

Rays set to stun

Marine Biologist

Matt Doggett reports on a project to survey undulate rays and their habits off the South Coast of England

Imagine swimming along slowly, eyes fixed on the seabed, your mind lost in a miniature world of detail and textures when suddenly the mud or sand beneath your face erupts in a cloud. Your heart flutters in excitement, or mild panic, as a magnificent ray lifts itself from its slumber and flies off into the distance.

For many of us in the UK, meeting a ray underwater might happen just once or twice a year; a quite rare and special event. So when you discover a site where you can be almost guaranteed to find rays in double figures, sometimes 20 or more in a single dive, you know you've stumbled upon something a little bit special.

A skate or a ray?

Skates and rays are essentially flattened sharks. They all belong to the same group of cartilaginous fish called elasmobranchs. The names skate and ray are used somewhat interchangeably although there are distinct biological differences. As a rule, skates lay eggs and rays give birth to live young. But, unless you're lucky enough to witness either event, you might need another clue.

General chat about rays can conjure up images of manta or eagle rays flying through open water and trailing their slender, whip-like tails behind them, sometimes bearing a venomous spine. Stingrays living on the seabed may have shorter, stockier tails... but the presence of a spine can still be a giveaway. Electric rays tend to have an overall rounder shape and also stocky tails.

Many of our 20 or so UK species – including thornback rays, blonde rays and undulate rays - are referred to colloquially as rays when they are actually skates. Skates have longer, more pointed snouts, more kite-shaped bodies and quite stocky tails with no venomous spines.

The thornback ray is one of the most common UK species, occurring throughout the British Isles. But beware, just because a ray has a thorny back, it doesn't make it a thornback ray. Blonde and spotted rays can also be easily confused, especially as the blonde ray often has more spots. A rarer sight is the small-eyed ray, cuckoo ray, marbled electric rays and the not-so-common, common skate.

Perhaps the most beautiful of all the rays found in UK waters, and the one we'll concentrate on here, is the undulate ray. An undulate's dorsal, or upper surface bears a design of spots and lines in an Aboriginal-style design, each one as unique as a fingerprint.

Above: Undulate rays are easily approached for photographs. If you are lucky you might find two or three together on the seabed

