

focus

# Fins

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Diagram of how the Oceanic Suction Force 2 split fin design forms a directed vortex providing forward thrust

WOLFGANG LEANDER

**Fins provide a great way to get from point A to point B in an H<sub>2</sub>O environment. In fact, with few exceptions, it is the only way to get around with ease while diving.**

The good news is, there are more styles and models to choose from than ever before. By the same token, the bad news is, there are more styles and models to choose from than ever before.

As a diver you are limited by your strength and stamina. This is when the design of the fin really can work for you. If you are an able-bodied, strong person, you will have little problem with whatever fin you happen to wear. A good blade design will merely fine tune your performance. But if you know your stamina is low, and it has been some time since you visited a gym, choosing the right fin can make all the difference between a

bad or good experience. However, it is easy to get confused. Fin designs have evolved over the years. Long fins, short fins, split fins, twisted fins, stiff fins, soft fins...

### How to choose?

We keep telling you to do your research, but looking at specifications in isolation will most likely just add to your confusion. To figure out what the right fit for you is, you need a step-by-step approach that will narrow down the options with a process of elimination.

### Fin Formula

Begin with clarifying which kind of diving you would normally be doing. Also, consider the level of your physical fitness in this context. Then, start looking for a fin. Today, there are choices that respond to different needs. It's a good thing. At the end, the fins need to be comfortable, and they need to perform.

### So, who are you?

Will you be mostly diving in a way where you need to cover long distances and rough water during your dives? Will you be fighting current and waves on a regular basis? Is it more important for you to be able to maneuver with ease under water? Or, are you one of those that just likes to cruise along and enjoy the view?

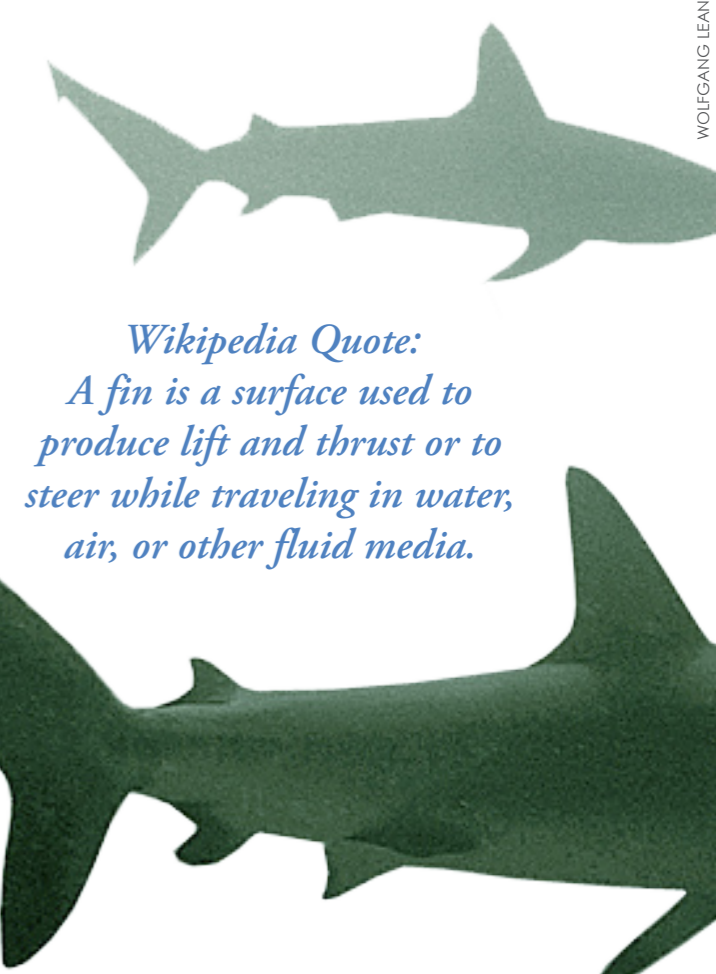


### The Mount Everest Diver

The Mount Everest Diver is a diver looking to move effectively and effortlessly through water,

while covering long distances during his dives. He does not like to take the easy road, the tougher conditions the better. With a compass in hand, he plots the course to the dive site from the shore. Then, he endures the long surface or under water swim to the site with a smile on his face—at least, with the right fins, he does.

