Inchmarnock Island Survey Report September 2013

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The Inchmarnock Maerl Bed

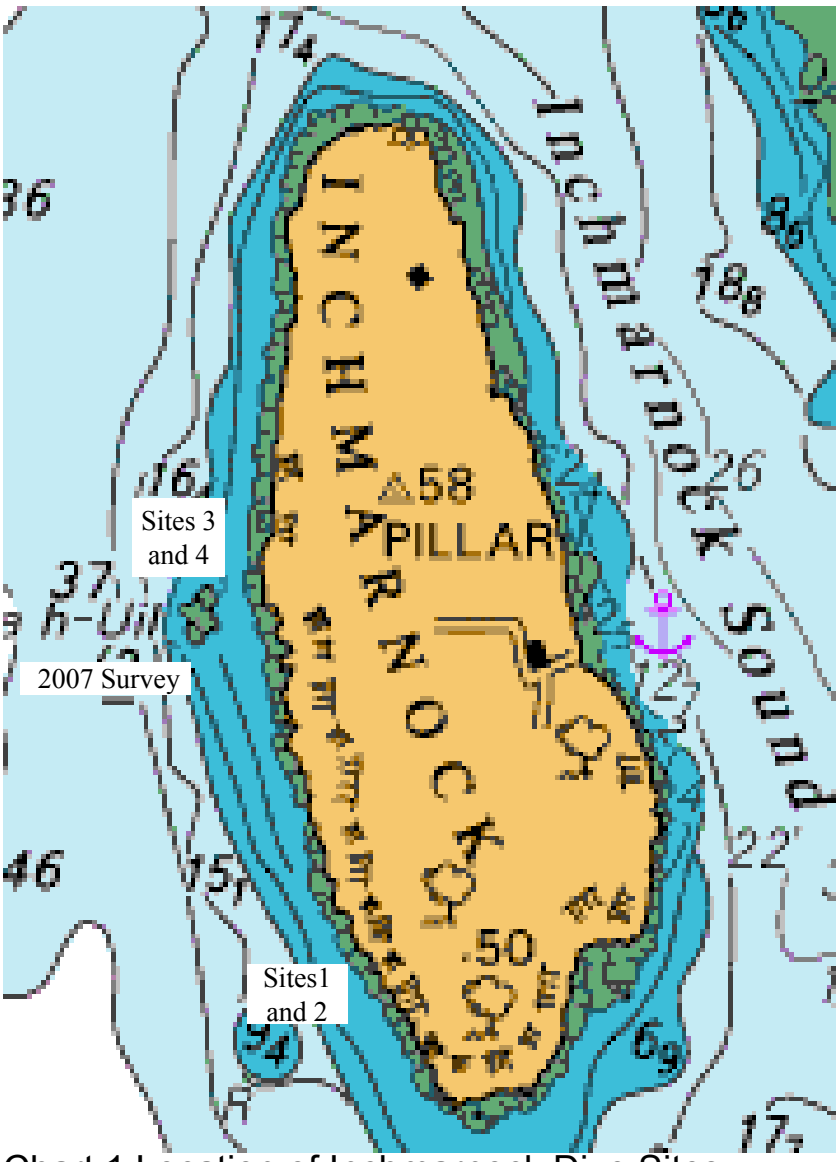


Chart 1 Location of Inchmarnock Dive Sites

Inchmarnock island lies about one mile off the west coast of Bute at the mouth of Loch Fyne. On the western side of Inchmarnock roughly half way down the island lies the tidal skerry of Tra na h-Uil. Following reports by a Tarbert dive boat operator Malcolm Goodchild a Seasearch survey in June 2007 recorded what appeared to be an extensive maerl bed around the skerry.

