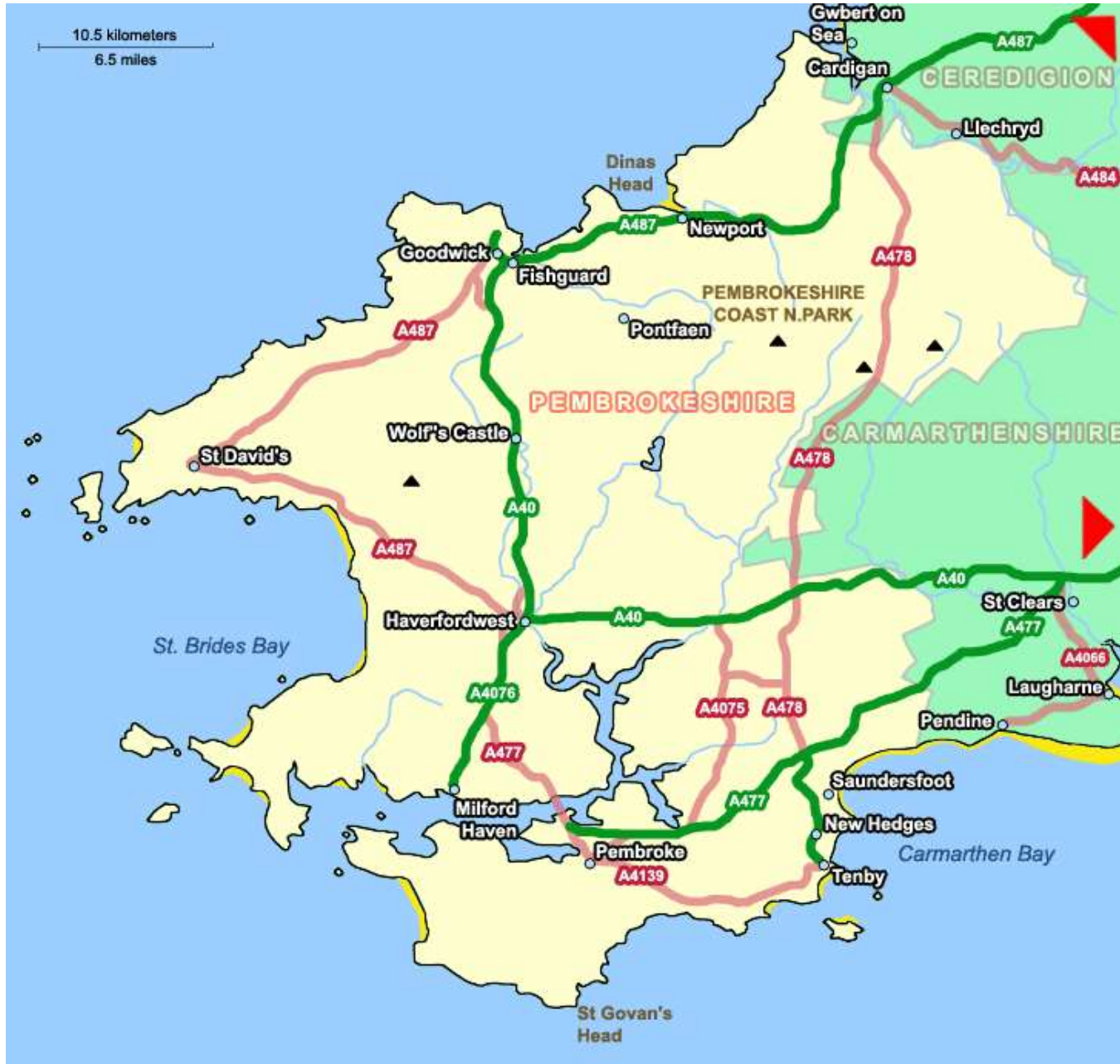


Tenby Field Trip

5 - 9 May 2017

Area Map



Geological Overview

- South Pembrokeshire
 - Mainly sedimentary upper Palaeozoic rocks
 - Devonian to Permian
 - ESE – WNW trending tracts
 - Conformable and unconformable transitions from marine Silurian to continental Devonian red sandstones
 - Sandstones, limestones, mudstones and coal measures
 - Rich variety of fossils
 - Older sedimentary and igneous strata exposed along major fault lines and cores of anticlines
 - Precambrian to Silurian
 - Mainly in the North of the region
 - Oldest (643 MYA) is the Johnston Complex of metamorphosed plutonic igneous rocks
 - Diorites; Granodiorites and granites

Plate Tectonics Setting for Deformation of South Wales Rocks

- Early Palaeozoic Deformations
 - Caledonian Orogeny
 - Avalonia docks with Laurentia closing the Iapetus Ocean (Late Silurian)
 - Acadian Orogeny
 - Closing of the Rheic Ocean (Mid Devonian)
- Later Palaeozoic Deformations
 - Variscan Orogeny
 - Progressive convergence of Gondwana with Laurussia (Upper Carboniferous)
 - Eventual formation of Pangea supercontinent
 - South Wales lies in the 'Forebold Edge' of the thrust
 - Uplifting, folding, faulting and erosion over 50 – 100 MY