PHOTO: MATT DOGGETT



Above:
Kimmeridge Bay
and the Purbeck
coast

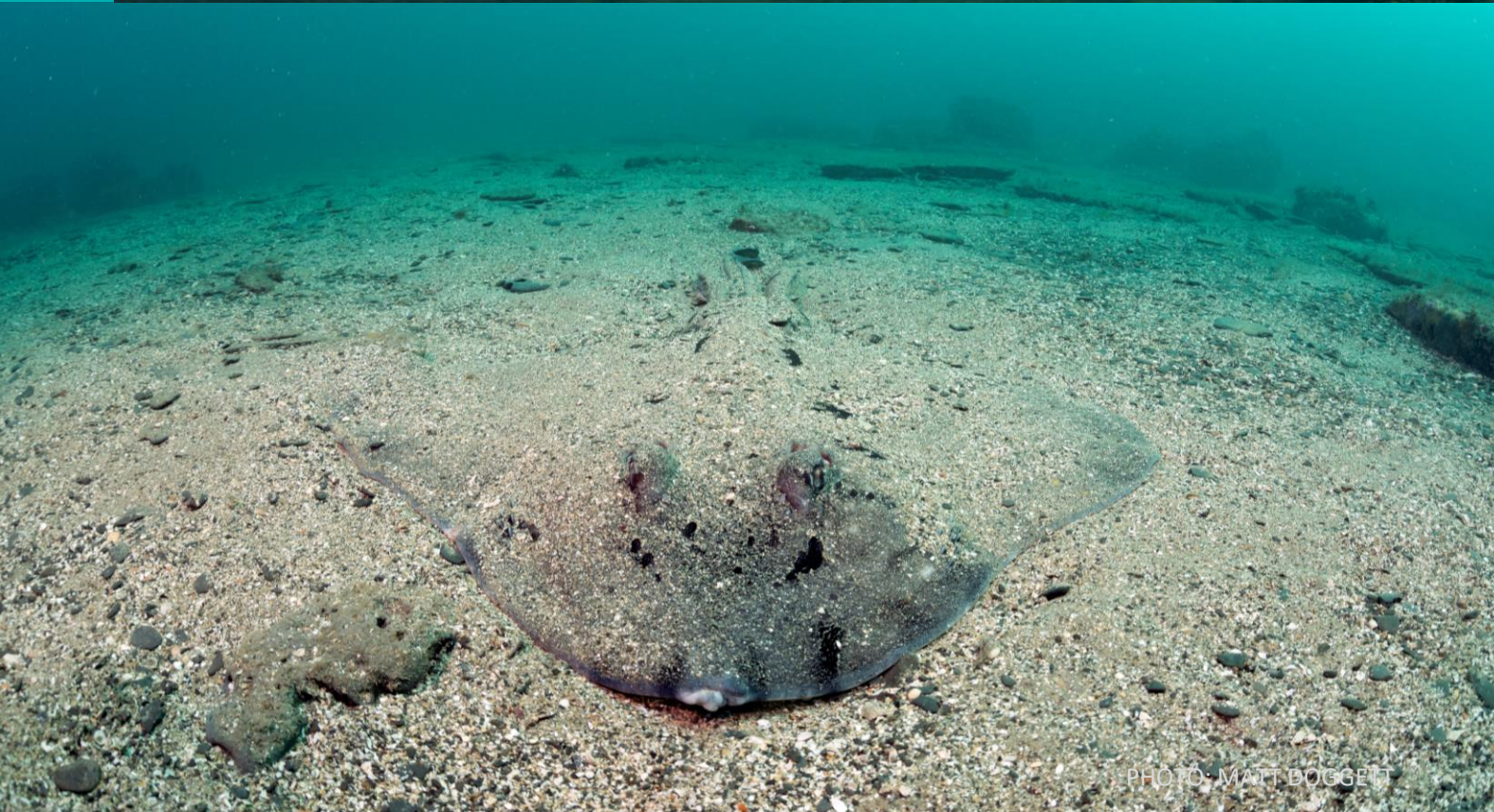


PHOTO: MATT DOGGETT

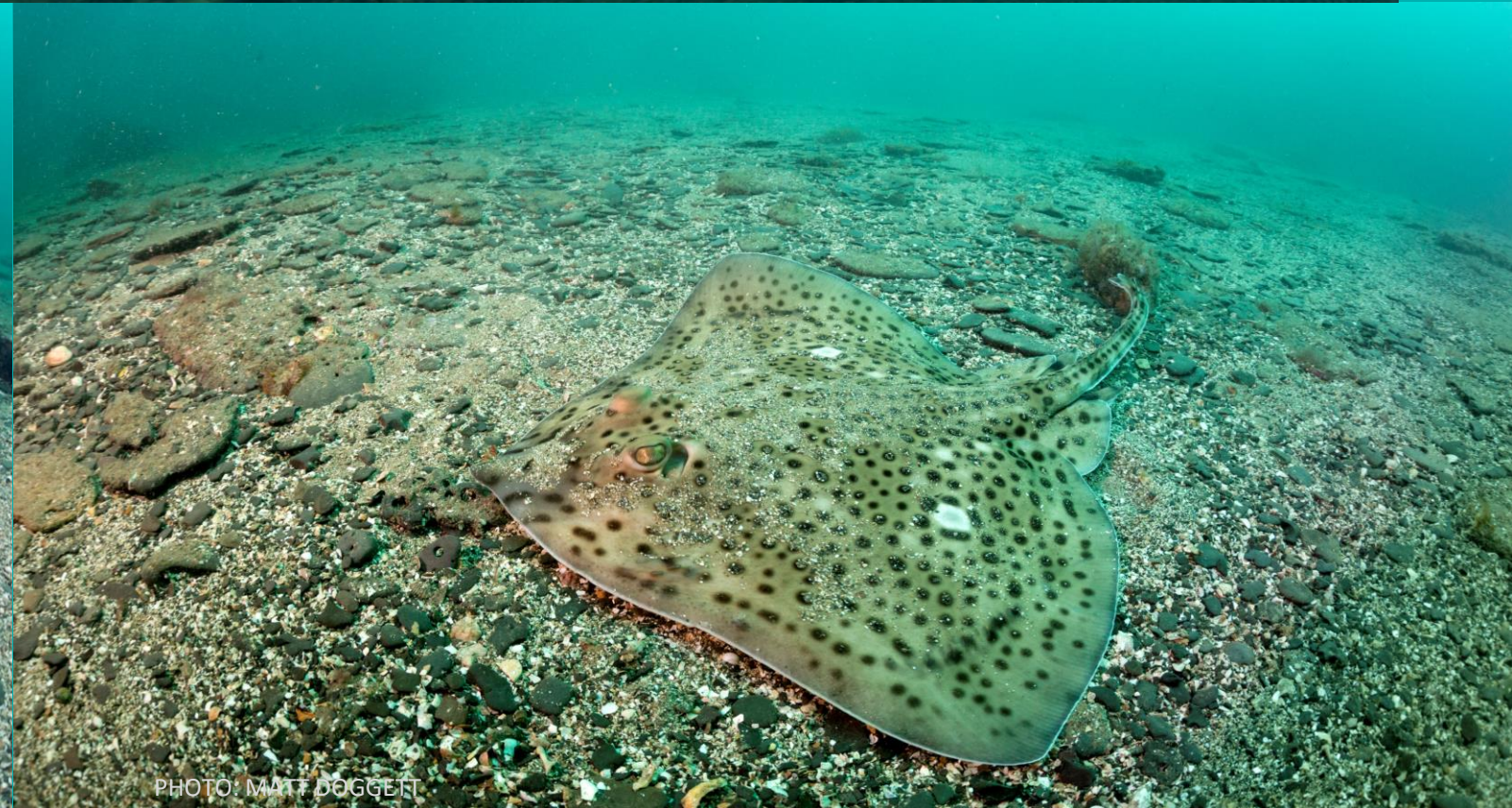


PHOTO: MATT DOGGETT

Above:
The ornate patterns of an undulate ray provide it with great camouflage against the Kimmeridge gravels

Ups and downs

Until recently, undulate rays were in decline, their recorded numbers having fallen by around 80 per cent since the 1980s. Globally, this ray is listed as ‘endangered’, while in European waters it is ‘near threatened’.

The species shows low dispersal habits, meaning that individuals do not move far from the population where they were born to the place where they settle and reproduce, which could hinder recovery of depleted, isolated populations, making them vulnerable to overfishing.

Undulate rays are known to live up to 13

years, but estimates suggest they could live up to 20 years. They do not mature, however, until seven to nine years old and individuals produce relatively few eggs – another factor making them vulnerable to overfishing.

Despite all this, undulate rays can be common at certain locations. Recent years have seen increased sightings and catches along some parts of the UK coast, including Dorset; as a result, since 2015 fishing quotas have been slowly reintroduced. However, a lot remains to be understood, about undulate rays, such as their breeding and migratory habits. The Undulate Ray Project (see box for

details), run by BSAC divers Martin and Sheilah Openshaw, has sought to expand our knowledge by making good use of all those spots and stripes.

