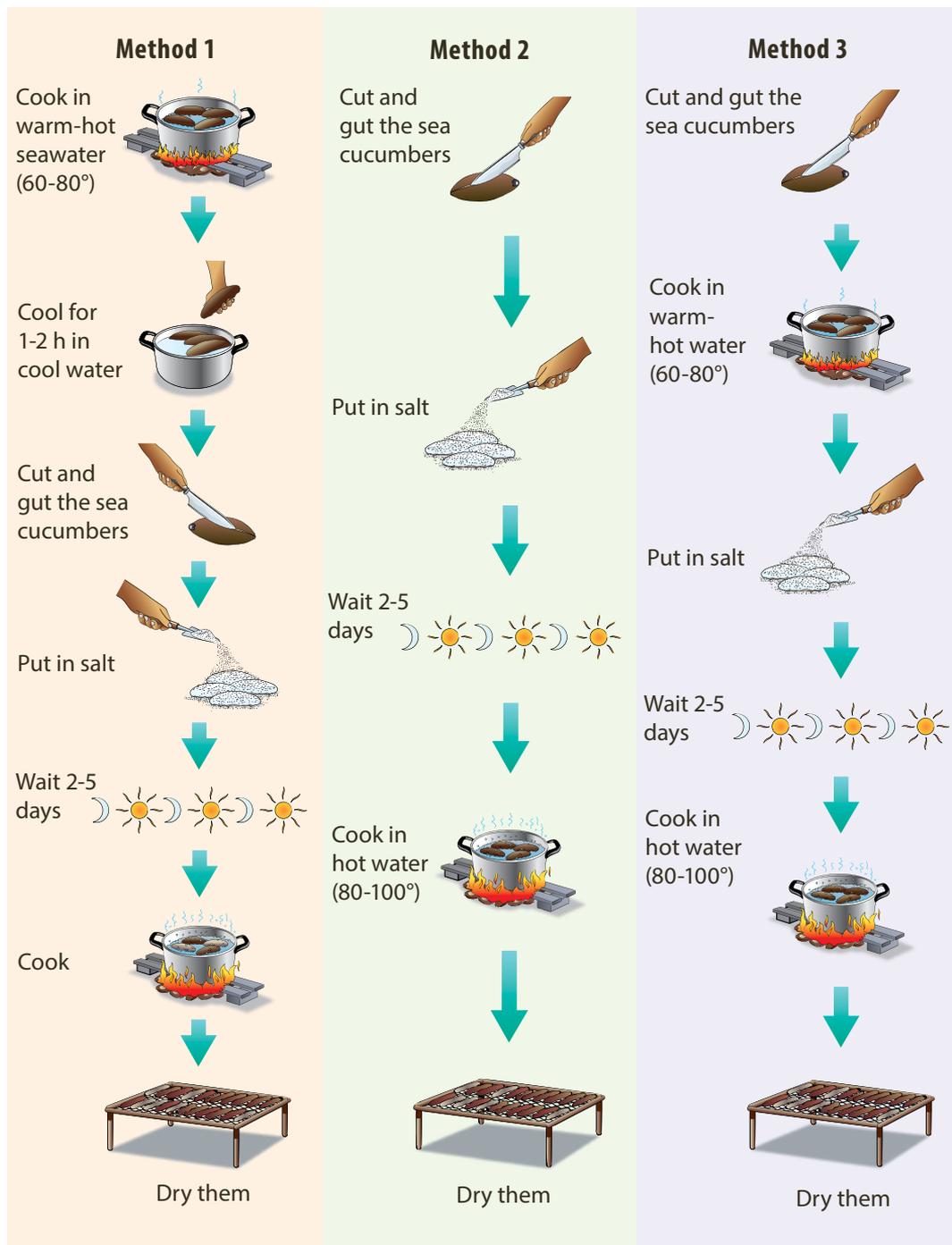
after cooking in warm water and gutting, put the sea cucumbers on salt in a wooden box with slits underneath. Put the cut side facing down. Layer the salt between the sea cucumbers. The liquid from their bodies will drip through the slits in the wooden box, so they will not get too wet. Use at least 1 kg of salt for 1 kg of sea cucumbers. After using it a couple times, rinse the salt before re-using it.

