

New insight into Avalonian deformation style and Acadian overprinting on the Bonavista Peninsula, eastern Newfoundland

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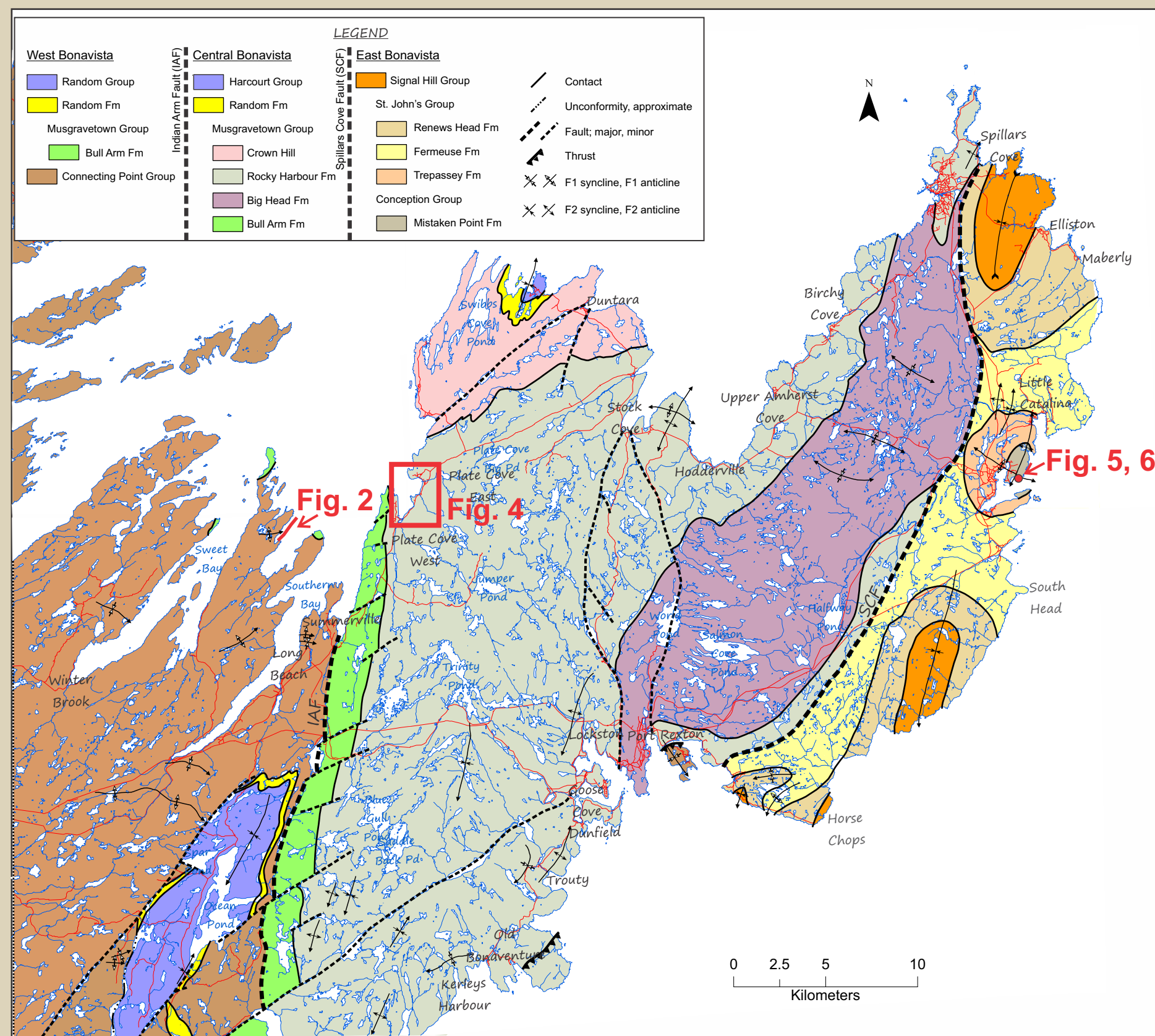


Figure 1. Regional map of the Bonavista Peninsula of Newfoundland highlighting the three areas of interest illustrated here.

