

SITE R1000

A site of pebbles and granular gravel set in muddy sand: striations and other bedforms indicate that benthic currents sometimes advect the seabed. There are occasional energetic events during which the sediments are sculpted into cusp-shaped ripples by oscillating flows. Unfortunately, no instruments were installed at this station during the SES project to investigate these events. There is evidence of a diverse benthic community and of significant demersal trawling activity. The site was visited on five occasions: in April, August and December 1995, and in May and August 1996. 126 photographs were taken altogether.

Reference No: *II/56/3/11*:

Site:	R1000
Cruise:	Charles Darwin CD92A
Position:	56° 30' N approx. 09° 18' W approx.
Depth:	1000 m nominal
Date:	8th April 1995.
Time:	18:30 GMT approx.

Pebbles are embedded in fine sands and silts. The finer sediments are being advected steadily towards the NW by benthic currents, forming low-profile bedforms. It is uncertain whether the NNE-elongated bedforms at the centre and top-right originate from near-bottom currents or are a relict of erosion of biological features (e.g. from feeding-trails). There are four brittle-stars (possibly *Ophiecten gracilis*), one in the centre of the picture (overall diameter 9 cm approx.) and one near the compass; two more can be seen near the top of the picture. The small protruding tube-like features (near the top centre) are unidentified but may be agglutinated foraminiferans or possibly made by polychaete worms. There is a small whelk near the top, but there appears to be little evidence for any well-developed burrowing benthic community. The view faces towards the ENE.



Reference No: **II/39/4/16A**:

Site: R1000
Cruise: Challenger CH121A
Position: 56° 30.85' N approx.
09° 17.89' W approx.
Depth: 1020 m approx.
Date: 14th August 1995.
Time: 02:33:16 GMT

A seabed of fine muddy sand and pebbles is seen with no evidence of sediment-advection caused by benthic currents. The sediment surface appears to have many small tubes, some branched, that may possibly be agglutinated foraminiferans or made by small polychaete worms, protruding from it as in photograph **II/56/3/11**; a degraded, sinuous feeding-track (possibly made by an irregular sea urchin) extends across much of the picture. The relatively large brittle-star in the foreground may be the actively motile carnivorous species *Ophiopleura inermis*. Its disc is about 1.5 cm in diameter, and the arms are about 15 cm across. The considerable biogenic texture caused by the tubes and other branched structures visible on the surface suggest the epifaunal and partially buried benthic community is quite well developed: note that the picture was taken in late summer. The view faces towards the SE.



Reference No: *II/54/2/11*:

Site: R1000

Cruise: Challenger CH123B

Position: 56° 31.06' N approx.
09° 16.26' W approx.

Depth: 1000 m nominal

Date: 7th December 1995.

Time: 13:10 GMT approx.

The seabed of fine muddy sand and small pebbles has been remoulded in the recent past; observations of ripple-symmetry and crest-bifurcation are interpreted as evidence for oscillatory benthic currents moving WNW - ESE and producing ripples, some of which are cusp-shaped. Straight-crested ripples have a wavelength of approx. 9 cm. There are two cobbles on the sediment-surface, 100 mm in diameter approx.: the one near bottom right has a benthic decapod prawn hiding behind it. Both have a well-developed epifaunal community of attached sessile animals. An imprint of a sea star is visible near the largest cobble just left of centre. There are several mounds 15 cm in diameter approx., and many white brittlestars, *Ophiecten gracilis*, some of which are partly buried in the surface-sediment. There is a single macrourid fish (probably *Coryphaenoides rupestris*), length about 15 cm. The view faces towards the WNW.