If you salt the sea cucumbers after gutting them and before the first cooking, put the sea cucumbers in a drum with salt soon after you catch them.

Often, processors will salt the sea cucumbers after the first cooking, which saves on the amount of salt needed. In this case, let the cooked sea cucumbers cool down before placing them in the salt.

Handling and processing methods

When to salt the sea cucumbers



Handling and processing methods

Do not salt all of the different species together! Salt one type of species together in the same box or drum.

But you can put some species together when salting.

- Salt the **black teatfish** and **white teatfish** together. You should put several handfuls of salt to fill inside the body cavity of these species. Then pack them in salt with the cut side facing down.



- Salt all **blackfish** species (*Actinopyga*) together. Do not put them with other species because they will stain the other species with a dark colour. If dry salting, lie sea cucumbers in salt at an angle with cut side downwards



Handling and processing methods

- Salt the **prickly redfish** alone or with surf redfish.



Keep sea cucumbers in salt for 2-5 days

Do not salt **greenfish**, as they will lose their dark colour if salted. Some processors also do not salt curryfish, but it can be salted after cooking.



Only salt **curryfish** after cooking!

For **amberfish**, only salt them for 2 days at most, otherwise they will lose their colour.



2 days in salt only

What to do if you don't have salt?

If you cannot get coarse salt, simply go straight to the cooking stage. But without salt, drying the sea cucumbers will take more days and the dried product will be lighter, so you will get less money per animal.

Handling and processing methods

Cooking

There are several methods that can be used to cook sea cucumbers.

Cooking too hot can damage the skin of sea cucumbers.

The best method is to cook once, then dry for 2–3 days, then cook a second and even a third time if needed.

General tips:

- ✓ For the first cooking, you can cook the sea cucumbers in warm water.
- ✓ Put sea cucumbers into warm water first before bringing to the boil.
- ✓ If you can, use saltwater for cooking, rather than freshwater.
- ✓ Cook different species of sea cucumbers separately.
- ✓ Cook small sea cucumbers for less time than the large ones.
- ✓ Use a big pot with a lot of fire underneath.
- ✓ Take care when stirring the sea cucumbers and when removing them so you do not damage the skin.
- ✓ After cooking, rinse sea cucumbers with freshwater to remove salt.

You can use your dried coconut husks as fire fuel for heating the water for cooking the sea cucumbers. Do not use mangrove wood because that is needed for your coastal ecosystems.

