

Bonne Bay, Newfoundland: Interpretation of multibeam bathymetry data



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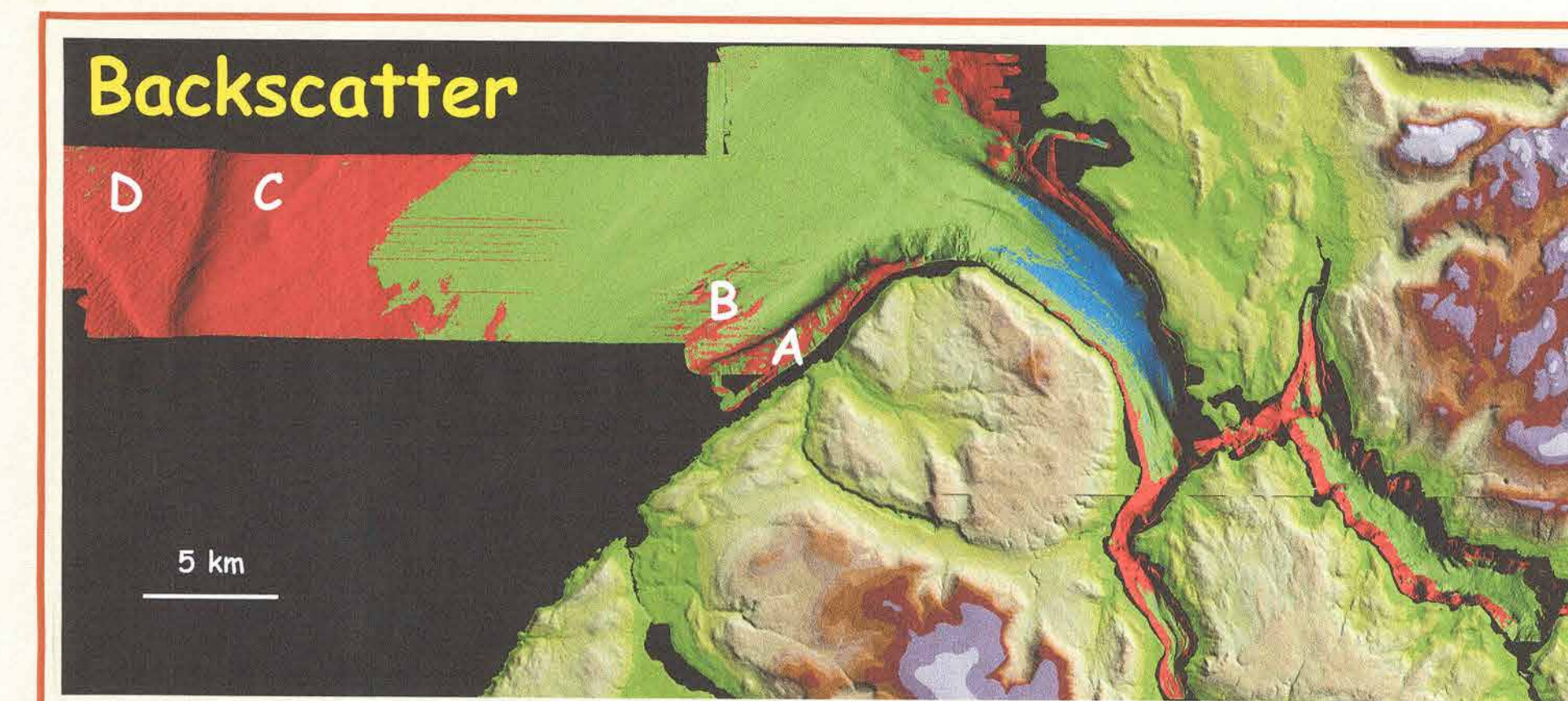
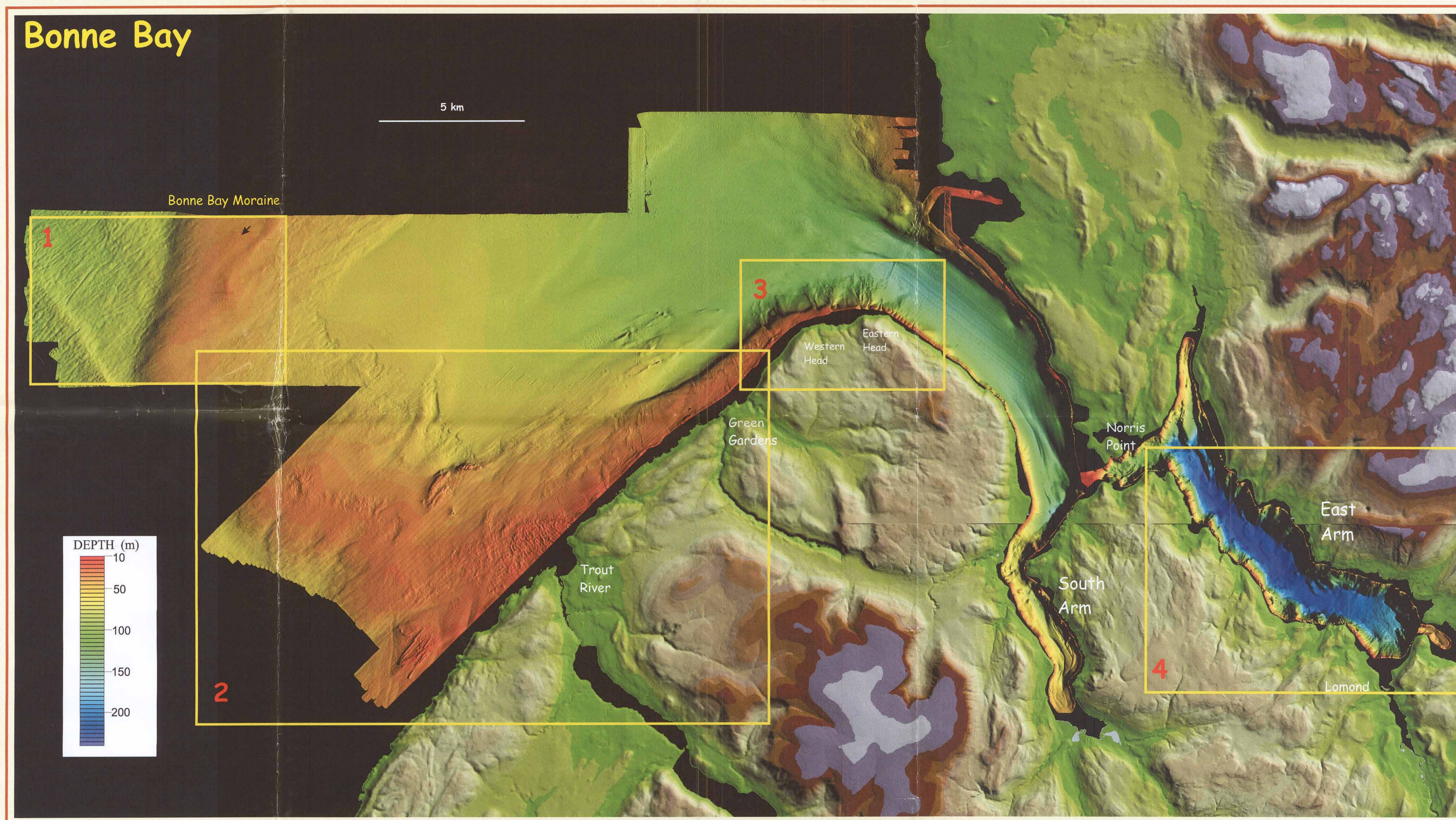
INTRODUCTION

