

9/34/69

Preliminary cruise report

195

CRUISE FOR NERC WITH VICKERS VENTURER/PISCES  
 AREA OF LOWER LOCH FYNE 7-12 NOVEMBER 1969

Scientific personnel

R.A. Eden	IGS Edinburgh.	Senior Scientist	full period
D.A. Arduis	IGS Edinburgh		"
S. Calvert	Geology Dept., Edinburgh University		7-9 Nov.
J.H. Fraser	Marine Laboratory Aberdeen)		} 7-9 Nov.
J.A. Adams	" ) (Plankton)		
B.H. Holford	Marine Laboratory Lowestoft		full period
W. Hemmings	Marine Laboratory Aberdeen)		} night 10/11 Nov.
J. Kinnear	" ) (Shellfish)		
J. Mason	" )		

Contractor's personnel

D. Samuel	Captain
R. Eastaugh	Pisces party leader
E. Marsden	Contractor's representative at Barrow (not aboard)
R. Mason	Vickers

General

R.V. Vickers Venturer and Submersible Pisces were on separate charter to NERC for the period 3-12 November 1969 (For Vickers Venturer - Uniform Time Charter dated 28 October NERC letters F3/6/22 and F3/6/23 refer). From 3 to 6 November the vessels were based at Oban, where they were operated for a group of which the Senior Scientist was A.H. Stride of N.I.O., and on 7 November they moved from Oban to Tarbert. The present report is concerned with operations from Tarbert.

The vessels left Oban at midnight on 6/7 November; they were delayed by weather and did not berth at Tarbert until about 2000 hours.

Representatives of the 5 scientific groups participating in the cruise met at Tarbert on the evening of 6 November and agreed the general outline of the programme. This was later modified due to (1) poor weather, (2) the consequent failure of R.V. Goldseeker to reach Tarbert until 10 November to take part in joint work with Pisces for the Aberdeen Laboratory, (3) break down of one of Pisces' engines on 10 November. In order to compensate for time lost in the delays Venturer and Pisces were made available to NERC (without extra charge) until lunch time 12 November instead of the evening of 10 November as originally planned.

Saturday 8 November

Dive 1. S. Calvert. Manganese nodules

Personnel. S. Calvert, R.A. Eden, D. White (pilot)

Period of dive 9.47 - 12.52

Sea conditions. Waves 1 ft on submergence, 6-8 ft on emergence. Wind force 8 on emergence, gusting to 10.

Location. Deep water 3 miles SE of Tarbert.

Maximum depth. 635 ft (sonar)

/Procedure

Procedure. Dive in deep water, travel SE along trough at about 1 kn. for an hour, then climb up near vertical rock face from 575 to 380 ft.

Visibility. 6 ft.

Recovery. Recovery was in difficult sea conditions and Venturer collided with Pisces giving it a fairly heavy thump which cracked the fibre-glass conning tower; the damage was not regarded as interfering with its operational efficiency.

Observations. S. Calvert remarked on the efficiency of the Vicker's organisation. He considered that his very specialised requirement of observing the environment in which manganese nodules occur had been met by the dive. Report will be submitted to NERC.

Because of weather conditions it was decided that further work was not possible. Returned to Tarbert for shelter. S. Calvert went ashore early morning of 9 November.

Sunday 9 November.

Dive 1. J.H. Fraser and J.A. Adams. Plankton

Personnel. J.H. Fraser, J.A. Adams, S. Bolton (pilot)

Period of dive. 0848 - 1120

Sea conditions. Calm

Location. Deep water due E. of Tarbert.

Maximum depth. 610 ft.

Procedure. Dive to maximum depth, switch off lights and observe any luminescent organisms, lights on and rise to surface stopping to make plankton observations at bottom and 5 levels on way up.

Visibility. 6 ft and improving upwards. Organisms observed were all within a foot of portholes.

Observations. Species could be identified. This type of in situ observation could only be carried out from a submersible, in particular it is possible to ascertain which organisms are alive and which are dead. Delicate material collected mechanically is apt to be crushed. Report being submitted to Director Aberdeen Laboratory.

Sunday 9 November.

