

THE EXPERT

COLIN SPEEDIE is a marine naturalist who leads yacht-based research projects on sharks, cetaceans and turtles around the UK. A writer and photographer, he is interested in educating the public on ways of minimising impacts on marine species.



Visitors to the Cornish seaside are sometimes surprised to see massive sharks just offshore. These are basking sharks – huge but harmless. Their massive mouths are designed to catch plankton, not swimmers.

Each summer, mysterious giants appear around our coasts – they are basking sharks, the world's second-largest fish. But why do they come here and where do they go in winter? **COLIN SPEEDIE** sailed into our shark-infested waters to discover some of their secrets.



MIND THE GAPE

SHARK NUMBER 50 was special – a huge fish of around nine metres long with a scarred nose. As it made its way through a slick of plankton, its leathery dorsal fin flopped from side to side. The only sound to break the calm was the rhythmic swish of its tail and the periodic susurrant of our camera shutters. We were in intimate contact with the world's second-largest fish (after the whale shark) and Britain's biggest wild visitor – the basking shark.

The crew were quiet – shell-shocked – for this behemoth was not our 50th of the season, but of the day. We had been sailing for several hours, and the initial exultation of our first sightings had turned into tension as we hurried to gather data and photo-identify as many animals as possible for our study. The pressure was on.

We were aboard an 11.7m sailing boat out by a remote lighthouse islet called Hyskeir, 20km west of the island of Rum. It is one of the most productive sites we have found for surface-feeding sharks in Britain. Far from major sea routes, it has the most intoxicating 360-degree vista of sea, mountains and islands I have ever seen. Now, out to the west, the silhouette of the outer islands was softening as evening fell

over the Sea of the Hebrides, and we knew that for us time was running out. It is one thing to sail amid a big shoal in the daylight when the sharks just below the surface can be spotted well in advance, quite another in darkening seas when a collision could be fatal for a shark and dangerous for us.

A last glance through the binoculars to the horizon revealed a remarkable sight.

DID YOU KNOW?

The basking shark is found in temperate oceans in both the Northern and Southern Hemispheres. The largest recorded was over 12m long.

There were basking sharks as far as the eye could see; some close enough to see their tails as well as their dorsal fins; the more distant ones just a series of little black triangles making their eccentric clockwork patterns to and fro in the gloaming. Just how many there were in total was impossible to say, and for now it would have to

remain a mystery. We all knew it was time to leave, but we consoled ourselves with the thought that maybe tomorrow we'd find the shoal again. We turned north and headed for Canna, supper and sleep.

NINE YEARS AT SEA

The Wildlife Trusts' basking shark project has been surveying our seas for nine years to identify the key sites for surface-feeding basking sharks along the west coast of

Britain. We also examine the extent of any threats to the sharks at those sites, and come up with ways to reduce them. During the surveys, we have had our highs and lows – feast and famine. In 2002, we went for six weeks without sighting a shark, a most frustrating experience. But days such as this, out among one of the legendary big shoals, more than make up for the lean times.

So when we had finally anchored and bolted down dinner, some of the volunteers aboard bombarded me with questions: why do some areas of the sea offer such rich concentrations of food for the sharks? And how do the sharks find them?

Basking sharks are normally first seen in the western English Channel in late spring, when the Ushant front pushes a long tongue of warm oceanic water in to meet cooler inshore waters, causing upwellings. This area of mixing water layers is called the 'frontal area' and it brings nutrients to the surface, fertilising a super-abundance of phytoplankton. These micro-organisms are fed on by the shark's favourite prey, calanoid copepods. When conditions are calm, smooth plankton slicks develop along the interface of the warm and cool water, attracting the attention of hungry fish shoals, diving gannets and basking sharks.

Why do some areas of the sea offer such rich concentrations of food for the sharks?

Similarly, at certain key sites – Land's End, the Lizard, Coll, Hyskeir – a combination of strong tides, a rising seabed and rocky, uneven seabed topography physically replicates the mix of currents and nutrients, stimulating plankton growth and attracting the sharks to feed throughout summer and early autumn.

Up until recently, we could only study the sharks when they were visible at the water's surface. Very little was known about their movements, and where they go in winter was a total mystery.