Maerl is a type of red seaweed which lays down a hard calcareous skeleton forming nodules up to 10cm across on the seabed. Alive it is a beautiful deep pink colour but when the seaweed dies it leaves behind a bleached white “skeleton” looking remarkably like coral. Photo 1 shows a live fragment of maerl alongside a dead bleached fragment. A healthy maerl bed should have a thin layer of pink living maerl overlying deeper deposits of broken up calcareous “skeletons” and gravel. The living maerl forms a complex three dimensional matrix with numerous niches for small invertebrates and other algae to shelter from larger predators. Even in the absence of live maerl this calcareous gravel forms an important habitat in its own right providing refuge for many species of burrowing animal. Individual maerl nodules are slow growing, around 1mm a year. They are also fragile and easily damaged by activities such as scallop dredging or anchoring. As well as physically damaging the maerl, activities such as dredging will also bury the live twiglets in the underlying gravel leading to eventual death through lack of light. Maerl beds are also vulnerable to reduced light levels and increased rates of sedimentation brought about by activities such as spoil dumping, suction dredging and aquaculture.

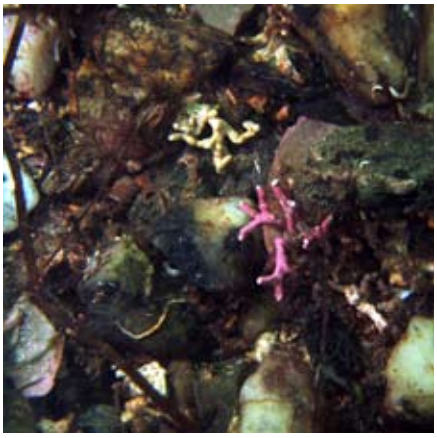
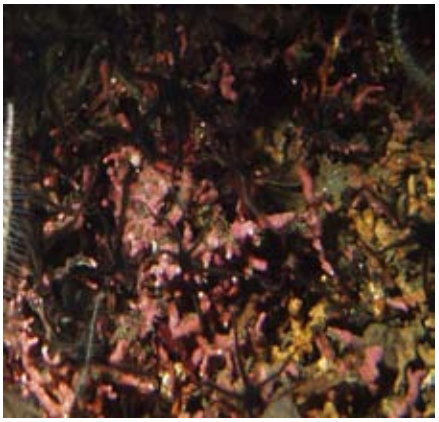


Photo 1: A fragment of live maerl at site 1 with a dead “skeleton” above

There are three main species of red algae capable of forming maerl in UK waters, *Phymatolithon calcareum*, *Lithothamnion glaciale* and *L.coralloides*. These are difficult to differentiate in the field and the taxonomy is open to revision so they are usually recorded as simply Maerl.



Healthy Maerl bed in Loch Sween

The September 2013 Survey

The western side of Inchmarnock is very exposed to winds from the south and west making diving difficult in anything but light easterly winds. The opportunity was taken in September 2013 to revisit the sites dived in June 2007 and to attempt to map the extent of the live maerl using diver towed SMB's with small GPS units attached.

Four dives were undertaken with each dive lasting 40 minutes. The general location of the dives are shown on chart 1 while the tracks of the individual dives are shown in charts 2 -5 with the first two dives being approximately 1.25km south of Tra na h-Uil and the the second two starting 300 metres north of Tra na h-Uil.