Bonne Bay, Newfoundland, was surveyed by the Geological Survey of Canada using a multibeam bathymetry system in 1997 and 2000. The survey provided millions of bathymetric soundings that have been gridded at a 10-m spacing and processed in a Geographic Information System to provide the coloured shaded-relief images shown here. Interpretation of the data is facilitated by results of a ground-truthing cruise in 1997 (Shaw et al., 1998). The view at left shows the entire multibeam image of the Bonne Bay area; the enlarged views are used to illustrate morphologic features and geological

INTERPRETATION

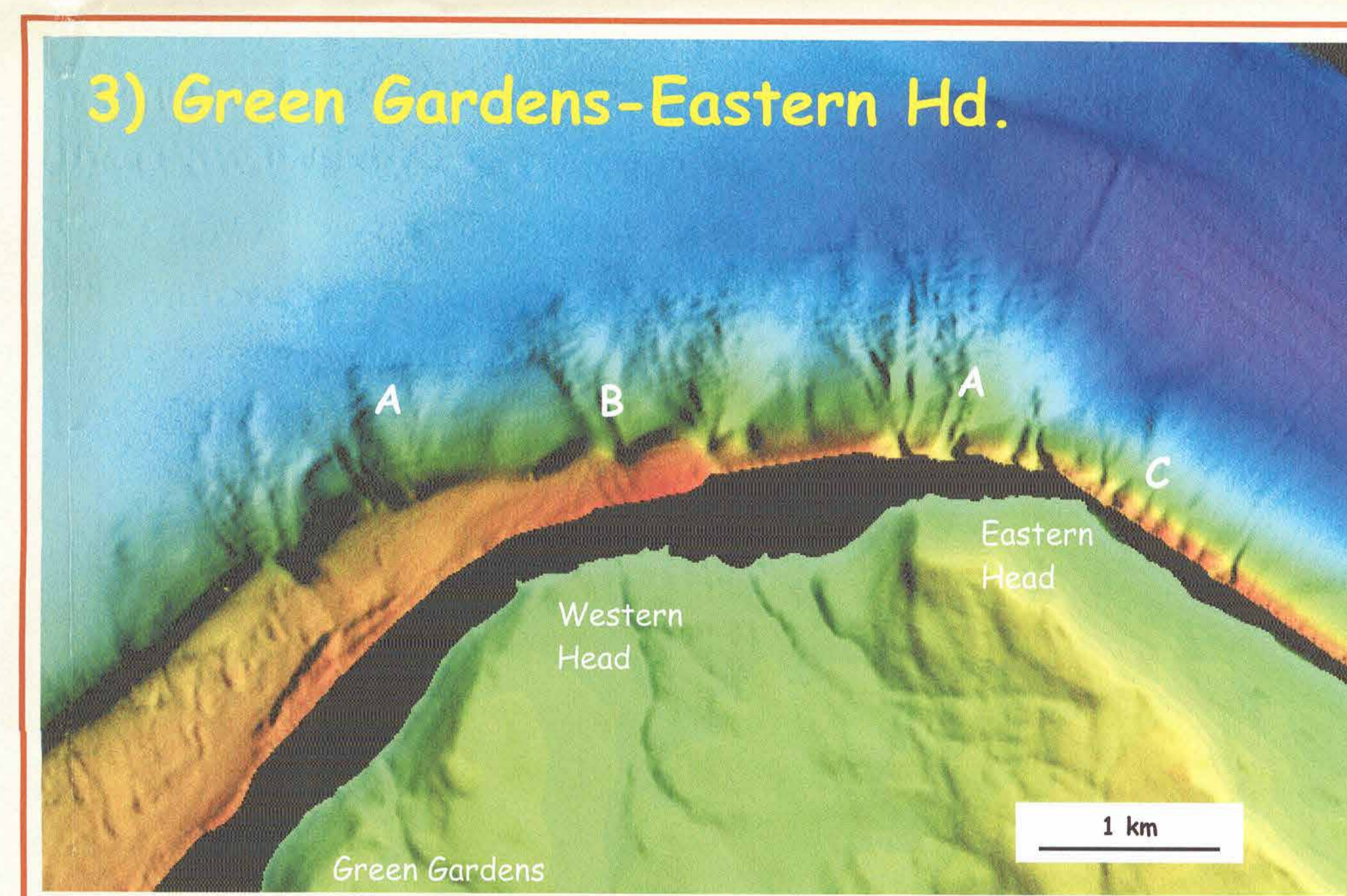
East Arm has the deepest water in Bonne Bay (226 m). This contrasts with most other Newfoundland fiords, where the deepest water is at the fiord entrance. Bonne Bay shallows considerably near Norris Point, then deepens towards the ocean, where depths reach about 130 m.

West of Bonne Bay, a submarine moraine deposited by ice emanating from Bonne Bay (c. 14,000 radiocarbon years BP) forms an arcuate shoal. After completing the first survey, we believed that the shoal reached the coast at Trout River, as suggested by earlier mapping on land. However, when the second survey was completed, it was recognized that the moraine runs close to the coast along the Green Gardens. It has been modified by waves in the shallow water, and forms the shallow littoral platform that extends from Green Gardens to Eastern Head. The most striking feature in the image is undoubtedly the cluster of large submarine fans that lie off Western Head. These are composed of sand carried into deep water from the littoral platform. The enlarged views illustrate some of the features and processes in the Bonne Bay region in more detail.