However, groundbreaking work carried out by Dr David Sims and his team at the Marine Biological Association, using satellite tags attached to a number of sharks in the Channel and the Firth of Clyde, allowed scientists to examine the habits of the sharks throughout the year. The results showed that many of the tagged sharks spent considerable time in offshore waters, such as the Celtic Sea, areas that had not previously been considered prime shark territory. They also revealed that, where warm fronts meet cold water, the sharks ascend to the surface by

While feeding, basking sharks swim with sinuous movements, their bodies appearing more flexible than those of typical sharks.



Colin Speedie

WHERE THE BASKING SHARKS ARE

Evidence from tagging and photo records reveals that basking sharks tend to move from deeper areas in winter to frontal areas offshore in spring and summer, with more appearing in northern waters as the year progresses.

SEE BASKING SHARKS

Basking sharks occur around the western British Isles, but you get the closest sightings from a boat. Many boat operators offering shark-watching tours will have attended a WiSe training course, and so will have received guidance in sustainable watching techniques. For a list of accredited operators, visit: www.wisescheme.org

» 1. THE SOUTHWEST FROM THE SHORE:

Sharks are best seen from the Lizard peninsula south of Falmouth, but may be seen from any vantage point.

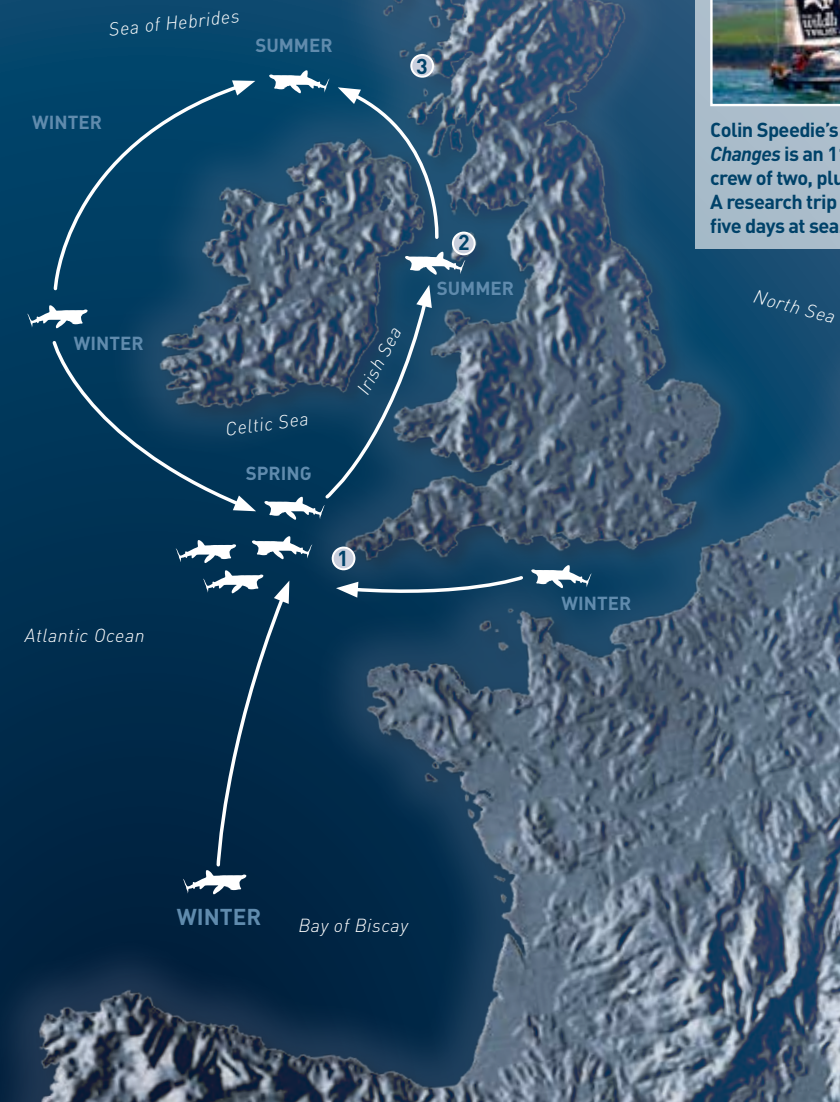
BY BOAT:
Falmouth: Orca Sea Safaris kingharryscornwall.co.uk/ferries/orca
Porthkerris on the Lizard: Porthkerris Divers www.porthkerris.com
Penzance: Elemental Tours www.elementaltours.co.uk or Marine Discovery www.marinediscovery.co.uk.