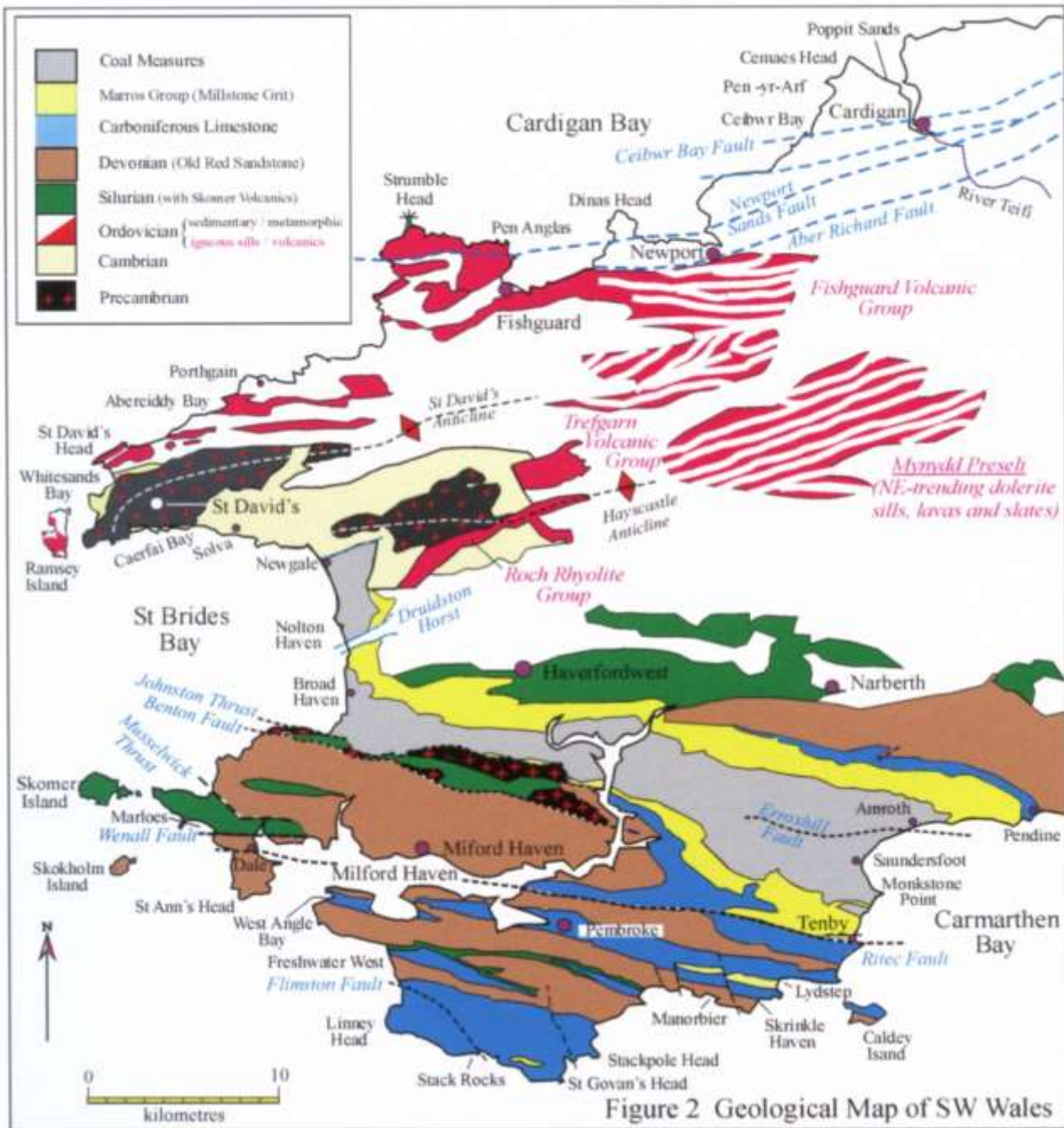


Figure 2 Geological Map of SW Wales

From: Geology of South Wales, second edition - Gareth T. George

Day 2 – 6 May 2017

- Morning
 - Skrinkle Haven

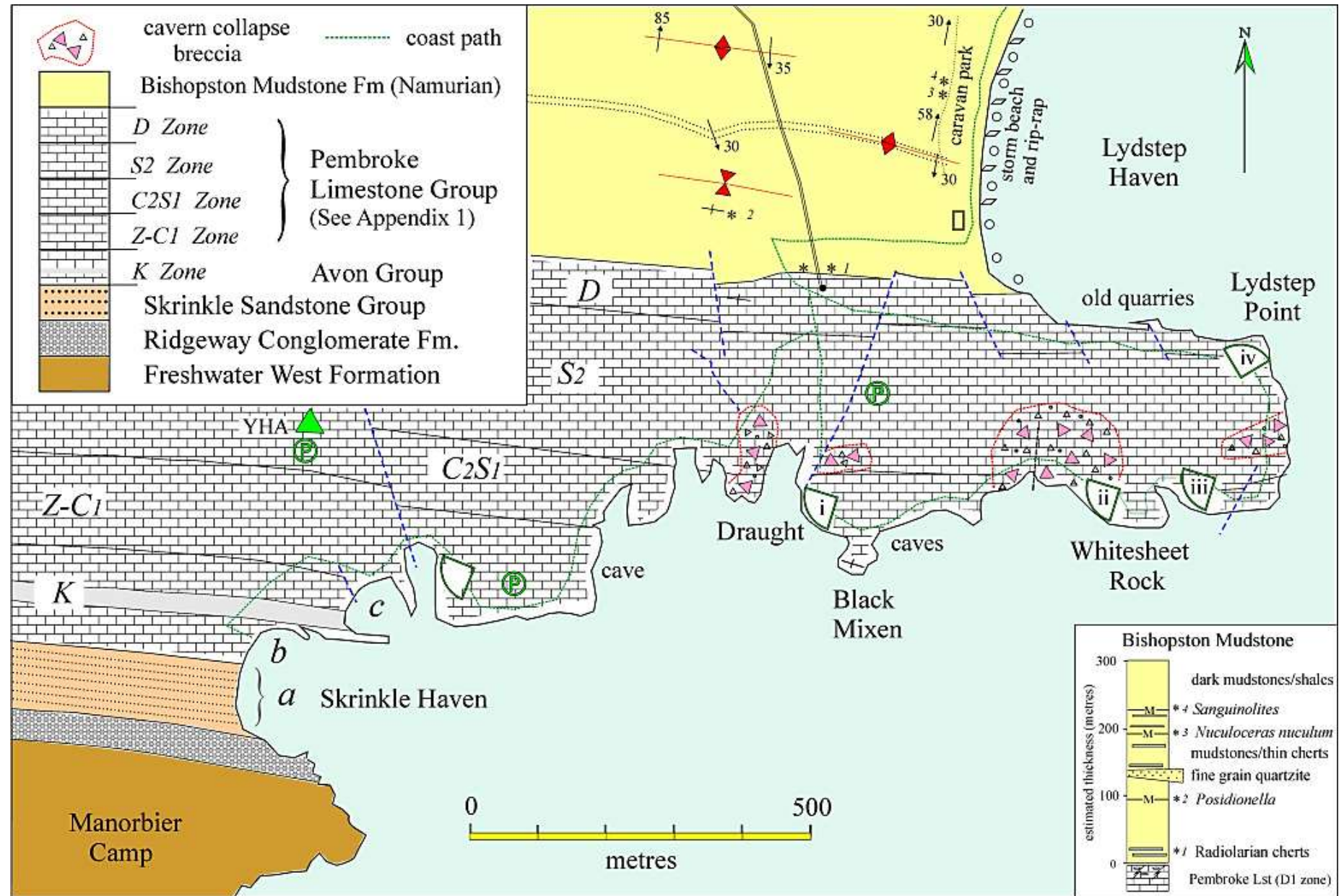
- Afternoon
 - Manorbier

Skrinkle Haven

Skrinkle Haven

- Late Devonian to Early Carboniferous
- Transitional contact visible between:
 - Pembroke Limestone Group
 - Lower Limestone Shales
 - Skrinkle Sandstone
 - Ridgeway Conglomerate
 - Freshwater West Formation
- 'Cavern Collapse' Breccia
 - Visible along coast line
- Fossiliferous

The Geology of Shrinkle Haven



From: Geology of South Wales, second edition - Gareth T. George

Skrinkle Haven



Impressive Natural Arch in the Black Rock Limestone Forming the Horseback



