

CHESIL MULTI-MEDIA PROJECT

ANNUAL REPORT 2007



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SPONSORS AND SUPPORTERS

We gratefully acknowledge the support that has been given to the Chesil Multi-Media Project by:-

Natural England: for their continuing support of the project, and particularly for their funding of the purchase of a new high-resolution data logger and a replacement anemometer.



Weymouth and Portland Borough Council: who continue to support the project in a variety of ways.



The Chesil Bank and The Fleet Nature Reserve volunteers: who continue to assist the project in a number of ways.



Cover picture: The lower Fleet looking north from New Ground, Portland.

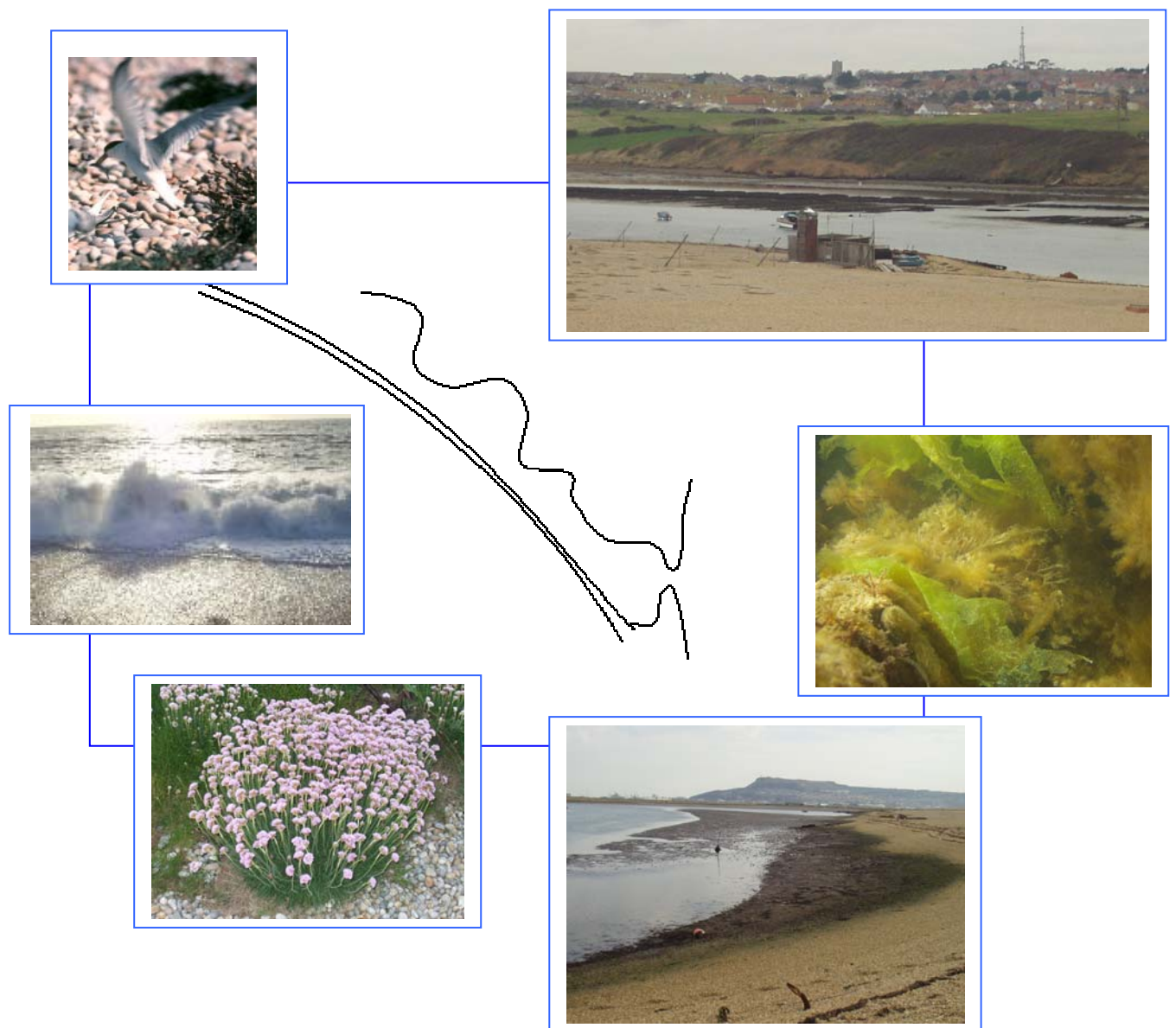
Aims of the work

To measure and monitor the environmental factors that can affect the Fleet and thereby gain a better understanding of the interactions within the Fleet and Chesil Beach environment.