You need a good pair of fins that can push water effectively and move you forward without tiring you. You need a large blade with some

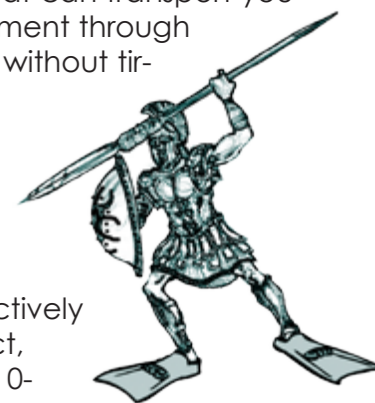


*Wikipedia Quote:  
A fin is a surface used to produce lift and thrust or to steer while traveling in water, air, or other fluid media.*

stiffness built in. How much stiffness depends on how fit you are, but you will need a fin that can transport you and your dive equipment through the water resistance without tiring you.

### The Spear Fisher

The Spear Fish Diver needs maneuverability as well as the option to move effectively through water. In fact, he needs to go from 0-







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60 in a split second in order to land that catch.

### The Ocean Diver

The Ocean Diver is a diver who knows that any second of the dive, the current can pick up. He needs a fin that can fight the current and violent wave action on a regular basis.



### The Cocktail Diver

The Cocktail Diver is a diver that just likes to cruise along and enjoy the view. He is typically found in tropical water, and cares nothing about efficiency and speed. He lives in the moment, knowing that the dive boat will pick him up when he runs out of air or time—whatever comes first.

### The Explorer

The Exploration Diver is a diver on a mission. They can be photographers, wreck and/or cave divers, and the one thing they all have in common is that there is a purpose to their dive. They need full control of every movement during the dive, not to stir up silt or scare the wild life. They have to be able to maneuver with ease. A conscientious tropical diver who needs to move carefully around to protect the reef might fall under this category, too. You need a shorter, more flexible fin than the average, which still has the capacity to move you forward with ease.

### The Snorkeler

The snorkeler hangs mostly on the surface. Occasionally, he takes a plunge to take



Illustration of the split fin principle. The blade opens up, creating both a pushing vortex directed away from the diver and lift on the inside of the blade

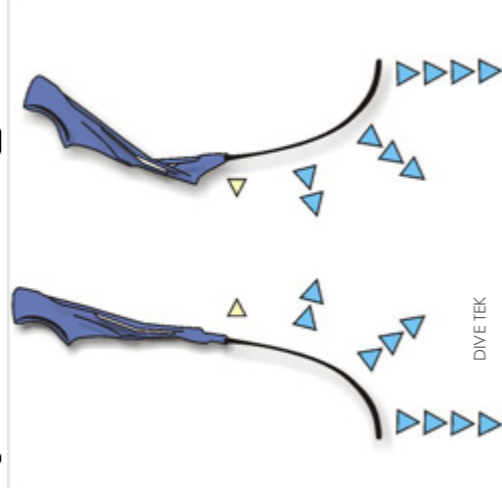
a closer look at something, but the main objective of his time in the water is to observe from above.

The snorkeler does not have the advantage of using the fin while immersed. He might favor a more flexible, light weight fin to handle the occasional "air" flip in an effective way.

Gone are the days when the rubber fin ruled the world. And for all you rubber fin fans out there, don't get offended. That is still a good design, but maybe not for everyone.

### The Physics of Fins

When diving, you need a flexible fin of moderate length. When you push down on the fin when kicking, you bend it, and it is largely the spring-back force from the fin as it straightens that propels you forward. This makes the material choice—



and fin shape critical to getting the right spring force for optimal efficiency.

### Fin Types

#### Paddle fins

The traditional paddle fin is a really simple design, a flat blade with a mounted foot pocket. The material of the blade is made out of stiff plastic, composite or rubber. The design of the fin generates quite a bit of resistance during the kick cycle and requires rather good leg muscle strength for effective strokes. Because of this, the paddle fins are sometimes considered to be not so efficient.

A more developed paddle fin can come with a water vent through the blade, opening backwards on the underside and forwards on the upper side, blowing a jet of water backwards out of the fin as the fin flexes. Others have convoluted channels and grooves, in an effort to improve efficiency.