Coprolite



Crinoid Stems



Chertified Limestone



Humocky cross - Stratification



Bryozoa



Skrinkle Carboniferous Fossil Assemblage: Crinoids, Fenestella Bryozoa, Rugose Corals



Michelinia Tabulate Coral



Palaeocasts



Draught - Lydstep Peninsula



The Group at the Lydstep Peninsula



At Draught on Lydstep Peninsula – Showing Blowhole and Collapsed Breccia

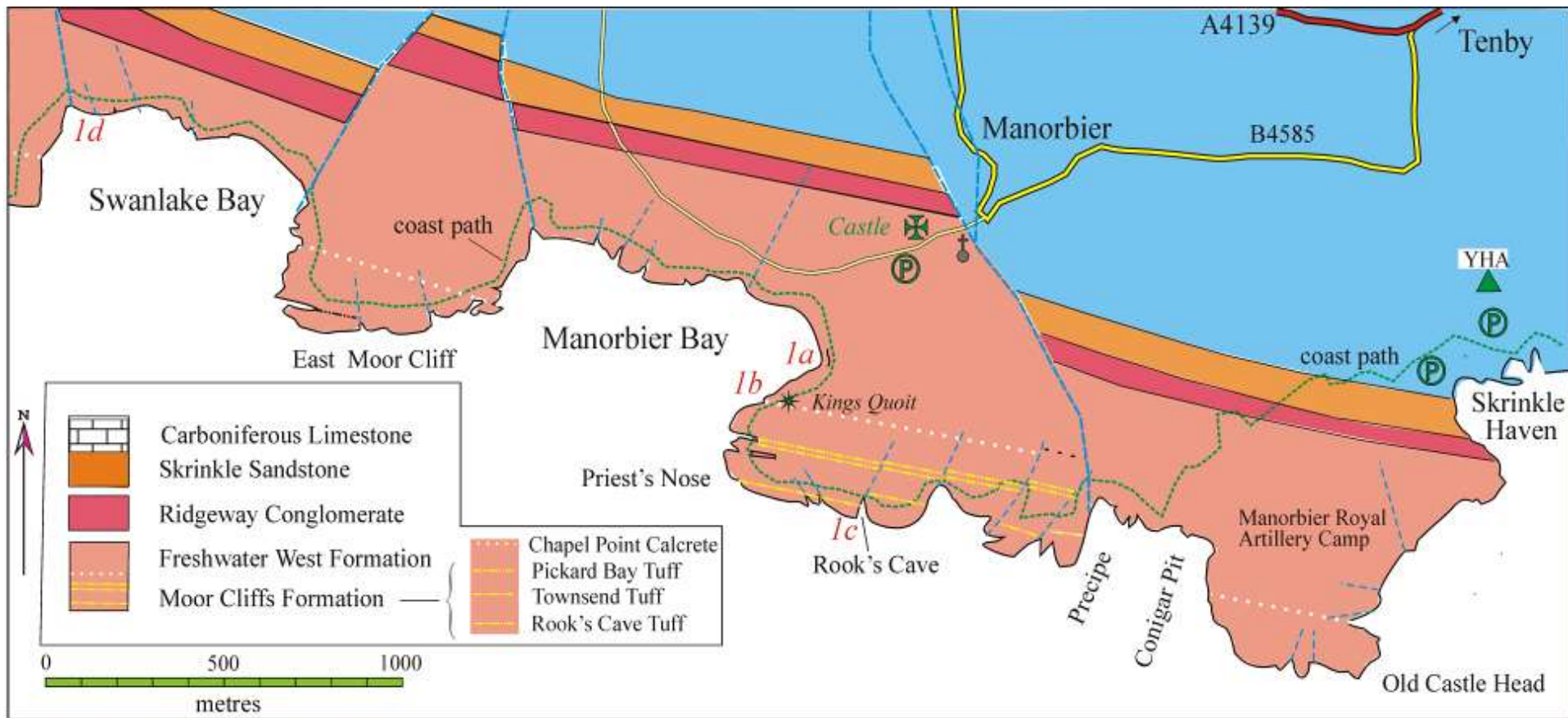


Manorbier

Manorbier

- Devonian
- Freshwater West Formation
 - Old Red Sandstone (ORS)
 - Near Vertical Strata in Cliffs above high water mark
 - Fining up
 - Six cycles visible each capped with fine mudstones containing Calcretes
 - Interpreted as fills of ephemeral meandering fluvial channels