Dive 2. B.H. Holford. Evaluation of fisheries research potential of Pisces

Personnel. B.H. Holford, D.A. Arduis, A. Johnson (pilot)

Period of dive. 13.25 to 17.10

Sea conditions. Waves up to 1 ft

Maximum depth. 230 ft

Procedure. Dive on Tarbert Bank. Object was to travel N. down side of bank, across deep trench and up the other side. Owing to a combination of strong tide and drift of the gyro compass the actual course taken was a parabola and the point of emergence due W. of the point of descent. The dive was terminated when the submersible found itself in 25 ft of water. Emergence was about 100 yd from the coast S. of Tarbert. Actual course was down a rocky bank, across a mud trench and up the rocky bank leading to coast. In the course of a collision with an unexpected rock face a chip of quartzite was knocked off by the handling arm. This accidental sample became lodged in the mechanism and was later recovered.

/Visibility

Visibility. 10 to 15 ft

Observations. B.H. Holford remarked on the long time spent on adjusting trim of the submersible, and its slow rate of manoeuvre. He was able to observe shellfish in their habitat. He felt that the speed was inadequate for the submersibles to follow and observe the action of nets. He will report to Director, Lowestoft Laboratory.

J.H. Fraser and J.A. Adams put ashore by Zodiac on afternoon of 9 November. Returned to Tarbert in evening to obtain spare sparking plug for Pisces deck compressor.

Monday 10 November

Dive 1. R.A. Eden and D.A. Ardu. Geology

Personnel. R.A. Eden, D.A. Ardu, D. White

Period of dive. 0912 - 1200

Sea conditions. Choppy waves 1 ft on descent, 3 ft on emergence.

Wind force 6-7 on emergence, but sheltered.

Maximum depth. 630 ft

Procedure. Dive in centre of trough 3 miles SE of Tarbert and travel SW towards side of trough, then climb up side. The intention was then to observe the ledge at top as far in as the 120 ft line, but it was necessary to abort dive at depth 460 ft due to a failure of the starboard engine.

Visibility. 5-6 ft.

Observations. It was possible to study the geomorphology of the base of the main trench of Loch Fyne, and of the lower part of the slope.

Effectively half of the period of the dive was lost due to the engine failure. Areas of manganese nodules were located and photographed.

It was necessary to return to Tarbert to effect repairs to the engine of Pisces. Berthed at Tarbert 1345. Spent afternoon overhauling engine; failure was due to faulty bearings. W. Hemmings, J. Mason and J. Kinnear came aboard in evening. R.V. Goldseeker arrived Tarbert in afternoon for joint work with Pisces.

Tuesday 11 November

Dive 1. W. Hemmings and J. Mason. Observation of clam dredge.

Personnel. W. Hemmings and J. Mason, S. Bolton (pilot)

Period of dive. 0945 - 1600.

Sea conditions. Chop 1-2 ft, very slight swell.

Average depth. 70 ft.

Procedure. Dive in Clunaig Bay with buoy attached. Standard clam dredge lowered nearby by R.V. Goldseeker. Pisces attached to dredge by cord, by diver working down buoy. Dredge and Pisces towed by Goldseeker. Process repeated with alternative net mesh and with Baird dredge and beam dredge. Observations of dredge behaviour were carried out. Experimental photography using polarised light and camera filters.

Observations. The method was successful and a useful piece of research was carried out. Report will be submitted to Director, Aberdeen Laboratory and to Messrs. Vickers.

Return to Tarbert to disembark W. Hemmings, J. Mason and J. Kinnear.

/Wednesday

Wednesday 12 November

Dive 1. R.A. Eden and D.A. Arduş. Geology.

Personnel. R.A. Eden, D.A. Arduş, A. Johnson (pilot)

Period of dive. 0900 - 1230

Sea conditions - Chop 1 ft.

Maximum depth - 630 ft.

Procedure. Dive in centre of deep water, 3 miles SE of Tarbert. Travel as fast as possible NE across mud area, then up vertical rock cliff from 600 to 200 ft and across shelf at top shoreward to depth 100 ft. Surface.

