The Ultimate Fish Finder Guide

Finding Fish –
The Smart Way.

Imprint

Cover design: Garmin Deutschland GmbH, Parkring 35, 85748 Garching

Photos and illustrations: all images © the-fishfinders.com, except:

Figures on pages I, 1, 23, 131 – www.pixabay.de (Creative Commons CC0)

Figures 3.12, 4.6, 4.7, 4.50, S. 115, 5.2, 6.5, 6.6, 7.21 – Garmin Deutschland GmbH (in part including illustrations by the-fishfinders.com)

Figures 3.11, 5.5, 5.6, 5.8, 5.9, 5.10, 5.11 – Echolotzentrum Schlageter (in part including illustrations by the-fishfinders.com)

Figures 1.5, 1.7, 3.2, 3.4, 3.6, 3.7, – Airmar Technology Corp.

Figures 3.3 (illustration: the-fishfinders.com), p. 123, 6.2, 6.3, 6.4 – The National Ocean Service, National Oceanic an Atmospheric Administration (NOAA)

image on p. 33 – illustration: the-fishfinders.com, photos: Airmar Technology Corp. (transducer) & Humminbird, Johnson Outdoors Marine Electronics, Inc. (fish finder)

Figure 3.13 – illustration: the-fishfinders.com, photos: Raymarine Deutschland GmbH and Navionics

1 mph

Figures 4.33, 4.38, 7.17, 7.18, 7.19 – Navionics (in part including illustrations by the-fishfinders.com)

Authors: Martin Jacobs & Jens Biegemeier

Translation: Rhett Whittaker

Formatting and design: Jens Biegemeier & Martin Jacobs

www.the-fishfinders.com

Editing: Martin Jacobs, Jens Biegemeier

ISBN: 978-3-9818475-4-3

Table Of Contents

Introduction

Fish finders provide an excellent technical foundation for finding large fish in a given body of water. For many hobbyist anglers, a fish finder or fish finder represents one of the most variable costs when it comes to purchasing equipment. And even though most everyone is willing to invest a good chunk of money in a unit, there is no standardized guide to the proper use of this technological wonder.

That said, it‘s always astounding to see how some people ultimately use their fish finders.

You see one fish arch after another on the fish finder screen, but who knows if the spot is good enough to actually catch fish? Where are those fish, exactly? And how do you interpret the images on your fish finder‘s display? These are all questions that arise while you‘re out on the water, which should be time you spend actually fishing.

The goal of this book is to communicate and deepen the reader‘s knowledge about fish finder functionality in order to give them the best chance of finding fish quickly and spending more time on the act of fishing itself. We aim to distance ourselves from the various fishing books on the market that deal with all different kinds of tricks and tips about fishing technique and methodology. For us, finding fish stands front and center. Based on the following statistics, this topic gets far too little attention:

90% of fish are located in just 10% of the total area of a given body of water

That is, nine out of ten fish occupy space that is incredibly easy to overlook. Because every angler‘s goal is to catch fish, the search for these rather small fishing areas should really be a central focus. Fish finders give you a significant advantage over other anglers, and you have a genuine chance of finding the hotspots you‘re after on lakes, rivers, or seas. However, incorrect operation or setup of your fish finder can completely negate any benefit you might otherwise have. The first step is to buy the right fish finder for your needs, but it‘s also important to deploy and operate your fish finder correctly if you want to be successful.

When it comes to establishing the exact location of fish in the water, the so-called „fish arches“ displayed by your fish finder are insufficient on their own. Time and again, we‘ve heard first-hand that using a fish finder isn‘t as simple as you might hope. For this reason, we want to use this book to show you how to use fish finder technology in different conditions on and under the water to successfully locate fish, either individually or in shoals. After all, what do the majority of anglers want out of their fish finders? To find fish, of course!

The following pages are dedicated to information above and beyond what you would find in your fish finder manual or the easily accessible regions of the internet. We‘ll cover not only the various technical details, but also the particulars of practical use. In doing so, we‘ll try to strike a good balance between genuine science, technology, and practical recommendations.

To start things off, we‘ll give you an overview of sonar and fish finder functionality.

Of course, this will include an examination of the various hardware components required by comprehensive sonar system. After the introduction to sonar technology, we‘ll take a look at the various kinds of devices currently available on the market. We‘ll also dedicate some time to traditional 2D displays, imaging features like down-imaging and side-scan, as well as the newest multi-beam fish finders. We‘ve dedicated a separate section to CHIRP technology, one of the key features that has now made it into the broadly affordable price segment.

After we cover basic functionality, we‘ll move to the most important chapter: how to put sonar technology to use in practice. The proper use of your fish finder is subject to physical limitations that many users are unaware of. Without this knowledge, you‘ll almost certainly miss prime fishing spots on a regular basis. Once you know and understand these limitations, you‘ll be able to interpret your fish finder‘s imaging in a whole new light. The end goal is to grasp these physical limitations and recognize specific blind spots in order to use your fish finder to your advantage.

Finally, we‘ll focus on the how to set up your fish finder to get the most out of this amazing technology.

Less searching means more fishing

We‘d like to mention once again that this book has been written without any advertising or intentional product placement in the text itself. That said, in order to describe certain fish finder functions and their applications, it‘s not always possible to cover all the details in a generalized manner. For this reason, registered brand names are mentioned in some places; this does not mean that we wish to endorse or advertise the product(s) of a given manufacturer.

Direct advertising pages are marked separately at different points in the book. The information presented in those advertisements is the sole responsibility of the respective advertisers.

Note regarding the structure of the book

The chapters of this book are thematically self-contained. The first two chapters focus on a lot of theory, which is meant provide a foundation for better understanding what comes in the chapters thereafter.

While we recommend that everyone start with the basics, we‘ve designed the chapters on practical information (starting with Chapter 3 on page 31) so that they can be understood even without the theory in the first two chapters.

Because traditional 2D sonar is used primarily to find and catch fish, we‘ve paid particular attention to it in Chapter 4, starting on page 49 Chapters 5 and 6 are about imaging technologies.

We conclude this guide with practical tips on individual fish finder settings (Chapter 7, page 131 on).

The history of fish finders

The speed of sound in water was established as early as 1826 in a series of experiments by Jean-Daniel Colladon. His research in Lake Geneva laid the groundwork for the later development of fish finders after 1900, which accelerated during the Second World War – largely on account of the massive losses to Allied ships caused by German submarines. In 1929, it was first recorded in writing that a goldfish could be detected with a 200 kHz sonar beam.

The first echo-imaging sonar was developed in 1935 by Wood, et al. Of course, the echoes back then were not displayed on a screen, but were instead represented on a paper print-out. That same year, the Marconi Company was the first to be able to detect a shoal of herring using sonar. Additionally, in the following year several foundational publications were released regarding fish finders.

In 1950, Carl Lowrance and his sons began to conduct underwater research. By way of various diving expeditions, they documented the behavior of fish in water and found that 90% of fish inland lakes occupy a mere 10% of the total area of those bodies of water. That 10% includes the areas around the shore, which is generally teeming with small and medium-sized fish.

If you fish in open water, the search for these locations can be as exciting as it is frustrating. After all, the best fishing technique in the world won‘t help you much if there aren‘t any fish around.

What did Carl Lowrance discover?

What makes that 10% of the water so appealing for fish?

The simple answer: composition and a hard bottom. By composition, we mean all the things that offer fish variety, protection and sustenance in the water. This includes submerged trees, water plants, stones, rocky outcrops, ridges, depressions and hills.

Hard bottoms like rocky substrate, clay or sand provide for better water plant growth, which offers fish an ideal place to live. Muddy, soft substrates are a hallmark of oxygen-poor regions of the water. In terms of the bottom, „hard“ does not mean the ground is made of solid stone. In practice, hard bottoms can vary substantially in terms of the density of the given substrate. Really, we should be speaking in terms of dense bottoms – After all, a sandy bottom can also be rock-hard underwater.

If you‘re able to find an area with the right composition and a hard bottom, the hardest part is already over. Armed with the proper knowledge about how to interpret substrate information on your fish finder, you can greatly reduce the amount of time spent on the search for the fish of your dreams.

On account of external factors and environmental conditions, a fish will often move to another more convenient (or safe) area of the water. These external factors can be things such as fallen trees or submerged wreckage. Diving expeditions have confirmed that most types of fish are influenced by a given area‘s underwater composition (e.g. trees, weeds, stones, and discarded objects of all kinds). These and other factors also have an influence on where fish are able to find the food they need (algae, plankton, other fish, etc.). Taken together, these circumstances and conditions are responsible for how often a fish population will occupy the location in question.

„If you‘re looking for fish,

find what the fish are looking for.“

Chapter 1

Fish finders – The physical foundations

1.8 Fish spacing – Range resolution at fixed frequencies

Range resolution indicates the minimum distance necessary between two objects for them to recognized as individual targets. This information is important when it comes to clear imaging of individual fish arches. As previously mentioned, the transducer doesn‘t send a constant tone into the water, but rather one sound pulse/ping after another (ping – receive echo – ping – receive echo – etc.). No transducer can transmit a single-wavelength pulse into the water; pulses always consist of multiple sound-waves (that is, multiple cycles).

Figure 1.4—Ping

If you know the number of cycles that make up the pulse produced by a given transducer, you can use that value to calculate the distance between two fish. In order to produce a separate echo for each fish, the pulse has to be able to pass in between the two.

First, let‘s look at the range resolution of a fixed 200 kHz frequency. We already know that this frequency corresponds to 200,000 soundwaves per second. However, the transducer emits a ping/pulse that is significantly shorter than a whole second. With each pulse, a proportional number of soundwaves are sent into the water; exactly how many soundwaves make up a pulse varies from transducer to transducer. We also know the wavelength of a soundwave at 200 kHz: 0.3 in (7.5mm) (see „Wavelength calculation“ on page 6).

How far apart do fish have to be to recognize them as individual targets at a fixed frequency?

Example 1

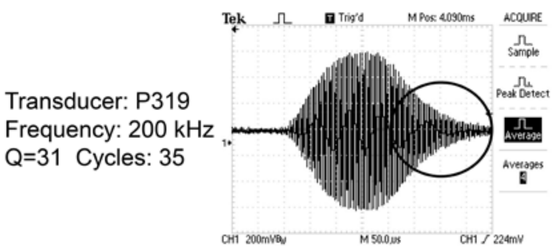


Figure 1.5—Example transducer at 200 kHz and 35 cycles

- Transducer = Name of transducer: P319
- Frequency = Frequency: 200 kHz
- Cycles = Number of cycles/soundwaves-per pulse/ping: 35
- Q = Q-Factor: 31 (transducer quality - see Chapter 1.11 „CHIRP – The best of the best“ on page 13)
- Wavelength at 200 kHz = 0.3 in (7.5 mm)

The range resolution (x) at a fixed frequency is calculated using the number of cycles (η) and the wavelength (λ):

$$x = \frac{\eta * \lambda}{2}$$

Example:

$$x = \frac{35 * 0.3in\ (7.5mm)}{2} = 5.2\ in\ (13.1cm)$$

The result: With this transducer (P319), fish have to be spaced 5.2 inch (13.1 cm) apart in order to be distinguished as separate targets. 5.2 inch (13.1 cm) is quite a lot if you‘re dealing with fish that swim in schools, as they prefer to stay close together. With this particular transducer, you‘d only be able to see a large spot on-screen. The following figure shows exactly how closely grouped fish sometimes can‘t be displayed as individual fish arches. This situation would be displayed differently depending on the particular settings and level of quality of the fish finder in question.