The Geology of Manorbier



From: Geology of South Wales, second edition - Gareth T. George

Manorbier Bay



Red Beds with Many Trace Fossils



ORS - with White Calcrete and Halos Around the Burrows



Beaconites Trace Fossil



ORS - With White Calcrete and Halos Around the Burrows



Trace fossil - A Single Millipede in Cross Section



Mud Aggregate in Mudstone



Mature Soil Profile



Beaconites Trace Fossil



Displacement on Fault



Erosional Base of Sandstone



Burial Chamber at King's Quoit



Sitting on the Burial Chamber at King's Quoit



Tuff Band



Townsend Tuff



Tuff Band at Rooks Cave



Tuff Band at Rooks Cave



Possible Faecal Pellets



Day 3 – 7 May 2017

- Morning
 - Freshwater West

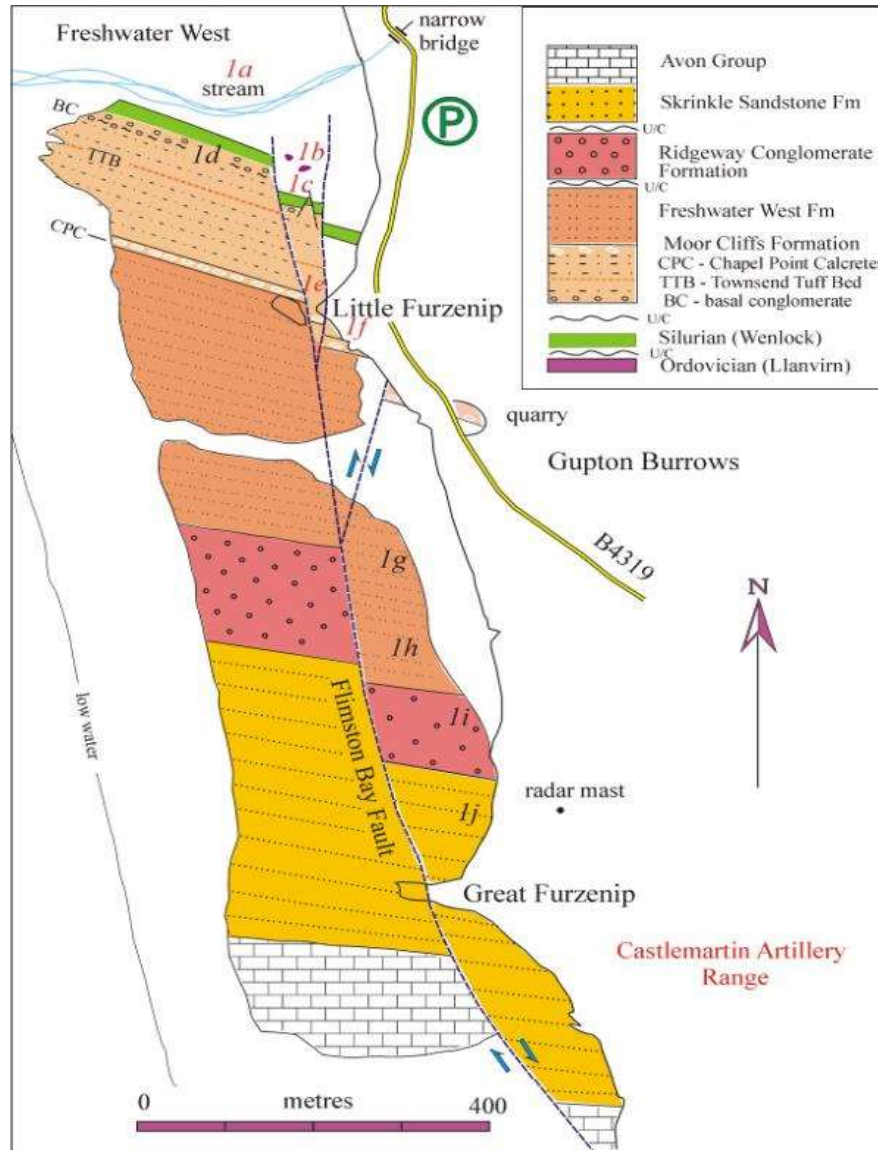
- Afternoon
 - West Angle Bay

Freshwater West

Freshwater West

- Lower Limestone Shales
- Upper ORS
 - Skrinkle Sandstone
- Lower ORS
 - Ridgeway Conglomerate
 - Freshwater West Formation
 - Moor Cliffs Formation
 - Chapel Point Calcretes
 - Townsend Tuff Bed
- Silurian Shales (Wenlock)
- Ordovician Shales (Llanvirn)