Reference No: *II/54/2/12* (Gage negative):

Site: R1000

Cruise: Challenger CH123B

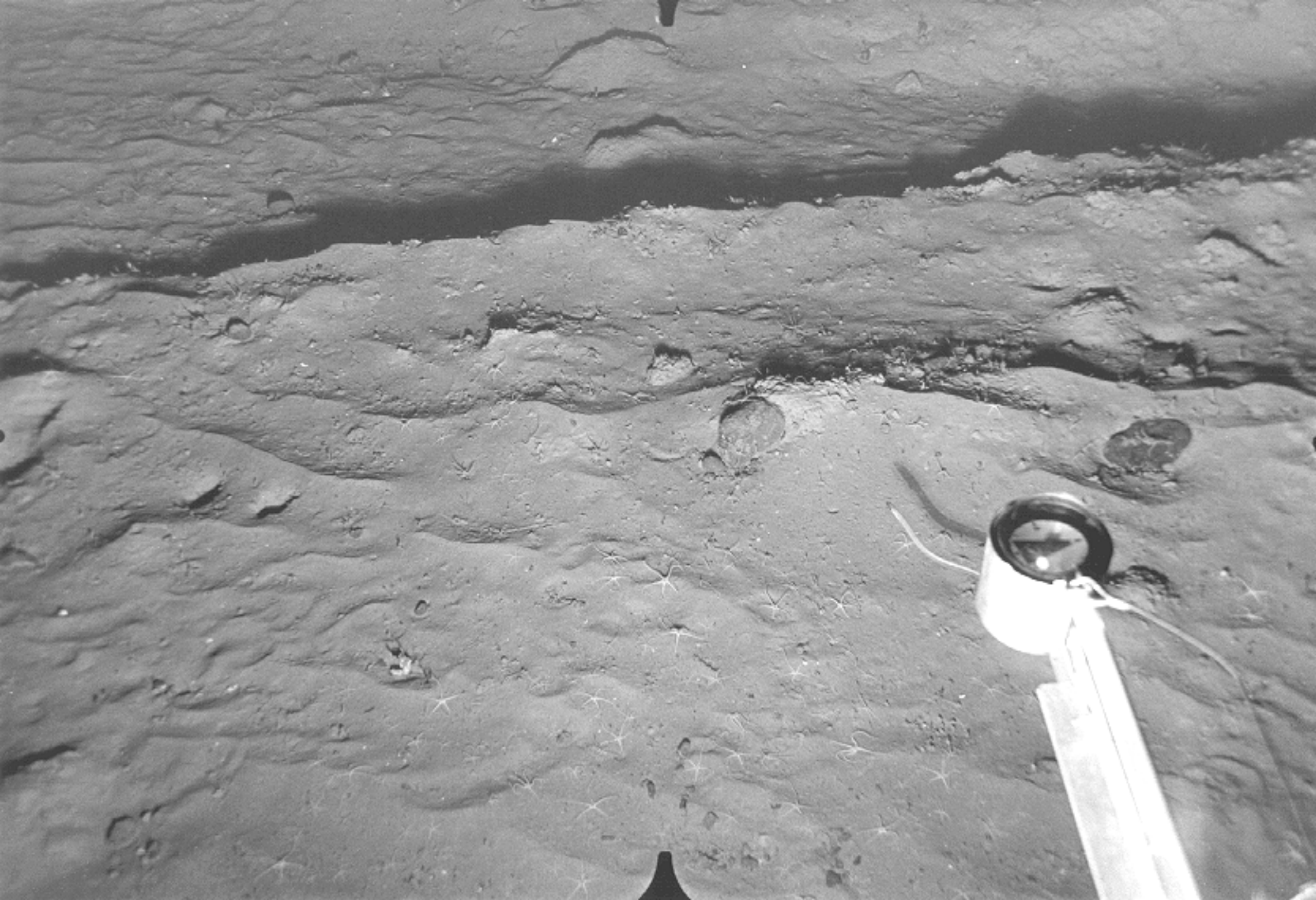
Position: 56° 31.06' N approx.
09° 16.26' W approx.

Depth: 1000 m nominal

Date: 7th December 1995.

Time: 13:12 GMT approx.

The ridges and furrows which appear in this picture were almost certainly caused by heavy demersal trawling activity; pebbles and cobbles (e.g. that seen near the centre, 8 cm in diameter approx.) on the sediment surface were probably exposed at the same time. The crests of the ridges and other bedforms have been moulded by oscillatory currents flowing NW - SE approx. White brittle stars, *Ophiecten gracilis* are seen; some are partially buried in the sediment-surface. There are two pit-like burrows near the left-hand edge; they will have been made by unidentified burrowing benthic organisms. The view faces towards the WNW.



