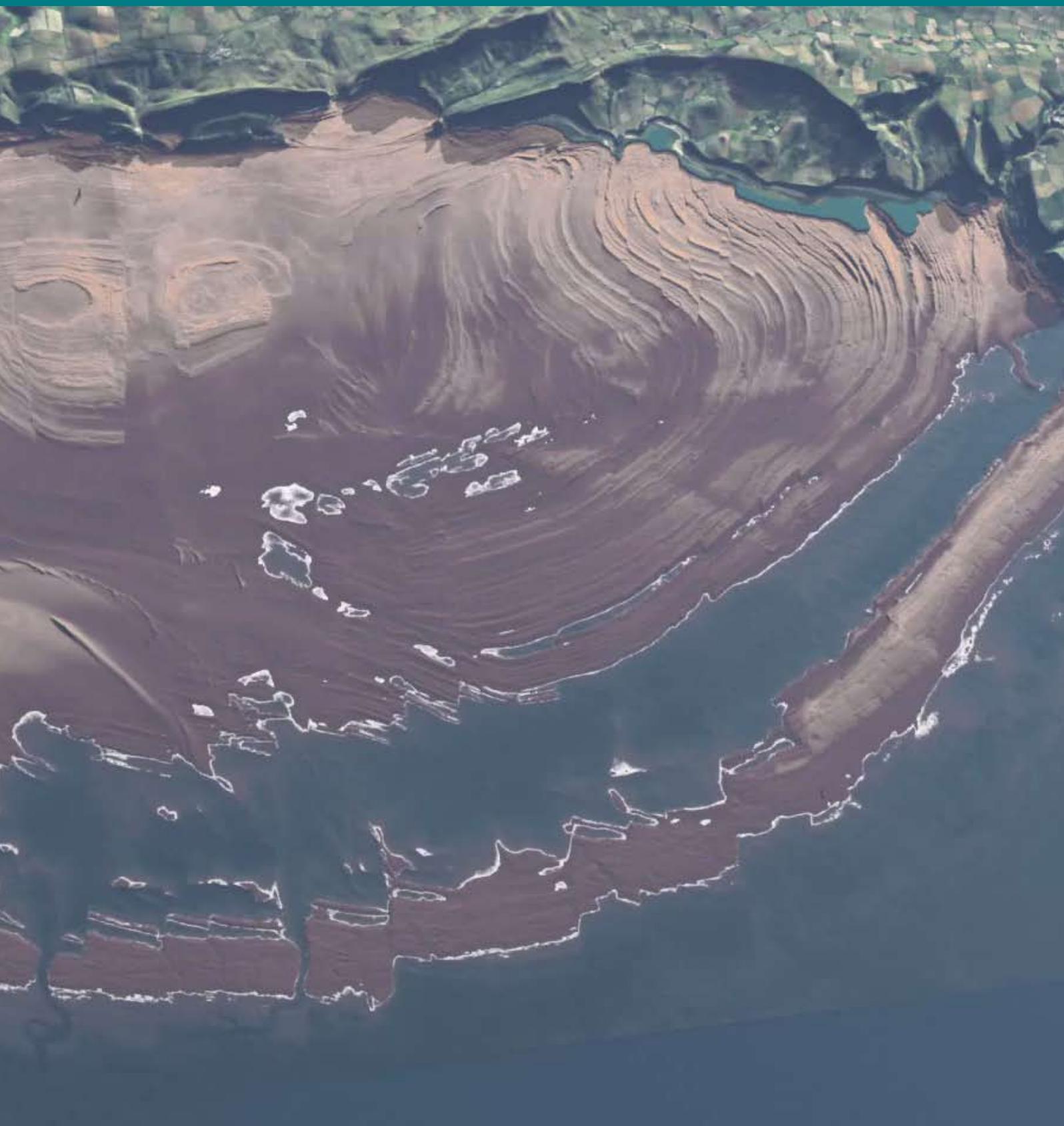


DORIS

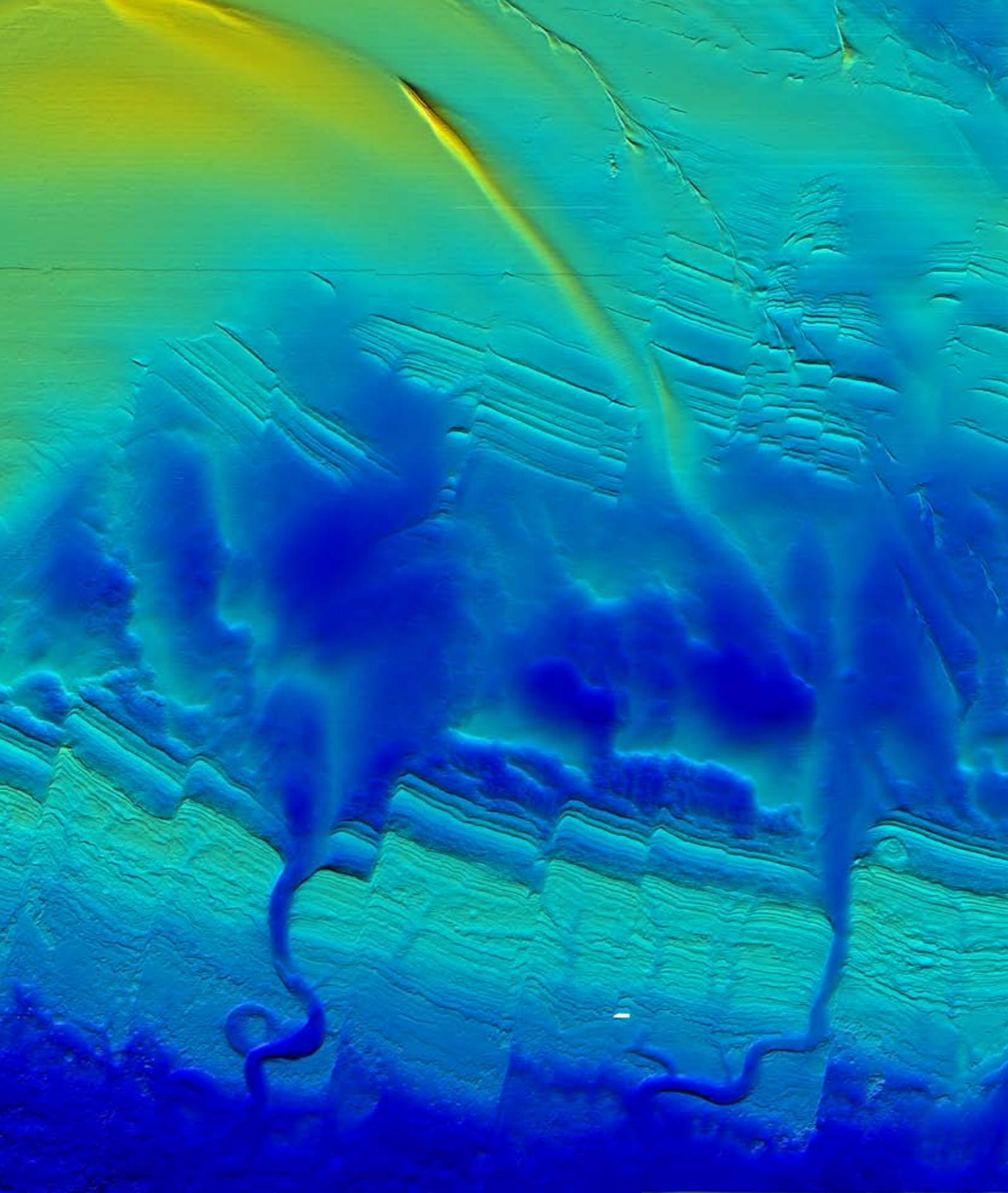
Dorset Integrated Seabed survey

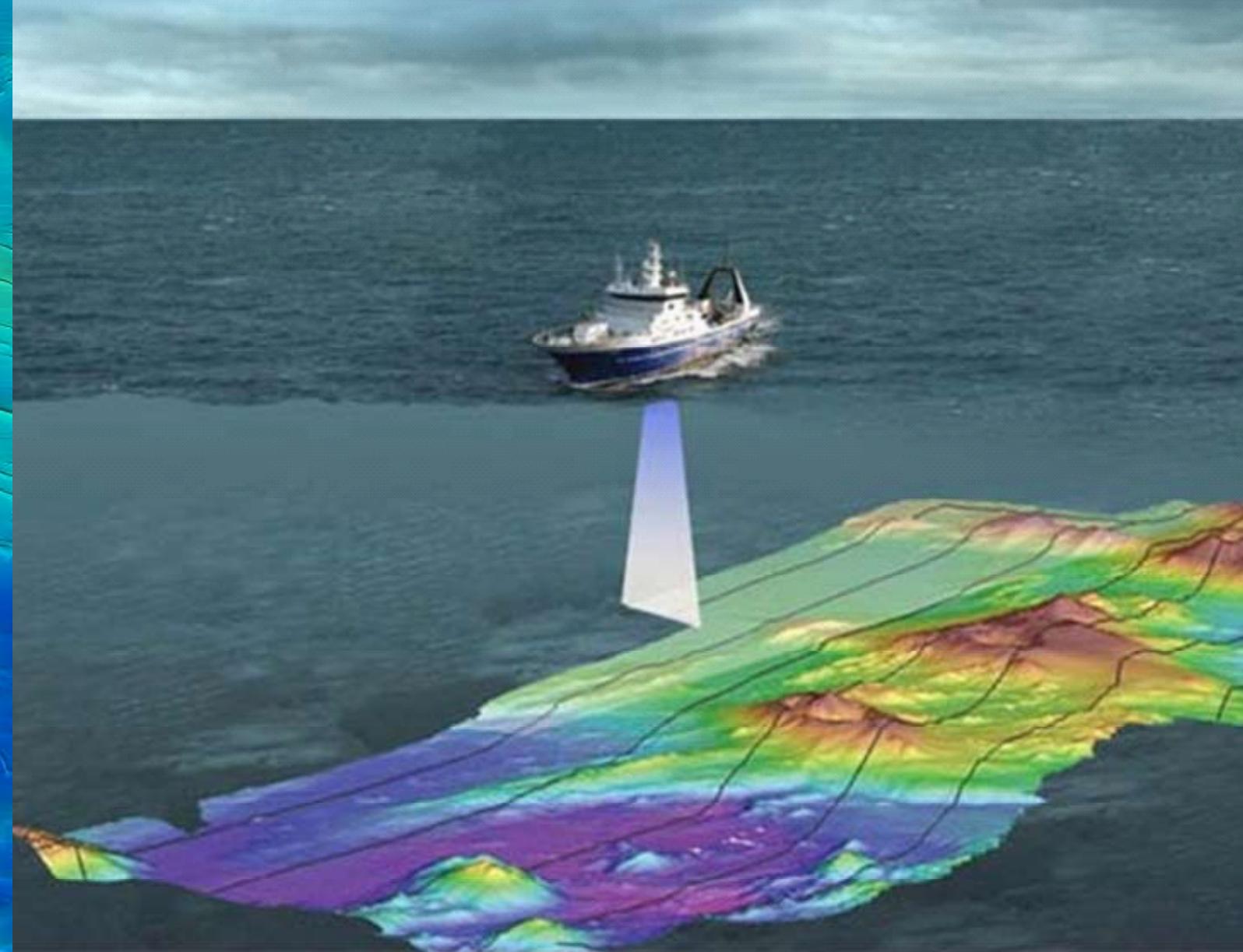


Part of a nationwide network of Wildlife Trusts

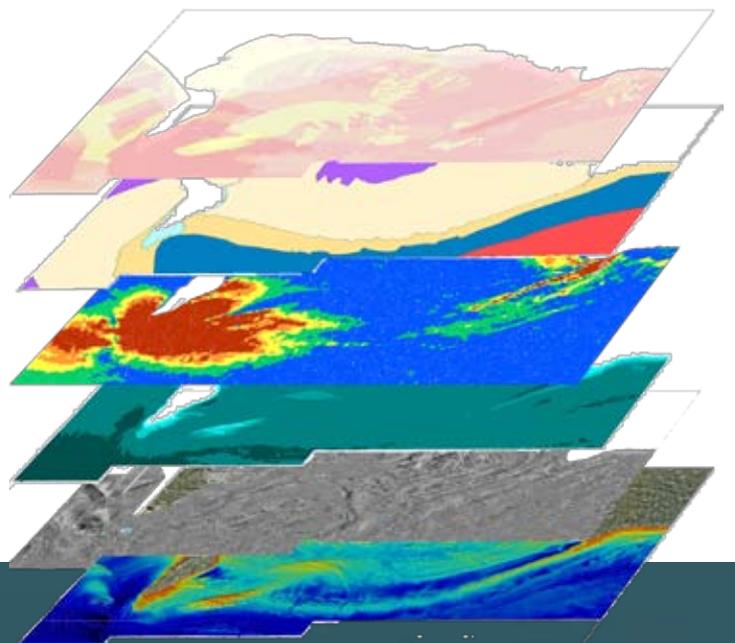