In 1985, Mares developed a new feature for water fins called channels. Traditional paddle fins suffered from water "spilling" off of the edge during the down stroke of the diver's kick. This loss of water translated into a loss of thrust,

Mares Quattro with the characteristic rubber strips that makes the fin flare creating the channelling effect



A traditional paddle fin with stiff blade—simple, durable



APS Mantaray's Dual Water Channeling System and side wings function as a combined unit to give the fin its ultimate stability and performance

meaning that the diver's effort was not being fully utilized. Mares' channels worked to maximize fluid stream channeling, keeping the water under the fin in place, so that it can be displaced during the down stroke. This increase in water displacement allowed for greater thrust levels and improved overall performance.

The addition of channels or grooves made the effort and energy expended by the diver more valuable—more thrust was generated with each stroke. But this advance in technology did not solve the energy inefficiency of the kick cycle upstroke.

#### Split fins

Split fins are considered one of the most efficient hydro-dynamic fin designs. However, that does not necessarily make it the best overall fin.

In the split fin, as the name indicates, the blade is split, which causes a kind of propeller movement. Using traditional fin kicks causes a suction and creates a lift, which allows the diver to move with less effort compared to using a paddle fin.

Water flowing towards the center of the fin's "paddle" portion also gains increased speed as it focuses, creating a "scooping" or channeling effect.

Split fins are generally regarded as among the most efficient fin designs, although there is





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Force Fin in a nutshell. Made in one piece, blade is split down the middle and with upturned fintips



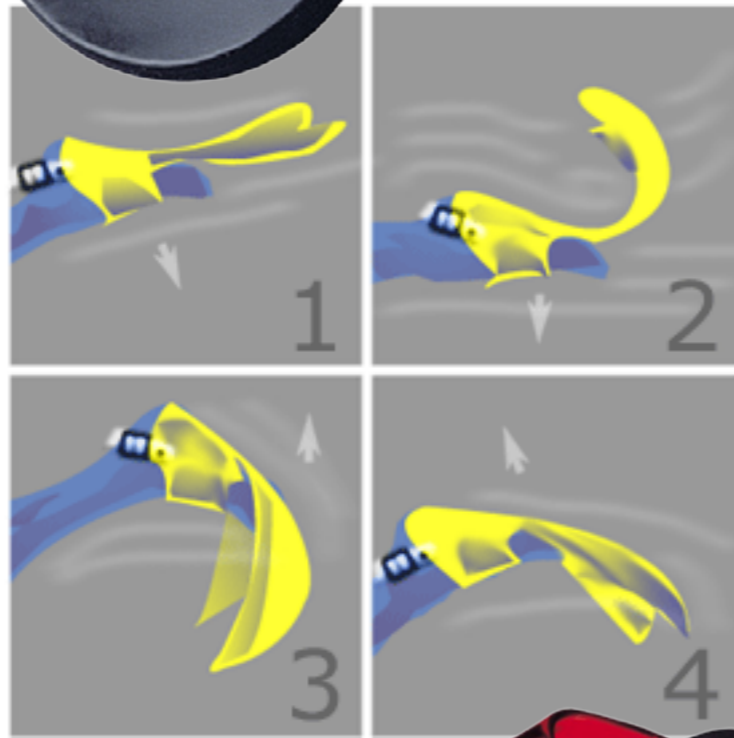
Force Fin swimming fins utilize the body's strength and put it where it's needed. The human body is built to have more strength when kicking down (during freestyle), than when kicking up. The downward, or power, phase of the kick emphasizes the powerful quadriceps muscle group at the front and side of the upper leg. The upward, recovery phase uses the weaker hamstrings at the back of the thigh

ongoing controversy among divers as to their versatility—many report that split fins cannot be used for frog kicks and are poor for maneuverability.

### Force fins

Force fins are in a category of their own. Radically different from all other fins, their now classic model is characterised by having a wide upturned blade made of polyurethane, with a shallow V-shaped cut into the end. Force Fins were the first to mimic the fins seen in nature and also pioneered the split fin.