Reference No: *II/54/3/20*:

Site: R1000

Cruise: Challenger CH123B

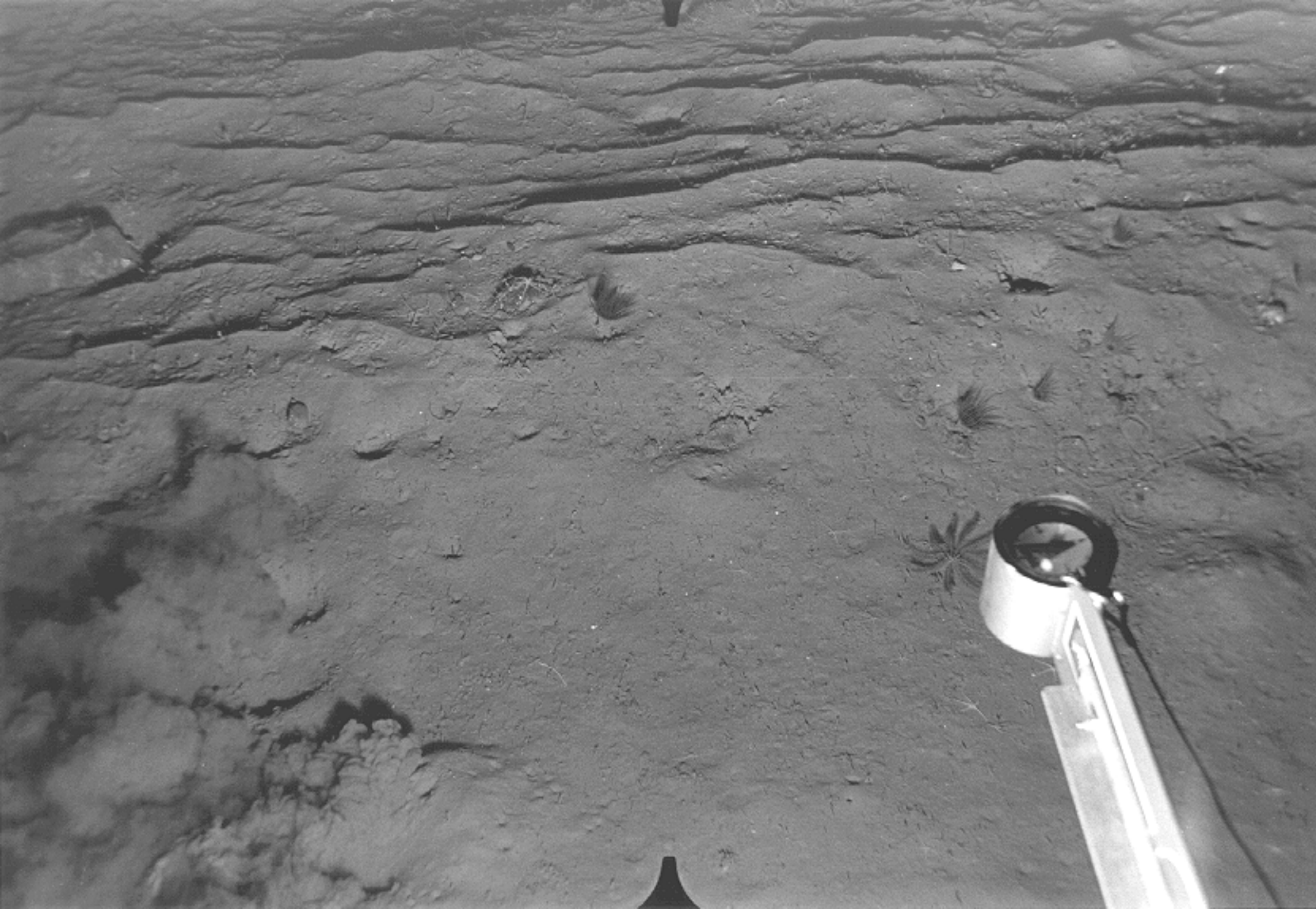
Position: 56° 31.10' N approx.
09° 16.00' W approx.

Depth: 1000 m nominal

Date: 7th December 1995.