Broken fragments of dead maerl and gravel at Dive 1

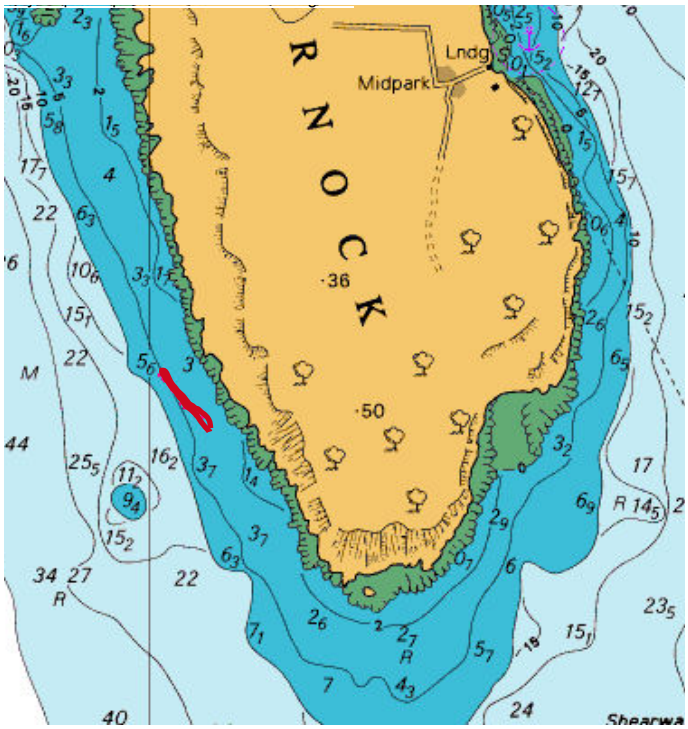


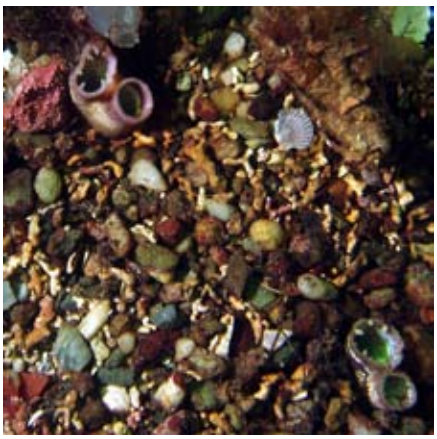
Chart 2 Track of Dive 1

Dive 1 Start Point-55°46.813N 05° 09.856W
Max depth 10 metres

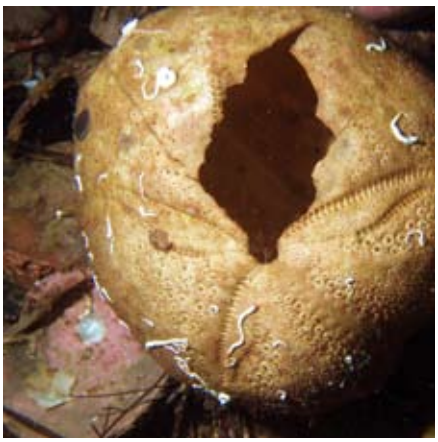
A few of the many bivalve shells observed at all four sites in 2013

Here the divers swam north towards Tra na h-Uil. In what was to become a familiar pattern they recorded large numbers of bivalve shells lying on a seabed made up of gravel, sand and dead maerl. The bivalve shells seemed to be approximately 80% *Dosinia exoleata* with the rest being made up of a mixture of *Tapes rhomboides*, *Ensis* sp, *Lutraria angustior* and *Mya truncata*. Parallel lines along the seabed were evidence of recent dredging activity. On digging down through the gravel sea bed the divers found large amounts of dead maerl buried under a layer of gravel. A small amount of live maerl was also found, sometimes buried, but nowhere was there more than 1% live maerl.

A damaged *Luidia* starfish, Damaged individuals were seen during all four dives



Tiny juvenile scallops were common amongst both the dead and live maerl showing the importance of this habitat as a nursery ground



This large *S.purpureus* test was photographed in the deeper water during dive 2. It was obviously quite old and may have been alive when the maerl bed was much more extensive than at present