The fins are characterised by a different swimming sensation and valued among their devoted fans for their high efficiency and acceleration, while others dislike their maneuvering characteristics. However, it



Attaching adjustable whiskers that channel the thrust enable the wearer to change the characteristics of the fin to make it fit the type of dive

is also said that you can back up with Force Fins. Also, for divers who wear neoprene wetsuit boots in colder waters, the negative buoyancy of the lightweight Force Fins is not sufficient to counter the positive buoyancy of their boots, calling for the use of ankle weights.

**Freediving fins** are far longer and are designed to work with slow stiff-legged kicks that conserve energy and oxygen. Though primarily intended for high efficiency at variable depths, they can still deliver



Top-end freediving and snorkelling fins are now made in advanced materials such as layers of carbon fiber and fiberglass

Monofins are made with speed swimming in mind



Karmo Maasik is owner of SpecialFins in Estonia specializing in high quality swimming fins for lifesavers, freedivers, swimmers, underwater rugby players and spearfishers. Twice the world champion in finswimming, Karmo Maasik custom make all their fins according to individual needs and requirements. They are made of carbon, Kevlar, fiberglass and hand-laminated fiberglass, which are vacuum processed in special moulds. SpecialFins mission is to make the world's best fins for sports ans challenge, fun and adventure.

Karmo Maasik writes: "I recommend the following fins for these types of divers: The Mount Everest Diver should use the Freediving Stereofins Carbon. They are very good flexible fins, hand laminated and produced from two layers of

thin carbon and 18 layers of fiberglass.

The Spear Fisher should use the Hybrid Professional made of two layers of hybrid material 50 percent Carbon and 50 percent Kevlar, hand laminated, with more than 20 layers of fiberglass.

The Snorkeler should use the Freediving Stereofins Pro." ■



WWW.SPECIALFINS.COM



**John Melius, President of Morfin Corporation, writes:**

Have you ever wondered how it would feel to be a fish in water and wander effortlessly, or to maneuver with speed through tight areas hardly disturbing the environment? Now you have the opportunity to come closer to this feeling than ever before. What you need to have in order to do this is the same kind of propulsion tools that fish use, which means pelvic and dorsal fins and a tail fin moving like a fish.

Why do they work? As in nature, excellent hydrofoils (wing shapes) generate excellent lift just like airplane wings. But wings only work when there is a flow over them, and so, an airplane needs a propeller (a rotating set of wings generating flow) just like the fish needs a relatively flat body and pelvic and dorsal fins to generate flow. Our fins work exactly that way, unlike paddle and split fins that work by creating a void in the water and being sucked into the void.

*What benefits does this new fin technology bring to every type of diver?*

First, you can make much smaller kicks (like fish) for greater control in tighter environments. Mor-Fins do not need to create a "void" in the water to work (the reason that "scuba kicks" are so large is to work the void longer) and our fins work in each phase of the kick (there is no recovery kick which means that you can swim almost full speed with only one fin). Second, the tail fin gives extra power and speed to your kick with no extra work.

### Why?

Because it generates power simply by being in the right place, as water flows over it the same way that an airplane wing generates power when air flows over it.

Third, these fins cause less silting while generating more directed power where you want it. This comes from the delta wing shape of the tail fin and blade that focus

the flow of water directly in the center of the fin pulling water from the sides of the fin to reduce silting and reduce vortices and drag.

Fourth, the blade and tail fin work in serial amplification of the flow of water to increase lift producing more power with less effort.