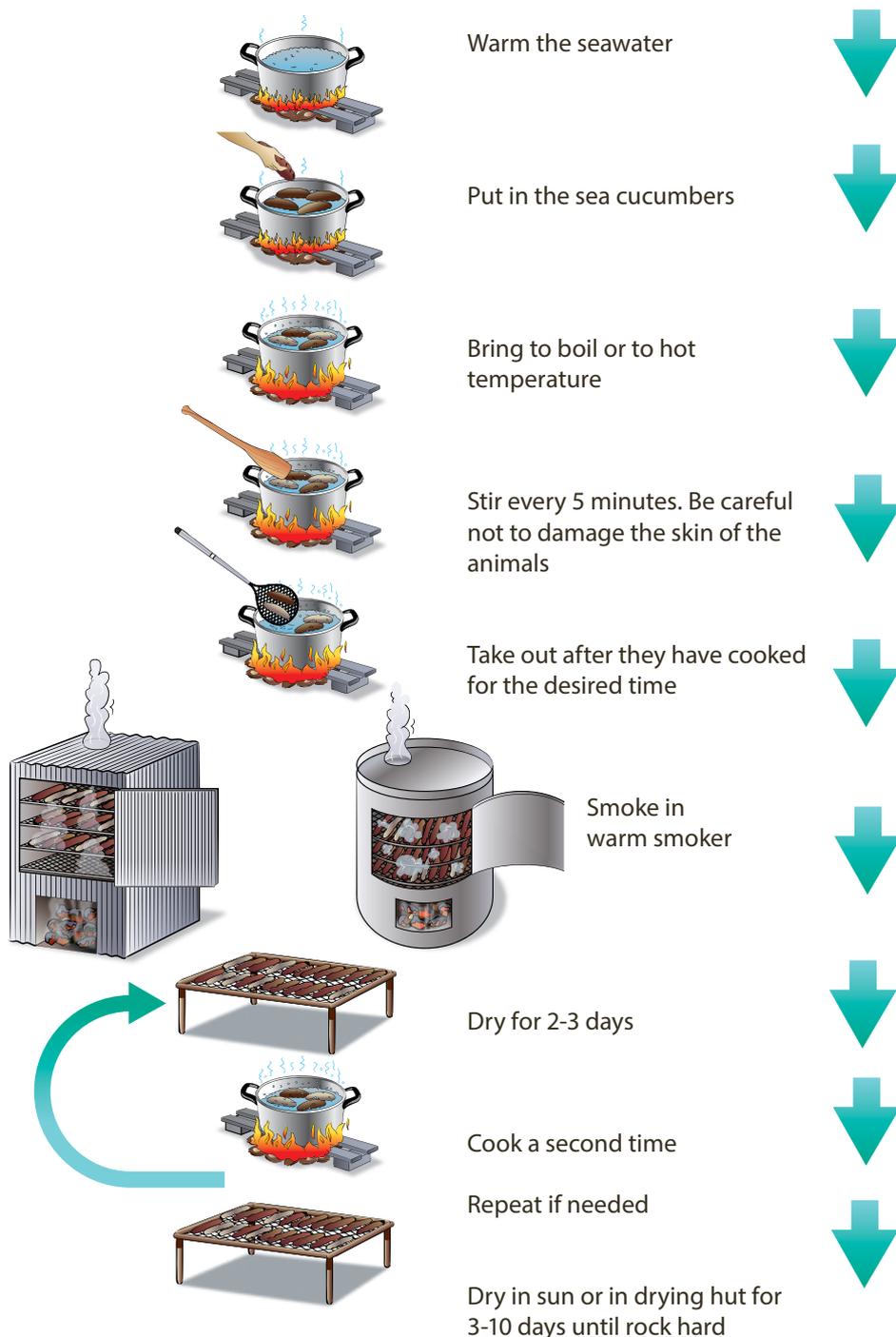
What type of water should I use?

Try to use saltwater in your pot for cooking the sea cucumbers, rather than freshwater. Saltwater will retain the colour of the sea cucumbers and keep the skin from being damaged.

If you cannot use saltwater for cooking, use freshwater.

Handling and processing methods

Alternating cooking and drying



Handling and processing methods

How hot should the water be?

There are two good methods you can try.

Method A

Start with cool seawater (20-30° C)



Put in the sea cucumbers



Bring to boil or to hot temperature



Cook for appropriate number of minutes.
Second and third cooking can be to boiling temperature.

Method B

Start with warm seawater (40° C)



Put in the sea cucumbers



Bring to 70-90° C



Cook for appropriate number of minutes.
Second and third cooking can be to boiling temperature.

Handling and processing methods

For how long should I cook the sea cucumbers?

White teatfish and black teatfish

Cook for 10-20 minutes for the first cooking, from when the water boils or when the top temperature is reached. When they go round like a coconut, they are finished cooking.



10-20 min

Blackfish (*Actinopyga*) species

Cook for 15-25 minutes for the first cooking from when the water boils or when the top temperature is reached. If you did not cut **stonefish** and **hairy blackfish** before cooking, stir them continuously so they do not burst.



15-25 min

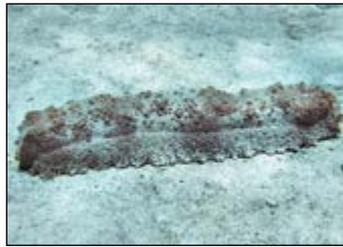
Handling and processing methods

Large species

Cook for 20-30 minutes for the first cooking from when the water boils or when the top temperature is reached.

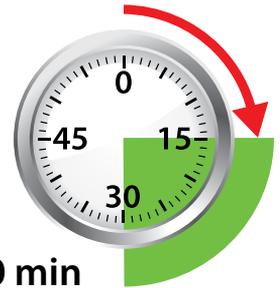


20-30 min



Other species

Cook for 15-30 minutes for the first cooking from when the water boils or when the top temperature is reached. While cooking, stir **curryfish** softly or not at all, as they have delicate skin that can damage.