Protecting **Wildlife** for the Future

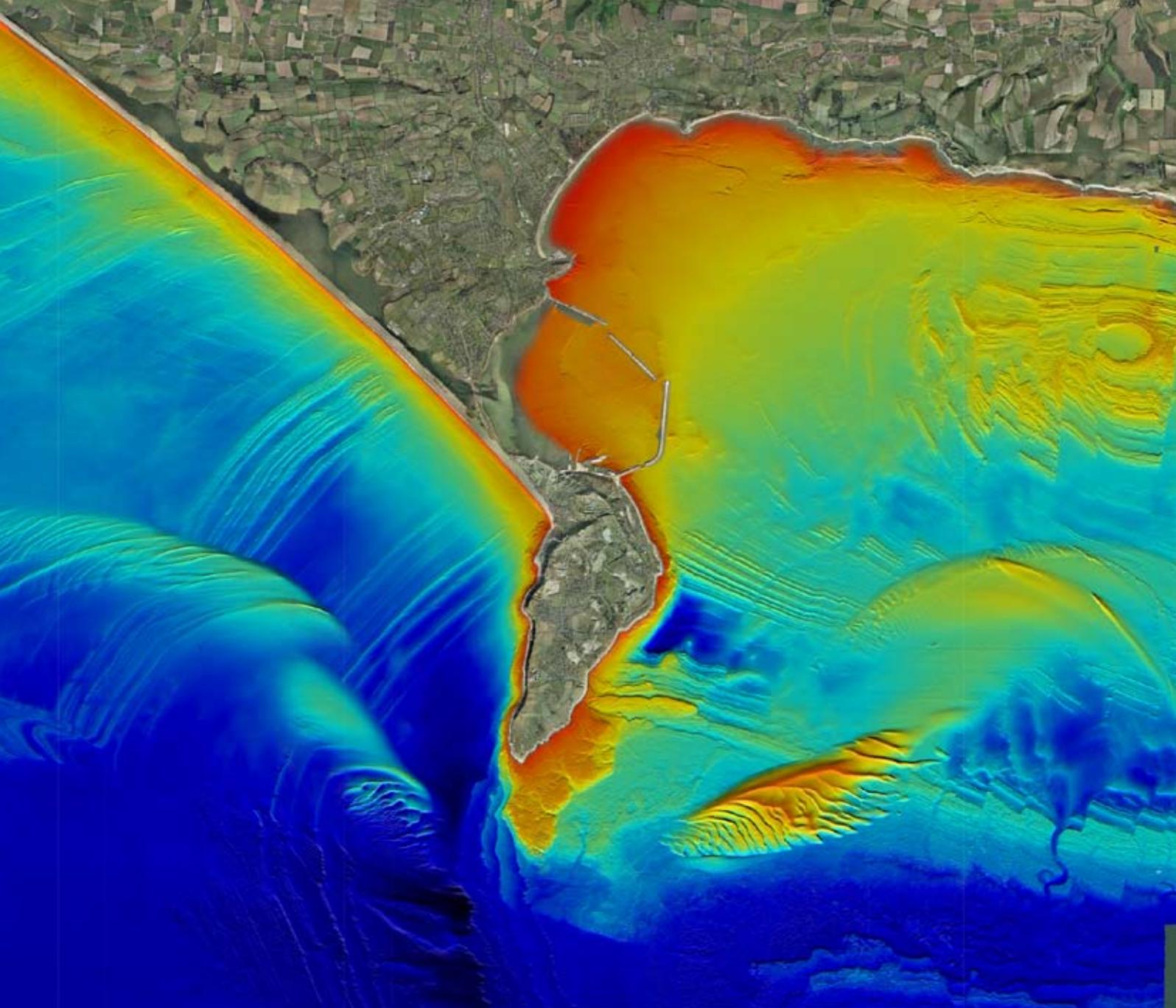




DORIS (DORset Integrated Seabed survey) formed the key initiative within Dorset Wildlife Trust's (DWT's) Living Seas programme between 2008 and 2011, greatly improving our knowledge of Dorset's marine environment. The project was carried out as a partnership between DWT, the Maritime and Coastguard Agency (MCA), Channel Coast Observatory (CCO), the Royal Navy and Viridor Credits, which enabled the project through a major grant of £300,000