To provide supporting data for other research and conservation projects in the Fleet and on Chesil Beach.

To educate and inform the public visiting the Chesil Beach Centre in order to promote a greater awareness and understanding of the value and needs of the Fleet and Chesil beach environments.

To develop new environmental data collection techniques for use in this and other Dorset and national environmental research projects



Introduction

This report covers Chesil Multi-Media Project (CMMP) activities during the year 2007, It provides a brief history of the work previous to 2007, the progress made during 2007 and plans for 2008. Some of the data collected during 2007 is also presented. Current equipment status as of 31st December 2007 is also set out.

History of the project

The Chesil Multi-Media Project (CMMP) has been running since 1997 when a temporary data collection unit was installed at the Black Hut on Chesil Beach to evaluate the problems of installing and using a range of sensors in a very challenging environment. The unit was initially powered by solar cells but this was supplemented by a wind generator in 1998.

In Spring, 1999, power and fibre-optic cables were laid between the Visitor's Centre and the Black Hut and this allowed the project to be expanded to include video and additional instrumentation sensors. A high quality colour camera was installed to monitor the nesting terns by day. At night an infra red camera continued the monitoring. Also in 1999 a tower was built alongside the Black Hut to provide facilities for monitoring the tern colony. The cameras were moved onto the tower and were used to provide video of the nesting little terns. This was used in conjunction with nest data loggers to validate the use of the data loggers to monitor the tern behaviour at night.

Early in 2000 the evaluation phase ended and the old instrumentation system was removed. A new system based around an RS485 communication bus was then installed. Data was sent to the Visitor's Centre over the fibre-optic cable.

Funding became available in 2001 for a major upgrade of the cameras to provide full colour capability at high quality. The data collection system was also upgraded to allow two-way communication between the Visitors Centre and the Black Hut. This allowed an operator at the Visitor's Centre to control the cameras at the Black Hut.

In July 2001 the first underwater camera was installed on a partially submerged pontoon (P1) adjacent to the Black Hut. The aim was to provide pictures of fish and crustacean feeding in the inter-tidal zone. Initially it used a monochrome camera, but it proved so successful it was upgraded to full colour in June 2002. A roving underwater camera that could operate up to 50 metres from the end of the P1 pontoon was added and this gave some exciting pictures from the main Fleet channel during a number of deployments. In June 2003 a second underwater camera was added. This was located within a wrecked pontoon (P2) on the edge of the main channel and has provided pictures of many of the fish species present in the Fleet.

Various sensors were added to the instrumentation system during 2002 and 2003, including a vertical string of temperature sensors buried in the beach, rainfall, humidity and light level sensors. The humidity sensor proved to be very sensitive to the salt-laden atmosphere and was removed in late 2004.

A standalone data logger measuring temperature and depth was obtained in late 2004 and deployed in the main channel adjacent to the P2 pontoon.

In late May 2005 the pontoon containing the P2 camera was struck by a boat moving through the shallow water. Further damage occurred in late August when a more serious collision occurred. Before this could be fully repaired the pontoon was struck yet again in September and this time the top third of the pontoon literally fell apart and collapsed onto the seabed. The decision was then made to relocate the camera further down the pontoon in deeper water.

In June 2005 the beach roving camera (R2) was upgraded with a new camera and the umbilical cable extended. The camera was then set up to look at an oystercatcher's nest. A video recorder was left running overnight and it captured pictures of a fox systematically taking all the eggs.

In 2005 the instrumentation system suffered two major setbacks due to lightning damage to the wind and air sensors and accidental damage to the beach temperature sensors.

Manual measurements of the Fleet water temperature by the Black Hut started in early 2006 using a Meteorological Office sea temperature bucket. On each visit to the Black Hut a measurement is made on the edge of the Fleet channel.

The P1 inter-tidal camera was re-deployed in March 2006 following storm damage in December 2005, but very quickly failed again due to water ingress. A detailed inspection showed that the camera housing had become porous in several places and that the junction box for this camera was badly damaged. The camera became operational again at the end of August.

Following the considerable damage to the shallow end of the P2 pontoon a new camera, designated P2b was built and deployed at the deep end of the pontoon in May 2006. This is much more open than the old position and the water is about 1.5 metres deeper. The P2b camera has two cameras, one looking through the pontoon towards the main channel, the other looking sideways up the Fleet. It has proven to be very reliable and has given some superb pictures of two-spot gobies, grey mullet and bass. Keeping it clean has proven to be more of a challenge because of the increased water depth.