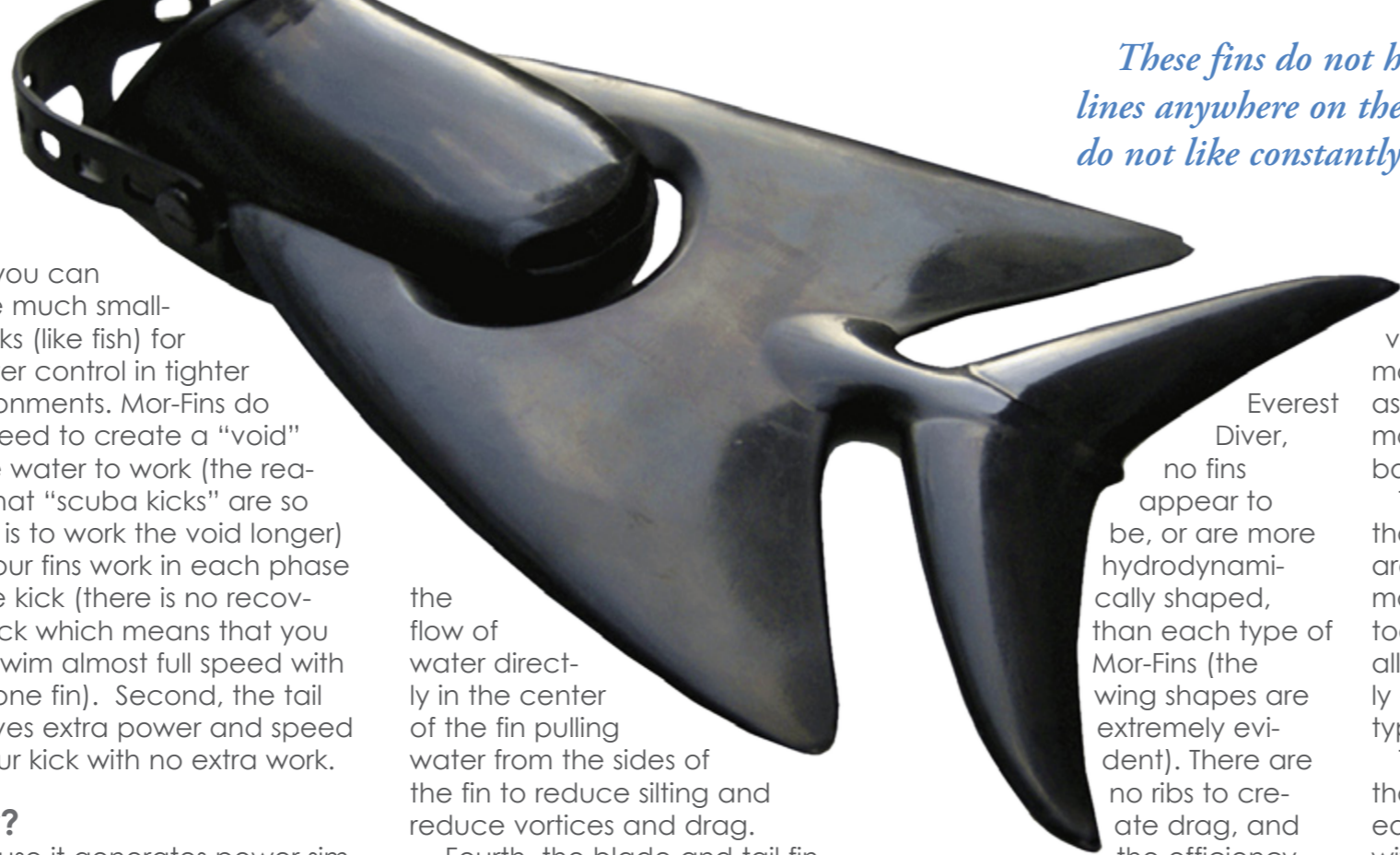
Fifth, the fins bend near the ball of your foot to allow more natural movement with less effort while producing more power using a living hinge.

All of these features are patented except for the living hinge that is patent pending. Therefore, these fins benefit you with more power, speed and comfort with more maneuverability using tighter kicks with less effort more efficiently.

### Which one?

The question is not which one of these fins would work best for which type of diver. The question is which one of these divers wouldn't gain from using Morfin's Delfins or VT-300's? For the Mount

*These fins do not have any straight lines anywhere on them, and machines do not like constantly changing curves.*



Everest Diver, no fins appear to be, or are more hydrodynamically shaped, than each type of Mor-Fins (the wing shapes are extremely evident). There are no ribs to create drag, and the efficiency

and ease of use of these fins are remarkable.

The Spear Fisher will accelerate faster and for a longer period using these fins and tight small kicking like the fish that he is tracking. Tighter smaller kicks create less drag using less effort and allowing more of your effort to go towards speed.

The Ocean Diver cannot have a better fin

for handling currents because these fins do not try to create voids in the water to move. The moving water in the current is an asset to fins with wings. Wings use moving water and convert it into badly needed power in a current.

The Explorer cannot find fins that have this much power and are smaller. These smaller fins maneuver just by moving your toes without your legs moving at all when necessary, but give highly efficient movement with any type of kicking too.