15-30 min



Handling and processing methods



You should cook the sea cucumbers a second time if possible. The second cooking should be after the sea cucumbers have been drying for 2–3 days. This will help to take out more water from the flesh of the sea cucumbers so they dry faster. Cooking again allows you to improve the product quality by reshaping the sea cucumber to be straight. After cooking, straighten the sea cucumbers while they are still soft. The second cooking is only for 10–30 minutes from when the water boils.



10-30 min

Sometimes, you will need to cook some sea cucumbers a third time. This is needed if there is still salt residue on the product or if the animal is still not straight. Again, dry for 2–3 days first, then cook the third time. The third cooking is only for 5–10 minutes from when the water boils.



5-10 min

Handling and processing methods

Sandfish and golden sandfish – removing calcareous deposits

Sandfish and **golden sandfish** have a lot of calcareous deposits (ossicles), which need to be scrubbed off them after cooking.



After cooking the first time, there are several methods for making the calcareous deposits come out of the skin. These methods make the skin decompose a little so that the deposits come to the surface.

1. Bury in sand and pour boiling water on sand after burying. Cover sand with sacks to keep warm. Put the underside facing up if burying in sand. Leave them overnight; or
2. Place the sea cucumbers together in a bin with weight on top and leave overnight; or
3. Keep the gutted sea cucumbers in seawater overnight.

The next day, take a stiff brush and scrub off the calcareous deposits. Make sure that you clean all the deposits off the body!



Another technique is to put some crushed paw-paw leaves in the water when the sea cucumbers are first cooked. This avoids having to bury them overnight and the sea cucumbers can be scrubbed after the cooking.

Handling and processing methods

Smoke curing

Not all processors in Pacific Island countries do smoke curing of sea cucumbers. You can use wood or coconut husks for smoking them.

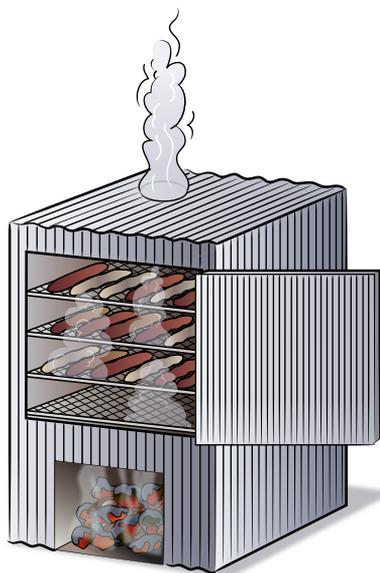
Smoke curing is good if you cannot do salt curing. Smoke curing will help the sea cucumbers to dry properly in rainy weather.

General tips:

- ✓ Smoke curing is a good method to use if you do not salt the sea cucumbers.
- ✓ A mild smoke smell on the sea cucumbers is okay, but not a strong smoke smell. So, do not smoke sea cucumbers for too many days.
- ✓ Use a small smouldering fire to smoke the sea cucumbers.
- ✓ Put the sea cucumbers well above the smouldering fire so they are not close to the direct heat.
- ✗ Do not allow the fire to get too hot. Too much heat will cause the skin of sea cucumbers to become too hard ('case hardening'), which will retard drying.

You can use a homemade smoke oven to smoke the sea cucumbers. Use racks well above the fire and allow some smoke to escape from the top.

You can smoke the sea cucumbers after the first cooking or after the second cooking.



Handling and processing methods

Drying

Sea cucumbers need to be dried very well after cooking.

General tips:

- ✓ Take care when sea cucumbers are still soft to not damage the skin while they are on the drying racks.
- ✓ The product will need to dry for several days, depending on the weather and the method you use.
- ✓ If the sea cucumbers are not drying well, cook them again using the method explained earlier.
- ✓ The sea cucumbers must be dried to 'rock hard' to get a good price and to prevent mould when they are stored.
- ✗ Do not dry the sea cucumbers at hot temperatures or the skin will harden too much and prevent the inside from drying out.

Put sticks in **teatfish** and large species to open them so they dry faster. You can leave in the sticks for the second and third cooking. But after the last cooking, take out the sticks and close the body by tying string around the sea cucumber once they start drying.