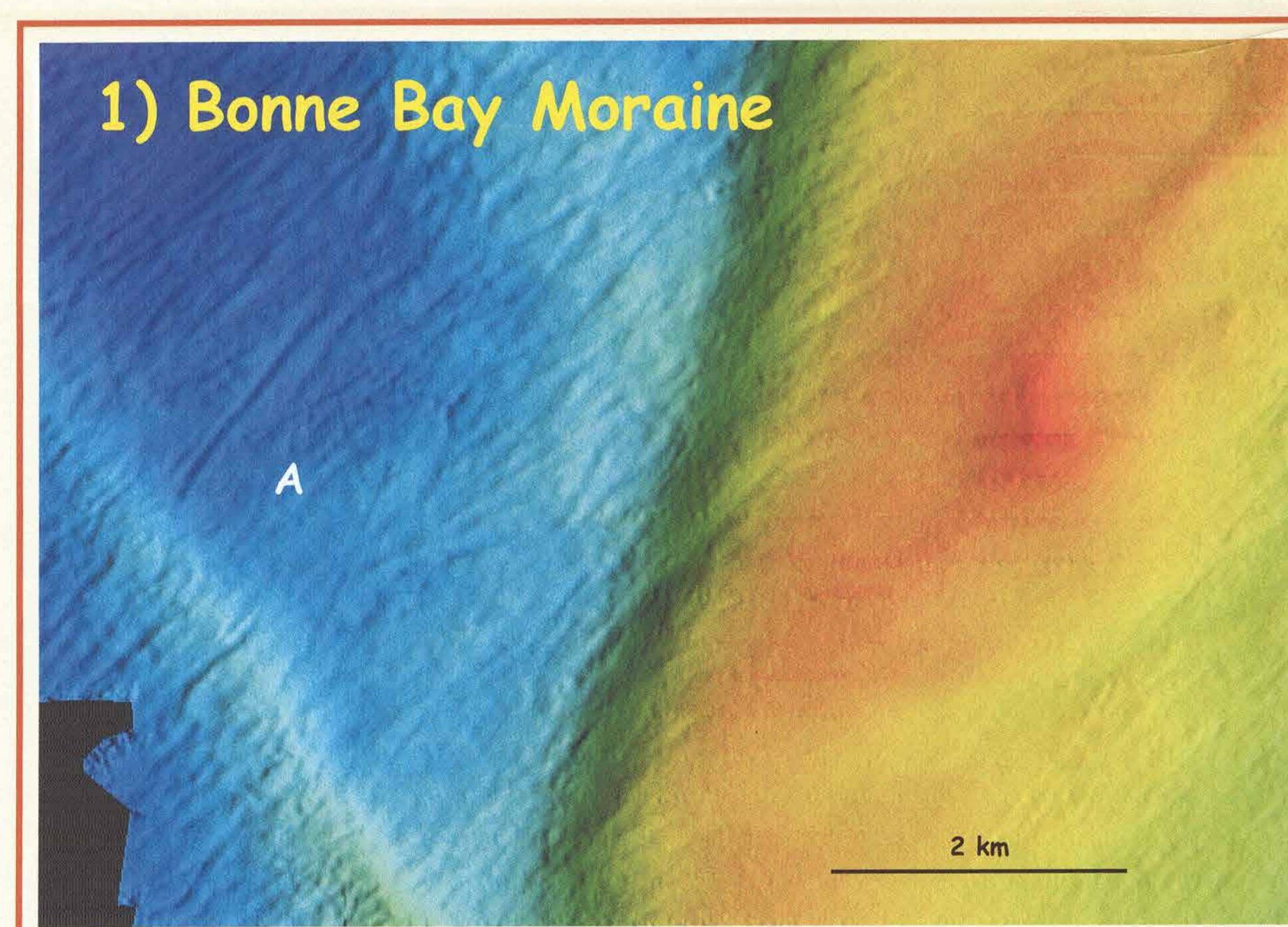


BACKSCATTER is defined as the percent of the sounder signal that is returned to the survey system. High backscatter usually correlates with a hard bottom (e.g., rock) and low backscatter with a soft bottom (e.g., mud). Here the backscatter signal has been classified into three colours and superimposed on a shaded relief image. Red indicates high backscatter, green is moderate to low backscatter, and blue is low backscatter.