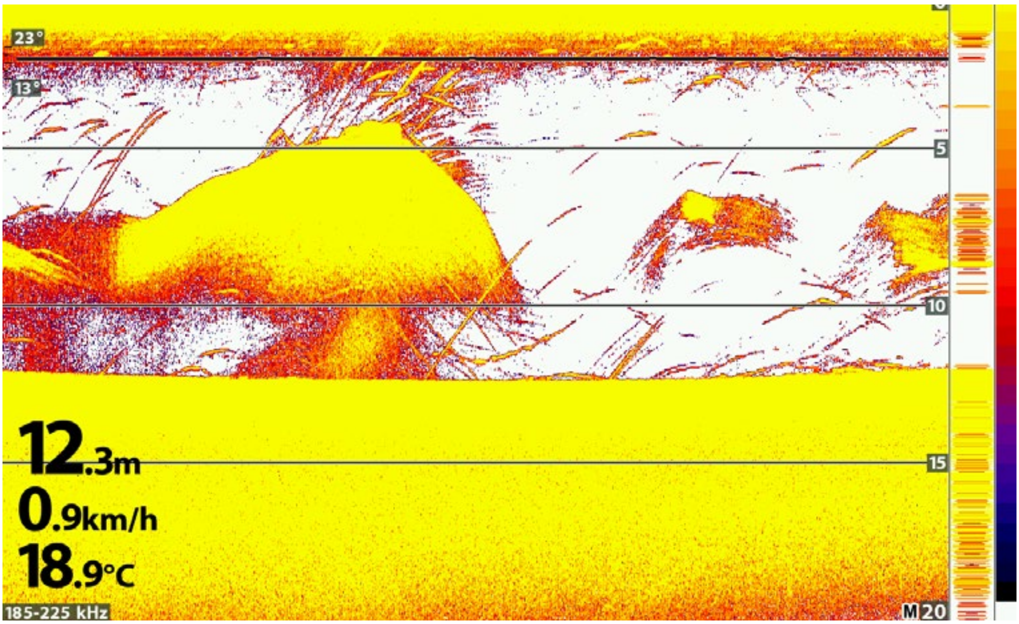


Figure 1.6—Fish shoal imaging

Note: If the transducer were operating at a frequency of only 83 kHz (at 35 cycles), the range resolution between fish would jump to 12.2 inch (31 cm)! At this point, shoaling fish really wouldn‘t be distinguishable as individual targets. At 50 kHz, the range resolution would come in at a whopping 20.7 inch (52.5 cm), which would also make any fish near the bottom invisible to your fish finder, as well.

Example 2

If a transducer can only produce 10 cycles per ping, the range resolution changes dramatically.

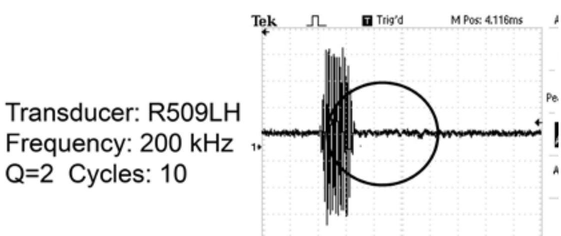


Figure 1.7—Example transducer at 200 kHz and 10 cycles

As a comparison, let‘s calculate the pulse length at 10 cycles.

$$x = \frac{10 * 0.3\text{in } (7.5mm)}{2} = 1.5\text{in } (3.75cm)$$

The result: With this transducer (R509LH), fish have to be spaced 1.5 inch (3.75 cm) apart in order to be distinguished as separate targets. If the transducer operates at a frequency of 83 kHz, fish need a minimum spacing of 3.5 inch (9 cm) to be distinguished as individuals. To calculate this value, you simply need to plug the wavelength for 83 kHz into the aforementioned formula

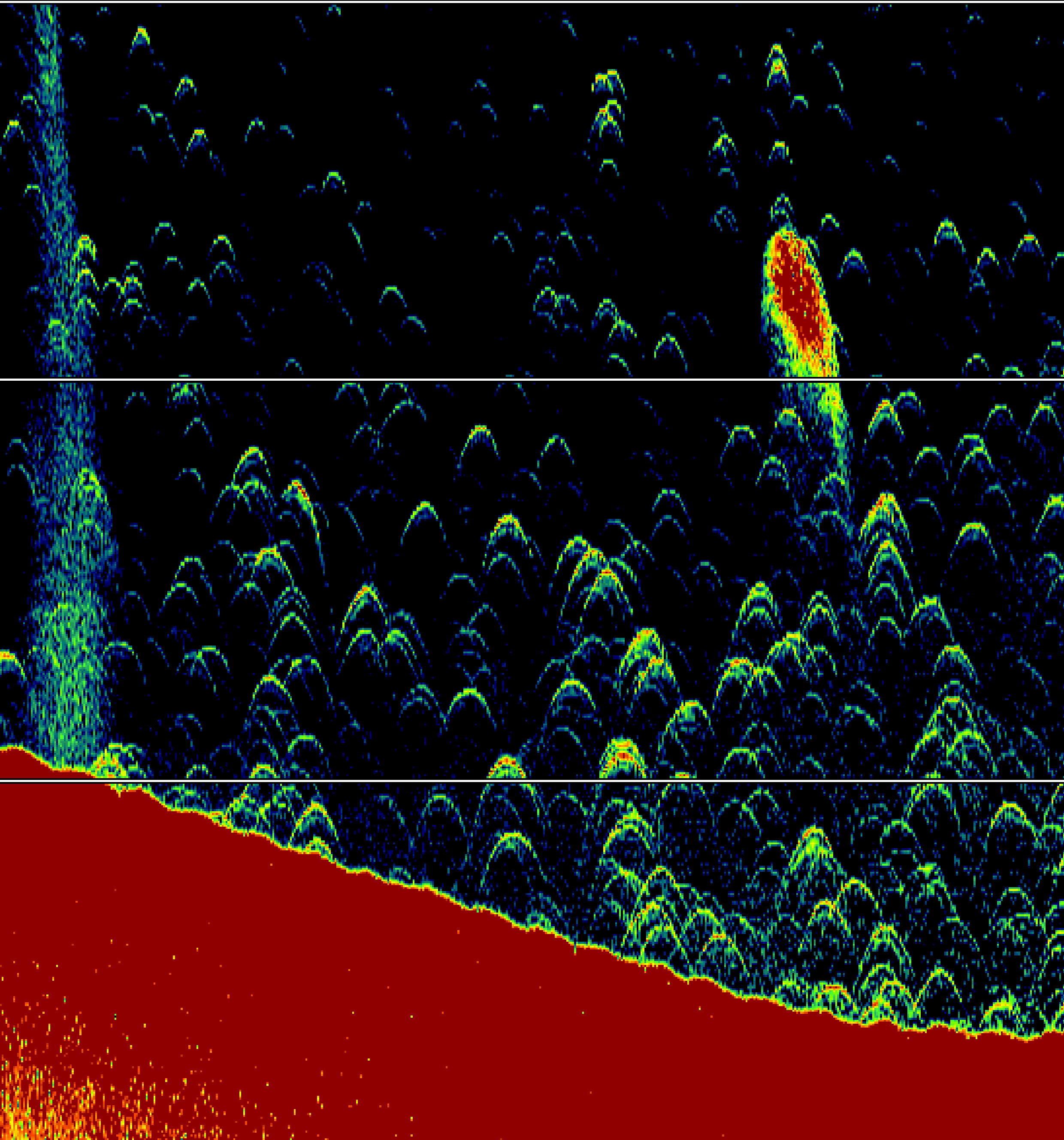
Note

The higher the frequency, the smaller the requisite spacing between fish. The shorter the pulse emitted by a transducer with a fixed frequency, the better the range resolution. Of course, the pulse length poses the following problem: a longer pulse has more energy, which results in stronger reflected echoes. Pulses that are too short can indeed be reflected by closely grouped individual fish, but the echo may not have enough energy to return to the transducer. This is why manufacturers of fixed-frequency transducers have to find a good balance between pulses that are as short as possible while also having enough energy to make it back to the transducer.

Important in choosing a transducer: unfortunately, most fish finder manufacturers don‘t publish specifications for transducer pulses. You‘ll likely search in vain for the number of cycles as given transducer has. In this case, the Q-factor can be of help (listed as 31 in Figure 1.5 on page 8, and as 2 in Figure 1.7 on page 9). A lower q-factor represents a shorter pulse – and a corresponding higher range resolution. Airmar is the only manufacturer that we know of that lists these values in the technical specs of their transducers. When it comes to other manufacturers, you have to hope that they have included a good value-for money transducer in their unit.

Chapter 4

How 2D sonar works



of your chosen body of water, and it is an ideal place for fish to find food and shelter. Large predatory fish are sure to be nearby. The ping covers the entire soccer field, and the fish finder calculates the depth of the bottom. Would the sand dune even show up on the A-scope?

The answer is a clear yes or no – it depends on the size of the hill and its location relative to the boat. If the dune is located far off to the side, it won‘t be recognized as part of the bottom (and therefore won‘t appear in the 2D sonar image) – this is because the ping returning from the bottom directly under the boat will arrive first and be treated as the ground line signal by the transducer

4.7 Each ping can only display a single depth!

The following picture was produced by a Garmin Panoptix transducer in „RealVü 3D ahead“ mode. This multi-beam transducer, unlike standard conical 2D transducers, can provide more accurate bathymetrical information. Let‘s compare the „RealVü“ display (upper picture) and the 2D display (lower pictures). You can clearly see the hills in the RealVü image. The 2D images would seem to indicate that the bottom is smooth.