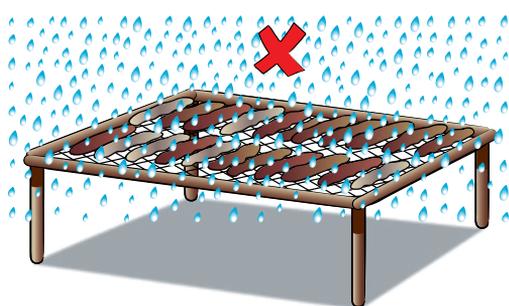


With a knife, pierce the pockets of water within tissue on the inside of **white teatfish** and **black teatfish** after cooking so they can dry properly.

Handling and processing methods

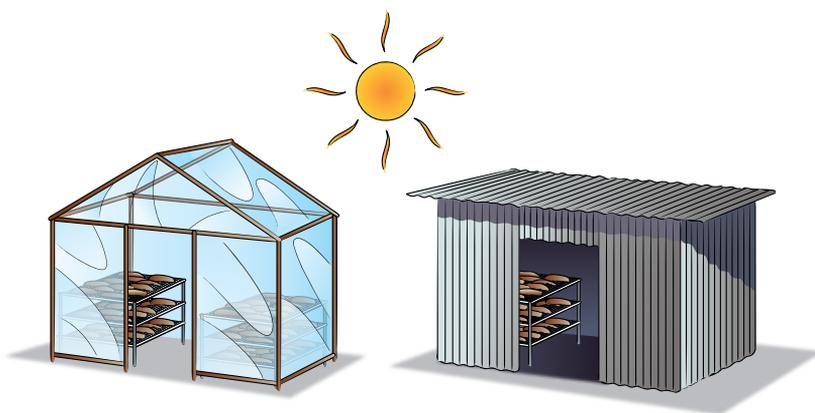
Dry in the sun on racks. Put a cover over the sea cucumbers if it rains or move them to shelter.

Rain will damage the skin of the product that is drying. So you must be very careful that no drops of water get on the dried sea cucumbers!



If you are in a humid region, cover the drying sea cucumbers at night. In rainy and humid weather, cook the sea cucumbers again and re-dry them so they will dry out properly.

You can use a drying house, consisting of a wood frame covered with clear plastic sheets or corrugated iron. This will keep the sun's heat in the drying house and protect the product from rain.



The temperature should ideally be between 35 and 45 °C. Hotter temperatures for drying are not good because the sea cucumber bodies will curl or become bumpy because they shrink too quickly, and the salt can come out of the body.

Examples of well- and poorly-processed sea cucumbers



Actinopyga mauritiana

Good Processing



No damage



Good cut

Bad Processing



Wrong cut on top



Over-cut both ends



Holothuria lessoni

Good Processing



Straight. Undamaged



Cuts small on under surface

Bad Processing



Not brushed enough. Chalky matter left



Cut too much across anus

Additional information

Examples of well- and poorly-processed sea cucumbers



Holothuria fuscogilva

Good Processing		Bad Processing	
			
Straight	Good cut	Cut not straight	Animal left in sun before cooking. Skin damaged