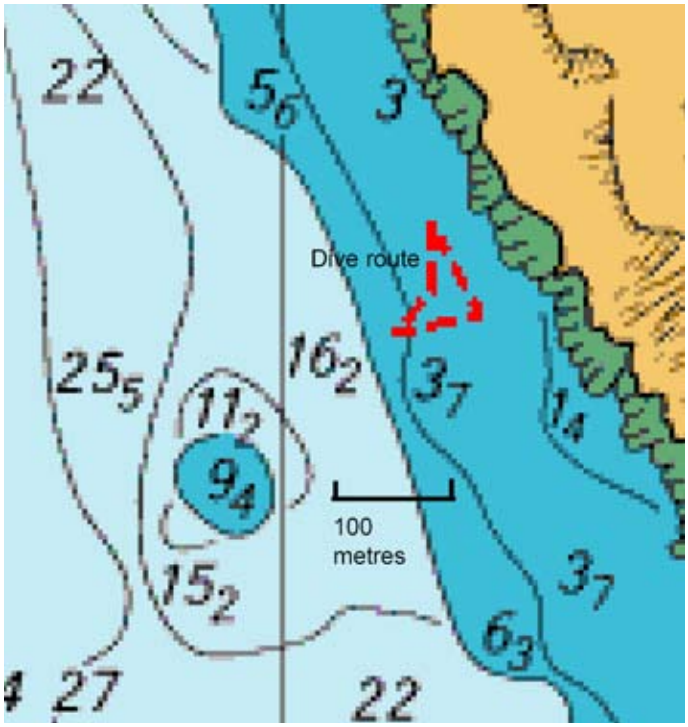
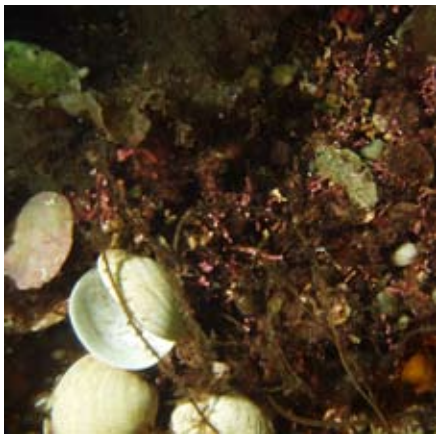


Chart 3 Track of Dive 2

Dive 2 Start Point- 55^{0} 46.805N 05^{0} 9.844W
Max depth 16 metres

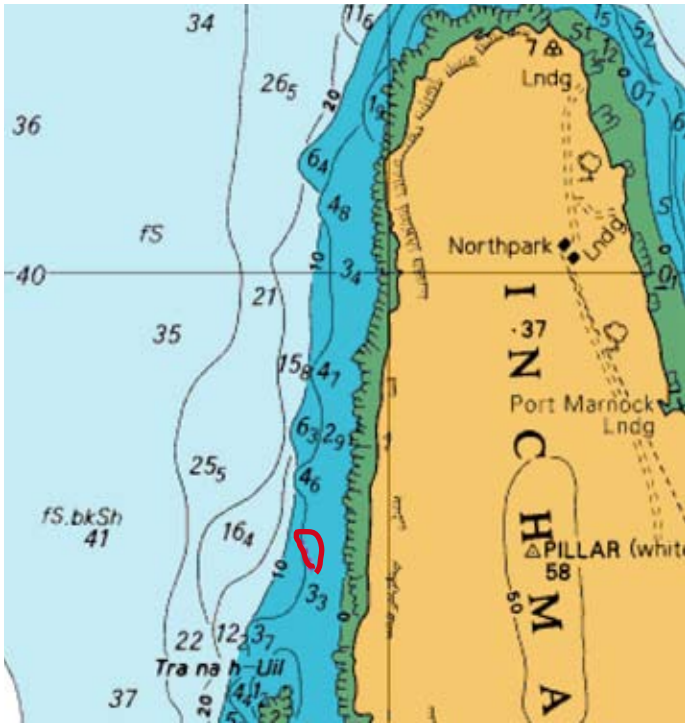
Dive 2 started on the shallow shelf then followed the fairly steep slope south west down to a depth of 16 metres where the slope levelled out. The seabed again comprised of a mix of gravel, dead maerl fragments and empty shells, mainly *D.exoleata* but again including *Enis* sp, *Mya truncata, Lutraria angustior* and *Tapes rhomboides*. A few small twiglets of live maerl were observed amongst the large amounts of dead maerl fragments seen. Marks on the seabed and a number of damaged *Luidia ciliaris* starfish again suggested a dredging episode at some point in the recent past.