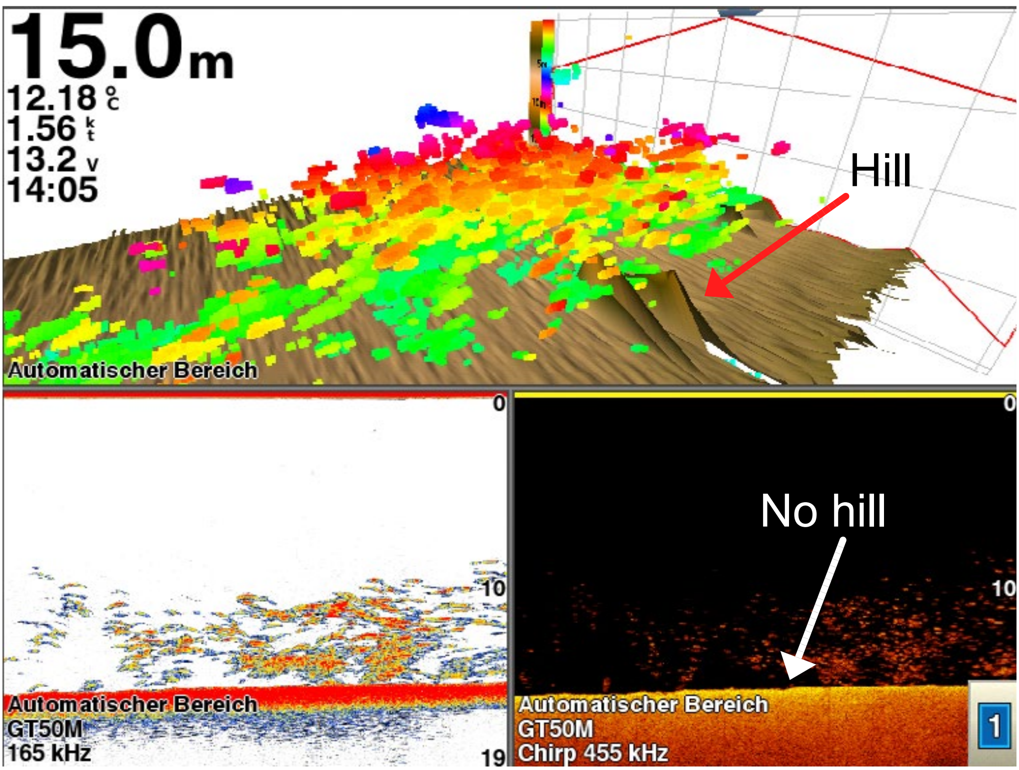


Figure 4.6—Hills and 2D vs. 3D transducers

A large plateau within the cone returns a strong signal, which causes the ground line to be drawn there, even though things slope away to the (much lower) true bottom. The fish below this ground line are not visible on the right side of the 2D image in Figure 4.7. Similarly, we only guess that there is a small hill below us that has sloping edges

In Figure 4.31 on page 87 you can see a fish (A) ascending at the edge of the sonar cone and approaching the jig (B). The ascending line is very narrow, so you could assume that the fish is moving from the edge of the cone toward the middle. Once the fish has entered the cone and changes its position, it produces a stronger echo. The fish could now be directly below the boat, where the rubber lure is located. Unfortunately, the fish didn‘t bite in this case. As we don‘t see a descending echo, the fish probably swam out of the sonar cone laterally. A second fish has also just ascended into the transduction cone (A-scope). We‘ve lowered the jig head a bit, but still left a sufficient gap between it and the fish arch.

4.25 Ground lines on steep slopes and hard edges

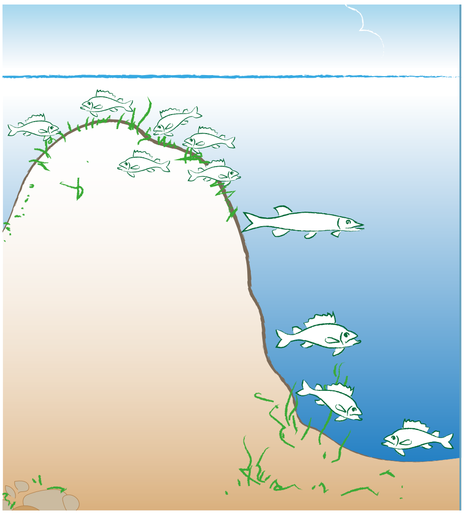


Figure 4.32—Fish on a slope

Descending terrain such as slopes and abrupt drop-offs or ridges can be some of the best fishing spots – fish of all sizes favor the various zones of the slope. Small fish find food and shelter among the plants that grow in the upper reaches of the slope. Large predators, on the other hand, don‘t have to travel far from deeper waters to eat their fill around these underwater slopes. These steep slopes are among the most-visited by fish in a body of water, but they aren‘t easily recognizable with 2D sonar.

It‘s not uncommon to read information in various forums about how to slide your way down these slopes – either jigging with a drift or trailing bait behind your boat

How deep is it at those drop-offs and slopes, really?

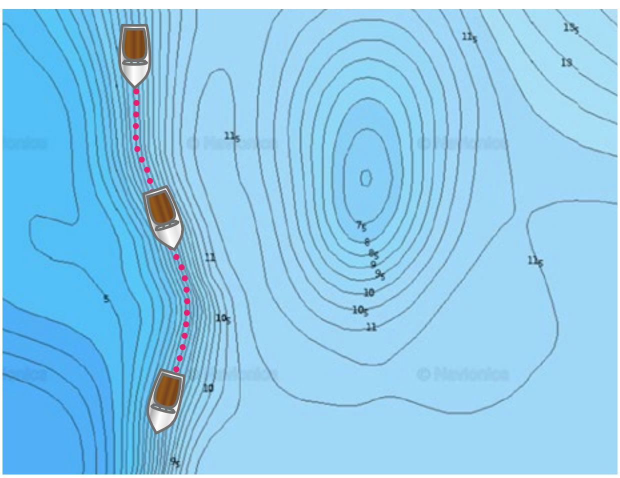


Figure 4.33—Route on the mountain

Our goal is to find one of these slopes and fish there. It should be as deep as possible if we want to pass the little fish by and get a shot at the big predators. Based on our fish finder in this example, we‘re dealing with a depth of about 40 feet (12 meters). The underwater hill gets to within about 4 meters of the surface – an ideal place for perch, that is.

We‘ll boat along the edge of this hill (Figure 4.33; boat with red line) to get out bait as close to as many fish as possible. How will we know when we‘ve reached the optimal position? Unfortunately, we don‘t know when we passed them, as our fish finder shows a depth of 23 feet (7 meters) and only one fish.

But why?

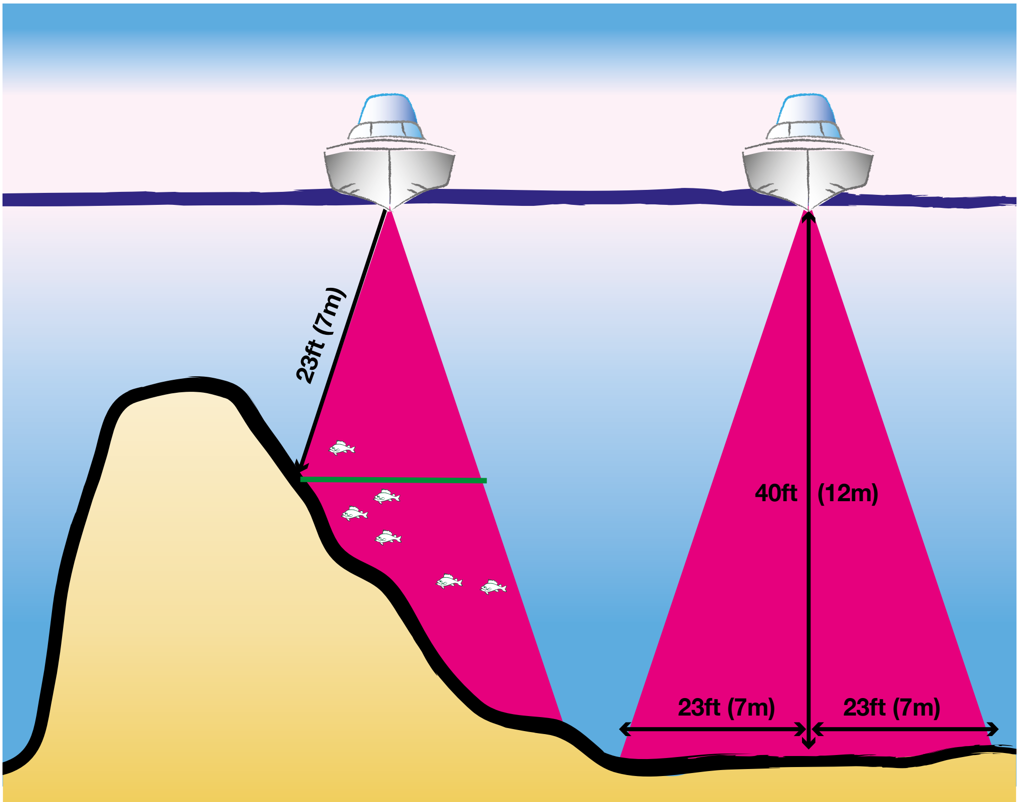


Figure 4.34—Underwater hill - 45° aperture angle

The first, strongest ping is reflected by the underwater hill itself before the main signal returns to the transducer. That initial signal (which reaches the transducer first) sets the ground line at a depth of 23 feet (7 meters). All echoes below that depth won‘t be displayed. This means that most of the fish remain invisible to the fish finder. This presents the following challenge: let‘s assume we want to fish the deepest part of the slope with drop shot bait or a jig. We check the fish finder and wait until the depth gauge reads 40 feet (12 meters). We stop the boat, drop anchor and lower the bait.

We should now ask ourselves the following question: Are we really fishing at the lowermost part of the slope at a depth of 40 feet (12 meters)?

Yes and no: Yes, we‘re fishing at a depth of about 40 feet (12 meters). No, we‘re not fishing the bottom of the slope (and likely missing the fish).

If you wait until you have a on-screen depth reading of 40 feet (12 meters), the sonar cone has a diameter of about 46 feet (14 meters) when it reaches the bottom. Therefore, if you have an aperture angle of 60 degrees, your transducer is about 23 feet (7 meters) away from the slope. However, because the lower part of the cone just „touches" the slope, the fish further up the slope will no longer be scanned by the fish finder. If you're too close, the fish on the slope are obscured by the ground line higher up.

The effect is that you have no chance of seeing the fish on-screen. At 23 feet (7 meters), we're either too close to the slope or too far away. This problem is caused by the fact that we want to move along the edge of the slope in a parallel fashion.

As such, we have a few different ways of dealing with the situation.

Option 1

We just accept it, because we know why the fish finder is returning a false depth. If we slowly travel along the ideal line of entire edge while trolling, we'll only ever see 23 feet (7 meters) of depth. Larger fish deeper than that will remain invisible to us. Especially with hills and depressions underwater, we should remain skeptical about the depth displayed on-screen.

Once we've put down anchor, we can drop our bait all the way to the bottom and estimate if it hits the bottom at 23 feet (7 meters) (or at some deeper point). Of course, a line counter makes things much easier than raw estimation. In our experience, not every fish finder owner pays attention to how deep their bait actually goes. They generally assume that the fish finder's reading is more or less in line with the actual depth of their bait.