The Snorkeler will not find fins that are more comfortable and easier to use with speed coming with effort that is less than walking on land. Fish propulsion is fast yet efficient, powerful yet comfortable, and very maneuverable.

*What other qualities could you want for any diver?*

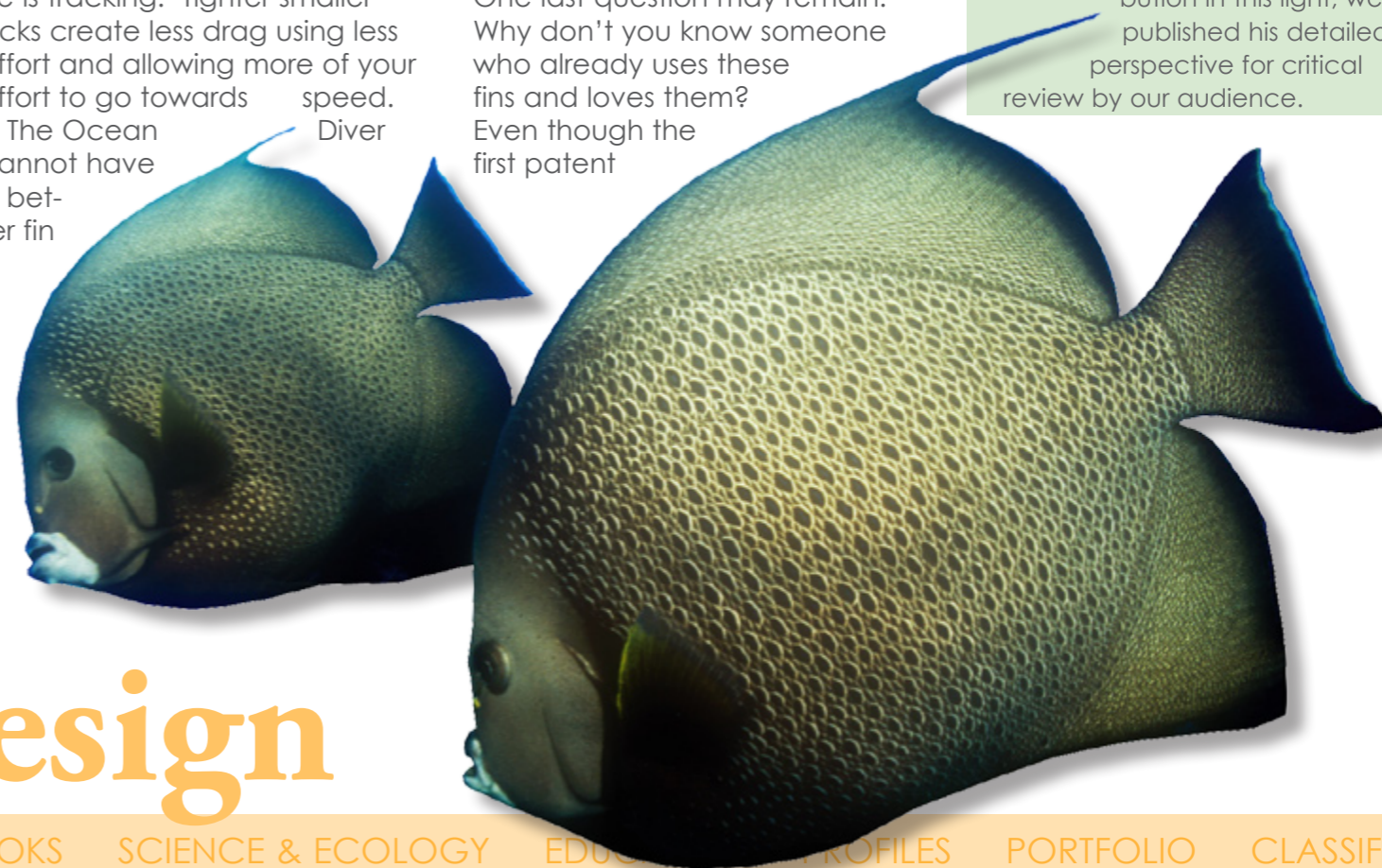
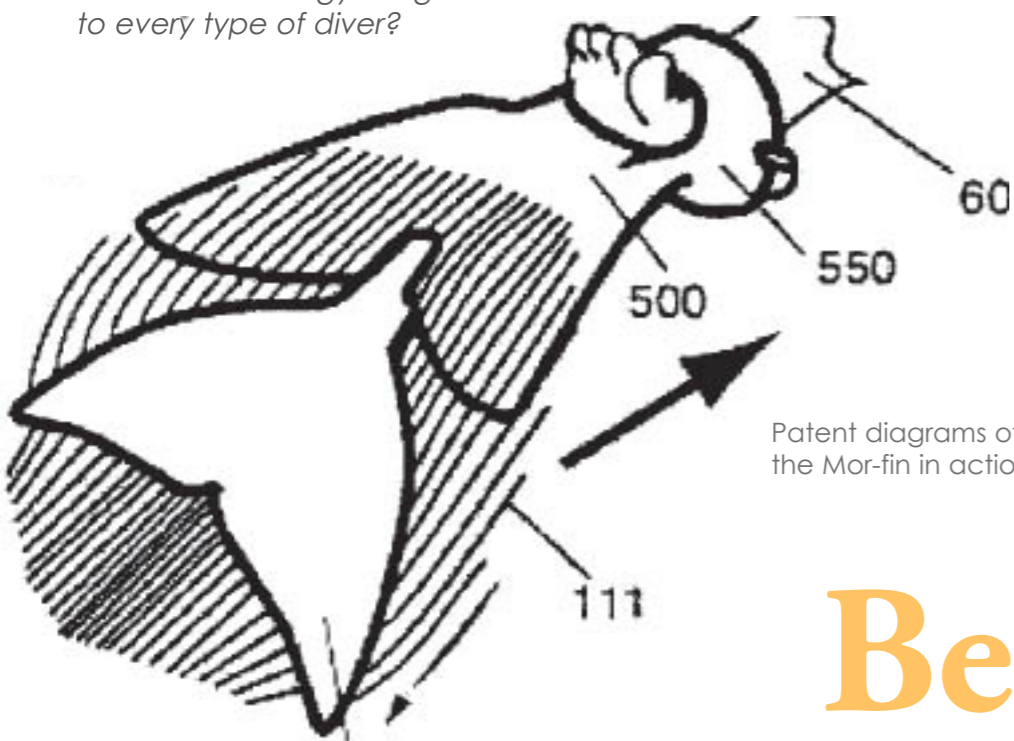
One last question may remain. Why don't you know someone who already uses these fins and loves them? Even though the first patent