Time: 13:18 GMT approx.

The large smooth area in the foreground is a linear depression aligned N - S: almost certainly, it is an old trawling-scar. The boulder in the left-background (at least 30 cm long) was probably uncovered at the same time. The floor of the trawling-scar is pierced by many small siphon-tubes. To the left of the compass, there is what is probably a comatulid crinoid, (a non-stalked sea lily). It has ten arms, each bearing elongated pinnules giving them a bushy appearance: they are used in feeding on suspended particles that are intercepted from the current. Nearby are at least five many-tentacled anthozoans resembling sea anemones. Their tentacles appear to be facing somewhat towards the right. There are some conspicuous pit-like burrows scattered throughout the view; they will have been made by burrowing benthos, as was the "volcano" mound at top right. The organisms producing these traces are unidentified. *Ophiecten gracilis* (white brittlestars) are less dense on the scar-floor than in the background, which has been reworked into ripples by oscillatory benthic currents flowing WNW - ESE. The cloud of sediment at the lower-left was caused by the camera-frame dragging over the uneven seabed. The view faces towards the WNW.



Reference No: **II/47/5/26A**:

Site:	R1000
Cruise:	Challenger CH126B
Position:	56° 29.99' N 09° 17.69' W
Depth:	994 m
Date:	7th May 1996.
Time:	13:05:44 GMT

The muddy seabed shows no sign of being reworked by benthic currents, but there is considerable bioturbation, and the whole surface is textured with small projecting tubules. Many of these may be agglutinated foraminiferans. The large circular object in the foreground may be a Xenophyophore (10 cm diameter approx.). These are strange, recently discovered single-celled protozoans related to the fresh-water Amoeba. They are extremely fragile, and usually do not survive intact in bottom samples; there is an object with a similar surface-texture in a depression further towards the top-left. At the extreme left, the bushy tentacle-crown of a sea anemone-like anthozoan is just visible and at the extreme right is a crab (possibly *Geryon* sp.). Near the crab there is a pale-coloured sea anemone with robust-looking long tentacles and an inner circle of finer short arms around the mouth (15 cm across approx. max.), and a squat lobster (probably *Munida tenuimana*) facing towards the camera and sitting in a shallow burrow. The view faces towards the NNE.



Reference No: *II/55/2/9A*:

Site:	R1000
Cruise:	Challenger CH128B
Position:	56° 31.16' N 09° 17.28' W
Depth:	990 m
Date:	4th August 1996.
Time:	21:40:53 GMT

This view is unusual in that the camera-frame was tilted forward and downward at the time the picture was taken, and therefore the sizing-grid cannot be used reliably. The lower lighting has accentuated the shadows cast by numerous bedforms. Crestlines are orientated generally WSW - ENE, and the crests are broken up into separated ridges which have in places been further broken by bioturbation. The orientation of the ridges indicates some sediment advection towards the SSE. The view shows many white brittlestars, *Ophiecten gracilis*, some of which clearly have been disturbed by the near-passage of the camera frame at the lower right. There are also many small, pale, spherical growths which are possibly agglutinated foraminiferans (0.5 – 2 cm diameter approx.) and a small, pale, branched growth just to the right of the centre of the photograph. The view faces towards the NNW.



Reference No: **II/55/4/18A:**

Site:	R1000
Cruise:	Challenger CH128B
Position:	56° 31.15' N 09° 17.21' W
Depth:	986 m
Date:	4th August 1996.
Time:	21:51:19 GMT

The bed is composed of fine muddy sand, but there are a number of pebbles (10 – 30 mm diameter approx.), particularly on the left of the picture. The sand has been reworked fairly recently by oscillatory benthic currents flowing in a NW - SE direction, producing sharp crests on the ridges: wavelength is 8 cm approx. The cause of the depression at the extreme left is unexplained. There are many white brittlestars, *Ophiecten gracilis*, and a single synphobranchid eel (length 15 cm approx.) near the top-left. The view faces towards the North.



Reference No: II/56/3/15A (part-frame enlargement):

Site:	R1000
Cruise:	Charles Darwin CD92A
Position:	56° 30' N approx. 09° 18' W approx.
Depth:	1000 m nominal
Date:	8th April 1995.
Time:	18:40 GMT approx.