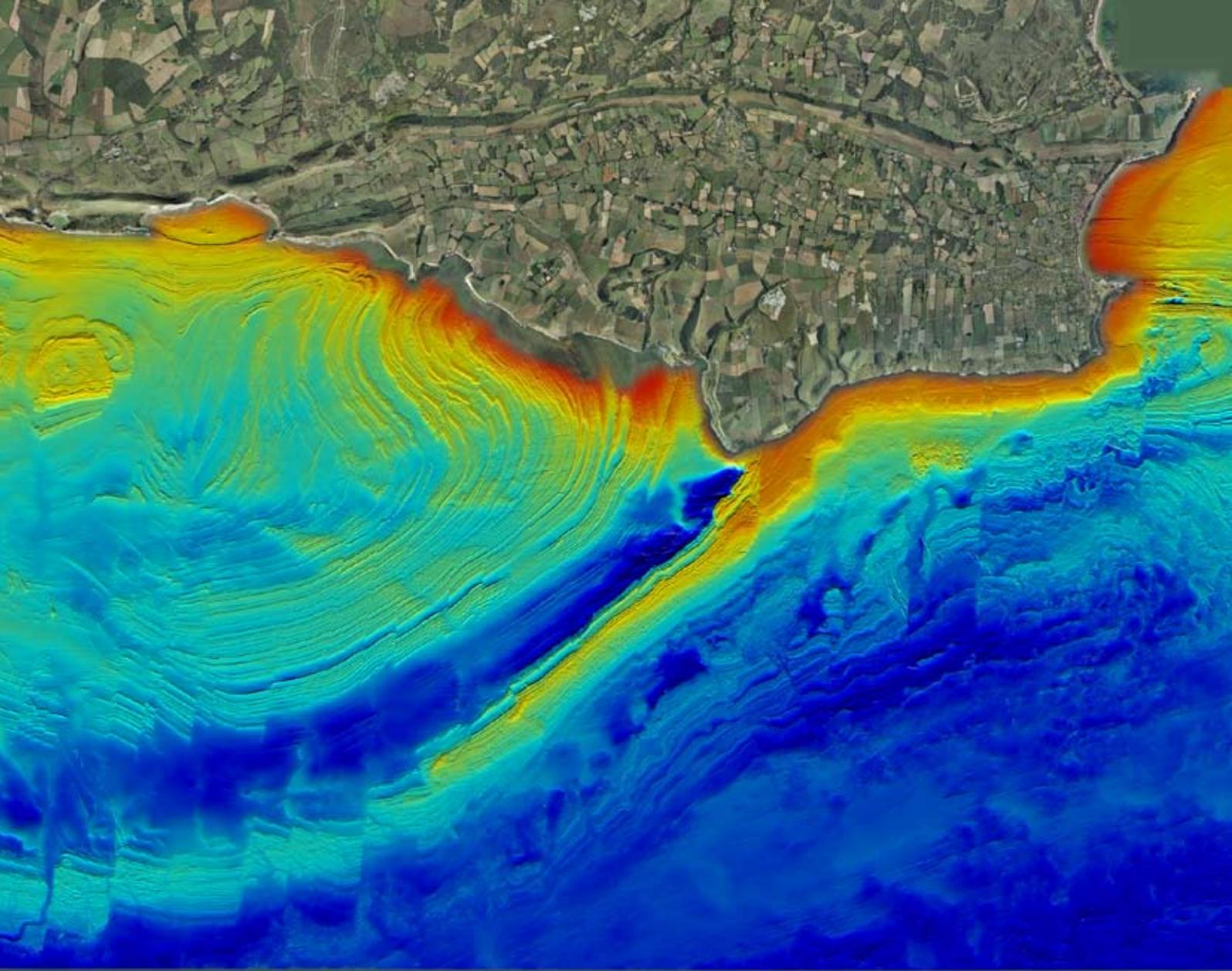
Opposite: Palaeo-river channels revealed by DORIS in Weymouth Bay



Over 800km² of seabed have been surveyed in great detail to reveal the undersea landscape and over 3,300 photographs and 55 hours of video covering 85km of seabed have been collected and analysed to match seabed communities to the physical features. On the way we have discovered ancient river-channels carved into rock ledges during the last ice-age and been able to link complex geological fault patterns visible in the seabed geology with known structures in the World Heritage “Jurassic Coast”.

This superior knowledge of the seabed and its wildlife was pressed into service almost at once. The promise of a detailed seabed habitat map enabled Dorset Coast Forum to win EU funding for C-SCOPE – a marine planning project for Dorset. DORIS data, and the iconic images that came from it, featured strongly in this project, which completed in summer 2012. It is notable that the south coast was selected for the second round of statutory marine planning by the Marine Management Organisation (MMO) shortly after C-SCOPE was completed.