was filed about ten years ago on these fins, the road to manufacturing has been difficult because of the hydrodynamic shape of the fins. These fins do not have any straight lines anywhere on them, and machines do not like constantly changing curves. So, the road to quality manufacturing has been a slow, but steady one leading us to today.

They are available now, and will be available soon in six sizes for open heeled fins. So, if you are curious to experience how fish swim instead of swimming like frogs (paddle and split fins), check out our web site, [www.mor-fin.com](http://www.mor-fin.com) for a no risk purchase to experience swimming with the only winged fins, Mor-Fins. ■

### EDITOR'S COMMENT:

Publishing Mr Morfin's letter took a bit of deliberation, since as president of a fin-manufacturing company, Mr. Melius obviously has a vested interest in the subject and promoting his fins. However, as we would like to credit our readership with being able to view his contribution in this light, we published his detailed perspective for critical review by our audience.



# Behind a design



# Fin Care



Rinse with fresh water after a dive

## Do's & Don'ts

Store your fins properly, and they will last a long, long time. Save the inserts, that helps keep the shape. They should be rinsed with fresh water after a dive, and dried before stored away, with the inserts. This is particularly important for a full foot fin.

- Store in a cool and dry place. Do not store in direct sun light.
- Do not store them standing on their blades for any long period of time. Hang them up if possible.
- Avoid leaving the fins in a car trunk or in direct sunlight for a long period of time on a hot summer day. The heat deforms the blade, which can seriously affect the performance of the fins.
- Also, avoid contact with chemicals. Exposure means that rubber and plastic materials can degrade, and that goes for pretty much all of your dive equipment. Even storing your equipment near chemicals, gasoline and solvents can cause problems.