Option 2

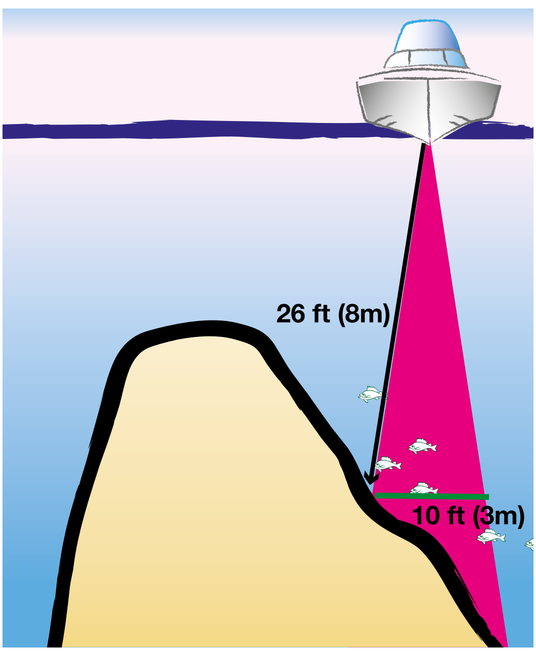


Figure 4.35—Underwater hill - 20° aperture angle

If we can use a frequency with a narrow aperture angle, we can get a more accurate depth reading. This will depend on the fish finder we're using. If we use a 20-degree aperture angle, the transduction cone has a diameter of about 10 feet (3 meters) at a depth of 26 feet (8 meters) (i.e. 5 feet (1.5 meters) in all directions from the transducer.) Now, our blind spot is considerably smaller.

This allows us to estimate the actual depth much more accurately. However, we'll still have to do without some of the fish arches being displayed, as the fish will lie outside of the narrower cone. Displaying all available fish arches won't be so important in this situation, because having more arches displayed isn't helpful in determining exactly where those fish are located.

We simply don‘t know where the fish is in relation to the boat. However, we do know that fish often congregate around steep slopes (even when we have a hard time seeing them).

> **Note**
>
> Note on options 1 and 2: When lowering your jig, make sure that the depth on the A-scope matches the depth of the jig. There are sometimes a few surprising things at work here. You observe them on the A-scope display: If, according to the screen, the jig head reaches the bottom but the bait keeps descending a bit, you‘ll have an idea of the true depth under the boat.

Option 3:

Rather than traveling along the edge of our search area, we cut across it. This technique has a few fundamental advantages, which we‘ll explain. A zigzag route takes us from shallower waters to deeper ones and back again (that is to say, alternatingly uphill and downhill relative to the slope)

4.26 From shallow to deep water

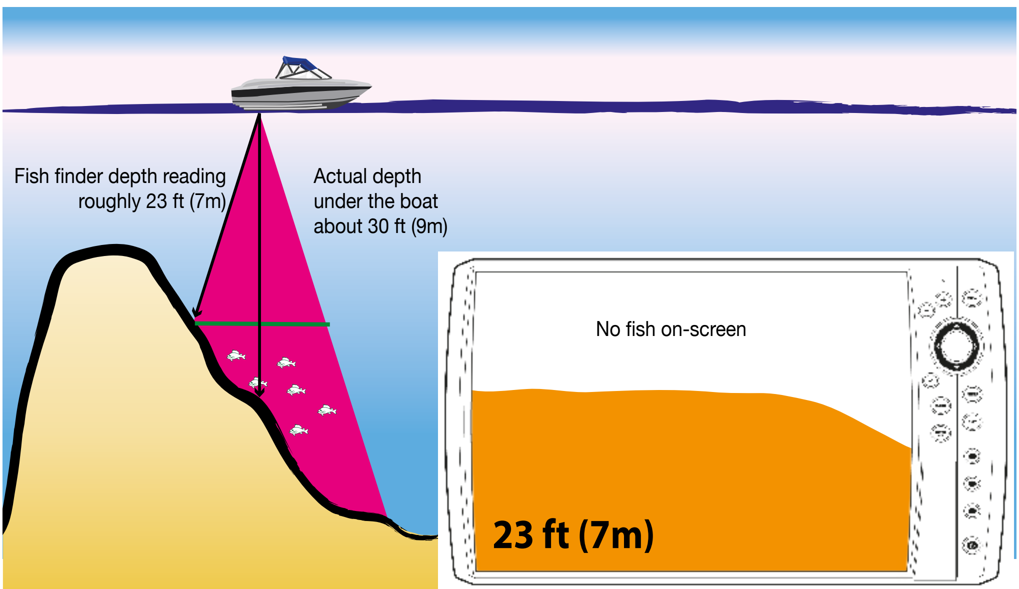


Figure 4.36—From shallow to deep water

Here‘s where the two approaches differ. If we go from shallow to deep water, we run into the same problem we did before: inaccurate depth readings. The aperture angle is the issue here, as the edge of the sonar cone is what establishes the ground line. However, the farther away we get from the slope (heading into deeper water), the more accurate the ground line becomes.

This introduces a new problem: When the boat is moving, fish are primarily scanned when they are entering the transduction cone from the front or the sides (relative to the direction of the boat‘s travel). Fish coming from the rear would have to swim faster than the boat in order to appear on-screen at all.

Then we‘re traveling downhill relative to the slope, the effect is different. The fish entering the cone from the front appear on the fish finder as usual. At the same time, however, the fish that were previously hidden by the elevated ground line on the hill start to come into view on the display. That said, we can‘t tell if the fish on-screen are in front of the boat or behind it. It‘s just not possible.

Note

The rear portion of the sonar cone will continue to drag the ground line lower, even though the boat will have moved on from that position well ahead of the change. As such, we won‘t know how deep things are likely to get. Fish only appear on the fish finder display long after you‘ve already passed over them.

From deep to shallow water

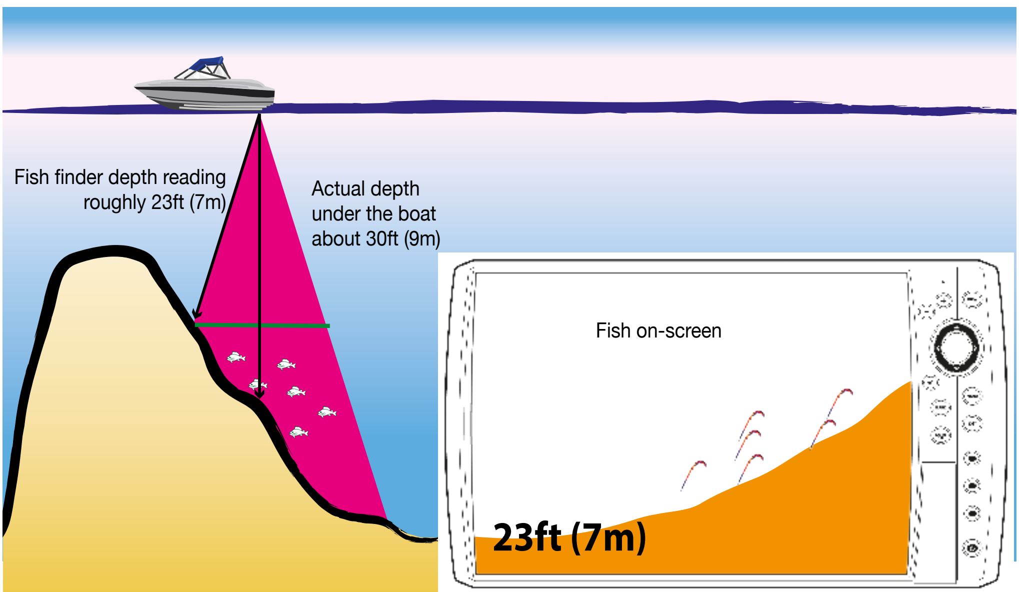


Figure 4.37—From deep to shallow water

When moving from deep to shallow water (uphill relative to the slope), we gradually see the fish on the slope as they are scanned in the sonar cone. The ground line forms in real-time. We now know that the fish are there and their approximate depth – that is, until the ground line being redrawn by the wide sonar cone eventually makes them disappear. With this approach, a wide sonar cone more useful, as more area is scanned.

It also gives the best possible indication of actual depth, as there are no blind spots. We can also recognize fish arches on the slope well in advance. With a CHIRP transducer, the fish arches are even more distinct from one another.

Note

It‘s important to know that the displayed ground line starts to flatten only when the boat begins to approach the slope. We can see the fish, and we know in advance that an underwater hill is coming. Now we have time to slow down if necessary. In short, approaching a slope from the deep end and moving uphill produces the most accurate imaging.

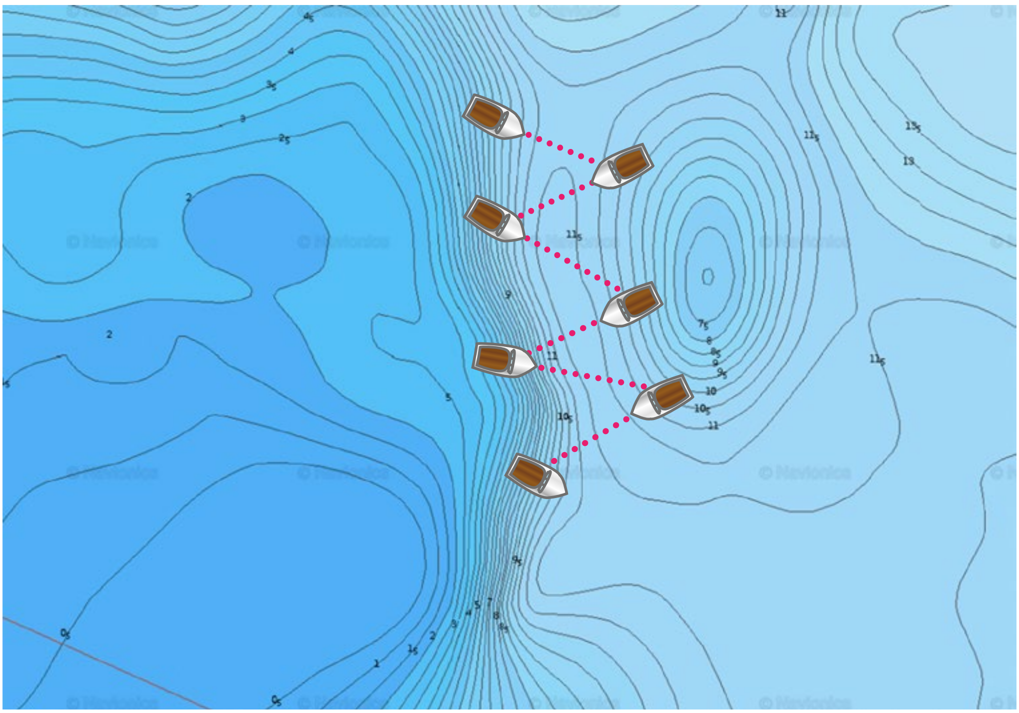
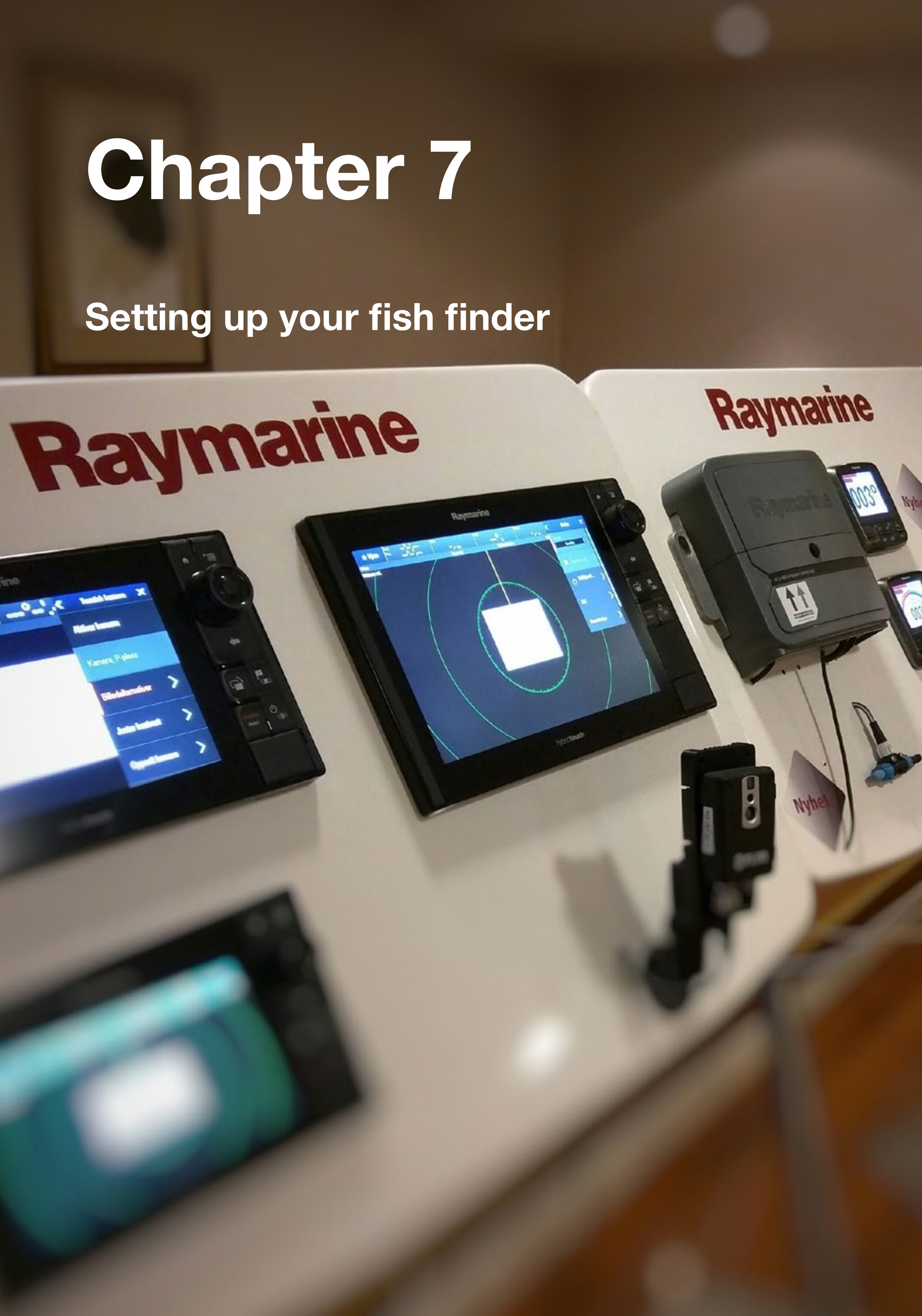