The project was extremely timely as two MPA selection processes made great use of the newly acquired data. The final boundary of the Studland to Portland reefs Special Area of Conservation was drawn using DORIS data and the ground-truthing data provided valuable and high quality supporting evidence for the proposed internationally protected site. A number of recommended Marine Conservation Zones (MCZs) were also strongly influenced by DORIS – the inclusion of Stennis Ledges and Portland Deep in particular. Nearly 50% of the area covered by DORIS has since been either designated or recommended for designation as a Marine Protected Area

Perhaps the greatest legacy of the project is the step-change in understanding that has taken place as a result. It is difficult to remember how little we used to know about the seabed in Dorset and easy to take for granted that we can now readily visualise the reefs, ridges, sandbanks and shoals that have already become familiar landmarks.

The project grew out of the increasing need for more and better seabed habitat data as conservation organisations, including the Wildlife Trusts, were calling for a radical change in how we manage the marine environment. The UK government was consulting on its Marine Bill (to become the Marine and Coastal Access Act 2009) and the lack of reliable marine environmental data was being highlighted as a significant issue for the future. Dorset Wildlife Trust had been collecting seabed records in the county using volunteer divers for over a decade, building up a picture of a rich and varied undersea landscape, but these dives were limited to the shallower, more coastal waters and any dives undertaken in new areas were effectively “blind”, with limited chance of discovering new areas of interesting or valuable habitat. A much more detailed understanding of the seabed was needed in order to better target such survey effort.

Several countries were beginning to use multibeam echosounder surveys to map large areas of seabed – the technology was stable and well understood and, though ship time was still expensive, the idea of county-scale seabed mapping was now feasible.

The project was driven by need but spurred by the opportunity offered by Viridor Credits flagship Biodiversity Award, offering a one-off £0.5M award for a high-profile, biodiversity project. Ultimately, DORIS failed narrowly to win the award but was offered a consolation prize of half the amount, with a year to find the additional funding necessary to complete the project.

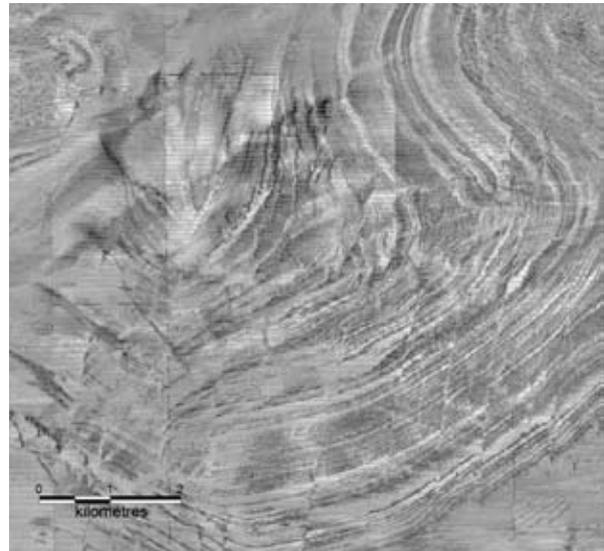
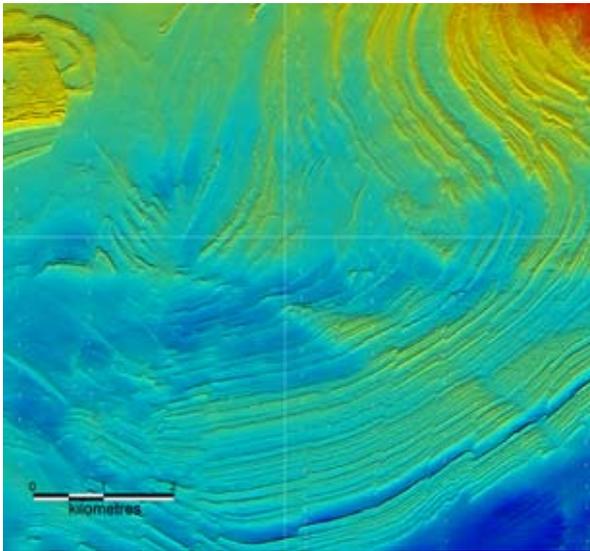
This turned out to be a blessing in disguise. Rather than dash out to hire a survey vessel, DWT began looking for partners and soon found that it was not alone in wanting detailed seabed data. The Maritime and

Coastguard Agency (MCA) had pencilled in almost half of the proposed DORIS area as part of the Civil Hydrography Programme (CHP), the Admiralty Chart for that area being in need of updating. The MCA had recently switched to using full cover multibeam echo sounder survey as the preferred tool for hydrographic surveys, which meant that the data they collected could be used for seabed habitat mapping. It also meant that any multibeam survey work commissioned by DWT could be used for updating charts, as long as it was collected to a minimum standard and it soon became clear that there were many advantages to working together and sharing data.

Two further organisations were also wanting to gather seabed data in the area. The Channel Coastal Observatory had funding to survey the coastal strip from low water mark out to 1km in order to inform coastal engineering decisions and the Royal Navy were planning to survey Weymouth Bay and Portland Harbour – prior to the 2012 Olympic sailing events.

An agreement was drawn up between DWT, CCO and MCA to pool funding to extend the original MCA survey area to cover the inshore strip and west to Abbotsbury and to share data. The Navy passed their data from Weymouth Bay on to the CHP, making it also available to the partners. This resulted in a single large block of seabed data being available for habitat mapping purposes. The remainder of the DORIS project funding was then used for an extensive ground-truthing survey which could be planned efficiently using the results of the hydrographic survey. The advantages of such partnership working, demonstrated by this project, have since been widely recognised and there is now a pan-government agreement to work co-operatively on hydrographic surveys, avoiding some costly previous duplication.