» 2. THE ISLE OF MAN

BY BOAT:
Peel: Manx Seafaris 01624 842731

» 3. SCOTLAND

BY BOAT:
Tobermory: Sealife Surveys www.sealifesurveys.com
Arisaig: Arisaig Marine. www.arisaig.co.uk

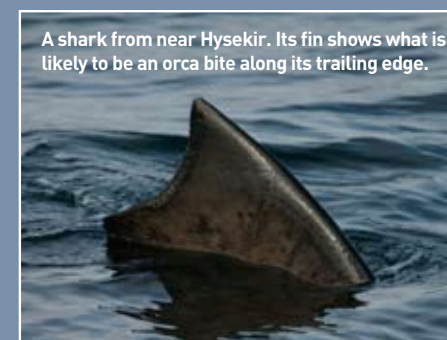


Colin Speedie's boat *Forever Changes* is an 11.7m cutter with a crew of two, plus five volunteers. A research trip usually comprises five days at sea.

EVERY FIN TELLS A STORY: HOW RESEARCHERS USE PHOTOGRAPHY TO TRACK SHARKS



A shark's dorsal fin showing damage probably caused by a boat propeller.



A shark from near Hyskeir. Its fin shows what is likely to be an orca bite along its trailing edge.



This shark's fin is easily distinguished by the large notch and clear blotches.

By taking images of the sharks, we can identify individuals from their unique marks and scars, particularly on their dorsal fins. This helps us to develop a population estimate for the species around

the UK. And if a shark is photographed again elsewhere, it gives us a clue to its movements. We can use all of this information to evaluate the level of human impacts on sharks through net marks or

collision scars, for example. Over 4,000 images of sharks are now on the Shark Trust's database. To take part in our photo-id study, or submit your own shark photos visit: www.baskingsharks.org

Photos by Colin Speedie

day and descend into the depths by night, mirroring the activity of their plankton prey, the reverse of what is thought to be their normal daily pattern. As a result, you have a much better chance of sighting a basking shark at the surface in one of these frontal areas than anywhere else.

And at last, the vexed question of the sharks' whereabouts and activity in winter has been answered. At the end of the summer, several of the sharks tagged in the Channel remained in continental shelf waters close to our shores, or migrated out to the shelf-break to the south and west of Ireland or the Bay of Biscay. Here, we believe they continue to forage for the copepods that make a similar migration into deeper water. The basking sharks show daily dive patterns from near the surface, down to more than 750m in some cases. They certainly don't hibernate, as some experts had hypothesised.

Dr Sims' work also showed that the sharks can and do forage over long distances if necessary. For example, one shark tagged off Plymouth made a migration of 1,878km in 77 days to the Hebrides. This may be because the sharks can detect productive frontal areas from huge distances away. The basking shark possesses a unique organ – the ampullae of Lorenzini (the pit organs on the nose) –

which contains a special gel that allows it to detect minute temperature differences as small as 0.001°C. Such thermoreceptivity is an important ability when your prey is so patchy and localised.

There may be other reasons why basking sharks find the key frontal areas so attractive. We have regularly recorded them engaging in courtship behaviour in these areas. Basking shark courtship comprises three or more sharks swimming slowly nose to tail, sometimes touching one another – and usually oblivious to our presence. Occasionally, when a courting group has passed close by, we've spotted a dozen or more sharks swimming in ranks beneath them, all locked in to the same slow, hypnotic dance.

DID YOU KNOW?

Basking sharks were hunted for their livers. Between 1945 and 2000, 105,000 basking sharks were killed in the northeast Atlantic.

We've also seen (and heard) breaching sharks, rolling over on to their backs as they clear the water before crashing down with a loud, percussive splash. No one knows why they do this, and it is when the sharks are at their most dangerous (see box, below).