Figure 4.38—Zigzagging the slope

Here‘s what this looks like in practice on the fish finder display: In Figure 4.39 on page 96 on page 100, we can see an approach on an underwater slope which was imaged with a 28-degree, 200 kHz transducer. The slope was approached from the deep end. Exactly at the top of the hill, the boat did a 180-degree turn and traveled back in precisely the direction from which it came. The distance for each leg of the journey was the same. Looking at the grade of the slope, you can see that the return trip (B) is imaged differently than the approach (A). The slope appears much flatter until it reaches an identical depth, even though both points mark the same area.

Chapter 7

Setting up your fish finder



7.6 Getting the big picture

In Figure 7.11 (Humminbird Helix 12), you can clearly see the hard bottom. The strongly reflected signals just about generate a triple bottom echo.

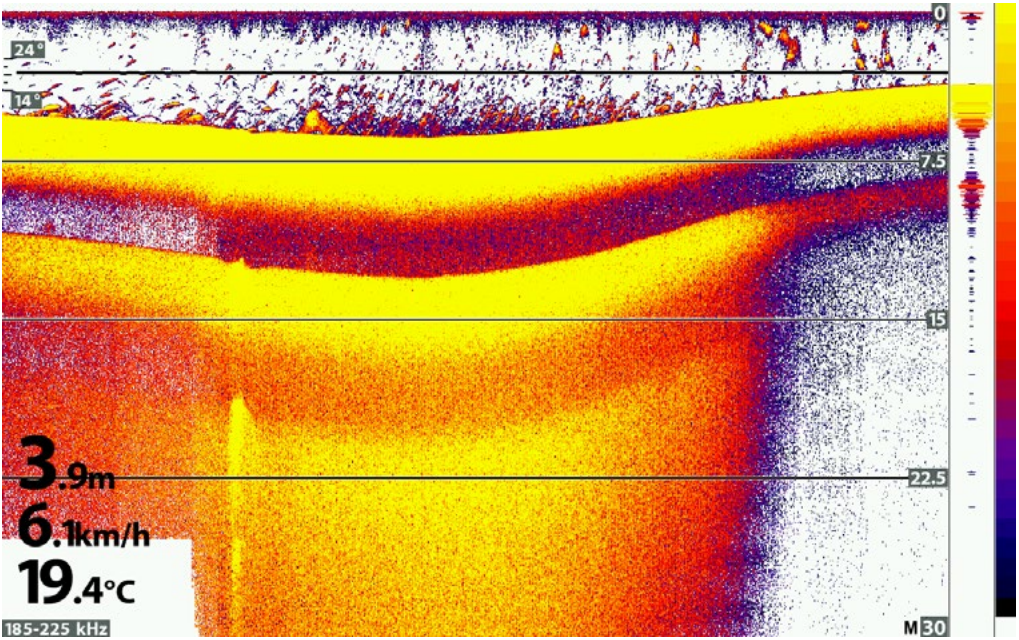


Figure 7.11 — Fish on a hard bottom

However, we garner the most important information from the image by setting a low scroll speed. In doing so, we can see that most of the fish and plants are on the hard bottom. There are some larger predators at the edge of this zone on the left (larger individual fish arches).

You can see the transition from soft bottom (left) to hard bottom (middle) and back to soft again (right) – this helps us zero in on the hotspot.

Tip: For more details, you can just retrace the same route with a shallower depth setting and hone in on the hotspot.

Note

Hard bottoms are actually denser substrates and designate hotspots. To more easily identify hard bottoms, you have to adjust the following settings manually:

- Manual depth should be set to two or three times the actual water depth.
- Scroll speed should be greatly reduced.

7.7 Combined views of different frequencies

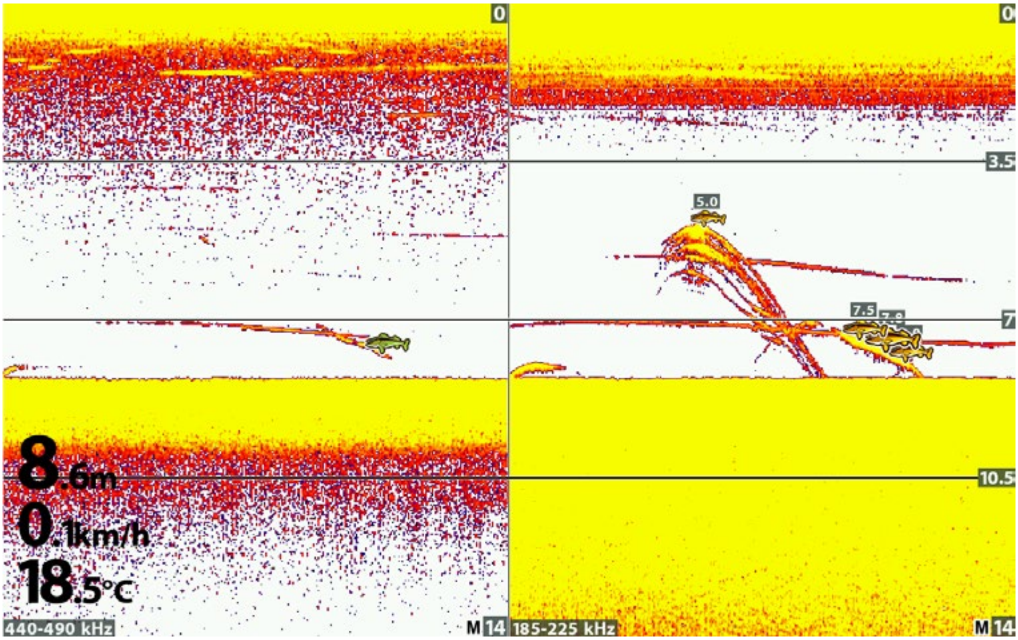


Figure 7.12—2 combined CHIRP frequencies

In Figure 7.12, a 440-490 kHz CHIRP frequency is displayed separately with a 185-225 kHz frequency. It's quite easy to see the fish are directly under the boat. The Humminbird fish finder handled the following very well: Fish in the narrow sonar cone (16 degrees at 440-490 kHz) are shown in green. Fish in the wider sonar cone (28 degrees at 185-225 kHz) are shown in orange. Although fish icons can tend to be bothersome, they make sense in the Humminbird's combined image. If both frequencies are displayed as a single image, the fish remain divided into green and orange. Therefore, you can identify fish from the respective cones of dual-beam sonar, even when the images are merged.

Thanks to CHIRP, in the 185-200 kHz image (right), you can clearly see that the ascending shoal in the center is not a group of smaller fish, but rather consists of several larger individuals. Small fish would cause the individual yellow signals to turn into one large cluster of signals

7.8 The depth reading and the zoom function

Basically, your fish finder displays an automatic or fixed depth. The factory setting is automatic on most units. Assuming you want to find fish (as opposed to hotspots, for which you'd need a higher depth setting), automatic depth display is just fine. That is, unless it winds up being too deep. We caught on to this problem in Chapter 7.2 „Automatic depth adjustment" on page 132. Specifically, the problem is that fine details can't be displayed because the on-screen pixel count is too low.