The red area (high backscatter) correlates with the steep rocky walls of the inner part of the fiord. Off the Green Gardens and Western Head it correlates with gravel on the sea floor (A), and bedrock ridges (B). Farther offshore, on the Bonne Bay Moraine, it correlates with bouldery gravel on the ridge (C). Yet farther west, where glaciomarine mud is exposed on the sea floor, it indicates



LITTORAL PLATFORM off the coast from Green Gardens to Eastern Head shallows and widens from southwest to northeast. A sidescan sonar survey in 1997 revealed that the surface of the platform is mostly rippled gravel, with patches of sand and scattered bedrock outcrops. The submarine fans (A) that fringe the platform consist of medium sand with some silt and a few pebbles. The channels (B) that incise the fans have levees. East of Eastern Head the image reveals regularly-spaced channels (C) extending into the deeper water. They are several metres deep.

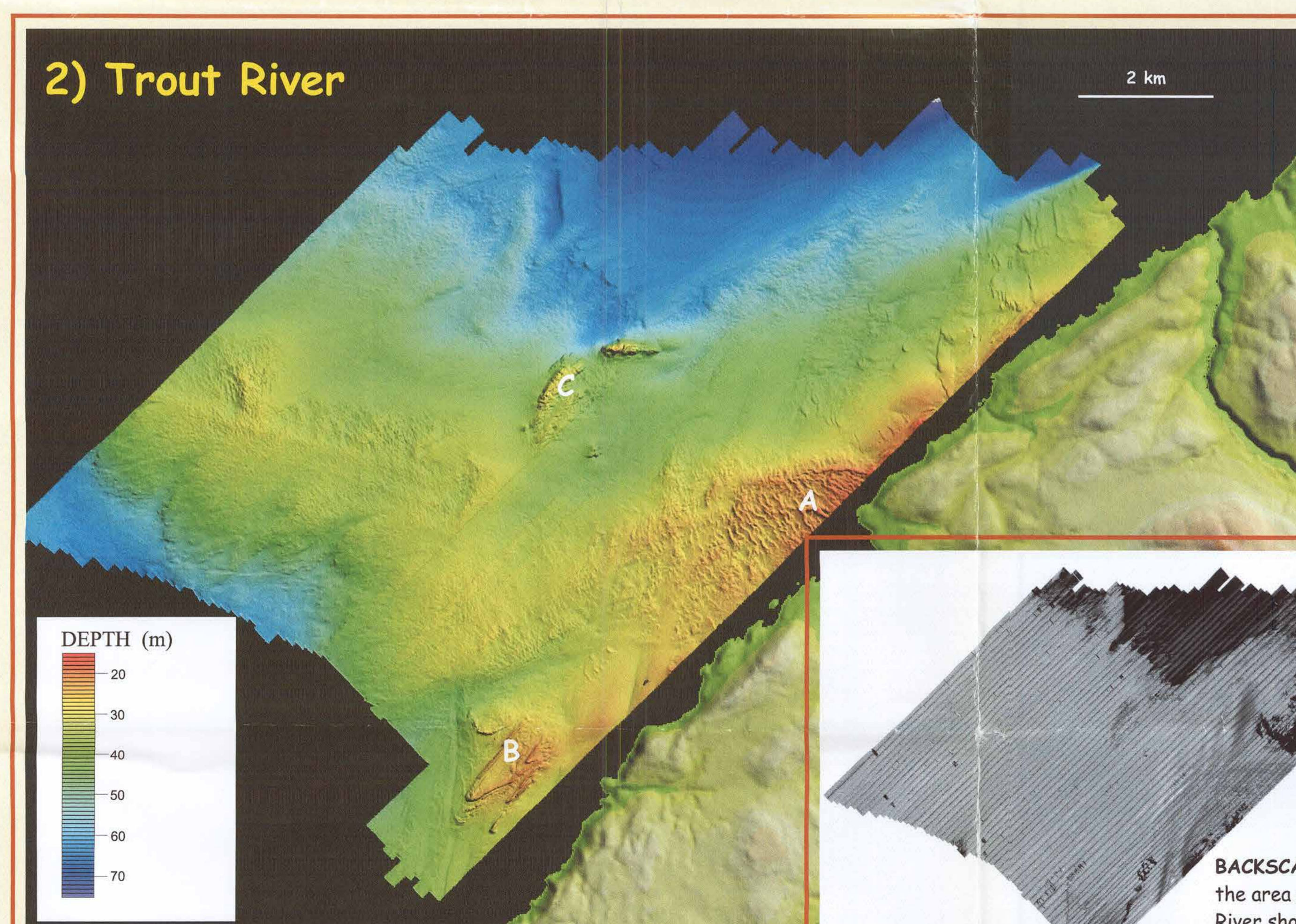


SUBMARINE MORAINES off Bonne Bay. The shallowest part of the ridge is 33 m below sea level. The ridge consists of ice-contact sediment (glacial diamicton) that is 30 m thick over bedrock. The surface appears relatively smooth although sidescan-sonar surveys and grab sampling reveal that it consists of gravel and scattered boulders.