Two deformation events are recognized in the Avalon Zone of Newfoundland: the Neoproterozoic Avalonian Orogeny, commonly described as enigmatic owing to the lack of clear, demonstrably Avalonian (Precambrian) structural elements; and the Siluro-Devonian Acadian Orogeny (e.g. King, 1990; Williams et al., 1995). Recent geological investigations on the Bonavista Peninsula (Figure 1), Avalon Zone of Newfoundland, have led to the recognition of Avalonian thrust tectonics and Acadian transpressional overprinting. In Newfoundland, Avalonian thrust tectonics have, to date, been solely recognized in the Flat Rock area of the Avalon Peninsula (Calon, 2001) and their occurrence on the Bonavista are documented here for the first time.

From west to east, we characterize structural elements in: 1) the Connecting Point Group in the Sweet Bay area (Figures 2 and 3), a marine flysch sequence approximately 610 Ma (G. Dunning, unpublished data); 2) the Rocky Harbour Formation of the Musgravetown Group (Figure 4), a coarse clastic unit that overlies rocks of the (possibly Bull Arm Formation – correlative; likely <600 Ma) Plate Cove volcanic belt (Mills and Sandeman, 2015); and 3) the Mistaken Point Formation of the Conception Group (Figures 5 and 6), the ca. 565 Ma, Ediacaran fauna-bearing, marine sequence correlative to rocks from the type locality on the Avalon Peninsula.

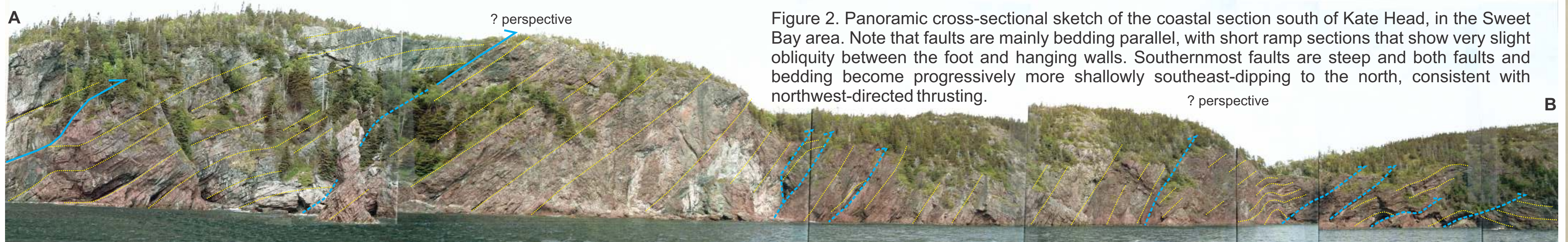


Figure 2. Panoramic cross-sectional sketch of the coastal section south of Kate Head, in the Sweet Bay area. Note that faults are mainly bedding parallel, with short ramp sections that show very slight obliquity between the foot and hanging walls. Southernmost faults are steep and both faults and bedding become progressively more shallowly southeast-dipping to the north, consistent with northwest-directed thrusting.