I'd like to imagine that the sharks are drawn to these places for the same reason I am – they are magical in their own right. I truly believe them to be Britain's equivalent of the Serengeti or Pantanal. Like those places, there is an abundance of other wonderful wildlife to be seen here, in this case anything from seabirds

to baleen whales. Despite the many recent discoveries, I still feel there is an air of majesty and mystery about the basking shark, in keeping with its appearance in these lonely redoubts. And, having witnessed so many people's reaction to seeing their first shark, I believe I'm not alone. Most people are exultant on seeing dolphins, emotional around whales and laugh at sunfish. But with basking sharks they are all quietly awestruck, as though they can't quite believe that such primeval giants still exist.

HUNTING LOSSES

For us, after seeing such a massive gathering of sharks, the journey back to Canna had other, more sobering resonances. For it was on Canna that the first recorded shark fishery was based in 1766. And just 25km to the north east lies the derelict shark factory built by the celebrated wildlife author Gavin Maxwell – we had been sailing in the wake of these hunters all day. Basking sharks would be much more numerous today without the historic losses inflicted by this industry. Hearteningly, our observations show that the ratio of sharks greater than eight metres in length has increased over the duration of our survey, which might signal the first faint sign of recovery for the species.

Though the basking shark may now be a highly protected species, some less obvious but

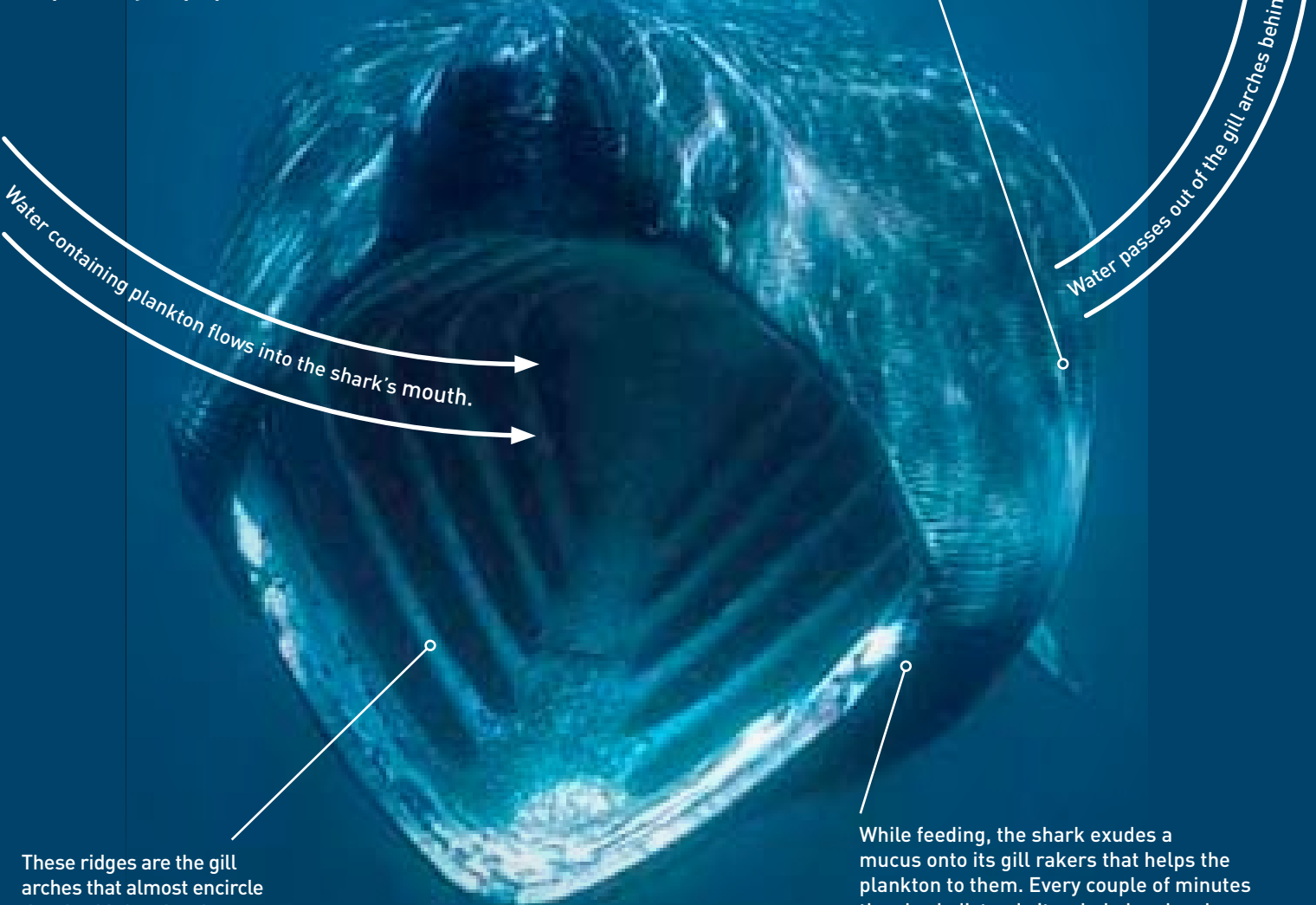
We had sailed in shark-infested waters, and not just survived to tell the tale but loved every minute of it.