Holothuria whitmaei

Good Processing		Bad Processing	
			
Undamaged. Good cut	Undamaged	Over-cut and twisted	Burnt during smoking

Examples of well- and poorly-processed sea cucumbers



Holothuria fuscopunctata

Good Processing



Straight. No damage



Good cut

Bad Processing



Over-cut



Damaged from poor handling



Bohadschia argus

Good Processing



Small cut, good colour



Small cut

Bad Processing



Over-cut and skin pierced



Skin burnt and damaged

Additional information

Examples of well- and poorly-processed sea cucumbers



Stichopus chloronotus

Good Processing



Dark. Undamaged



Good cut. Dark colour

Bad Processing



Over-cut. Lost colour



Broken skin



Thelenota ananas

Good Processing



Dark. Undamaged



Good cut

Bad Processing



Salt residue on surface of body



Cut too much. Needed to be tied with string

Examples of well- and poorly-processed sea cucumbers



Holothuria scabra

Good Processing

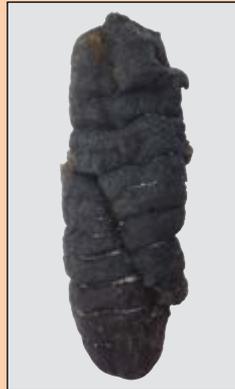


Dark colour, undamaged skin



Small cut on under-surface

Bad Processing



Cuts from poor handling



Poor salting damaged skin



Holothuria coluber

Good Processing



Small cut. Undamaged



Small cut

Bad Processing



Sand left after gutting.
Twisted body



Over-cut

Additional information

Storage of dried product

Sea cucumbers must be stored in a dry place, otherwise they can get mouldy or become soft again.

Keep the product in a dry bag and cover them to protect from moisture. If you do not have a dry room to store the product, keep the bag of dried sea cucumbers above the ground to stay dry.



Keep the dried sea cucumbers away from rats.

Selling your product

Ask your local fishery officer for contact information for the buyers to whom you can sell your product.

The best thing that you can do to get high prices for your sea cucumbers is to have a few buyers that you can choose from and to pick the buyer that gives you the best prices.

You should receive higher prices for the sea cucumbers that are well processed. This means that your product should be:

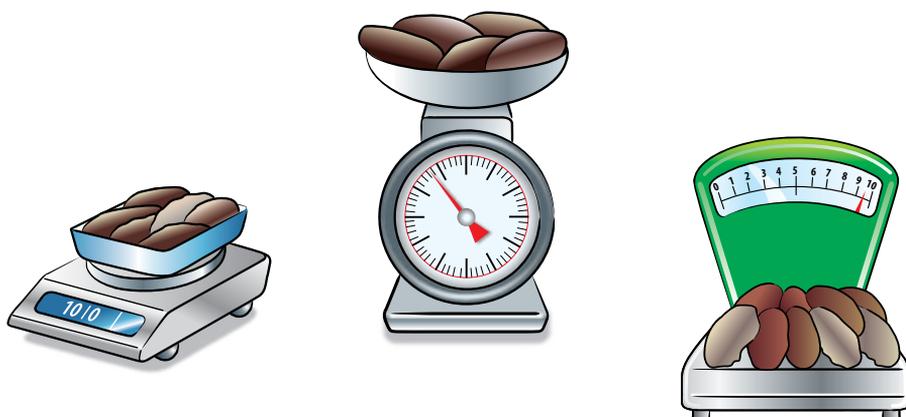
- ✓ Cut in the proper place and sand removed
- ✓ Undamaged and unbroken
- ✓ Cleaned of salt residue on the outside
- ✓ Straight, not bent
- ✓ Fully dried
- ✓ Good colour

You should not expect the top price for your dried sea cucumber if they are cut poorly, damaged, bent, with salt residue, faded colour, or not fully dried.



If your dried sea cucumber is processed well, demand the highest price from your buyer for each species.

Additional information



Ask the buyer to pay you by the kilogram and verify the weights of the dried sea cucumbers.



You can ask for a receipt for the purchase of your sea cucumbers. It should have the price paid for each species and the weight of sea cucumbers sold for each species.

Processing sea cucumbers into beche-de-mer:

A manual for Pacific Island fishers

This manual was produced to help artisanal fishers in Pacific Islands to understand how to handle and process fresh sea cucumbers into dried beche-de-mer for export. It was produced as an information tool through the ACIAR project FIS/2010/096 – Evaluating the impacts of improving postharvest processing of sea cucumbers in the Western Pacific, with a focus on fishers in Fiji, Kiribati and Tonga. Sea cucumbers are eaten primarily by Asians as luxury seafoods for festive meals and as medicinal foods. Once collected, sea cucumbers must be handled and processed carefully to achieve a dried product that has the best colour, shape and appearance for Asian consumers. Well-processed sea cucumbers fetch high prices but a lack of care in processing will result in low prices for fishers and exported products. This manual provides instructions on best-practice methods of how to handle, cut, cook, smoke, dry, store and sell tropical Pacific sea cucumbers. Photo examples are given of live and dried species most commonly exported from Pacific Islands and of common mistakes in processing sea cucumbers into beche-de-mer.



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