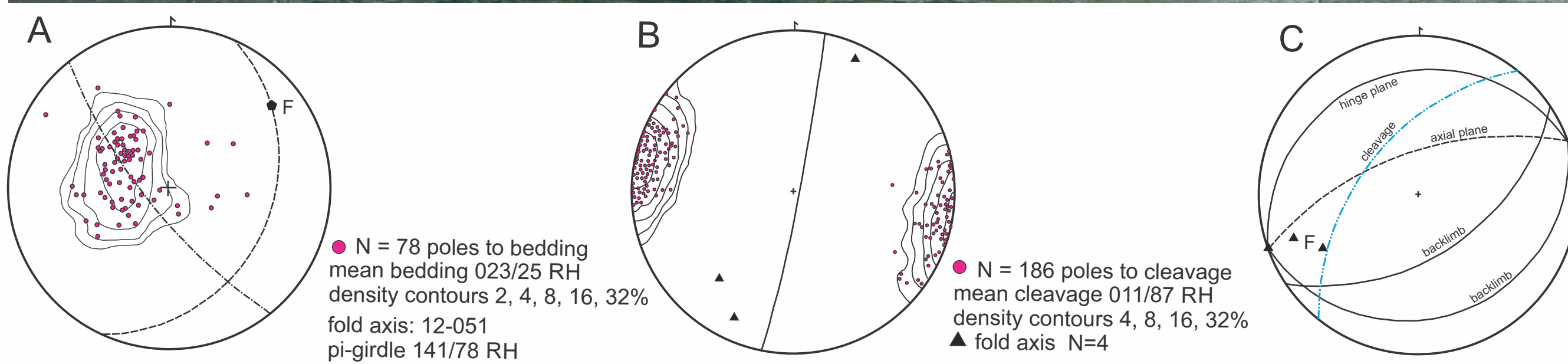


Figure 3. Stereoplots for structures in the Kate Head area. (A) bedding; (B) Acadian cleavage and fold axes; (C) Fold geometry in Avalonian thrust stack, station 13AM395. The Acadian cleavage clearly transects the fold geometry outlined by the bedding pole distribution, and associated fold axes trend NNE-SSW, notably oblique to the trend of measured and calculated fold axes (ENE-WSW) in the Avalonian thrust stack. The thrust stack is dominated by back limb imbricates, with small ramp anticlines located at footwall ramp segments on the trailing back limb portions.