Project Work

Back in 2012, Martin and Sheilah discovered a hotspot for undulate rays near Kimmeridge in Dorset. Ray sightings regularly hit double figures per dive as they explored the site. Being keen photographers, they documented these rays and their range of stunning patterns. The following year while reviewing his latest images, Martin had a sense of déjà vu. Based on a distinctive black spot

spot he realised he had seen one of these rays before. ‘Billy’ was duly named and the idea of identifying individuals was born.

At first, individual rays were identified by eye. Each ray’s unique pattern is almost symmetrical and comparison of a handful of fish was simple enough, but it became a painstaking task, open to potential mistakes, as numbers increased. The discovery of freely available software called Wild-ID was a game-changer. Wild-ID uses computer algorithms to match the spot patterns of individual fish and determines the probability of an exact match. The software is similar to that used by scientists to

Above: Spotted rays can be quite shy. Getting close to them requires some patience.

PHOTO: MATT DOGGETT

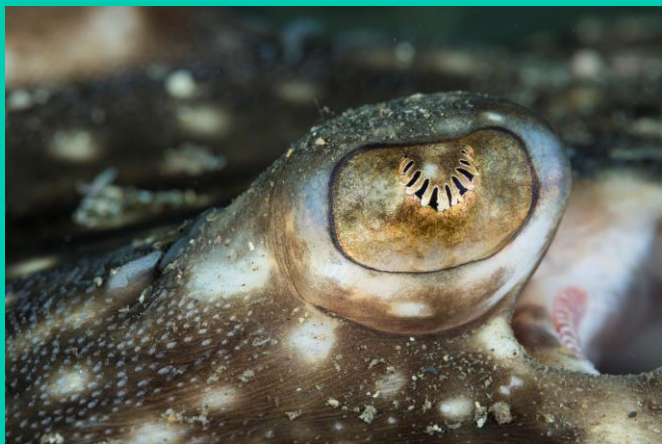


PHOTO: MATT DOGGETT



Top: A ray's eye in the camera's viewfinder

Above: A well hidden ray camouflages itself on the shingle seabed

Bottom: Thornback rays can also be found on the undulate ray site, but in much lower numbers

identify whale sharks, which migrate over thousands of miles of open ocean.