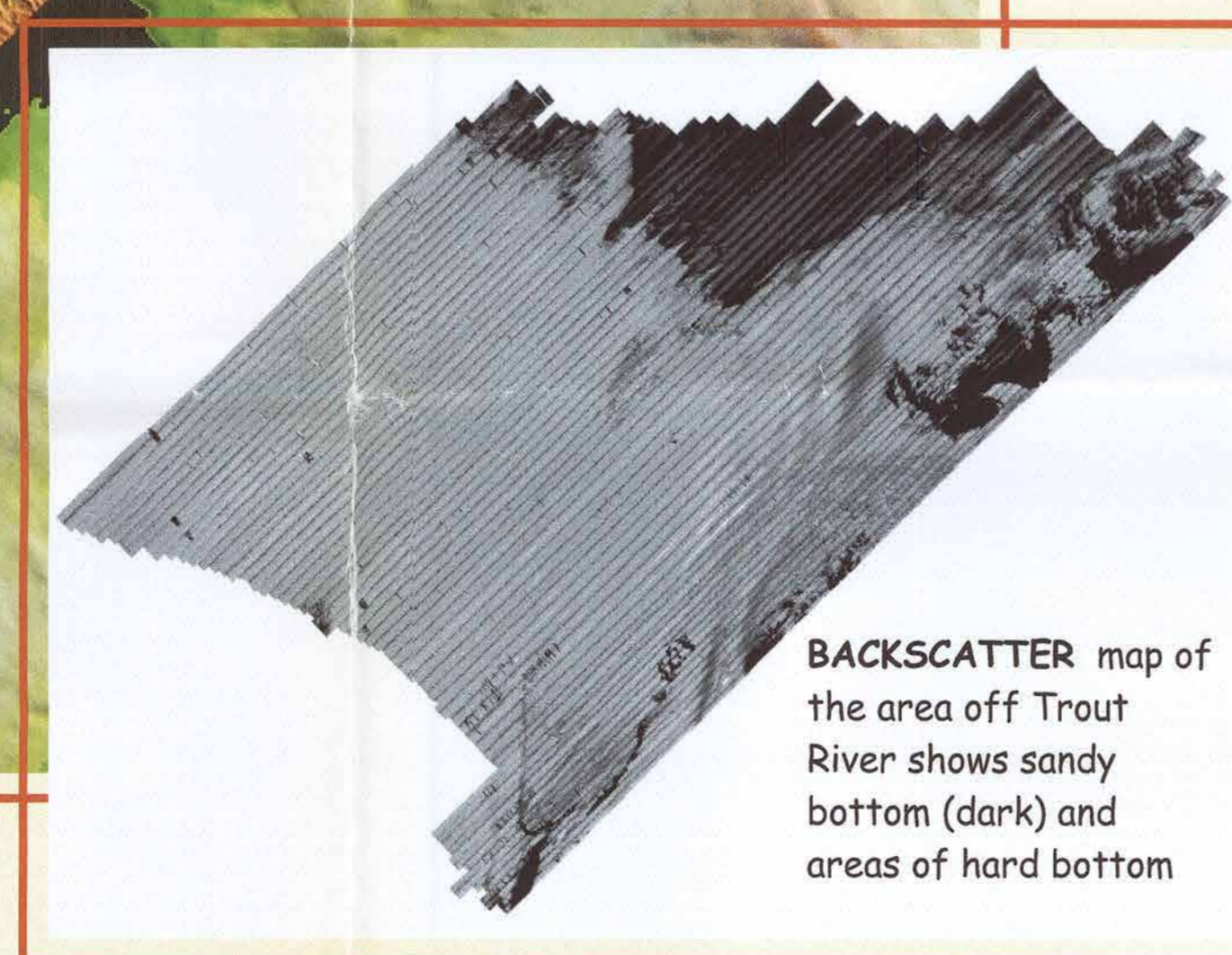
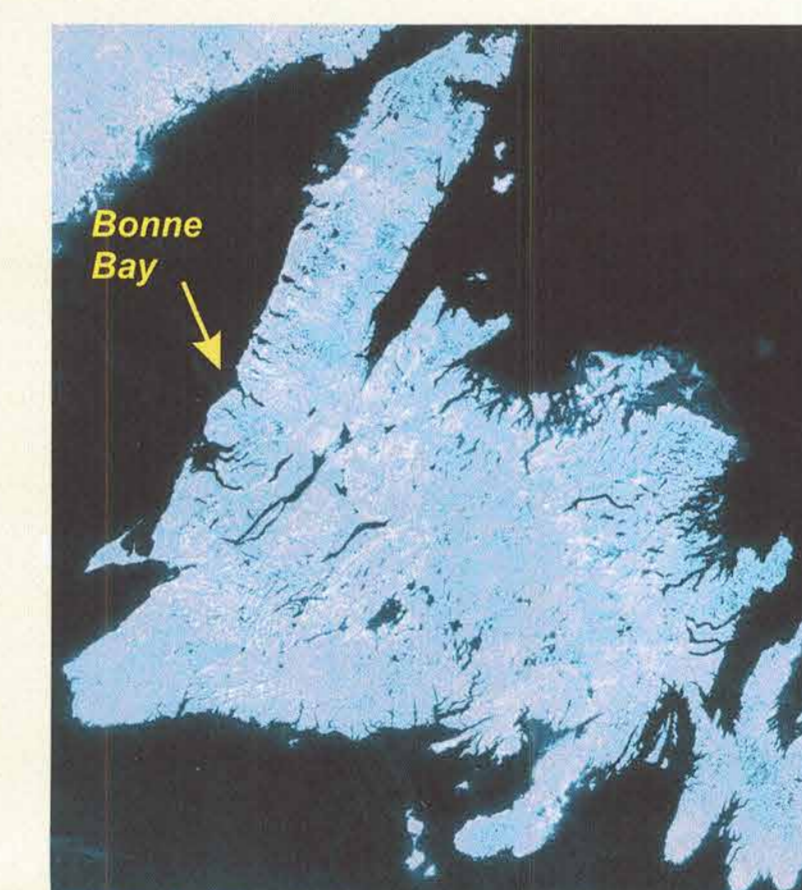
West of the moraine the sea floor deepens to more than 90 m below sea level (A). Here the sea floor has been intensely furrowed by icebergs, probably between 13,000 and 11,000 years ago. These furrows average 1.5 m deep and commonly trend about 040 degrees.

REFERENCES

Shaw, J., Courtney, R.C., Christian, H., and Dehler, S. 1998. Ground-truthing of multibeam bathymetry data in western Newfoundland: Bonne Bay, Bay of Islands, Port au Port region, and St. George's Bay. Geological Survey of Canada Open File 3789.