In spring 2006 it was decided to extend the range of the R2 roving camera to allow improved monitoring of the little tern colony. Four hundred metres of power cable were purchased. This was installed to provide power at the hide near the tern colony. A microwave link to get video back to the Black Hut was also obtained and installed at the hide. The R2 roving camera was then adapted to allow operation with the new set-up and re-designated R3. This camera operated throughout the tern nesting season, providing pictures of tern activity and predation on the nests. However, the microwave link suffered from interference from the air traffic control radar on Portland. The camera used was a day/night combination camera that worked well at night, but the daytime picture quality was poor.

The older roving camera (R1) was moved in late summer 2006 to a new location on the top of the beach to monitor wave activity on the Lyme Bay shoreline, but two months later suffered a catastrophic failure with a lot of internal damage.

Two new high resolution dataloggers were purchased thanks to a grant from English Nature and these are now being deployed near Abbotsbury and at the Black Hut.

Progress during 2007

The two new dataloggers have been deployed during the year with mixed success. Of the three deployments at Clouds Hill, two were very successful while the third yielded no data. There was also one successful deployment in the lower Fleet. The reasons for the failed deployment have been investigated and the deployment procedure has been modified to prevent this happening again. Money became available at the end of the year to purchase a third logger for use in the mid-Fleet.

Early in the year the P2 pontoon camera developed a fault such that only the sideways looking camera could be selected. This was traced to rodent damage to the cable as it entered the Black Hut. The cable was repaired and the camera then operated normally. During the fault tracing it was discovered that a junction box embedded in the beach had partially flooded causing significant corrosion of the cabling. An exceptionally high tide had just reached the height of the box. The cable ends were re-terminated and the cable seals replaced. After these two repairs the camera worked well for the rest of the year.

In April a tide board was installed near the Black Hut and is visible from the cameras.

As the terns started returning, the enclosure fences were erected. This year they were mapped out using GPS and a plot produced so that for the first time it was possible to accurately locate the nests. The roving camera was modified to use a coax cable to carry the video signal. This completely removed the problems experienced in 2006 from interference from the Portland aircraft surveillance radar on the Verne. Although the equipment was all laid out on the beach ready to monitor the terns, the very low numbers and short-lived nesting season meant that the camera was not used to the extent expected.

The original roving camera (R1), destroyed in autumn 2006, was repaired and mounted inside the enclosure behind the Black Hut. Had the birds nested close to the Black Hut then this would have been used to monitor the nest. Unfortunately there were no nests within cable range (150 metres) so it was positioned to monitor the vegetation within the compound.

In July the wind sensor failed. Initially it was thought that only the mounting had failed but once this was repaired it was found that the direction sensor had also failed. Opening the unit up revealed severe corrosion and the unit had to be scrapped. A substitute unit was borrowed and placed back at the Black Hut in September. A new unit that uses ultrasonic sensors has now been obtained and this should prove much more reliable in the severe environment of Chesil Beach.

In September a second set of video modems was purchased and installed allowing two video feeds from the Black Hut to the Visitors Centre.

In November, following further degradation of the P1 pontoon in the autumn storms the decision was made to remove the P1 camera to prevent damage in subsequent storms. It is hoped to modify this pontoon in spring 2008 and this will allow the P1 camera to be re-deployed. Routine maintenance of the P1 camera after recovery showed a small amount of water around the temperature sensor and an intermittent fault with the hydrophone. Both problems are currently being resolved.

At the end of the year the original T3 tower camera was recovered from the Swannery with the aim of re-installing it on the tower. During the inspection it was found that severe corrosion had occurred and it was necessary to scrap the housing. A replacement housing was obtained and work is now in progress to re-assemble the camera.



Also at the end of the year, the top temperature sensor in the BT4 vertical sensor string measuring the temperature profile of the beach became intermittent and then failed completely. This will need to be dug out of the beach before it can be repaired.

Wildlife observations

Work to compile the P2 species list has continued using the camera and by visual searching around the P2 pontoon. Highlights of the year were a lumpsucker, *Cyclopterus lumpus*, that took up residence in front of the P2 camera from early March to late April and black-face blennies, *Tripterygion delaisi*, seen during the early summer.

Another first was a fifteen-spine stickleback, *Spinachia spinachia*, seen on the P1 inter-tidal camera in August. There are a number of these fish in the bladderwrack close to the P1 camera, but this was the first seen on the camera. Also observed near the P1 camera was a half-grown cuttlefish in July.