But Martin and Sheilah's goals were a little more local. They wanted to know whether other rays returned to the site year after year, or was it just Billy. And was the same thing was happening in other locations along the south coast of England? By enlisting help from other divers and sea anglers, they have built a photo database of more than 700 undulate rays seen between Start Point in Devon to the west of Kimmeridge, and Selsey Bill in Sussex, to the east.

At Kimmeridge, around one-third of the rays have been recorded on the site more than once, often two or three years apart. This might not sound a lot but considering that the site where the rays are photographed is only the size of a football pitch (say 100m by 70m) these numbers are pretty high. The results show a remarkable ability of the rays to return to the same the area of seabed time and time again.

Similar repeat sightings have been made at Chesil Cove, Burton Bradstock, Swanage and from Boscombe Pier in Bournemouth, all in Dorset. Together these patterns illustrate a degree of site-fidelity by individual undulate rays, which is essential information for devising successful conservation measures.

It's all in the genes

Undulate rays are found from as far south as Morocco and the Mediterranean north to the English Channel and the coast of southern Ireland. This makes southern Britain very close to the species northern limit.

Given undulates patchy occurrence in the English Channel, low dispersal tendencies and the decline in numbers, there could be implications for the species' gene pool if populations become

isolated. A smaller gene pool could prevent adaption to environmental change or cause individuals or populations to be more susceptible to disease.

Samantha Hook is a geneticist at Manchester University who studies undulate rays throughout Europe. Her work aims to understand the species' genetic makeup to assess the impacts of overfishing. Sam heard about the Undulate Ray Project and saw it as a unique opportunity to develop a method

Right: Once taken, the sample is bagged and photographed

Below: AN undulate ray poses for photographs



PHOTO: MATT DOGGETT

SCUBA

PHOTO: MATT DOGGETT

SCUBA

PHOTO: MATT DOGGETT

to gather non-intrusive DNA samples from the fish. Often samples can only be collected from fish trawled up or caught on rod and line.

Undulate rays are rarely skittish. They can be approached by divers with ease and will tolerate attention far more than other rays. This makes the process of taking ID photos and DNA swabs from the slime on their skin quite an easy task. Add to that the high densities of rays on the Kimmeridge site and Sam was able to sample plenty of fish on each dive.

Early DNA results have confirmed a high level of relatedness of the Kimmeridge rays, which further signifies the importance of protecting local populations which stay faithful to certain sites. Overall, the project has demonstrated how divers with a strong knowledge and understanding of their local sites can contribute to scientific research and conservation policy, with impacts at the local and hopefully wider level.



PHOTO: MATT DOGGETT

The known unknowns

There’s still more to discover about Dorset’s undulates and how they use the local coast. At Chesil Cove, for example, they can regularly be seen feeding during the night: search YouTube for Colin Garrett’s excellent video footage of this.

Juvenile rays can often be found in sheltered bays along the Dorset coast. These are important nursery areas for them to hide and feed, and old egg cases, or mermaids’ purses are often found washed ashore. We don’t know why so many rays congregate at Kimmeridge. Some have even been recorded together in the same pairs over different years, making us ask do they have BRFFs (best ray friends forever)?

Maybe they use the site to rest up during the day, or to feed, or to breed? We have yet to find live egg cases to confirm breeding areas and haven’t yet dived the site at night. And it’s not just undulates we see, the site is also popular with spotted, thornback and small-eyed rays, albeit in lower numbers. Some of these individuals have also been seen repeatedly on the site.

This exciting stretch of coast continues to yield new discoveries and throw up more questions each year. We’re certainly looking forward to what next season has to offer.

Below left:

Undulate ray patterns can look like Aboriginal art

Below: This ray was named ‘Al’ owing to its ‘Scarface’ appearance

Bottom left: Team members Martin. Sheilah, Sam and Matt receiving the Highly Commended BSA-JT certificate for the Duke of Cambridge SCUBA Prize at Kensington Palace from HRH Prince William



PHOTO: SHEILAH OPENSHAW

Spread the rays

To find out more about the methods used and the findings of the Undulate Ray Project, visit www.undulateray.uk. The project team is grateful to the British Sub-Aqua Jubilee Trust for funding part of the work. The project received a Highly Commended recognition in 2018 from the Duke of Cambridge Prize, which recognises outstanding achievements in research each year.

If you find old, empty ray egg cases washed up on the shore, or while diving, you can record your find with the Shark Trust’s Great Eggcase Hunt and improve our knowledge of the important places for rays around our coast. www.sharktrust.org/en/great_eggcase_hunt



PHOTO: SIMON ROGERSON