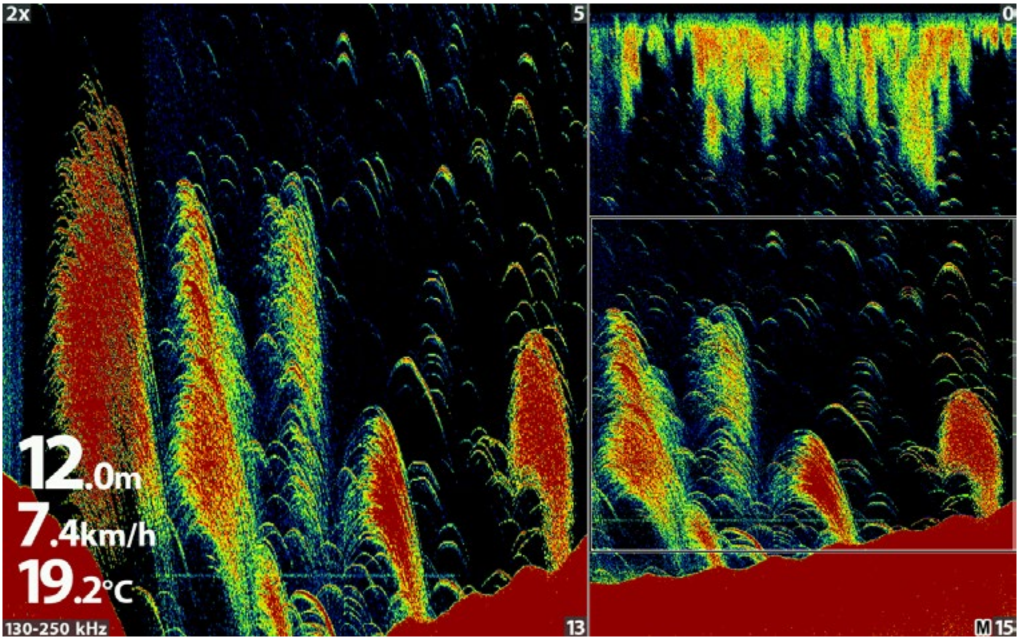


Figure 7.13—Left: Zoom 5-13m, Right: 0-15m

For example, let's look at a screen with a resolution of 400 x 400 pixels. Our fish finder indicates a depth of 165 feet (50 meters) – each vertical pixel represents 5 inch (12.5 cm) (165 ft / 400 or 50m / 400). This means that a fish would have to be 5 inch (12.5 cm) tall to fill a single pixel. That's just about impossible with any of the fish we'd be catching (here in Germany, at least – more luck in the U.S., e.g.). If we now adjust the zoom or depth range function and have a look at the bottom (and the 33 feet (10 meters) above it), each pixel a mere 1 inch or 2.5 cm (33 ft / 400 or 10m / 400). Now things are starting to look good. We can definitely live with this resolution and imaging. One takeaway: the more vertical pixels, the better!

7.9 The temperature line

Fish finders can also measure water temperature (unless they are mounted in the hull). This information is important for locating fishing spots, especially in spring and fall. In these seasons, the water circulates – cold and warm currents mix.

In spring, when much the water is still cold, fish tend to congregate in the warmer areas of a given body of water. One or two degrees can make a significant difference in this regard. When traveling around the body of water, you can record the temperature readings in the various regions of the water – you can also look at the temperature line on your fish finder to see how the temperature varies over time

When the days begin to get colder toward the end of summer, you'll find more and more fish in the cooler regions of the water. They like to spend time there recovering from the warmer water temperatures of summer.

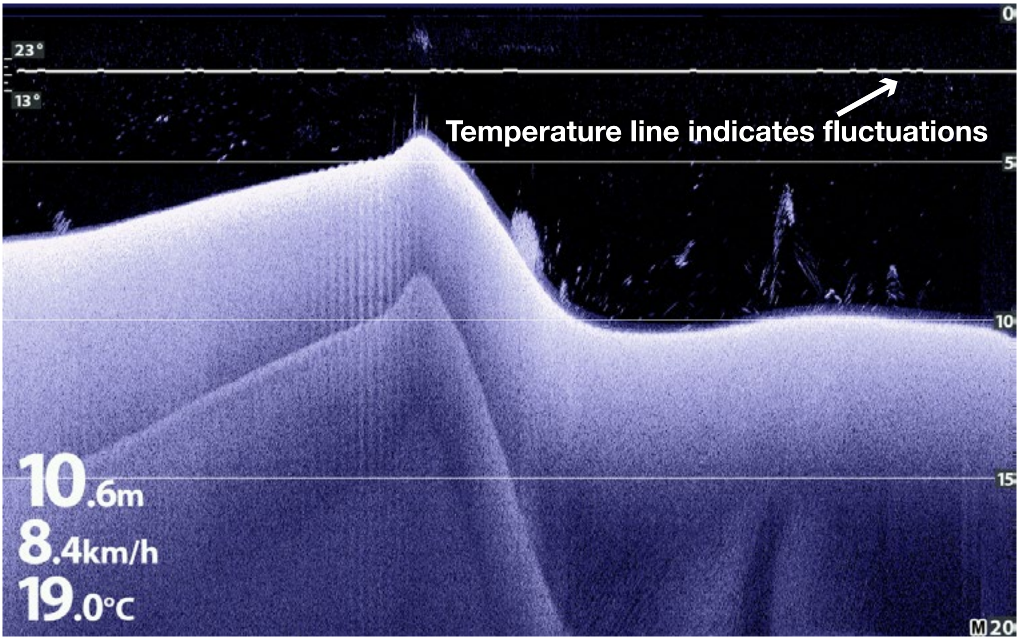


Figure 7.14—Temperature line (top of image)

It's important to set a low scroll speed so that you have a meaningful comparison carried out over a long distance. It's really not a useful exercise to compare water temperatures every 65 feet (20 meters) or so.

7.10 Noise reduction

Every fish finder has an adjustment setting for its noise filter. The best thing to do is play around with the adjustment and find a setting that works best for you. The impact that noise has on imaging varies from transducer to transducer. The age of your transducer and the software being used also play major roles.

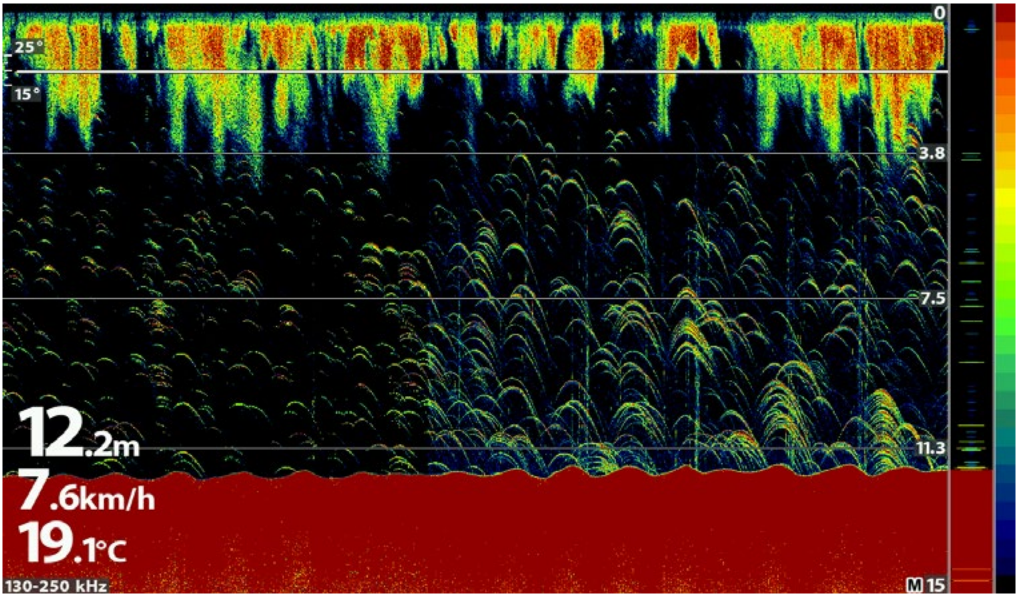


Figure 7.15—Medium noise filtering

Figure 7.15 – Medium noise filtering switched to no noise filtering. Fish arches are clearly visible – they‘re even clearer using 130-250 kHz CHIRP, and that‘s without a noise filter!

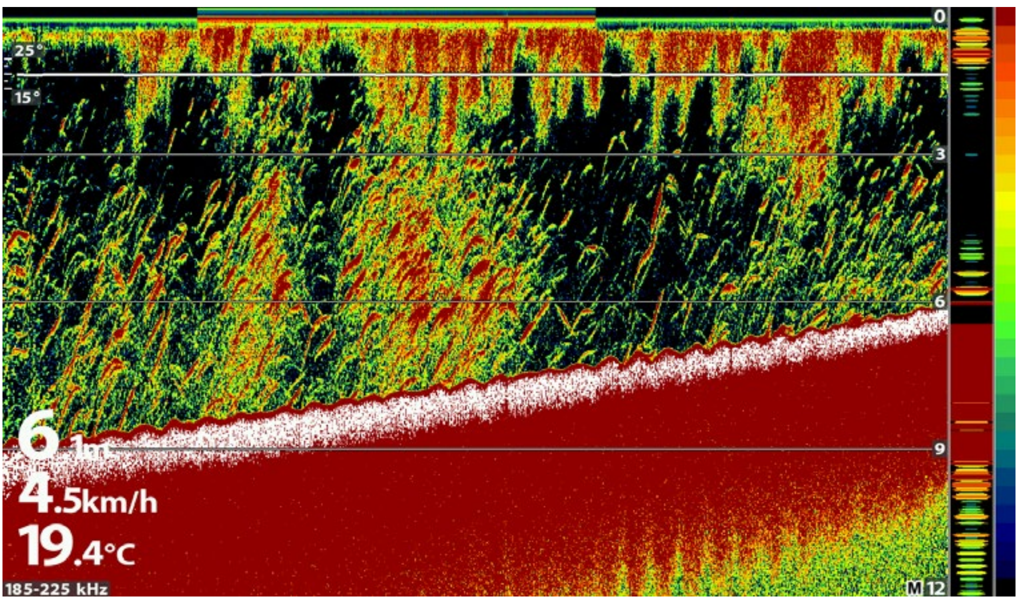


Figure 7.16—No noise filtering

Figure 7.16 - Change to settings (no noise filter) using a different, 185-225 kHz CHIRP transducer. This results in a multitude of signals – using noise filter in this situation would make a lot of sense.

7.11 GPS and fish finders

Is GPS functionality a useful addition or just an expensive extra? Readers of our blog often ask this question, and we have a pretty clear-cut answer:

GPS is an indispensable feature for fishing in open water!

GPS allows you to mark interesting fishing spots on your fish finder. Once you‘ve saved those locations, you can come back to them with pinpoint accuracy, any time you want. In terms of hotspots like shipwrecks, you need to have the most accurate location information possible – the fish stay as close as they can to the obstacle in order to secure food and shelter.

There as effectively no visual cues in open water, and you don‘t have landmarks available to you (as you would closer to shore). If you recall the principle that 90% of fish are located in just 10% of the total area of a given body of water, it‘s easy to see why GPS is the single biggest aid in terms of fishing effectively. GPS enables you to reliably find locations that you otherwise would have slim chances of returning to.

Do you have to buy expensive maps?

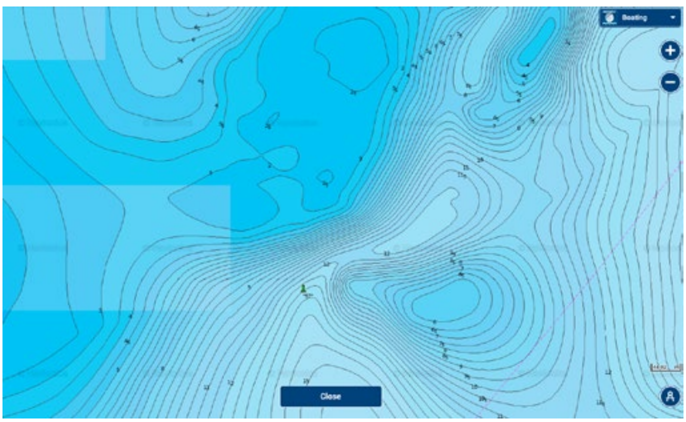


Figure 7.17—Bathymetric chart

We‘ve got some good news here. While you certainly can buy expensive maps, you also don‘t have to. Proprietary maps often cost several hundred euros to purchase, and sometimes require annual update fees. The companies offering these maps have all started providing users with bathymetric charts. This means that the depth contours lines are drawn at short intervals to give you a precise overview of underwater ridges and structures. Armed with this information, you can start look for promising fishing spots even before you get out on the water.