The DVD recorder installed at the Black Hut on the P2 camera video and programmed to record two 5 minutes sequences each day has been in use throughout the year. It is hoped this data can be analysed as part of a university project.

The water temperature usually reaches its lowest in February and very few fish are seen from January to March. The common species is the two-spot goby, *Gobiusculus flavescens*, with a colony of around 50 in the P2 pontoon. As May progresses the grey mullet appear, followed by bass. The mullet and bass are mostly immature fish. Later in the summer full adult grey mullet appear. The mullet stay in reducing numbers until the end of the year. The bass were not seen after early December.

Shannies, *Lipophrys pholis*, are seen on the structure of the pontoon throughout the summer. There are large numbers of common gobies, *Pomatoschistus microps*, on the sandy areas around both pontoons, although numbers vary considerably through the year. One variation which happened in both 2005 and 2006 is that for approximately 2 weeks in September the common goby numbers reduce to near zero. It was not possible to observe events in September 2007 because of poor visibility.

The common crustacean around the pontoons are the prawn *Palaemon elegans* and the shore crab *Carcinus maenas*. Another prawn that occurs in low numbers in the patches of algae along the edge of the channel between the pontoons is the hooded shrimp, *Athana nitescens*. No other prawns were found in 2007.

There were very few peacock worms, *Sabella pavonina*, around the P2 pontoon this year compared with the previous two years. The white fan worms, thought to be *Bispira volutacomis*, increased in numbers this year and there are now around fifty specimens in the shallows between the P1 and P2 pontoons.



The commonest sea anemone is the snakelock's anemone, *Anemonia viridis*, which can be found all along the Fleet foreshore. The Daisy anemone, *Cereus pedunculatus*, is common along the steep edge of the channel at the end of the P2 pontoon and increased in numbers during 2007 compared with 2006.

Chesil Beach Website

www.chesilbeach.org

The website for Chesil Beach and the Fleet became fully operational during February 2007. Pages were added through the spring covering Chesil Beach, the Fleet, The Visitors Centre, the Chesil Bank and the Fleet Nature Reserve, CMMP, the Fleet Study Group, and the Fleet and Swannery Trust. An extensive picture gallery covering the whole length of Chesil Beach and the Fleet has been provided and an interesting addition has been a collection of old postcards of Chesil Beach covering the last 120 years.

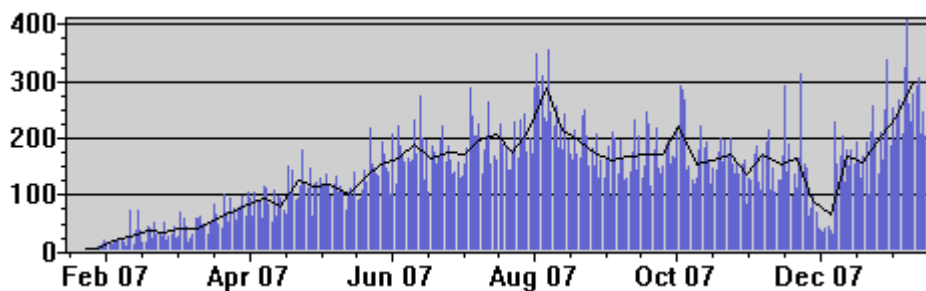


Figure 1. Site hits/day

The use of the site has built up through the year. Initially site usage was low, typically 30 hits per day, It peaked in August with over 300 hits per day during Portland Marine Week. By the end of the year it had settled at around 180 hits per day but now shows a marked increase in use in early 2008 with a peak of 410 on the day that it was announced that avian flu had been confirmed at Abbotsbury.

The website was originally written using Microsoft Publisher but this resulted in cumbersome maintenance procedures. Thanks to a Natural England grant it became possible to purchase Adobe Dreamweaver and through the autumn the whole site was re-written using this software. Although a major operation, the re-write is now almost complete and site maintenance is now very much easier.

Marine Week 2007

CMMP provided support for the Portland Marine Week activities this year. The audio files for both the GPS-guided bus tour and the walking tour of Ferrybridge were recorded and edited. Both tours were then tested in detail to ensure correct operation. It is hoped to provide improved commentaries for both tours for 2008.

As part of the Marine Week activity a second video display was added in the Visitors Centre. This is a medium-sized flat screen display which provides a much improved picture compared with the older display unit.