A painted goby, one of eight fish species recorded



Empty bivalve shells were very common at all 4 sites, mainly *Dosinia* but several other burrowing bivalves were also present

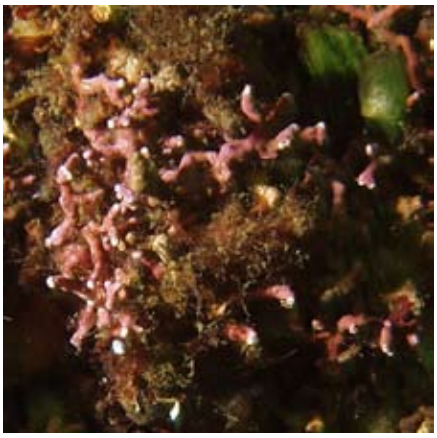
Large *Marthasterias* with a small patch of live maerl

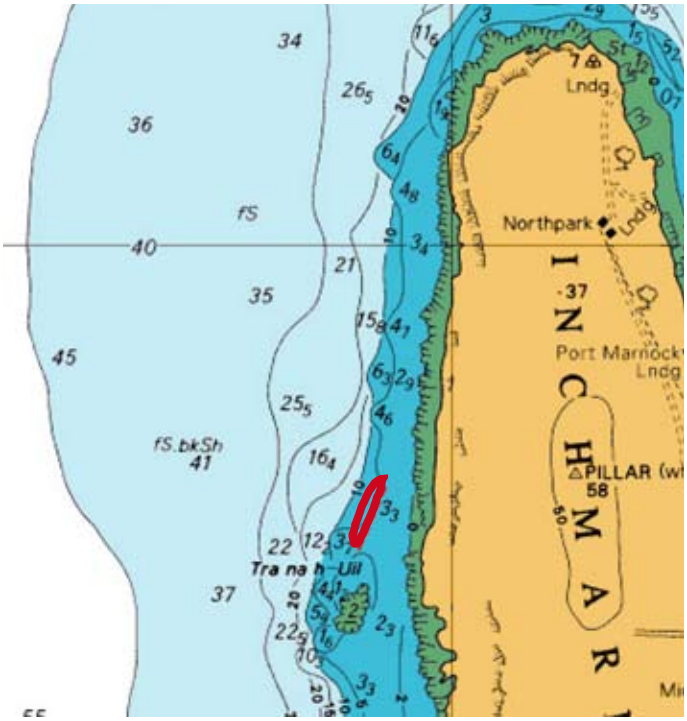


Track of Dive 3

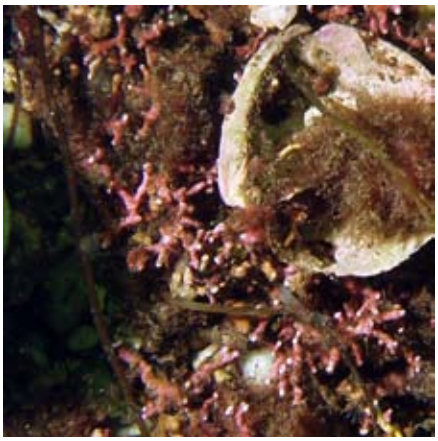
Dive 3 Start Point- 55° 47.632N 05° 10.193W
Max depth 8 metres

Dive 3 explored to the north of the anchored boat and was very similar to Dives 1 and 2. The seabed once again was comprised mainly of gravel, sand and dead maerl often buried under a layer of gravel. Again there were a large number of bivalve shells, mainly *Dosinia exoleata*. Small amounts of live maerl were seen, slightly more than found at the southern sites but still less than 5%.





Track of Dive 4



Dive 4 Start Point- 55^{0} 47.518N 05^{0} 10.212 W
Max depth 8 metres

On the final dive of the day the divers swam south from the anchored boat towards Tra na h-Uil. Early on in the dive they began encountering live maerl and by the time they were within 200 metres of the rock the seabed was covered in 80-90% live maerl in a depth of approximately 5 to 6 metres. The three photographs on this page were taken close to Tra na h-Uil. Large numbers of tiny juvenile scallops were also noted. This was the only dive where a healthy maerl bed was encountered.