Freshwater West



From: Geology of South Wales, second edition - Gareth T. George

Freshwater West



Gareth Explains Rock Types and Deposition Structures



Using the Stream to Demonstrate Deposition Structures in Flowing Water



Standing Waves



Almost Anti-Dune



Mudstone in Silt - Lower Ordovician - Llanvirn Series



Lava Bread Seaweed



Freshwater East Formation - Upper Silurian



Porphyry - From Outside of This Area



Red Beds of the Moor Cliffs Formation



Fault - Silurian / Devonian Unconformity



Fossiliferous Rock A



Fossiliferous Rock B



Chapel Point Calcrete at the Fault



Chapel Point Calcrete - at the Fault



Chapel Point Calcrete



Freshwater West Formation



Ripples at Top of Formation



Fining up Sequence



Trace Fossil of Large Worm Tube



Laminations Approaching Beaconites Beds



Orthocone - Long Shore Drift



Beaconites Trace Fossils



Beaconites Trace Fossils



Green Sand



Beaconites Trace Fossils in Green Sand



Multi Story Original Erosional Surface



Ridgeway Conglomerate A



Ridgeway Conglomerate B

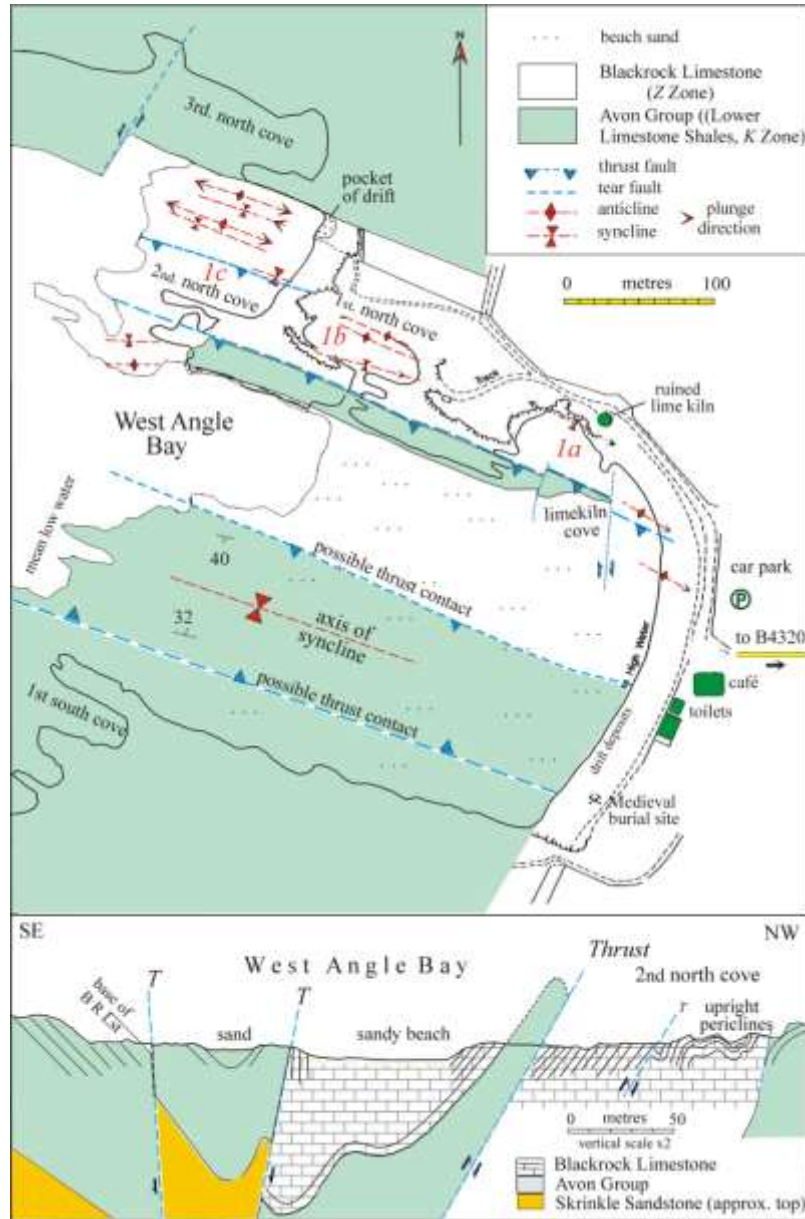


West Angle Bay

West Angle Bay

- Formed by erosion of lower Carboniferous (Dinantian) Limestone within the Angle Syncline
- Main Rock Types
 - Blackrock Limestone
 - Avon Group (Limestone Shales)
- Very Fossiliferous