Public presentations

The CMMP data was presented to the public in early March with a guided talk and walk about the effects of the weather on Chesil Beach. This event was part of the programme of walks and talks put on through the year by the Chesil Bank and the Fleet Nature Reserve.

Plans for 2008

It is hoped to complete the new underwater roving camera early in 2008. Some progress was made during 2007 but higher priority tasks took precedence. Completing this unit is now a high priority project. The camera will be used to survey the bed of the main channel between the two pontoons to continue building the species list for this area. It will also be used to look at the colonisation of another pontoon unit which lies on the bed of the main channel adjacent to the Black Hut.

If it is possible to repair the P1 pontoon the inter-tidal camera will also be replaced as soon as possible.

Work is already underway to provide three new cameras around the Black Hut. One will look permanently at the tide board, a second will look along the beach while the third will be an additional security camera.

Work will continue to rebuild the T3 camera and reinstall it on the tower. This camera looks north-west towards the beach crest.

The original tern camera is in the process of being modified and it is hoped to install it on the beachcrest camera pole. This camera will look downwards on the Lyme Bay shoreline. The new unit is much more robust than the one destroyed in October 2006.

The BT4 sensors will be dug out of the beach and the top sensor repaired. The new wind sensor is currently under test and will be deployed at the Black Hut to replace the units that have now been in use for over ten years. The air temperature sensor will also be replaced later in the year with a more accurate unit so that the old masthead sensor system can be completely removed.

Data from 2007

As described above, the water temperature was measured during each visit to the Black Hut using a Meteorological Office sea water temperature bucket. The data from these measurements are shown in figure 2 below.

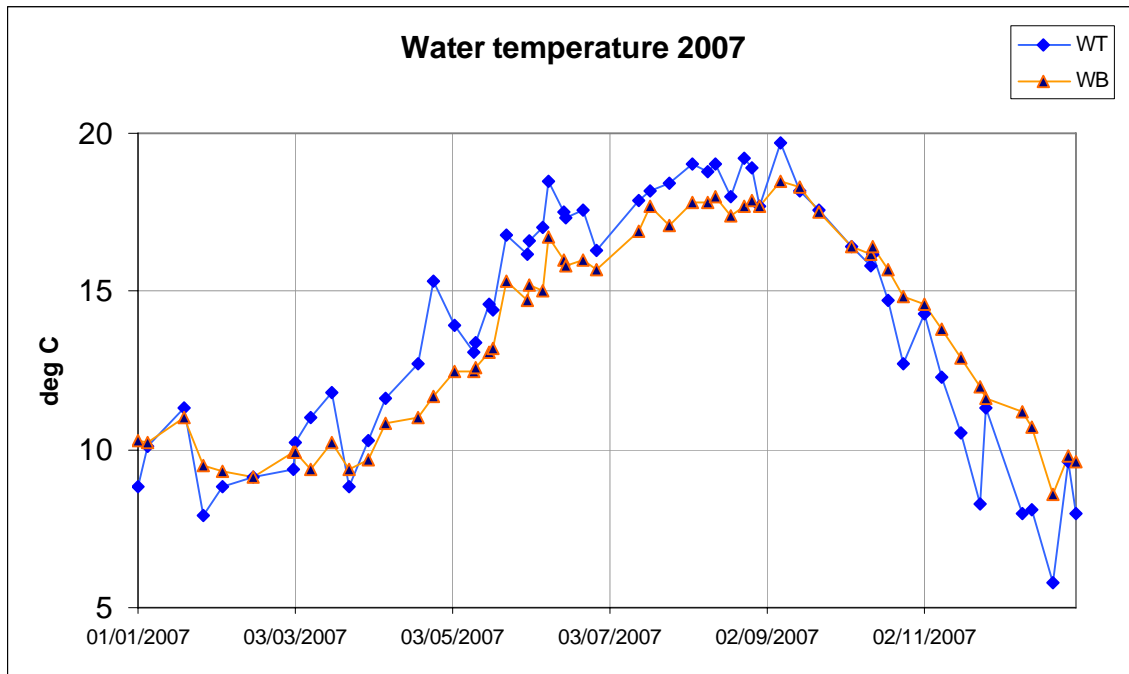


Figure 2. Lower Fleet water temperature

The blue plot is the measured data from the lower Fleet, the orange plot is data from the Channel Coast Observatory Waverider buoy located off Bowleaze Cove in Weymouth Bay. This shows that during the spring and summer the Fleet water temperature is generally higher than the temperature of Weymouth Bay, while in the autumn and winter it is generally colder. The oscillatory nature of the Fleet temperature is caused by the wide temperature variation of the water in the lower Fleet during the tidal cycle. On the rising tide water from Weymouth Bay enters the Fleet, while on the falling tide water comes down from the mid-Fleet. Depending on when the measurement is made, there may be up to a 4°C variation during a single tidal cycle.