Discussion

Evidence of live maerl was found during all four dives but a healthy maerl bed with more than 80% live marl cover was only confirmed for a restricted area in a band stretching 200 metres north from Tra na h-Uil in shallow water . This may well continue towards the south as was seen during the 2007 survey but the conclusion must be that the healthy maerl bed is restricted to a small area around Tra na h-Uil. The historical extent of this bed may be gauged from the finding of large amounts of dead maerl over 1.25km to the south of Tra na h-Uil. Until fairly recently the maerl bed may have extended the full length of Inchmarnock, a distance of over 3km.

Very noticeable at all 4 dive sites were the large number of empty *Dosinia exoleata* shells lying on the seabed. Some of these, especially in the deeper water at dive 2 were old and discoloured but those in the shallower water seemed fresh with some soft body parts still present in the shells. A few specimens were found intact on the surface but either didn't close or closed very slowly when picked up by the divers. These were not recorded during the previous survey in 2007 and are not visible in the photographs taken at that time. Other bivalve shells such as *Ensis* sp, *Glycermis glycermis, Mya truncata, Lutraria angustior* and *Tapes rhomboides* were also present but the *Dosinia* shells were by far the most abundant. A similar assemblage of molluscs was recorded by Hauton, Hall-Spencer and Moore (2003) using grab sampling in the nearby Stravanan bay where there is also a large degraded maerl bed which is regularly dredged.

Also noticeable at all sites were the presence of several *Luidia ciliaris* starfish with regenerating arms showing signs of physical damage some time in the recent past.

Table 1 compares the species recorded at the site in 2007 with those recorded in 2013. Both surveys were similar in the number of divers used and the dive durations. At first glance there seems to have been a large increase in species recorded which could be taken to indicate a healthy recovering system. However the increase in species recorded from 34 to 54 is largely explained by the increase in fish species, (0 to 8) and a doubling of molluscs recorded (4 to 8). The increase in mollusc species recorded is mainly due to the large number of fresh shells lying on the seabed which allowed several of these normally hidden species to be recorded. In 2007 bivalve siphons were recorded and it is likely that all the species recorded in 2013 were present in 2007 but safely hidden in their burrows. The increase in fish species recorded is likely to be partly due to seasonal variation and partly due to the increased experience of the dive team in 2013 compared to the team in 2007.

Conclusion

At some point prior to the 2013 survey there was at least one episode of dredging in the area with evidence including live maerl buried under dead maerl, *Luidia* starfish with damaged arms and parallel lines on the sea bed. This dredging seems to have avoided the shallow area adjacent to Tra na h-Uil but away from the rock it seems likely that a once thriving maerl bed has been repeatedly dredged.

Mystery surrounds the apparent mass die off of the bivalve infauna in the area. Possible explanations are a toxic algal bloom earlier in the year or a deterioration in water quality but there is no evidence to support or disprove these conjectures. The die off does not seem to be the result of dredging as the numerous empty shells were found in both the dredged and undredged areas. Despite the increase in species recorded the general impression gained by the divers was that the site had deteriorated since 2007 with a smaller area of live maerl present and that this was likely the result of increased bottom-towed fishing pressure.

Like many of the maerl beds in the Clyde the patches of live and healthy maerl show the potential for regeneration if they are relieved from anthropogenic pressures such as bottom-towed fishing gear and eutrophication.