Now, let‘s look at the alternatives. On smaller lakes, you can do without a map. You‘ll still be able to mark any good fishing spots you come across with your fish finder‘s GPS function. Your fish finder won‘t show you any depth contours, but you can travel directly to the GPS points that you‘ve marked previously.

Your fish finder doesn‘t have GPS – What now?

Fortunately, there are now a ton of great smartphone apps that allow you to enter and save GPS coordinates. In this arena, Navionics offers a great way to display bathymetric maps on your smartphone or tablet. The app offers users all kinds of functions that are otherwise found only in high-end fish finders. The privilege requires an annual fee. If you don‘t continue with the annual fee, you‘ll still be able to use the maps, just without updates. You just have to decide how important the most recent depth measurements are to you. If it‘s a heavily traveled body of water, the depth contours are updated fairly frequently. In our view, it‘s usually sufficient to download a given map once. The underwater landscape doesn‘t change all that much on a yearly basis. Some Raymarine fish finders can interface wirelessly with the Navionics „Boating“ app. It creates an on-screen live map which provides very accurate depth readings from your own fish finder. It also doesn‘t require any updates – the maps are yours to keep. In our view, the difference in the depth contour precision is phenomenal.

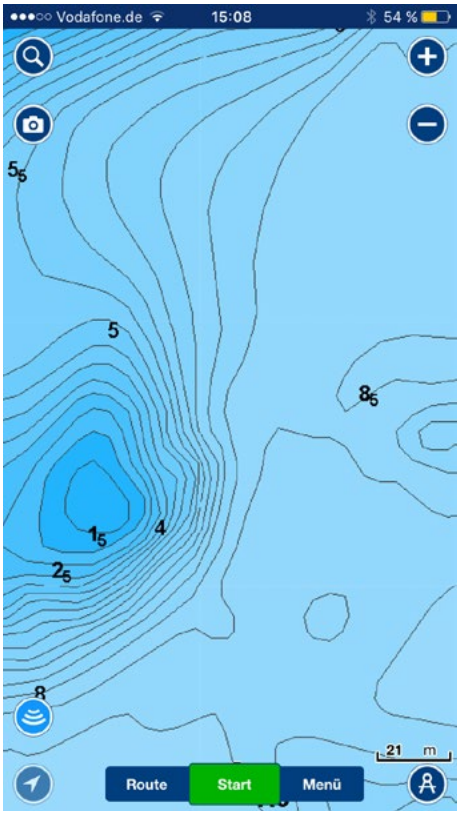


Figure 7.18—Navionics App: Bathymetric map - Download without fish finder

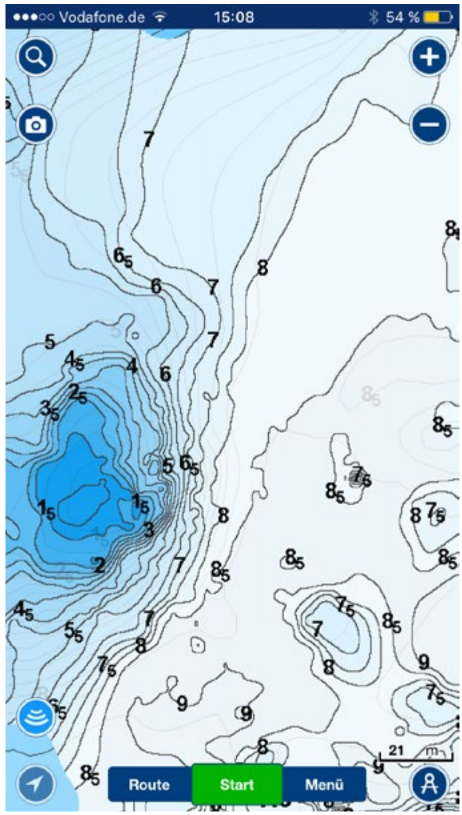


Figure 7.19—Navionics App: Bathymetric map created by Raymarine Dragonfly 5 Pro

On the other hand, you can also use free apps. Depending on what kind of smartphone you have, there are a number of different. In all cases, your smartphone determines your current position so you can store GPS points. Although they generally don‘t provide depth maps, you can use the GPS functionality to find fishing spots, etc. You can also enter, mark and save GPS coordinates. This allows you to use Google Maps and similar services to look for interesting spots before your trip.

> **Note**
>
> Make sure your phone is fully charged, and bring battery backups (if necessary). It‘s also important to make sure your fish finder is charged before the trip. We‘ve experienced it first-hand: nothing is worse than having your fish finder die on you just as you‘re using to navigate to that prime hotspot.

GPS – A lifesaver

The weather isn‘t always good, and it can turn on a dime. Anyone who spends a significant amount of time on the water likely knows this all too well. When things get hairy, reacting quickly can be a matter of life and death. Having GPS functionality (even without special maps) allows you to orientate yourself quickly, even in the dark or heavy fog. Thick fog and moonless nights make it nearly impossible to judge where you are in relation to the shore, and in rough waters, making it to shore is the only sure-fire way to be safe. A charged smartphone with reception or GPS functionality on your depth can literally save your life in such situations. If the things go pitch black when you had told yourself „just one more hour“ out on the water, the situation can get serious very quickly. In the absence of moonlight, visibility is less than 33 feet (10 meters). If you are able to see the shore at all, it may already be too late when you do. We speak from experience!

GPS line as orientation while drifting

If you‘re fishing in a larger body of water and your boat keeps drifting, it can be exceedingly difficult to travel an ideal line without buoys or on-shore landmarks. Especially when a hotspot is over a ridge or other distinctive feature, traveling to the exact location necessary can be nearly impossible without outside help. This is where GPS tracking comes into play. It‘s a huge help in being able to come back to the same spot whenever you want to.

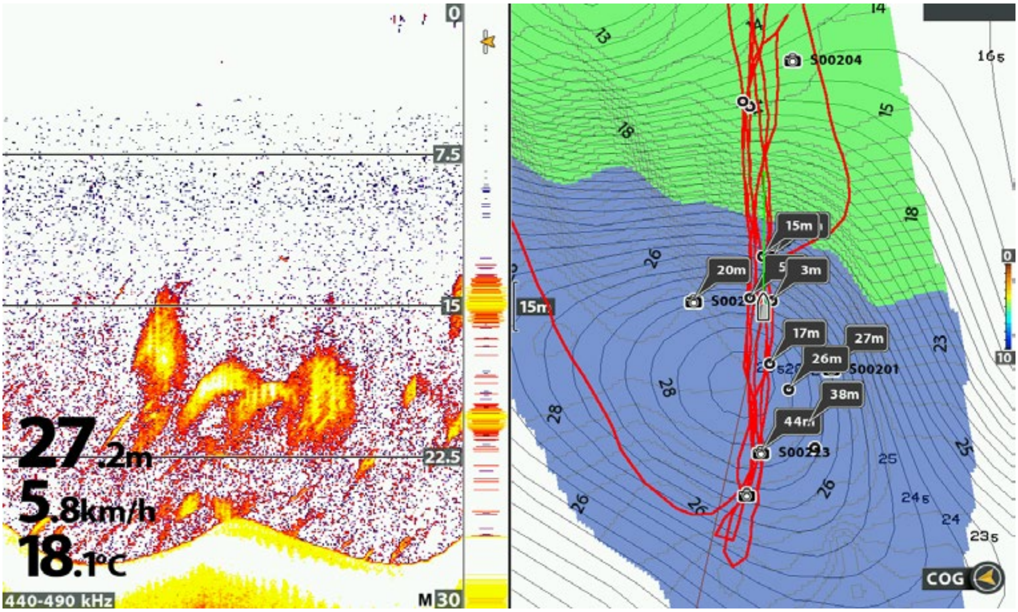


Figure 7.20—Track line (red line on the right side of the image)

Note

On most fish finders, the track line never disappears. At some point, your display will be completely covered in these lines, and you won‘t be able to make anything else out. You can clear the track in the navigation settings.

GPS and side-scan sonar

Side-scan sonar has another great feature: you can use it to mark a location on your fish finder by scanning the surroundings on either side. To do this, you generally move the fish finder‘s cursor to the appropriate place and drop a waypoint. If, for example, there‘s a shipwreck 65 feet (20 meters) to the right of the boat, you can mark it for future reference. In Figure 7.21, there‘s a shipwreck roughly 100 feet (30 meters) to the right of the boat – a GPS marker would allow you to head for exactly that location at your leisure.

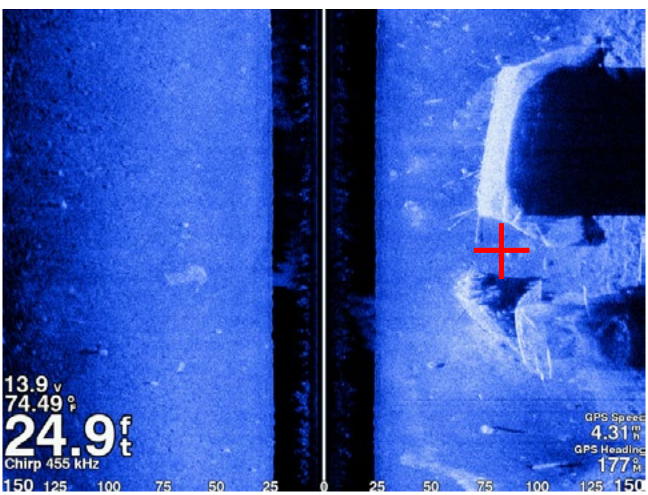


Figure 7.21—Garmin SideVü - Shipwreck

7.12 The color palette

Each fish finder offers a selection of color palettes. The selection is generally a matter of taste. That said, there are a few deciding differences among the available palettes. Some fish finders use the same color palette for all echoes – this means that fish are imaged in a color similar to that of the bottom, which can make them difficult to distinguish. In order to better separate fish and bottom hardness, you can go with a better transducer (preferably CHIRP), select down-imaging, or simply use a different color palette. Additionally, there‘s often an option for night mode, which can greatly improve detail imaging at dusk and in the dark. Accurate target separation is crucial to catching more fish.