The water temperature data is also available on the CMMP website and is updated whenever measurements are made.

The maximum water temperature usually occurs in the second or third week in August, but in 2007 this was delayed until a week into September. The water was at its coolest in mid-February.

Figures 3 and 4 show data from the high-resolution datalogger deployed at Clouds Hill from June to December 2007.

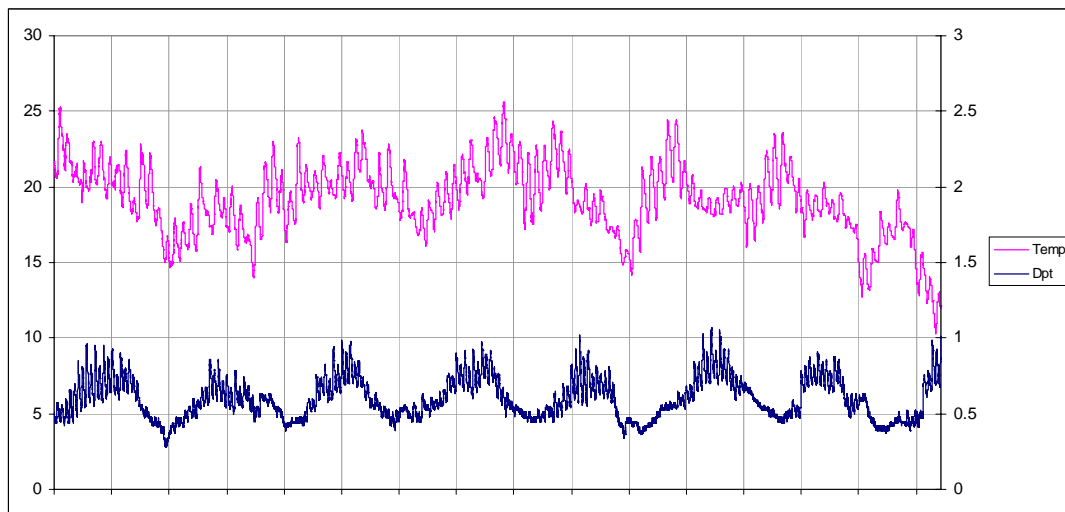


Figure 3. 12th June to 27th September 2007

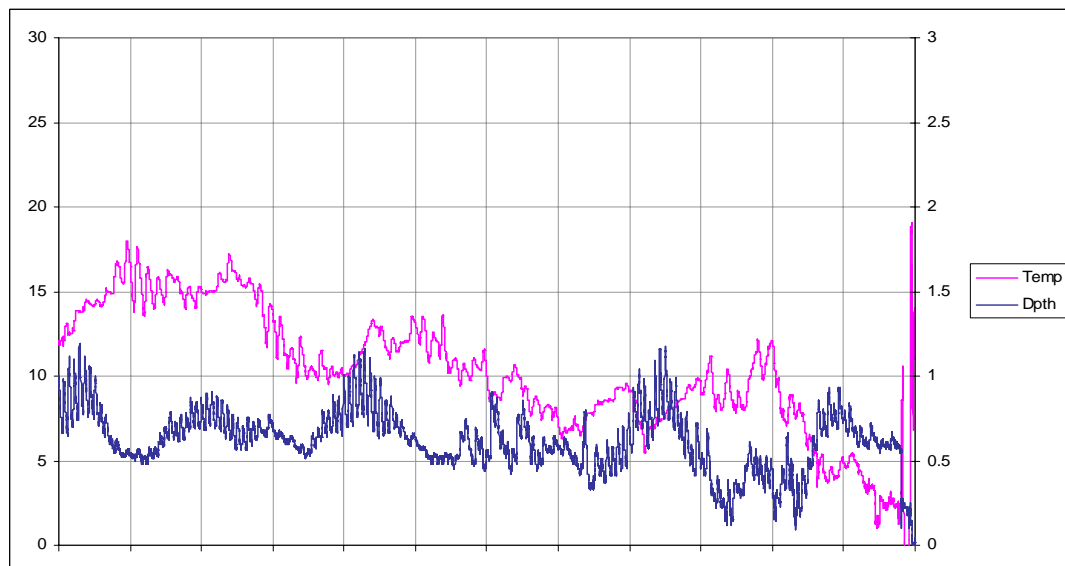


Figure 4. 28th September to 20th December 2007

There are a number of points of interest to note. The temperature oscillated around 20°C during the summer with no obvious peak and then started to drop in early September and reached just 2°C in the cold spell in mid December. This is much colder than the sea temperature in Lyme Bay which had only dropped to 9°C in late December. Comparison with figure 2 shows that whilst there was a clear peak in water temperature in the lower Fleet in early September, this did not occur in the upper Fleet. The temperature cycle through the summer showed highest temperatures around 18:00 each day with the highest recorded temperature of 25.6°C at 18:30 on the 5th August. The lowest daily temperatures occurred around 05:00.