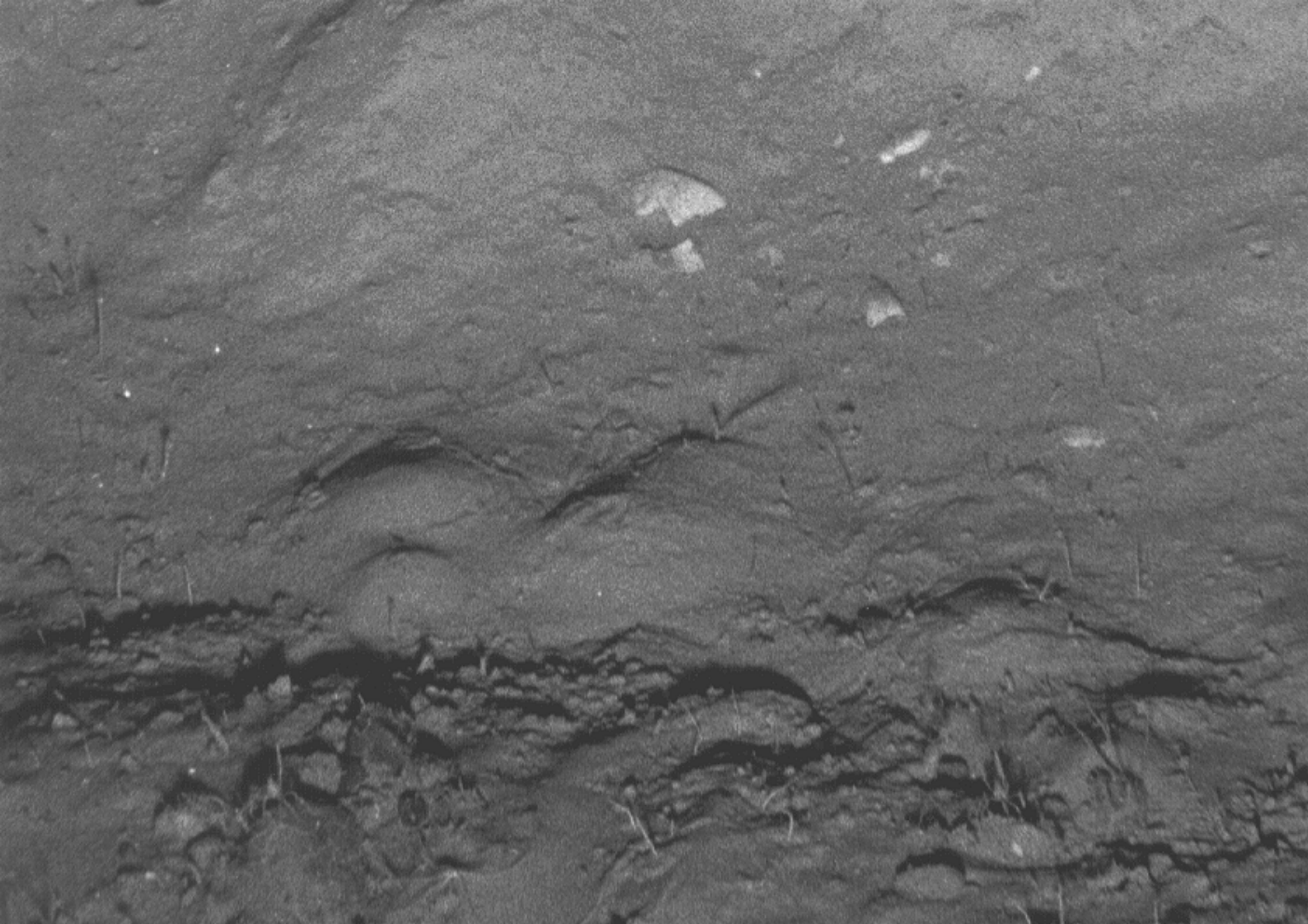
Fine sand is slowly being advected by steady benthic currents, forming very shallow ripples with wavelength 15 cm approx. Lighter-coloured minerals on the West of the ripple-crests probably consist of carbonate-rich grains; advection towards the West is implied. The rosette of the anthozoan coelenterate is 10 cm across approx. It has an outer series of long, and an inner series of short, tentacles around the central disc and mouth. The fish is probably a synphobranchid eel, but definition is poor in this part of the photographic frame.