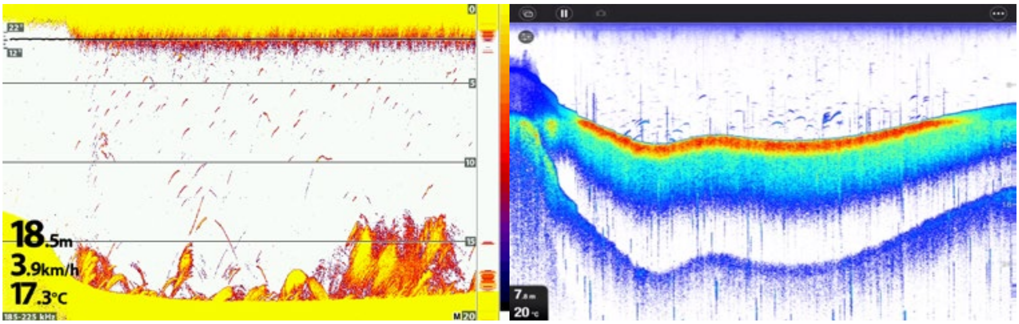


Figure 7.22—Sample color palettes

7.13 Sensitivity

When adjusting your fish finder‘s sensitivity, you should know that its ability to display fish arches and other details depends on the fish finder itself, as well as your transducer. Basically, you can use the sensitivity settings to increase or decrease how prominently fish arches are displayed. If the setting is too low, the edges of your fish arches – that is, the weak signals – will often no longer be displayed. All you‘ll see are the strong signals generated when fish are directly below the transducer. When this happens, keep one thing in mind: you usually can‘t catch the fish that you can‘t see. If the automatic settings result in a nearly-empty display, it‘s very often tied to the sensitivity setting.

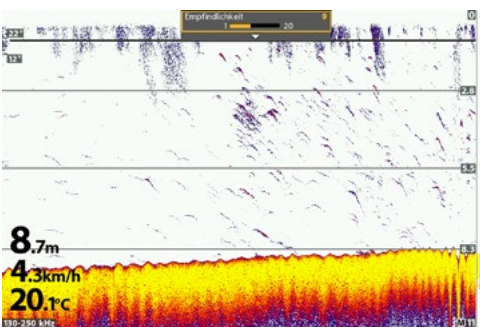


Figure 7.23—Sensitivity level 9/20

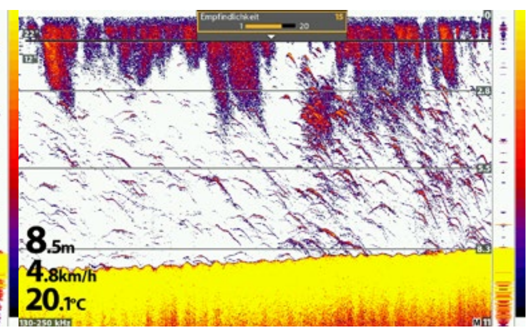


Figure 7.24—Sensitivity level 15/20

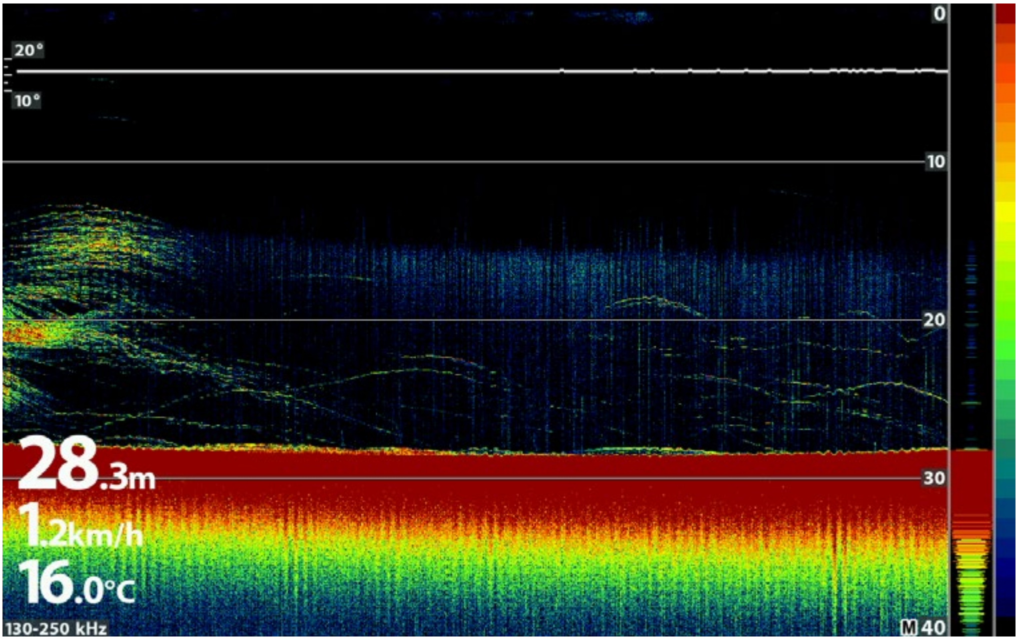


Figure 7.25—Blue stripes and big fish

In Figure 7.25, the sensitivity setting results in these blue stripes at a depth of about 40 feet (15 meters). This echo could be the thermocline – all said, the echo signal is very weak. It‘s more likely to be plankton or other suspended particles that are obstructing the view below.

You can still recognize some nice, large fish arches in the field of suspended particles. Because the arches appear individually, it could mean that they are larger predators hunting feeder fish (like the shoal on the left side of the image). It‘s been established that large, deep-swimming pike in open water use water-borne plankton as camouflage while hunting for feeder fish. The pike attack their prey from the bottom up. This interpretation makes sense in our case, so it would be worth trying to fish vertically here with some large pike bait.

If the sensitivity were too low, you wouldn‘t be able to see the image as displayed. The big predators‘ fish arches would be omitted or truncated on account of the sensitivity, and you would simply sail right by this potential hotspot. You should find the settings that are right for you in order to get the information most relevant to you out of your fish finder.

7.14 An overview of the most effective settings

We‘d like to conclude the book with a summary of the most important settings and some corresponding tables to help expedite the process. We hope we‘ve been helpful in upping your chances out there on the water. Here‘s to a great catch!

For all views used while looking for fishing spots:

- ✓ *Ping speed or scroll speed as low as possible*
- ✓ *Depth reading (to locate hard bottom)*
- ✓ *Depth reading set to at least double the actual depth - or - „white line“ activated*
- ✓ *If possible, display both 2D frequencies via split screen*
- ✓ *If possible, use side-scan*
- ✓ *Set GPS-markers for hotspots and make a quick note*

While fishing

2D sonar and down-imaging view

- ✓ *Ping speed/scroll speed should correspond to boat speed (Chapter 7.4 on page 136)*
- ✓ *Depth reading on (to see fish arches)*
- ✓ *Automatic depth reading with „white line“ - or - depth reading set to about 1.3 times water depth*
- ✓ *Zoom function turned on in deep waters (if you‘re fishing near the bottom)*
- ✓ *Contrast and sensitivity set to automatic (adjust if necessary)*
- ✓ *Activate CHIRP on fish finder (if available)*
- ✓ *Set color palette (2D sonar) according to taste and weather conditions*

Down-imaging and side-scan view

- ✓ *Set frequency between 455 and 800 kHz (your preference)*
- ✓ *Frequencies vary depending on manufacturer*

Side-scan view

- ✓ *Adjust range (depends on fish finder model)*

7.15 Overview: The most important tables

Diameter of sonar cone at different depths and aperture angles

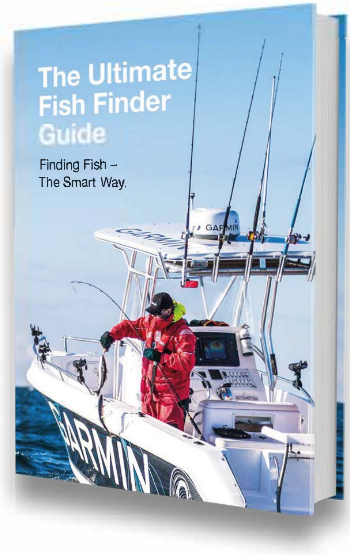
Aperture angle	6°	10°	20°	30°	40°	60°
Depth						
1	0,01	0,02	0,09	0,20	0,44	1,04
3	0,07	0,20	0,79	1,77	3,98	9
5	0,20	0,55	2,18	5	11	26
10	0,79	2	9	20	44	104
15	1,77	5	20	44	99	234
20	3	9	35	79	177	415
30	7	20	79	177	398	935
40	13	35	140	314	707	1.662
50	20	55	218	491	1.104	2.597
60	28	79	314	707	1.590	3.739
70	38	107	428	962	2.165	5.090
80	50	140	559	1.257	2.827	6.648
100	79	218	873	1.963	4.418	10.387
125	123	341	1.364	3.068	6.903	16.230
150	177	491	1.963	4.418	9.940	23.371
175	241	668	2.673	6.013	13.530	31.810
200	314	873	3.491	7.854	17.671	41.548
250	491	1.364	5.454	12.272	27.612	64.918
300	707	1.963	7.854	17.671	39.761	93.482
400	1.257	3.491	13.963	31.416	70.686	166.190

Diameter of sonar cone at different depths and aperture angles

Aperture angle	6°	10°	20°	30°	40°	60°
Depth	corres-ponds to 1/10 of the depth	corres-ponds to 1/6 of the depth	corres-ponds to 1/3 of the depth	corres-ponds to 1/2 of the depth	corres-ponds to 3/4 of the depth	corres-ponds to 1.15 times the depth
1	0,10	0,20	0,30	0,50	0,75	1,20
3	0,30	0,50	1,00	1,50	2,25	3,50
5	0,50	0,80	1,70	2,50	3,75	5,80
10	1,00	1,70	3,30	5,00	7,50	11,50
15	1,50	2,50	5,00	7,50	11,25	17,30
20	2,00	3,30	6,70	10,00	15,00	23,00
30	3,00	5,00	10,00	15,00	22,50	34,50
40	4,00	6,70	13,30	20,00	30,00	46,00
50	5,00	8,30	16,70	25,00	37,50	57,50
60	6,00	10,00	20,00	30,00	45,00	69,00
70	7,00	11,70	23,30	35,00	52,50	80,50
80	8,00	13,30	26,70	40,00	60,00	92,00
100	10,00	16,70	33,30	50,00	75,00	115,00
125	12,50	20,80	41,70	62,50	93,75	143,80
150	15,00	25,00	50,00	75,00	112,50	172,50
175	17,50	29,20	58,30	87,50	131,25	201,30
200	20,00	33,30	66,70	100,00	150,00	230,00
250	25,00	41,70	83,30	125,00	187,50	287,50
300	30,00	50,00	100,00	150,00	225,00	345,00
400	40,00	66,70	133,30	200,00	300,00	460,00

Vertical fishing - Depth of bait compared to fish

	Depth of jig head on A-scope		
Depth of fish arch on A-Scope	**16°**	**30°**	**60°**
16 ft (5 m)	15 ft (4.5 m)	13.5–15 ft (4–4.5 m)	13.5 ft (4 m)
33 ft (10 m)	26–32 ft (8.5–9.5 m)	(30 ft) 9 m	23–26 ft (7–8 m)
)50 ft (15 m)	(13,5–14.5 m)	46 ft (14 m)	36–39 m (11–12 m
65 ft (20 m)	61–63 ft (18.5–19 m)	60–63 ft (18–19 m)	52–60 ft (16–18 m)


The Ultimate
Fish Finder
Guide
Finding Fish –
The Smart Way.
GARMIN

Buy Now