The depth data shows a clear cyclic pattern correlating with the lunar cycle through the summer, but that pattern is disrupted by the winter storms from early November. The summer cycle shows that the water is at its highest during the spring cycle, with a weak dependence on the daily tidal cycles. The water is at its lowest during the neap cycle with no dependence at all on the daily tidal cycles. There was a period in early December with exceptionally low tides that lasted over a week.

It is also interesting to note the correlation between the neap/spring pattern and the water temperature during the summer. This may be caused by cooler water entering the upper Fleet via the Narrows, or it may be water percolating through the beach from Lyme Bay.

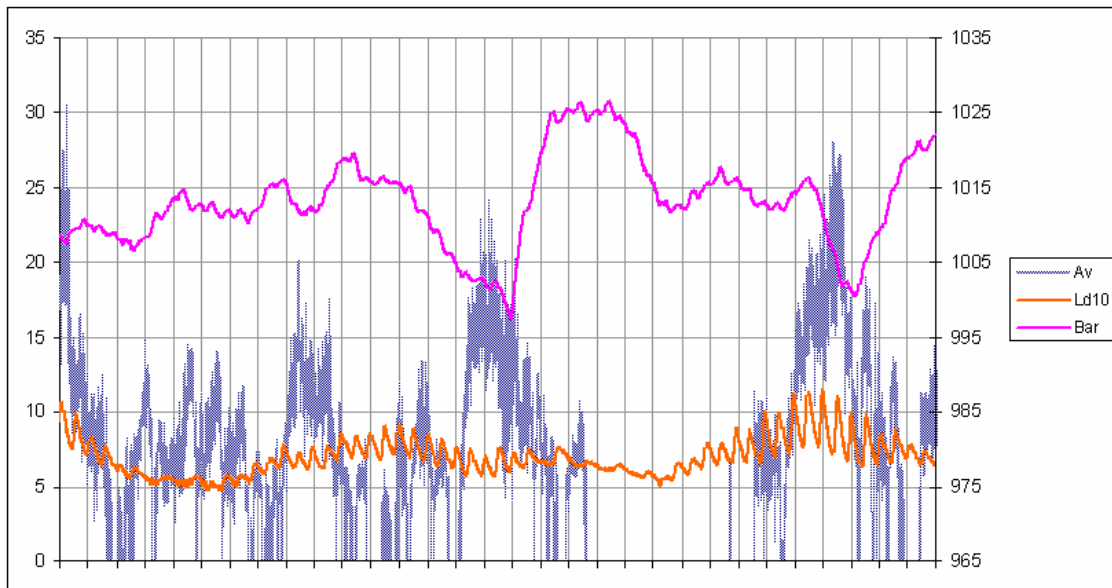


Figure 5. Composite plot for October 2007

Figure 5 shows a composite plot of barometric pressure (purple), wind speed (faint blue) and water depth from the Clouds Hill logger (orange). The water depth has been multiplied by 10 to get a usable scale. The left-hand axis is for wind speed (knots) and depth (metresX10). The right hand axis is barometric pressure in mbar.

The regular change between spring and neap tides can be clearly seen. Note also that the daily tidal cycles are asymmetric with faster rise and slower fall. This is typical of non-linear systems. There also appears to be an overall increase in water depth on the trailing edge of the first spring cycle and this may be caused by the marked drop in barometric pressure.