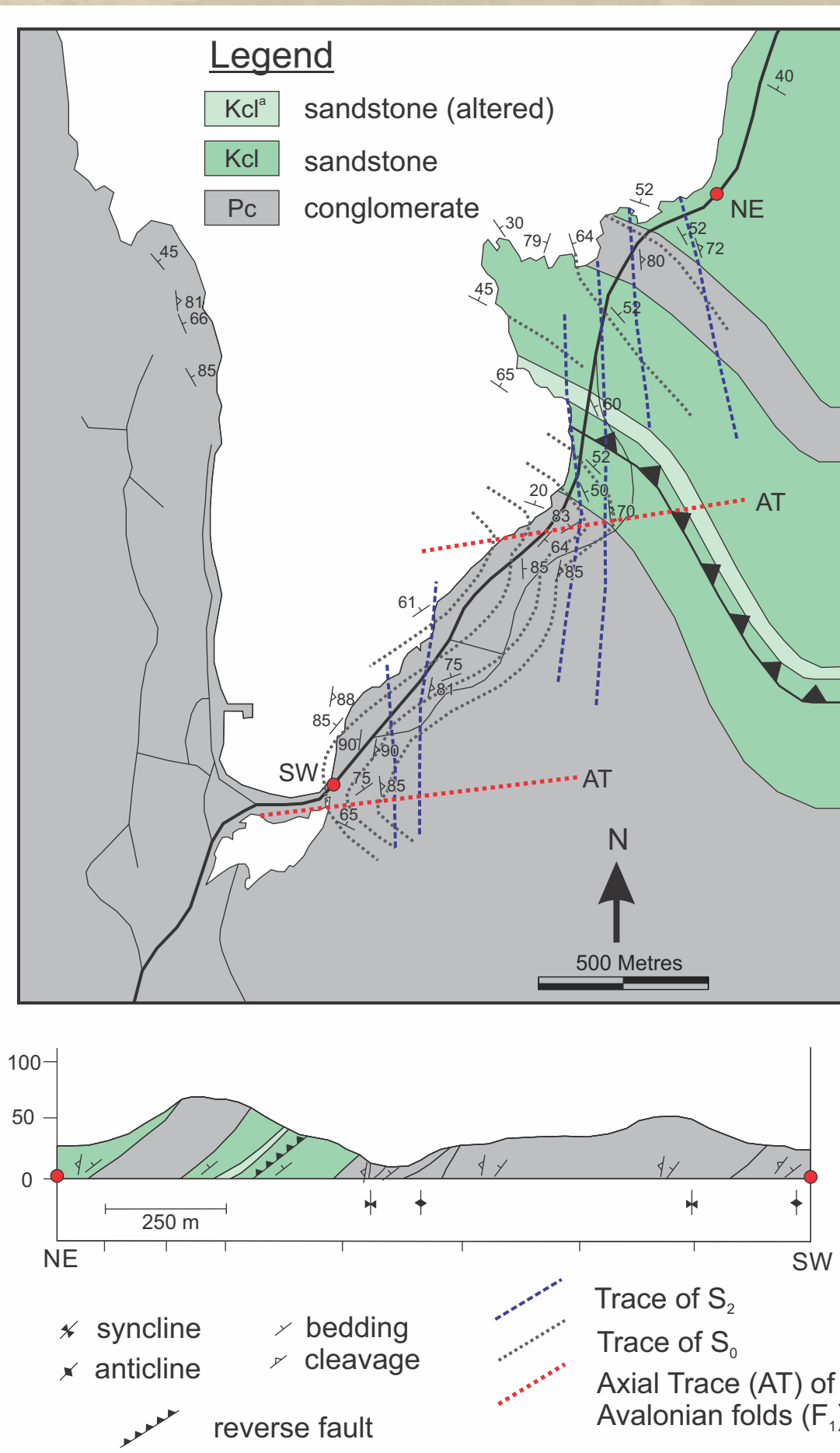


Figure 4. Inset map of the Plate Cove area showing the trace of bedding clearly transected by a NNE-striking Acadian cleavage.