TECHNICAL DETAILS



Sample of multibeam data processed to show seabed relief (left) and backscatter (right)

MULTIBEAM BATHYMETRY

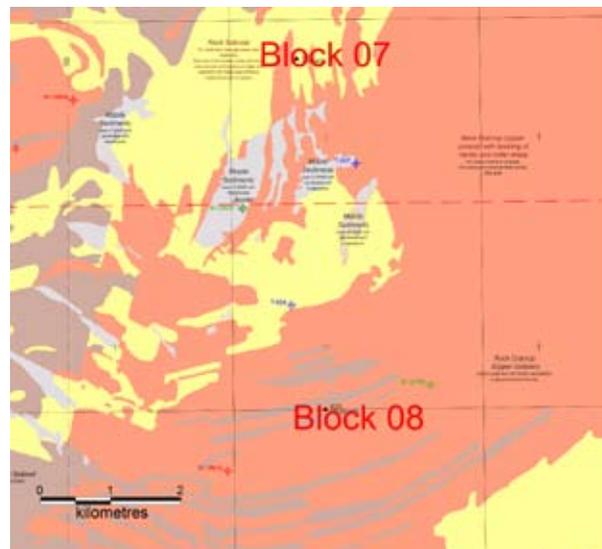
Swath bathymetry and co-registered backscatter data was collected across the DORIS area during 2008 and 2009, with a total coverage of over 800km² from the mean low water mark up to 20 km offshore. The data were acquired to IHO (S-44: 2008) Order 1a standard and were collected from four different survey vessels.

The final data set was quality controlled and converted to OSGB36/Ordnance Datum Newlyn by the UK Hydrographic Office (UKHO). The full dataset is available to download in 1m grid files from <http://www.channelcoast.org/> and can be viewed in Google Earth at www.tinyurl.com/dorismap

MULTIBEAM BACKSCATTER

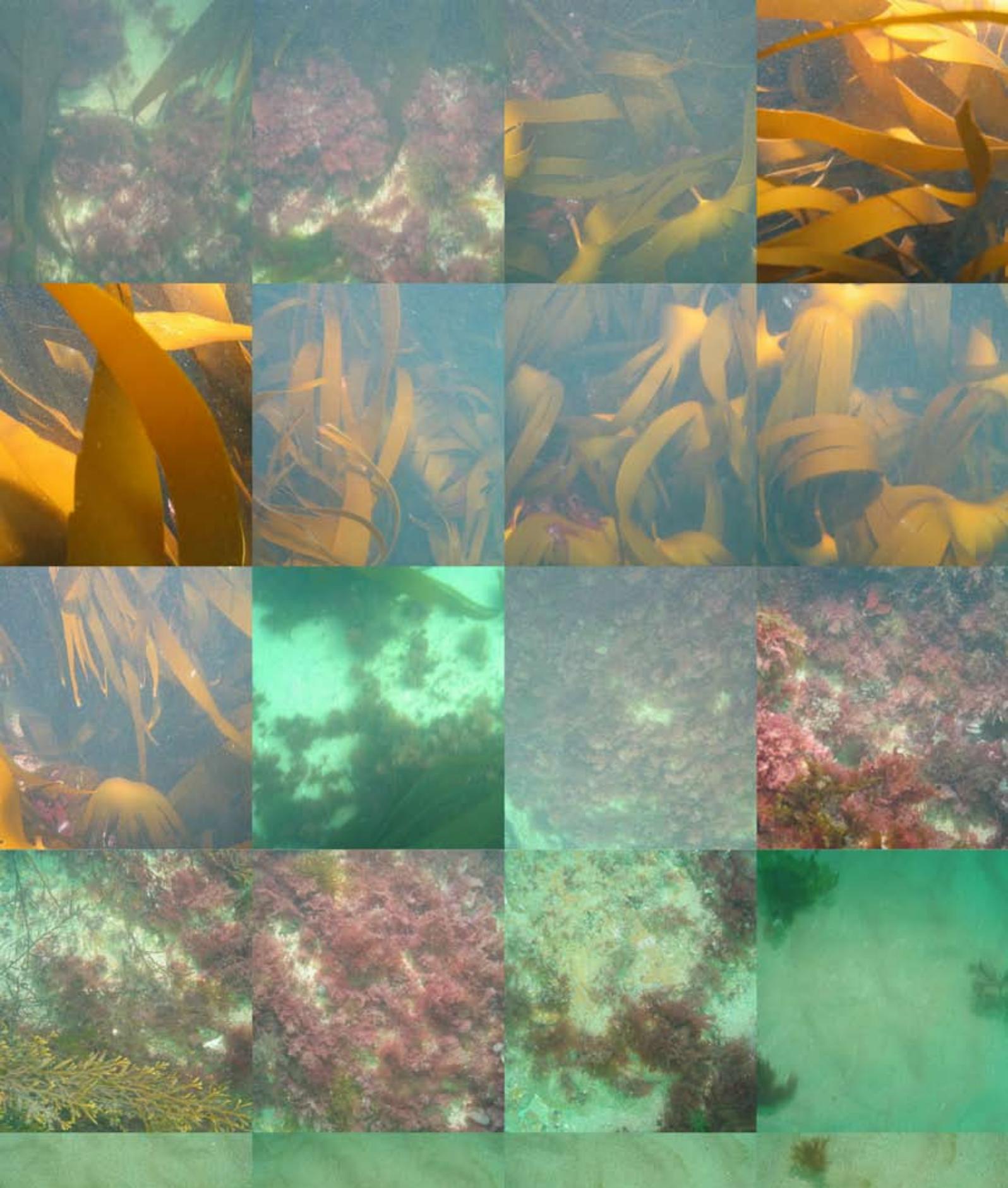
Backscatter data were processed by staff and researchers at Southampton University using the software programmes PRISM and ERDAS.