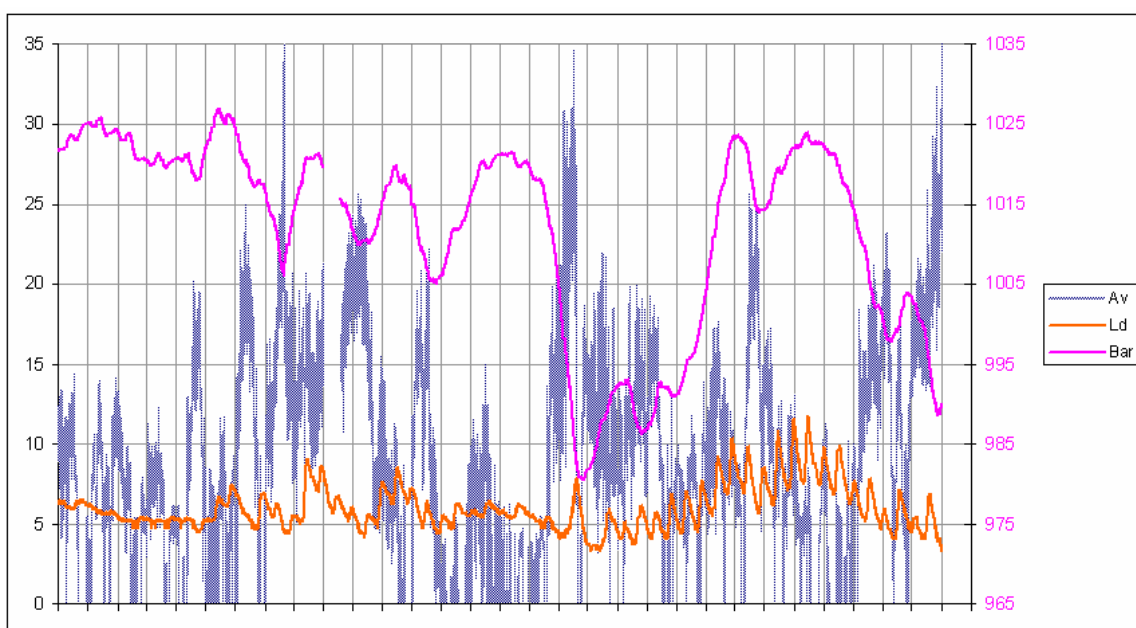


Figure 6 Composite plot for November 2007.

Figure 6 is a similar composite for the month of November. Here one of the spring tidal cycles is less obvious, although the effect of the daily tidal cycle does increase. However, there is no accompanying increase in water level and the variation in water level is more erratic. The second spring cycle has been amplified compared with the summer spring cycles and there is no clear dependence on the barometric pressure variations or on wind speed.

All this raises more questions than answers. More work will be needed to resolve the role played by the various forces driving the water level and temperature in the upper Fleet.

Equipment status at the end of December 2007

Sub-system	Description	Location	Status
T1 camera	Mono IR camera	On tower	Operational
T2 camera	Colour camera with zoom	On tower	Operational
T3 camera	Colour camera with zoom	Under repair	Incomplete
T4 camera	Tide board camera	Awaiting junction box	Incomplete
R2 camera	Colour roving camera	On Beach	Operational
R3 camera	Tern colony camera	In Storage	Operational
B1 camera	Beachcrest camera	Awaiting junction box	Incomplete
UR2 camera	New u/w roving camera	Under construction	Incomplete
P1 camera	Colour underwater camera With audio + temperature	Removed pending changes to P1 pontoon	Operational
P2 camera	Colour underwater camera	Removed May 2006. Awaiting re-deployment in new site	Operational
P2b camera	Colour underwater unit 2X camera plus audio	On deep end of P2 pontoon	Operational
S1 camera	Monochrome IR camera	Security camera in BH	Operational
S2 camera	Monochrome IR camera	Second security camera	Incomplete
Air sensors	Wind speed/dir, air temperature	On Black Hut roof	Operational
Rainfall	Tipping bucket sensor	On Black Hut roof	Operational
Sunshine	Photodiode sensor	On Black Hut roof	Operational
BT4 sensor	Vertical line of 4 temperature sensors	Buried in beach near Black Hut. Top sensor intermittent in operation	Operational
BT sensor	Single beach temp sensor	In beach behind Black Hut	Operational
U/W sensors	Underwater temperatures and depth	In Black Hut	Awaiting deployment
Barometer	Air pressure sensor	In Black Hut	Operational

How to contact us

If you have any queries or questions about this report or the Chesil Multi-Media Project then please contact either of the authors whose details are shown below. If you would like to make use of the data collected by the Project then please address requests to Don Moxom.

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Also look at our website <http://www.chesilbeach.org/CMMP/>



Two-spot gobies (*Gobiusculus flavescens*) in front of the P2b camera