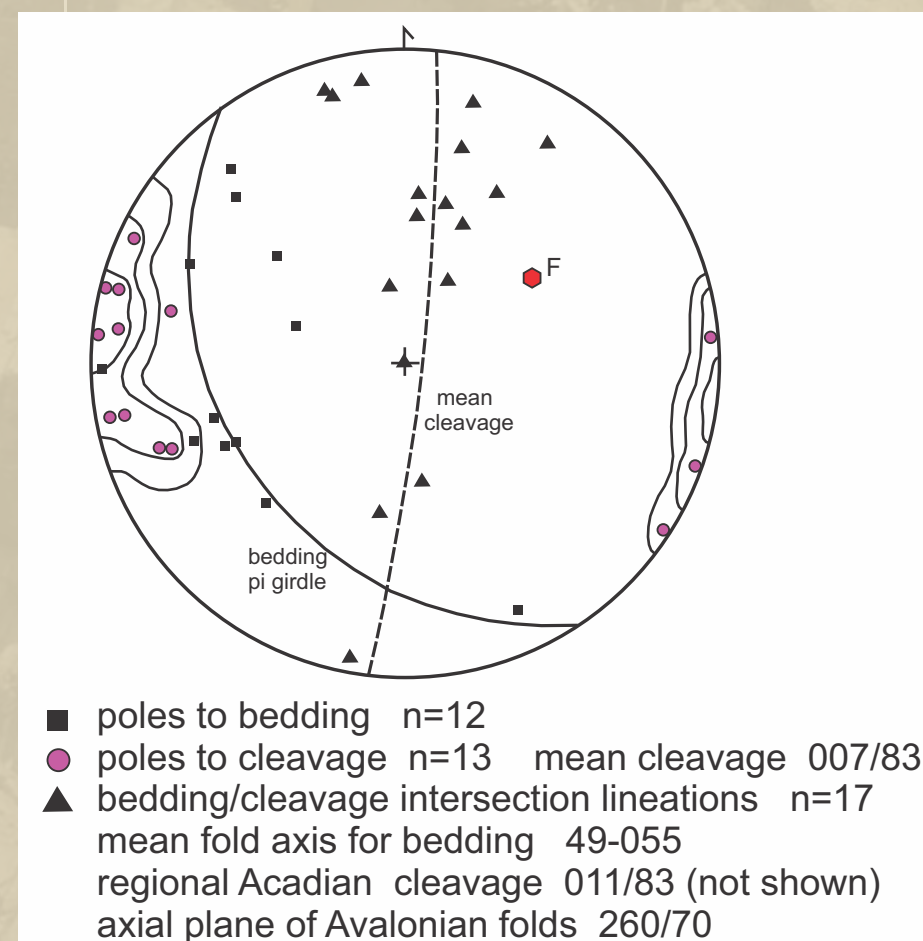


Figure 4a. Stereoplot for structures in the Plate Cove area.

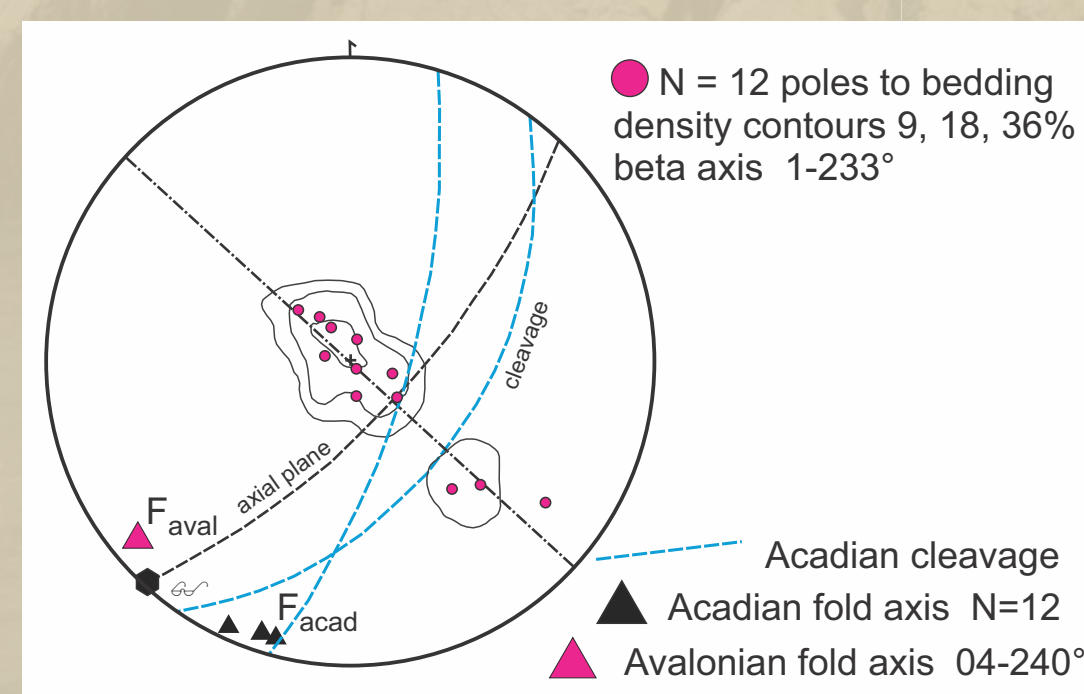


Figure 6a. Stereoplot for structures in the Catalina area.



Figure 5. Interference folds at Catalina. An open and upright, Avalonian F1 syncline plunges 4° toward 240° (yellow) is refolded by an open and upright, Acadian syncline-anticline pair that plunge about 7° toward 198° (orange). View to the south.