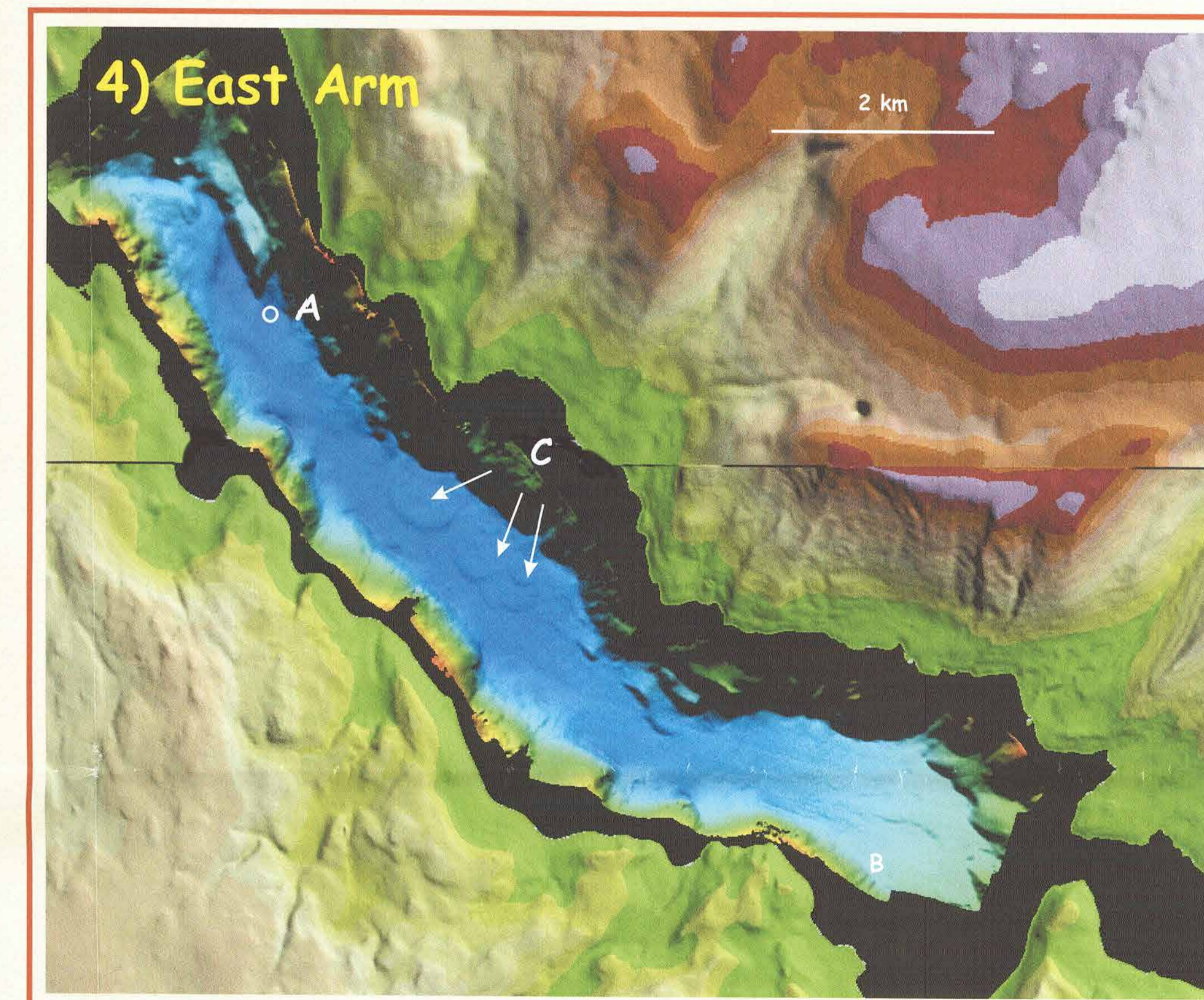


Before the area off Trout River was surveyed, it was thought that the Bonne Bay Moraine reached the coast at Trout River. However, the surveys show that the moraine curves towards the north. The ridges on the sea floor (A) immediately offshore from Trout River may be bedrock, but more likely they are gravel; this area remains to be examined by a ground-truthing survey. Several other bedrock outcrops are visible (B, C), each with a differing character.



This poster was reviewed by Brian Todd and Robert Taylor, GSC Atlantic.

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EAST ARM of Bonne Bay has a maximum depth of 226 m at A. The arm has steep bedrock sidewalls and a relatively flat floor. It contains up to 100 m of Quaternary sediments, mostly glaciomarine mud with strong acoustic stratification, overlain by postglacial mud that is acoustically transparent.

The floor of the fiord slopes towards the southeast, where a rough texture on the sea floor off Lomond (B) is interpreted as slope failures on the face of a river delta. The most intriguing features are overlapping lobes (C) of muddy sediment mid-way along the east side of the arm. These are lobes of material that have failed on the sidewalls, perhaps triggered by input of sediment from streams.