Leave out of sun, avoid chemicals

## Use

To avoid stress on a full foot fin, wet the pocket, fold over the back of the fin, insert your foot and flip up the back part.

To avoid stress on a heel strap fin, use your buckle. Loosen the strap, buckle up, pull to fit. That way you reduce the stress on your buckle, which will most certainly not like you if you keep stretching and pulling your strap when putting your fin on. However, if you are one of those who like the speed and convenience of the pull the strap-method, always, always keep a couple of spare straps at hand.

## Buckle up, buckle down, buckle shut, buckle tight

There are a number of different solutions to keep your foot in your fin, and the buckle and/or strap should also be considered when shopping for a fin. All you warm water divers out there, you probably have no idea why we are even addressing this, unless you have some physical problems that makes it tougher for you to handle yourself before and during a dive. But for us cold water divers, a dry suit and dry gloves can really put a damper on our graceful appearance in the water. Before we spend money on a good quality fin, we should take care to look for a fin we can put on and adjust with ease, and at least bring your dry suit gloves with you while you do your shopping.

*Always keep one complete strap as a spare*



Metal springs are more durable, and flexible

Metal springs with finger strap

Simple rubber strap for buckles

reinforced with slats of steel

The commonplace buckle and strap set allow for easy adjustments of strap tightness

## A variety of fin straps

You have heard it before, and we all know it, yet I have enough dives under my belt to know that we don't always follow our own advice, and this one is worth being a nag about: Be prepared, always keep one complete strap as a spare, including both locking buckle ends. ■



With Aqualung's HF (Hands Free) Buckle, you just step on the red bottom to release the strap



For bare feet or boots? If you dive in cold water you'll need the boots. You can use these in warm water too



**Special thanks** to the following participating fin manufacturers for their help with the fin feature article:

APS Mantaray  
[www.apsmantaray.com](http://www.apsmantaray.com)

Beuchat  
[www.beuchat.fr](http://www.beuchat.fr)

Mares  
[www.mares.com](http://www.mares.com)

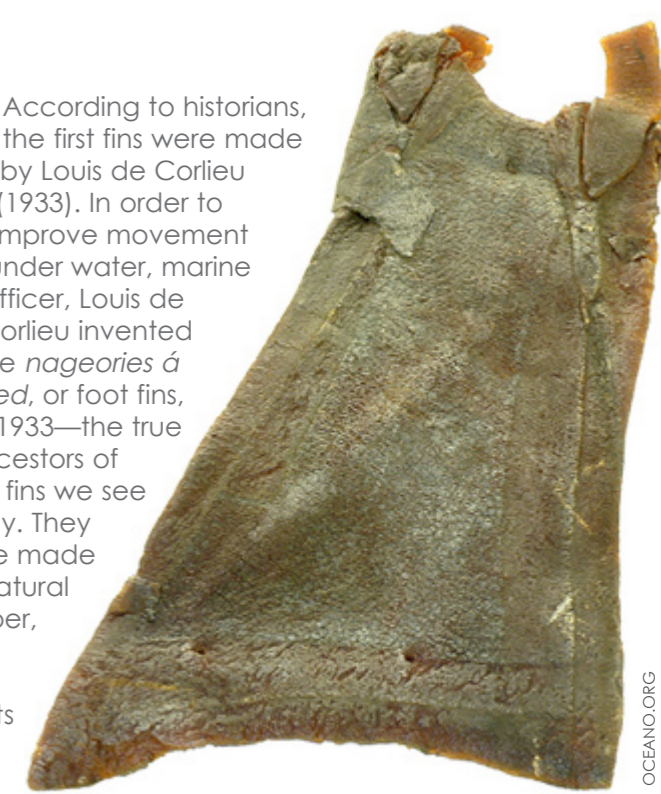
Mor-fin  
[www.mor-fin.com](http://www.mor-fin.com)

Seemann Sub  
[www.seemannsub.de](http://www.seemannsub.de)

Elastic bands for securing fins with footpockets



Mares' ABS buckle is hinged and can be flipped open even with gloves on



According to historians, the first fins were made by Louis de Corlieu (1933). In order to improve movement under water, marine officer, Louis de Corlieu invented the *nageoires à pied*, or foot fins, in 1933—the true ancestors of the fins we see today. They were made of natural rubber, reinforced with slats of steel

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