West Angle Bay



From: Geology of South Wales, second edition - Gareth T. George

Lower Limestone Shales of the Avon Group



Crinoid Debris in the Sandy Limestone



Slickensides Mineralised with Calcite



Zaphrentis – A Rugose Coral



Worm Burrow



Approaching North Cove



Silicified Worm Burrows



Mapping the Periclines - North Cove



Dynamite Cracks from Previous Quarrying - North Cove



Styloplitic Contact in North Cove



Glacial Till - Diamicton



Gastropod



Day 4 – 8 May 2017

- Morning
 - Tenby South beach
 - Tenby North beach

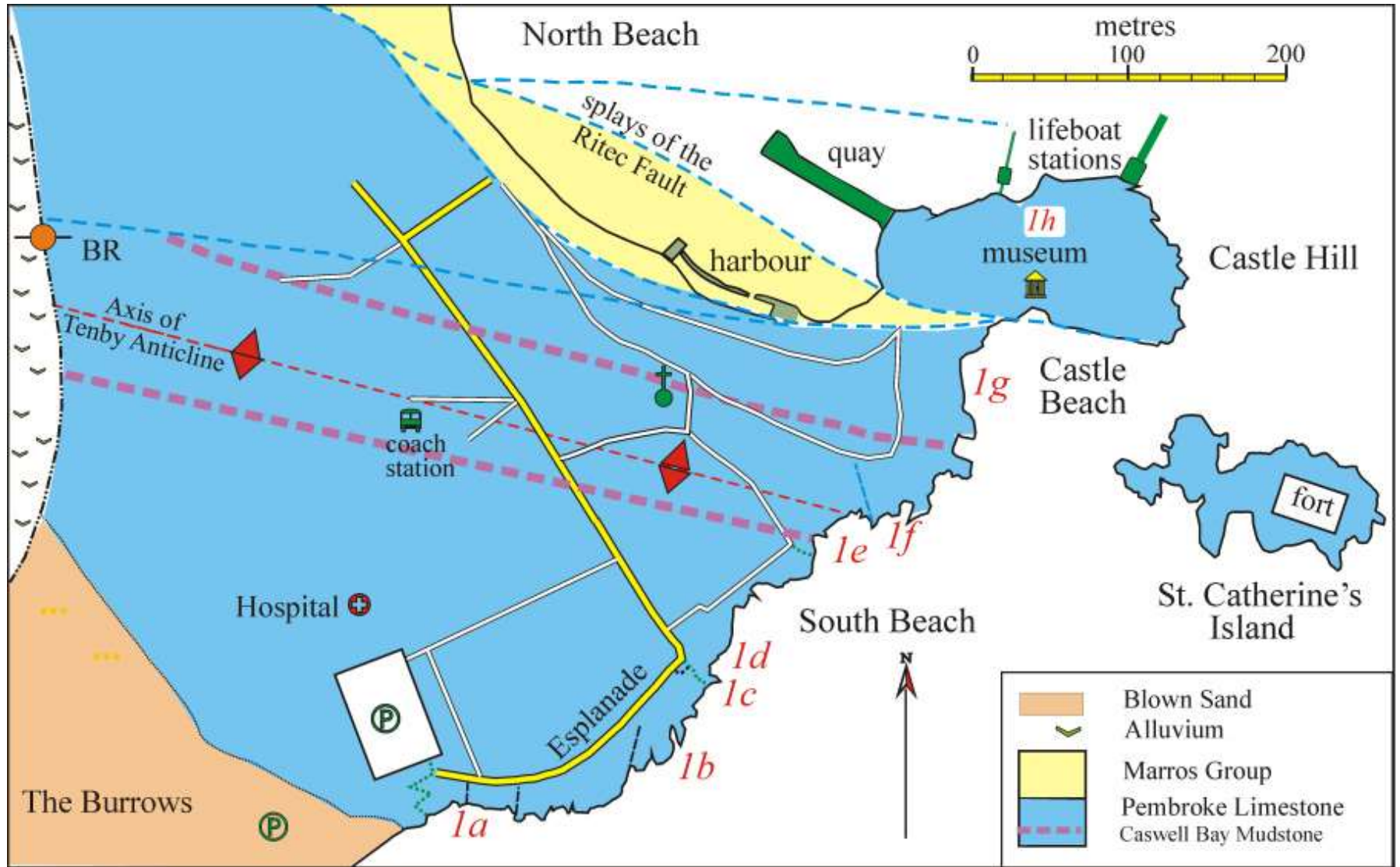
- Afternoon
 - Amroth
 - Ladies Cave

Tenby South Beach

Tenby South Beach

- Rock Types
 - Bioclastic and Oolitic (Hunts Bay) Limestone
 - Crowded with Brachiopods
 - Caswell Bay Mudstone
 - Thinly bedded with Hunts Bay Limestone
 - Dipping steeply in cliffs
 - Blackrock Limestone
 - Dolomitised Bioclastic Limestone
 - High Tor Limestone