Reference No: II/54/3/21 (part-frame enlargement):

Site:	R1000
Cruise:	Challenger CH123B
Position:	56° 31.10' N approx. 09° 16.00' W approx.
Depth:	1000 m nominal
Date:	7th December 1995.
Time:	13:19 GMT approx.

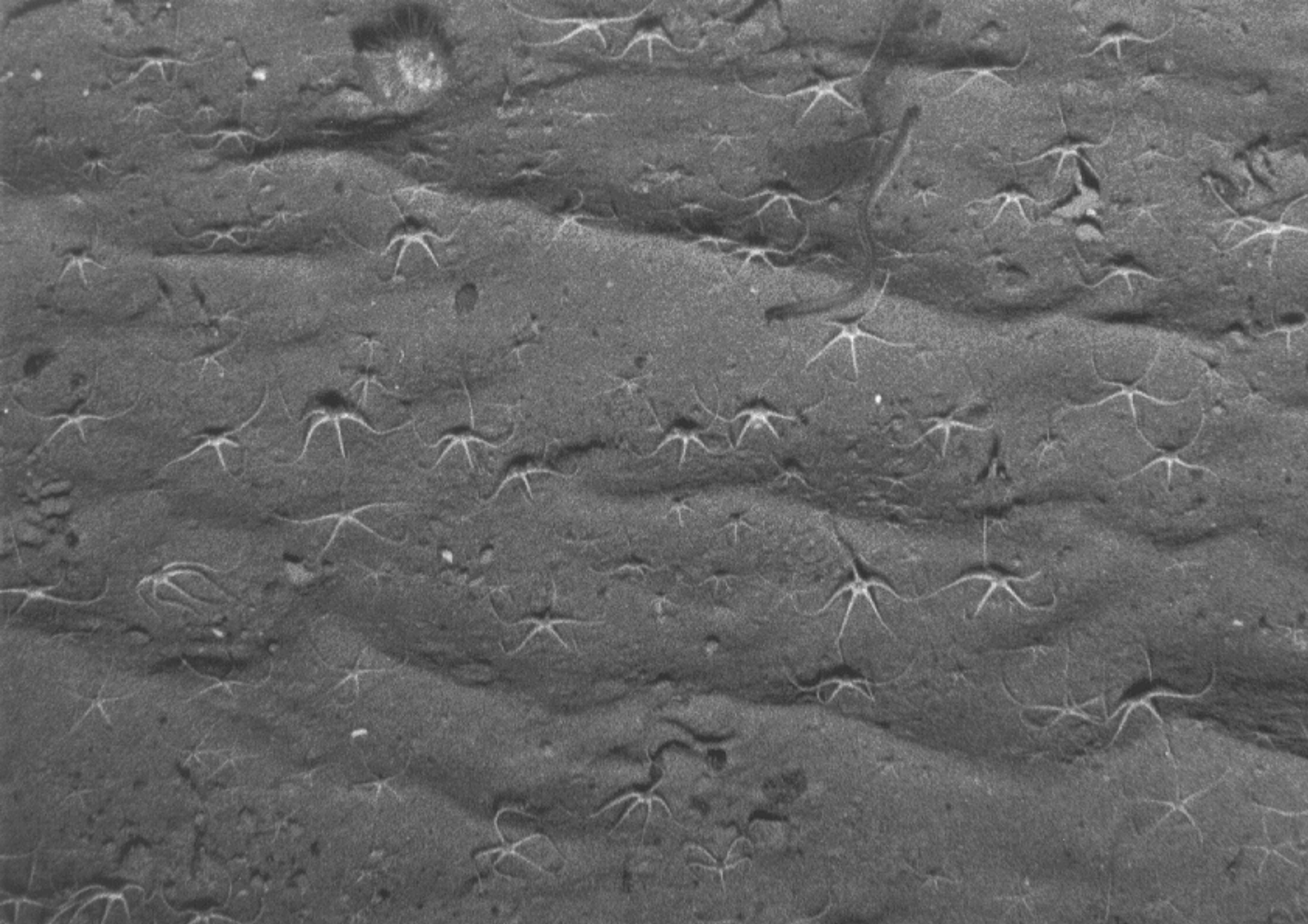
The smooth background is the bed and far-wall of an old trawling-scar. The foreground probably shows the colonisation of the disturbed material at the near crest of the scar, with many tubules (possibly made by small polychaete worms and/or agglutinated foraminiferans) extending upwards; two small, prawn-like decapod crustaceans are just visible standing on top of clods of bed-material in the foreground.