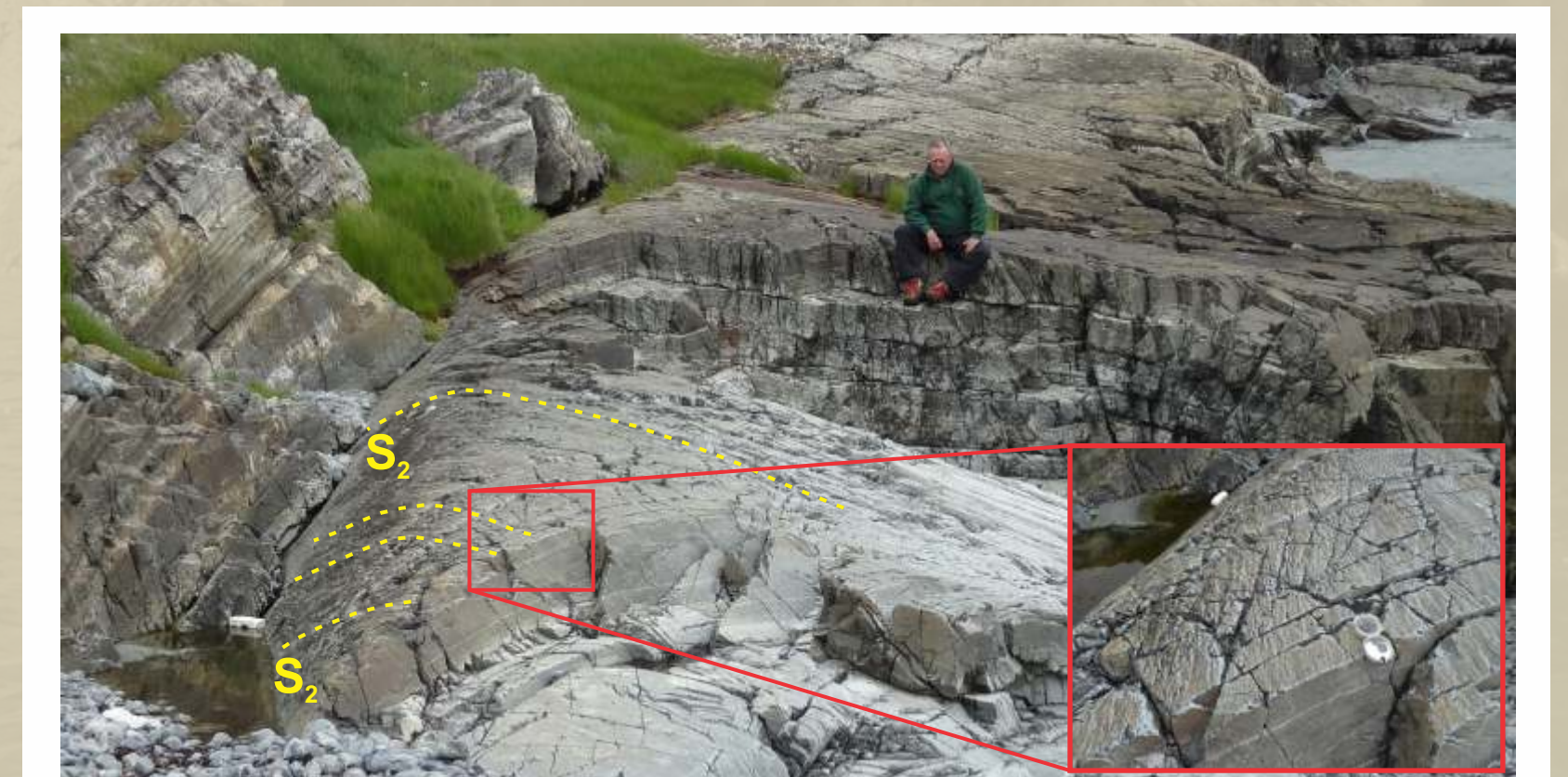


Figure 6. Asymmetric, Avalonian F1 anticline plunges 4° toward 240° and is transected by a weakly developed Acadian cleavage oriented at 035/56°. View to the northeast.