Geology of Tenby



From: Geology of South Wales, second edition - Gareth T. George

Slickensides on South Beach Cliffs



Small Cave at the Start of South Beach



Large Calcite Veins - South Beach



Observing the Dip at the Start of the South Beach Cliffs



Jellyfish



Pseudo-Breccia Formed During Diagenesis



South Beach – Steps leading to the Atlantic Hotel



Gigantoproductus Giganteus



Siphonodendron Martini - Colonial Rugose Coral



Corals



The Group Progresses Along South Beach



Syringapora Coral



Examining Another Pseudo-Breccia



Lithostrotion Coral



Unknown Coral



Slickensides - South Beach Cliffs



Lithostrotion Coral - Distance



Lithostrotion Coral - Close Up - Was on a Reef



Siphonodendron Junceum - Spaghetti Like, Colonial Rugose Coral



Rugose Coral

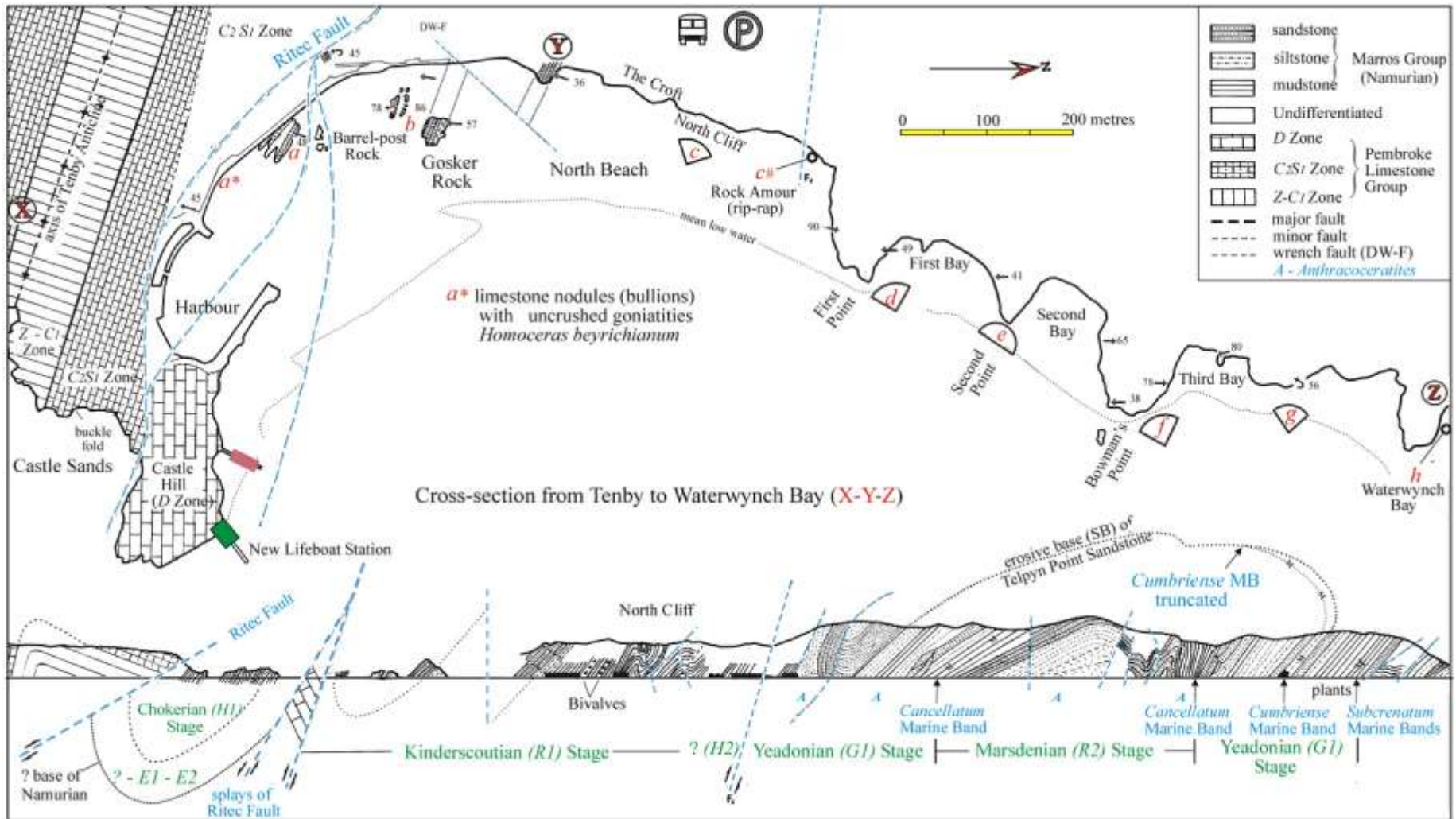


Tenby North Beach

Tenby North Beach

- Complex Folding and Faulting during the Variscan Orogeny
 - Seen in cliff and low outcrops on the beach
- Main Rock Types
 - Marros Group (Middle Carboniferous)
 - Sandstone, Mudstone & Siltstone
 - Pembroke Limestone Group (Lower Carboniferous)

North Beach- Plan & Cross Section



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Start of North Beach from Tenby Harbour



Gosker Rock from Tenby Harbour



Conglomerate Horizon at First Point

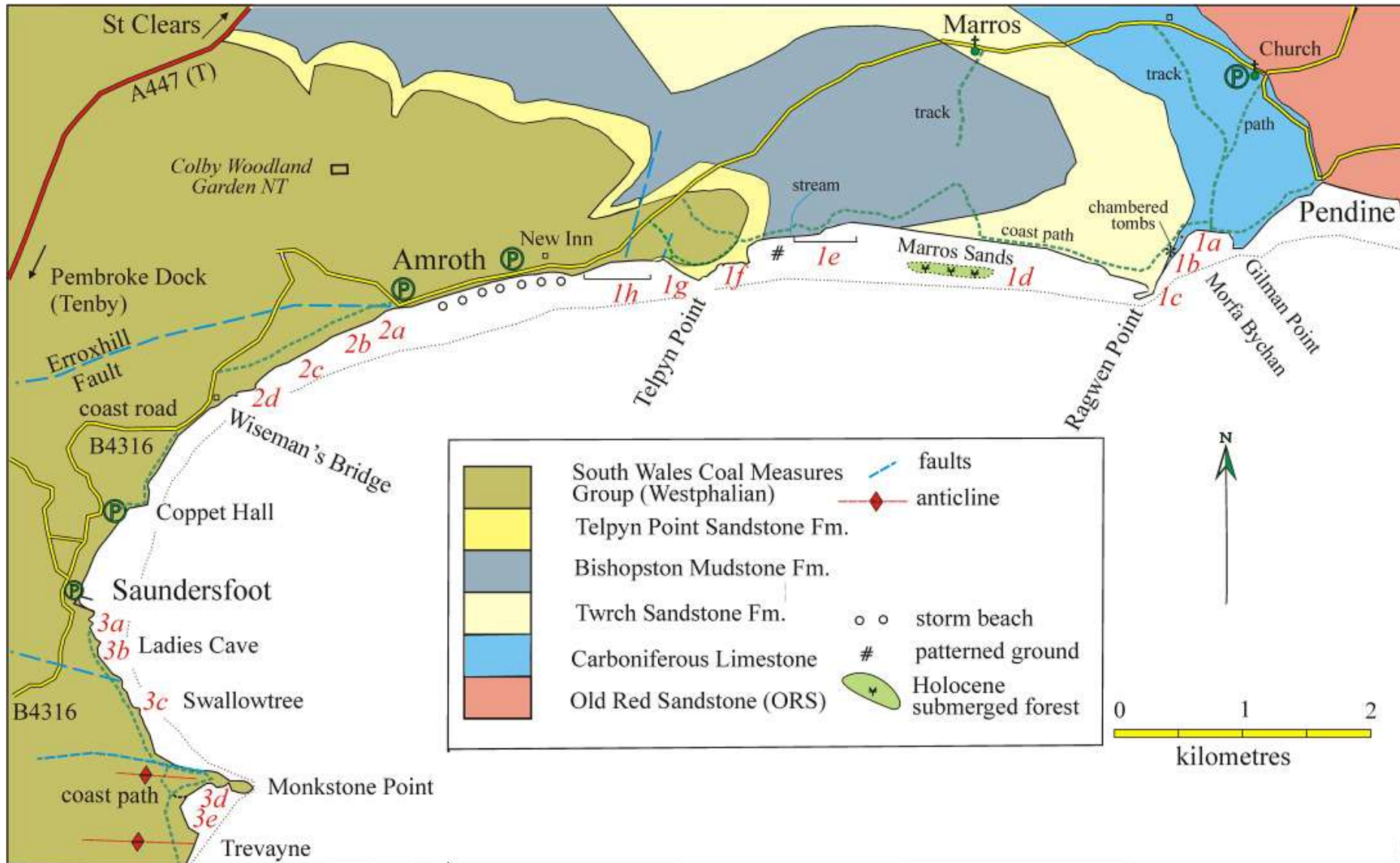


Amroth

Amroth

- Rock Types
 - Upper Carboniferous (Westphalian Strata)
 - South Wales coal measures
 - Sandstone, Mudstone, Limestone & ORS
 - Heavily folded and faulted
 - Slumping
 - Fossiliferous

The Geology Around the Amroth Area



From: Geology of South Wales, second edition - Gareth T. George

Walking Towards Amroth East



Stratigraphy at Amroth East – The Lady Frolic Coal Seam Above the Black Mudstones



Closer Detail of the Stratigraphy at Amroth East



The Amroth Slump Sheet



The Amroth Slump Sheet



Ripple Marks in the Slump Sheet



Basal Lag Conglomerate from the Telpyn Point Sandstone



Climbing Ripple Cross Lamination



Iron Nodules



Non-Marine Bivalves (Mussels) in Amroth Freshwater Limestone - Possibly *Anthracosia Regularis*