Reference No: *II/54/4/23* (part-frame enlargement):

Site:	R1000
Cruise:	Challenger CH123B
Position:	56° 31.10' N approx. 09° 16.00' W approx.
Depth:	1000 m nominal
Date:	7th December 1995.
Time:	13:20 GMT approx.

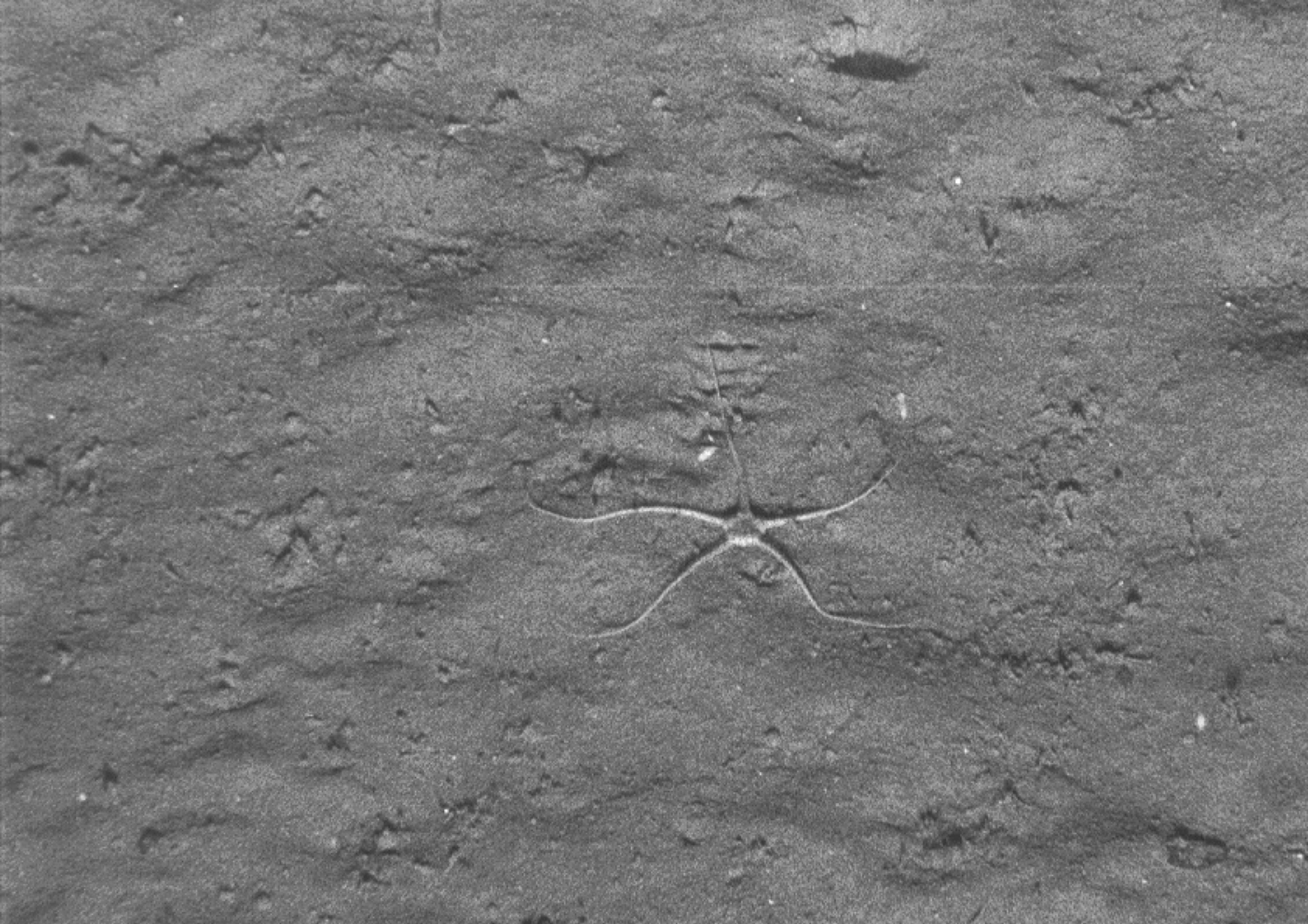
A field of cusp-shaped sand-ripples (caused by oscillatory benthic currents) is being degraded slowly by the movement of many white brittlestars, *Ophiocten gracilis*, some of which have lifted their bodies up off the bed, supported on their flexed arms. There is a small sea urchin (*Echinus* sp.) and a synaphobranchid eel at the top of the picture.