The datasets were sub-sampled from the original acquired bin size of 0.1m to 0.25m to reduce the large file sizes (total data volume was still 21 Gb). The final image was added to the master GIS for integration with the bathymetric layers.



Sample of seabed texture sheet derived from backscatter and bathymetry data (UKHO)





DROP-CAMERA AND ANALYSIS

The drop-down camera survey work was undertaken from June to September 2009 with all survey operations conducted from Seastar Survey's survey vessel 'Mariner'.



Drop-camera frame on the deck of survey vessel "Mariner"

Camera survey tracks were chosen after scrutinizing the multibeam bathymetry and backscatter data and consulting available literature and records from the area. The camera survey was designed to cover as many of the different environmental and physical features as possible that had been shown by the bathymetric survey.

High definition video cameras and a digital stills camera, mounted on a steel frame, were lowered to the seabed. The camera frame was drifted slowly above the seabed - a live feed from the forward-looking video camera enabled those on board the survey vessel to monitor the progress of the cameras on the seabed and allowed for still photographs of interesting features to be taken at will.

Differential GPS was used to track the vessel's position and allowed the individual photographs to be accurately geo-referenced. All 3000+ seabed images have been catalogued and made available on-line via Dorset Wildlife Image database. Images are

searchable by species and biotope, providing a great resource for conservationists, managers, marine biologists, students and the interested public. <http://54.247.90.217/RS>



Photo from transect B01, showing previously un-recorded seagrass bed

GRAB SAMPLES

Sediment samples were taken in December 2009 using a 0.1m² van Veen grab. Grab samples were taken at 22 locations in the DORIS survey area. The grab sites were selected to represent the different sediment types indicated by the multibeam data and seabed video footage and to collect additional data for the biotope classification



Grab sample

process. The sediment sampling programme was established subsequent to the drop-down camera survey to allow a full assessment of the seabed environment prior to selection of sample locations.

Initially 45 locations were selected, concentrating on soft sediments from sandy gravel to muddy sediments. Some of these locations were subsequently found to consist of coarse material not suitable for sediment sampling or in areas too restricted in size (surrounded by rocky outcrops) to allow sampling to take place.

Samples were analysed for particle size and any faunal species were sieved out and identified at the laboratory.

SEASEARCH

Seasearch is a volunteer diver project using trained recreational divers to collect species and habitat information during their dives. Seasearch in Dorset has been operating since 1995 but from 2009 onwards, divers were able to use the DORIS bathymetry data to target dive new dive sites, making the diving more efficient but also more rewarding and enjoyable for those taking part.

Seasearch diver recording gravel sea-cucumber gardens near Dancing Ledge



OUTCOMES AND LEGACY

C-SCOPE

C-SCOPE was a three-year cross-border (UK and Belgium) project looking at planning in the marine and coastal environment. The aims of the project were to:

- Develop a marine plan for an area of sea and coast.
- Develop coastal management tools.
- Engage with stakeholders on coastal zone management.

The DORIS seabed data and habitat maps formed an integral part of C-SCOPE Dorset and contributed to all three aims. A copy of the maps on USB flash-drive were issued to all C-SCOPE participants at the final conference in summer 2012. The Marine Management Organisation – tasked with preparing marine plans for all regions in England, took a keen interest in C-SCOPE and chose to begin the full marine planning process in the south coast in 2013.

Marine Protected Areas

As an example of the fortuitous timing of DORIS, not one, but two marine protected area initiatives arose during or shortly after the project.

PORTLAND TO STUDLAND SPECIAL AREA OF CONSERVATION

In early 2010 Natural England (NE) began a public consultation on a number of proposed marine SACs around England to meet the requirements of the European Habitats Directive. This included the Poole Bay to Lyme Bay draft SAC for reefs and sea-caves. Parts of this mosaic site overlapped the DORIS area (see map) and DWT were able, during the consultation, to provide significant new information on the extent and quality of reef habitat within and near the proposed boundary. Following the consultation NE decided to split the proposed site into a



Map showing Studland to Portland cSAC (green) with original proposed boundary overlain in white. DORIS “rock” layer in grey

Lyme Bay/Torbay reefs site, which has since been submitted to Europe, and a Studland to Portland site, which was significantly revised following the consultation and merited a second round of consultation. The revised boundary included considerably more reef habitat than previously, thanks to the strength of the evidence provided by DORIS. This evidence was later tested during an independent review of the site selection process and found to be sound, primarily thanks to the quantity and quality of data provided by DORIS. The Studland to Portland SAC was submitted to Europe in the autumn of 2012 and is now to be considered as a protected site.

MARINE CONSERVATION ZONES

The 2009 Marine and Coastal Access Act provided for the creation of “an ecologically coherent network “of marine protected areas around England and Wales. In England that included the selection of marine