Plant Remains



Non-Marine Bivalves (Mussels) in Amroth Freshwater Limestone

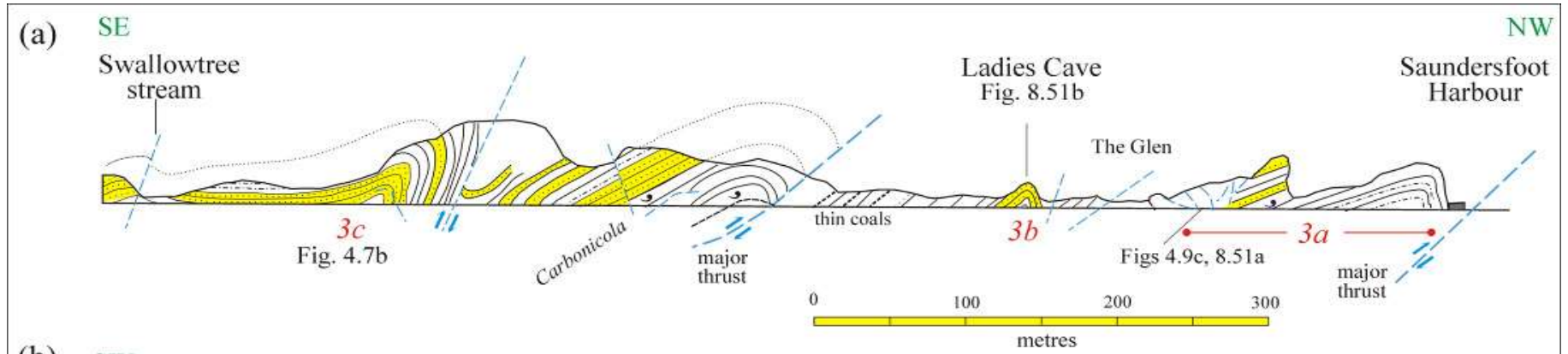


Ladies Cave

Ladies Cave

- Classic Chevron Fold Anticline
 - Shale Beds
 - Softer Mudstone at fold hinge

Cross Section Around Ladies Cave



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Ladies Cave



Ladies Cave



Fossil Leaf at Ladies Cave



Day 5 – 9 May 2017

Laugharne

Laugharne

- Succession of ORS Facies
 - Red Mudstones
 - Red Siltstones
 - Immature Calcretes

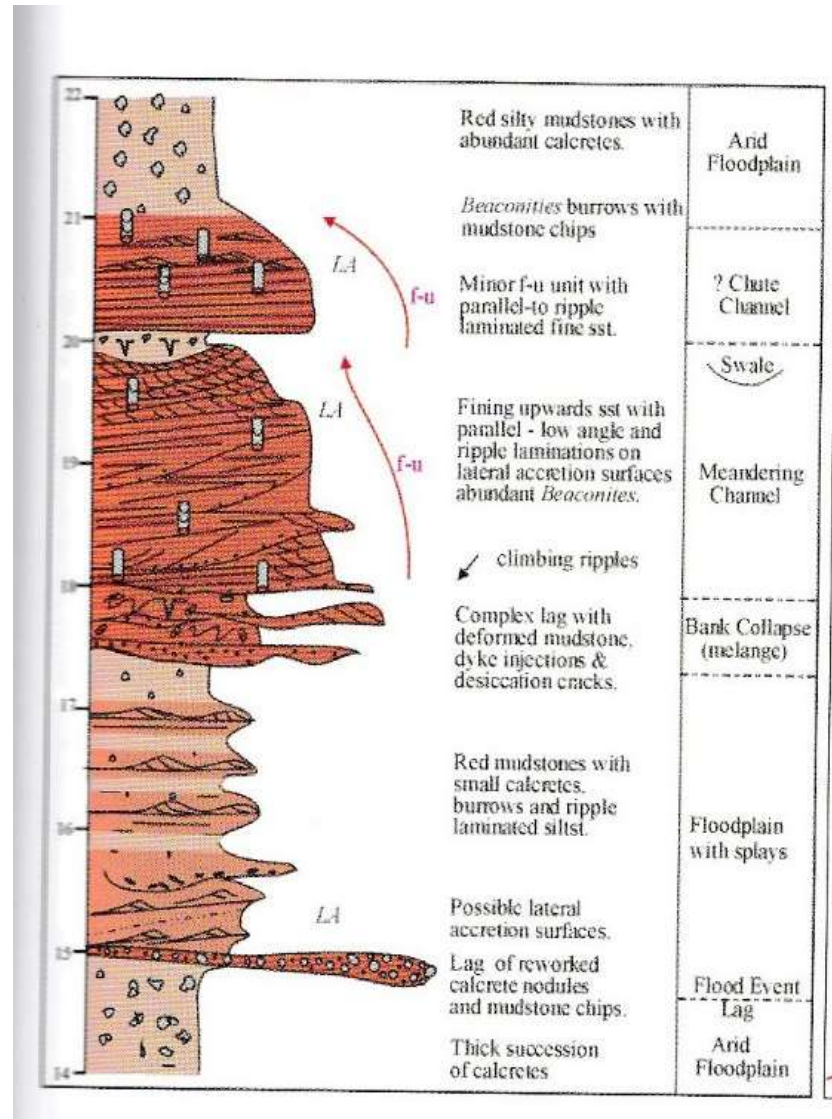
Boat House



Local Trouble Makers Examining the Devonian ORS Cliffs



Graphic Log of Exposed Cliffs Along the Estuary



From: Geology of South Wales, second edition - Gareth T. George

Calcretes



Base of Intraformational Conglomerate Bed of Reworked Calcrete Nodules



Lensoidal Sandstone Stringers



Climbing Ripples



Beaconites Burrows in Mudstone



Cross Sections of Beaconites Burrows in Sandstone



Concoidal Fracture



Small Dyke



An Ice Cream and Then Home



The End