Observations. Excellent geological exposures were observed on the cliff and on crags just above its top. Sediment types and geomorphology were studied.

Return to Tarbert to disembark R.A. Eden, D.A. Arduş, B.H. Holford.

Ship off charter at 1500 hours after survey.

Note on Pisces

1. The Vickers Pisces party aboard consisted of 4 pilots/divers, plus a party leader (Eastaugh) who is also a diver but not a pilot, and a member of the Vickers office staff (R. Mason). Help in launching and retrieving the submersible was given by the crew of Vickers Venturer. Servicing is by the pilots.
2. The submersible was fitted with a torpedo recovery arm which was capable of digging holes, excavating and recovering boulders, and holding a bucket for collection of a sample. It is not intended for sampling, and delivery of a suitable arm for this is awaited. Operating staff realise that a satisfactory handling device is essential for any work involving sampling, and they have asked for suggestions for specialist tools.
3. Maximum depth reached in the present work was 635 ft. The submersible has been tested to 2500 ft in Canadian trials and is intended for work at up to 3500 ft.
4. Excluding equipment solely for control and safety, the following items which have possible scientific value were carried by Pisces during the present cruise:

Western Marine Electronics sector scanning sonar. Ranges 3000 ft to 100 ft. Also usable as an echo sounder and to give distance to surface.

Pressure depth gauge (Standard Controls Inc.)

Ross Echo sounder (Sportsman Dual Range Indicator). Used for fine control of landing.

Sea temperature gauge.

Closed circuit TV (hand held camera in cabin) with display unit and video tape.

Sonar voice communication to surface (Oceanic Enterprises).

/Radio

Radio communications for use on surface.

Gyro compass.

Harrier log speedometer.

5. Apart from cameras (which are at hazard and should be in good cases) observers would be well advised to take small personal tape recorders and to wear soft shoes. For research work, as opposed to the present evaluation, it would probably be most efficient to limit the crew to one pilot and 1 scientist, and if possible operate submerged all day rather than in half day stints. Some passengers reported severe headaches after their dives.
6. Vickers Venturer is fitted with Decca Navigator Mk 12, Decca Plotter and Radar.
7. Pisces appears to be operational in any reasonable weather conditions, although operation in a long swell was not seen in the present work. Recovery on 8 November was in 6 to 8 ft waves and Force 8 wind; the minor damage sustained on that occasion could probably be avoided with experience.
8. There was no effective location system for the submersible fitted on the present cruise. The Pisces crew can attempt to locate themselves by dead reckoning, but currents plus errors in the gyro compass make this difficult. It is understood that a location system is about to be fitted for the use of the crew, and a system for use from the surface ship is being planned (S.P.A.T.E., manufactured by Messrs. Marconi). For some scientific applications precise location is vital, and this is realised by the operators.
9. Pisces maximum speed at present is about 2 kn. This is slower than expected but it is hoped that a slight modification to the screws will increase the speed substantially.

Notes on Vickers Venturer (all measurements approximate)

1. Vickers Venturer is the sister ship of R.V. John Murray but appears to be rather more stable (as far as can be judged in sheltered waters). She carries 60 tons of cement ballast. Top speed is just under 10 kn but she is said to be due to be re-engined next year.
2. She carries a stern hydraulic gantry with a swinging A frame, which is rated at 12 tons and has a stern overhang of 18 ft, and a main winch also rated at 12 tons operated from a stern console. This main winch has a large drum 37 in. wide 7 in. deep and with inside diameter 20 in.; it does not at present have a free fall capacity but could be converted to have one by a minor modification.
3. There is 30 ft x 18 ft of open space in the platform for the submersible. This would have to be boarded over on top of the submersible skid guides if required for use as a working area. The A frame could then handle a 12 ft high vibrocorer in the vertical position from this platform. For use in this way it would be necessary to build a wooden stairway from the platform to the main deck to facilitate contact from laboratory to platform. There would be room to mount fore and aft anchor winches at the forward end of this platform, which has been strengthened to take a heavy capstan not yet installed.