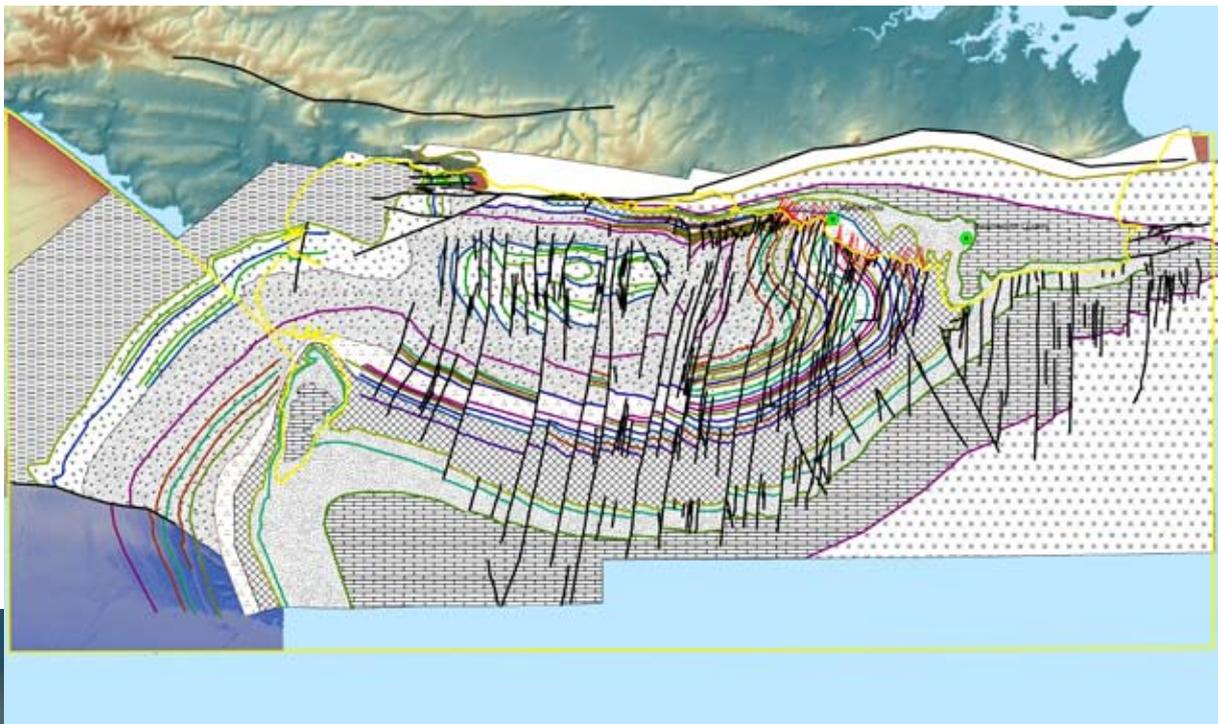
conservation zones to be selected by four “regional MPA projects”. In the southwest, Finding Sanctuary (FS) filled that role and spent four years developing a recommended suite of MCZs. All DORIS data were made available to the local FS group and the wider FS project and 4 of the 8 recommended sites in Dorset are within the DORIS area. Following the completion of the regional MPA projects each of the recommendations were assessed by NE and the Joint Nature Conservation Committee (JNCC) - again making use of DORIS data to demonstrate the level of evidence of the extent and quality of conservation features within the recommended sites. The influence of DORIS is clearly visible in recommended sites such as Chesil Beach and Stennis Ledges rMCZ (where the seaward extension covering the ledges matches the feature depicted from DORIS) and South of Portland rMCZ, covering Portland Deep



Map of recommended Marine Conservation Zones suggested for Dorset

GEOLOGY

The amount of geological information obtained from DORIS was an unexpected bonus. Much of the seabed is swept clear of sediments or covered only with a fine veneer of sediment, such that the underlying geological structure is clearly visible. Individual rock ledges can be traced back to strata on the shore or in the cliffs and a large number of faults are apparent on the seabed. As well as helping to understand the geology of the World Heritage “Jurassic Coast”. This extends the story of the “Jurassic Coast” World Heritage Site beyond the cliffs and out to sea and detailed analysis of the exposed geology has been undertaken by researchers at Southampton University. One of the biggest surprises was the presence of clearly defined river channels in the Portland stone ridge running across the study area – covered by sea for 12,000 years but still very visible on the seabed today (see inside front cover)



Interpretation of seabed geology - University of Southampton

VISUALISATION/OUTREACH

Perhaps the biggest difference DORIS is going to make locally is the change in how we relate to the seabed. The high resolution of the bathymetry data and its free availability offer unrivalled opportunities to “peel away the sea” and reveal Dorset’s undersea landscapes to a wide audience. The relentless march of computing power and software can be harnessed to create visualisations that would have been unfeasible only a few years ago. As well as viewing stunning static images of seabed features, we can now “fly” along virtual underwater cliffs and over virtual sandbanks. The DORIS seabed data can be served up on desktops and phones using web-based mapping facilities such as Google Earth, OpenLayers etc. The 2012 Olympic sailing events in Weymouth provided a unique opportunity to show off a 360° panoramic animation diving into Portland Deep, cruising over the Shambles and swimming across Lulworth Banks on a 21m diameter 360° screen – a truly “immersive” experience. The images running across the bottom of these pages are stills taken from the 360° animation.

The DORIS map and animation are now available in an interactive display at the re-developed Chesil Beach Centre, managed by



ICCI 360 dome at London 2012 Games - Weymouth

DWT, which has had approximately 15,000 visitors in the first four months of opening. DWT has also produced a poster showing the DORIS map, which has already sold xxx copies. Viridor Credits has been credited throughout.

All 3000+ seabed images have been catalogued and made available on-line via Dorset Wildlife Image database. Images are searchable by species and biotope, providing a great resource for conservationists, managers, marine biologists, students and the interested public. <http://54.247.90.217/RS>

- *user name DORIS,*
- *password doris123*

The videos are currently being processed and will soon be also available to download.



CONCLUSIONS

The DORIS project has been extremely valuable and influential and leaves a lasting legacy in:

- Our understanding of Dorset's marine environment.
- An ethos of partnership working for marine data gathering in Dorset and nationally.
- Proposed Marine Protected Areas backed up by robust data.
- Greater understanding of the geological context of the Jurassic Coast World Heritage Site.





Cover image created by Roger Harris



Part of a



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