Table 1: Comparison of species abundance recorded during the 2007 and 2013 surveys.					
	2007 Survey	Dive 1	Dive 2	Dive 3	Dive 4
Cnidarians, hydroids, anemones					
Cerianthus lloydii	F	O	F	O	O
Metridium senile			R		
Sagartiogeton sp	R				
Cyanea capillata	R	R	O	O	
Cyanea lamarkii	R				
Membranopera membranacea	O	C			R
Worms					
Keel worms	R		O		O
Chaetopterus variopedatus	O	O	O		R
Myxicola sp	R				
Eunoe nodosa?	R				
Sabella pavonina				R	
Lanice conchilega					P
Crustaceans					
Liocarcinus depurator	O		F		F
Necora puber	O	O	F	O	F
Cancer pagurus	O	O	O	R	F
Carcinus maenas	O	O	R		O
Macropodia sp	R	O	R	O	R
Pagurus bernhardus	O	O			O
Pagurus sp			O		O
Munida rugosa			R		
Molluscs					
Pecten maximus	R	O	O		O
Recently settled scallops		R	F	O	F
Dosininia exoleata			P		P
Tapes rhomboides			P		P
Ensis sp			P		P
Bivalve siphons	F	R			
Bivalve siphons 2	O				
Gibbula sp			R	R	O
Glycymeris glycmeris					P
Triva sp	R				
Archidoris pseudoargus		R			
Echinoderms					
Marthasterias glacialis	F	O	C	O	C

Table 1: Comparison of species abundance recorded during the 2007 and 2013 surveys.					
	2007 Survey	Dive 1	Dive 2	Dive 3	Dive 4
Luidia ciliaris	O	O	O	O	O
Porania pulvillus	F	R	O	O	R
Asterias rubens	R	R	F	O	O
Astropecten irregularis			R		
Henricia sp	O	R	P		R
Crossaster papposus	O	R			
Echinus esculentus	O	R	R	R	O
Spatangus purpureus test			P		
Sea Squirts					
Ascidiella aspersa		O	O	O	R
Corella parallelogramma			R		R
Fishes					
Gobiusculus flavescens			O	O	R
Pleuronectus platessa		R			R
Scyllorhinus canicula			R		
Gadus morhua			R	R	
Pholis gunnellus			R		
Pomatoschistus sp		O	R	R	
Gurnard sp				R	
Crenilabrus melops				R	
Algae					
Maerl *Lithothamnium* sp	F	R	R	R	C
Corralina officinalis					R
Encrusting red	O	O			F
Delesseria sanguinea	O				
Odonthalia dentata	O				
Saccharina latissima	O		P		O
Chorda filum	O	O	P		
Dictyota dichotoma	O				
Ulva sp	O	O			
filamentous brown			F		
Desmarestia ligulata		O			
Desmarestia aculeata			O		
Himanthalia elongata			O		
Other					
Beggiatoa sp				R	

Table 2: Comparison of the number of species in each group recorded during the 2007 and 2013 surveys.		
Group	No of species recorded 2007	No of species recorded 2013
Cnidarians, anemones and hydroids	5	4
Worms	4	4
Crustaceans	6	8
Molluscs	4	8
Echinoderms	7	9
Sea Squirts	0	2
Fishes	0	8
Algae	8	10
Other	0	1
Total	34	54

Table 3: Abundance scales used in 2007 and 2013				
	Code	Encrusting and Turf species e.g. algae, sponge, mussels, barnacles	Small Plants and animals (1-5 cm) e.g worms, anemones, cup corals, shells, sea squirts	Large plants and animals >5cm crabs, starfish, fish, seapens
Super Abundant	S	80-100% cover	10 000 per m2	100 per m20
Abundant	A	40-80% cover	1000 per m2	10 per m2
Common	C	20-40% cover	100 per m2	1 per m2
Frequent	F	10-20% cover	10 per m2	1 per 10 m2
Occasional	O	5-10% cover	1 per m2	1 per 100 m2
Rare	R	< 5% cover	<1 per m2	1 per 1000 m2
Present	P	Identified from photograph but abundance unknown		

Acknowledgements

It would be impossible to carry out Seasearch without the willing assistance of the volunteer divers and boat handlers who carry out the surveys.

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Photography by Owen Paisley.

References

Hauton, C., Hall-Spencer, J. M., and Moore, P. G. 2003. An experimental study of the ecological impacts of hydraulic bivalve dredging on maerl. – ICES Journal of Marine Science, 60: 381–392.

Paisley (2007) Inchmarnock Island Survey Report www.seasearch.org.uk

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Seasearch is a volunteer underwater survey project co-ordinated by MCS which encourages recreational divers to contribute towards the conservation of the marine environment.

marine conservation society