serious threats remain. Sharks are regularly caught and killed in gillnets and, as leisure boating increases, there are more collisions with vessels in some of the busier areas. Fortunately, the shark's value as a magnificent spectacle and icon of the wild means that Britain is leading the worldwide conservation efforts. The WiSe scheme (see box, p49) is just one manifestation of our increasing respect for these giants.

When we left Canna the following morning, we realised that it wasn't just conservation that had spared the sharks from hunters – the weather must also have played a part. A lowering sky, drizzle and freshening wind meant that the sharks would not be feeding at the surface – we'd never find them again. But we couldn't complain. As a team, we had shared something that few people in Britain may ever experience – we had sailed in shark-infested waters, and not just survived to tell the tale, but loved every minute of it.

HOW BASKING SHARKS FEED

With its mouth open and swimming at two knots, a basking shark filters seawater through its gills, extracting various marine plankton species, especially copepods.



These ridges are the gill arches that almost encircle the shark's head and support the gill rakers.

While feeding, the shark exudes a mucus onto its gill rakers that helps the plankton to them. Every couple of minutes the shark distends its whole head and swallows a ball of mucus and plankton.

COPEPODS THE FOOD OF GIANTS

Copepods are energy-rich herbivorous crustaceans that are the main food source for many marine species, including herring, storm petrels and North Atlantic right whales, as well as basking sharks. In UK waters, the principal species are *Calanus finmarchicus* and *C. helgolandicus*. Reddish in colour, these creatures grow up to 3mm in length and feed on phytoplankton blooms, particularly where thermal or tidal fronts occur.

Copepods are spread throughout the world's oceans and may form the largest animal biomass on Earth. In deep open waters, they make a dusk ascent and dawn descent of up to several hundreds of metres through the water column, an activity known as diel vertical migration (DVM). Such behaviour may be linked to avoidance of visual predators such as fish. But in shallow frontal waters, this migration reverses, perhaps as a means of avoiding macroplankton

predators such as chaetognaths – marine worms that use touch to find their prey.

Copepods are not only a vital component of the oceanic food chain, but also play a major role in capturing carbon so that it cannot contribute to global warming. They absorb carbon from the phytoplankton they graze upon in the surface layers of the ocean and deposit it in deep waters as they respire, defecate and die.



A calanoid copepod – small but an essential link in the ocean's food chain.

10 METRES OF FLYING SHARK

Despite their colossal size and languid movements, basking sharks can rouse themselves to leap clear of the water. It has been suggested that this breaching behaviour serves to remove parasites from the fish's body. But it seems a phenomenal expenditure of energy. My colleagues and I believe that it may have more to do with the courtship that takes place at the same time.

Whatever the reason, when breaching starts, we move away as the sharks have little awareness of boats. Indeed, the only recorded incidence of a shark 'attack' in UK waters involving fatalities occurred when a breaching shark capsized a small boat in the Firth of Clyde in 1937, drowning three of the occupants.



Though basking sharks breach regularly, this is a very rare photograph of this behaviour.