4. There is 500 sq ft of open space on the main deck aft of the bridge. This could be used for mounting a hut for sample storage, or equipment such as a generator. There is no available hold space.
5. There is a laboratory 10 ft x 20 ft with sinks; the sinks can be covered up and used as benches, in which case total bench space is 75 sq. ft. but there is room for an additional 25 sq. ft. bench.
6. There are good facilities aft of the bridge for launching an inflatable.
7. There is room for installation of a small hydrographic type winch to operate over the port side aft of the superstructure.
8. There is ample cabin space (cabins for a total of 26 supernumeraries; on the present cruise 12 were carried) and the ship is efficiently operated.
9. There is a chart room 10 ft x 16 ft aft of the bridge.

#### Safety

1. There is no efficient means of locating the submersible should it be in trouble. I would prefer that it should carry a pop-up buoy for emergency use.
2. The view out from the submersible is very limited and external television would be an asset for both safety and scientific reasons. It is understood that a TV is to be added near the conning tower which will be capable of adjustment to look up or down, and this will be of considerable assistance.
3. This is a matter primarily for the operators, but I would prefer that the use of divers for assisting retrieval should be kept to a minimum.

Sampling drill. The submersible requires a means of sampling solid rock if it is to be a geological tool, and the best method is likely to be by means of a small diamond-tipped core barrel for the hydraulic drill which it is understood will be fitted for use with the planned telechiric arm. The barrel will probably require to have core snappers comparable to those on the Liverpool University/IGS underwater drill (Harrison drill) to enable it to break off cores. There should be facilities for at least 12 drill samples in an 8 hour dive.

Contract and indemnity. I was separately requested to sign comprehensive indemnity forms on behalf of the NERC party by the Captain of Vickers Venturer and the party leader of Pisces. I refused to do so on the basis that an indemnity is already included in the negotiated contract. Fortunately the matter was not pressed, but I was told that all former NERC users had signed the forms, and in fact Vickers instructions are that personnel are not to be allowed aboard without the forms being completed. This matter requires clarification before the next contract is agreed. Copies of the forms are attached for NERC (Finance) consideration.

#### Possible use for biological and fisheries purposes

Separate reports will be submitted by personnel concerned to their Laboratory directors.

/Observations

Observations on possible use for geological purposes

1. Efficient location and rock and sediment sampling systems are essential.
2. Only very short traverses are possible in areas of complex geology or topography, because the submersible is a slow and rather cumbersome vehicle.
3. Many of the functions of a submersible can be met by the underwater television with drill attached, which we have developed in conjunction with Liverpool University.
4. Proper appreciation of underwater geomorphology can only be made by use of a submersible (or by a diver). Underwater topography is quite different to that on the land surface, and it is of value to be able to see in three dimensions the type of rock exposure with which we are dealing in our sampling endeavours. Our concept of the Loch Fyne sea bed has been considerably modified by the present work. Many of the rock faces were in fact too steep to have been sampled with our drill and some of the sediments collected by dredge earlier this year came from thin patches on top of steep sided rock tables. With a little extra surface work it is hoped to be able to produce for publication a short account of the geomorphology of the restricted area studied during the present cruise.
5. Maximum value of a submersible would be in detailed work in areas of special interest, of which Lower Loch Fyne is one. In addition trial runs could be made in areas showing a variety of sea floor conditions; then could be regarded as 'type-areas' for study of sea floor geomorphology and sampling conditions.

Acknowledgment

The fullest possible co-operation was received from the captain and crew of R.V. Vickers Venturer and from the Pisces party leader and team. There was a refreshing atmosphere of enthusiasm and efficiency about the operations. The party leader was generous in his assessment of extension of time to make up for time lost.

R.A. EDEN Senior Scientist  
District Geologist Continental Shelf Unit II  
IGS

Director IGS  
Chief Geologist GB  
A.D. Edinburgh  
A.D. Leeds  
W. Bullerwell  
D.G. Continental Shelf Unit I  
NERC HQ (attention P. Fenning)  
NERC (Finance)

S. Calvert  
J.H. Fraser  
J.A. Adams  
W. Hemmings  
B.H. Holford  
R. McQuillin  
J. Cleverly RVU  
R. Eastaugh (Vickers)