Reference No: **II/47/3/11A** (part-frame enlargement):

Site:	R1000
Cruise:	Challenger CH126B
Position:	56° 30.37' N
	09° 17.82' W
Depth:	1001 m
Date:	7th May 1996.
Time:	12:27:47 GMT

A large brittle star (probably *Ophiopleura inermis* see also photograph **II/39/4/16A**), disc-diameter 1.5 cm approx., overall diameter 15 cm approx.) lies on a silty bed which is pierced and roughened in places by the activities of burrowed animals. Some marks are associated with mounds of excavated or ejected sediment, while others appear not to be associated with debris mounds, and may be caused by the movement of large deep-burrowed animals causing tension fractures at the surface.



Reference No: **II/47/5/25A** (part-frame enlargement):

Site:	R1000
Cruise:	Challenger CH126B
Position:	56° 30.01' N 09° 17.70' W
Depth:	995 m
Date:	7th May 1996.
Time:	13:03:50 GMT

A squat lobster (probably *Munida tenuimana*) shelters under the arms of a large pale-coloured anemone (diameter 11 cm approx.) which has both long outer and shorter inner tentacles. This species closely resembles that shown in photograph **II/47/5/26A**. It is interesting that the latter sea anemone also has a squat lobster living close by. Degraded feeding-tracks in the background may have been caused by irregular sea-urchins.



*Reference No: **II/47/5/26A** (part-frame enlargement):*

Site:	R1000
Cruise:	Challenger CH126B
Position:	56° 29.99' N 09° 17.69' W
Depth:	994 m
Date:	7th May 1996.
Time:	13:05:44 GMT

An unidentified, spherical Xenophyophore (diameter 10 cm) rests on a bed of fine sand and silt, which is pierced by many small organisms. The contrast of this picture has been maximised to accentuate the porous surface of this enigmatic giant-sized protozoan.



Reference No: **II/47/5/26A** (part-frame enlargement):

Site:	R1000
Cruise:	Challenger CH126B
Position:	56° 29.99' N 09° 17.69' W
Depth:	994 m
Date:	7th May 1996.
Time:	13:05:44 GMT

A squat lobster (probably *Munida tenuimana*) rests in a shallow burrow, the sharp-edged lip of which indicates that it is being reworked by steady benthic currents. The large pale anemone (overall diameter 15 cm approx.) has a rosette of short arms over a second rosette of much longer arms. Some of these latter appear to be branched, but this is not so; close inspection reveals that the illusion is caused by some of the arms overlapping partially.



Reference No: *II/55/3/10A* (part-frame enlargement):

Site:	R1000
Cruise:	Challenger CH128B
Position:	56° 31.16' N
	09° 17.28' W
Depth:	990 m
Date:	4th August 1996.
Time:	21:42:04 GMT

A small, pale-coloured squat lobster (probably *Munida tenuimana*) looks out from under a stone across a bed of degraded ripples which may have been produced originally either by oscillatory currents or by the "ploughing" activities of irregular sea urchins. Towards the left, there is a sea anemone in a shallow depression. Several white brittlestars, *Ophiocten gracilis*, are visible in the foreground.

