Chapter 24
Offshore Western Ireland

C. N. WATERS

This offshore area comprises two broadly NNE–trending Mesozoic and Tertiary basins present to the northwest of Ireland: the larger Rockall Trough occurs to the north-west of the interlinked Slyne Trough–Erris Trough–Donegal Basin (Northwest Offshore Basins). To the west of Ireland is the north-trending linked Main Porcupine–Seabight basins (Fig. 17.1). There has been little exploratory drilling in the basins, other than the Porcupine Basin (Croker & Shannon 1987), for which there are extensive seismic reflection data. Carboniferous rocks up to 3 km thick are present within the Porcupine Basin, with deposits also recorded in the Goban Spur and Northwest Offshore Basins (Naylor 2001). The Donegal Basin is considered to have initiated during the Carboniferous in response to dextral strike-slip displacement (Dobson & Whittington 1992). Geophysical data suggest the offshore extension of the Namurian Clare Basin, which may have existed as a west–east orientated Pennsylvanian basin extending beneath the Porcupine Basin. The age of the sedimentary infill of the Rockall Trough is still uncertain and may extend back to Late Palaeozoic in age, although the main phase of extension is likely to be during the Cretaceous (Naylor 2001, and references therein).

Tournaisian

Within the Main Porcupine Basin the earliest sedimentary rocks are of possible late Tournaisian age, deposited during a transgressive event upon pre-Carboniferous crystalline basement (Tate & Dobson 1989). Phillips well 35/15-1, drilled on the eastern margin of the Porcupine Basin (Fig. 17.1) proved sandstone and siltstone (80 m), overlain by interbedded micritic limestone and mudstone (50 m), in turn overlain by interbedded sandstone and siltstone beds (230 m) and capped by a 10 m-thick conglomerate. The overlying succession (180 m) is dominated by fining-upwards cycles comprising bioclastic limestone, orthoquartzite, calcareous siltstone and dolostone. The uppermost 630 m comprise interbedded sandstone, shale and subordinate skeletal limestone, with subordinate ignimbrite and other volcanic material (Robeson *et al*. 1988; Tate & Dobson, 1989). The age of the 1174 m-thick succession is poorly constrained, though the upper part has yielded the palynomorphs *Lycospora pusilla* and *Vallatisporites* spp. (Tate & Dobson 1989), suggesting a latest Tournaisian to early Visean age. Shell 26/26-1 well, drilled on the northern part of the Main Porcupine Basin is described by Robeson *et al*. (1988) and Tate & Dobson (1989). Probable Dalradian rocks are overlain unconformably by 60 m of ?upper Tournaisian strata, dated from palynomorphs. This succession comprises a basal conglomerate, overlain by sandstone, siltstone and mudstone with anhydrite stringers.

Visean

The succeeding Visean succession commences with siliciclastic rocks, probably continental in origin, overlain by transgressive carbonate rocks with interbedded claystone (Tate & Dobson 1989). In well 26/26-1 the Tournaisian succession is overlain conformably by strata of early Visean or Arundian/Holkerian age, comprising about 90 m

of fine-grained sandstone, siltstone and mudstone with evaporite in 10 m-thick fining-upward cycles, in turn overlain by about 90 m of limestone (packstone with ooid and crinoid bioclasts). This passes upwards by alternation into a succession of sandstone and argillaceous rocks of ?late Visean to early Namurian age.

Amoco well 19/5-1, drilled on the eastern margin of the Erris Trough (Fig. 17.1), has a succession, well constrained by age, containing basal conglomerate and arkose (Robeson *et al*. 1988; Tate & Dobson 1989). The lowermost 260 m proved in the well comprise grey sandstone and siltstone of Holkerian age, possibly the equivalent of the onshore Mullaghmore Sandstone Formation (see Chapters 18 & 19) (Sevastopulo & Wyse Jackson 2001). The Asbian marine succession is represented by 325 m of sandstone and brown to red siltstone overlain by 70 m of skeletal limestone and shale, possibly equivalent to the onshore Dartry Limestone Formation (see Chapters 18 & 19). The Brigantian succession comprises 430 m of varied sub-littoral to marine limestone, shale and sandstone 'Yoredale-type' cycles, including a coarse clastic interval in the lower part of the succession, broadly equivalent to the onshore Glenade Sandstone Formation (Tate & Dobson 1989).

Namurian

Much of the Namurian succession appears to be absent north of 52°30'N with only lower Namurian strata resting conformably upon Brigantian rocks (Tate & Dobson 1989). This is analogous to the onshore, where in the Ballymote Syncline (Chapter 19) and South Mayo (Chapter 20) only Pendleian to Arnsbergian strata are preserved beneath an unconformity. Amoco well 19/5-1 drilled in the Erris Trough (Fig. 17.1) proved 349 m of upper Brigantian to Arnsbergian strata, with a lower succession of mudstone, siltstone and subordinate micritic limestone passing up into thick (up to 30 m), fine-grained sandstone interbedded with claystone, siltstone and coal, preserved beneath an unconformity (Tate & Dobson 1989). In the Main Porcupine Basin the Shell 26/26-1 well proves probable lower Namurian strata also beneath an unconformity (Tate & Dobson 1989). Here, and elsewhere in the region, middle Namurian strata have not been proved (Robeson *et al*. 1988). Upper Namurian claystone and sandstone strata (340 m) proved in the North Porcupine Basin (Chevron well 36/16-1) pass up conformably into a Westphalian succession (Robeson *et al*. 1988).

Westphalian

A thick Westphalian succession occurs extensively in the Porcupine and Donegal basins and Erris Trough (Fig. 17.1; Robeson *et al*. 1988). Strata of latest Namurian, Westphalian, Stephanian and early Permian age form a conformable succession in the Main Porcupine Basin (Tate & Dobson 1989).

In the Porcupine Basin strata of Langsettian age have only been reported from the eastern margin of the basin (Chevron well 36/16-1), in which 230 m of coal-bearing sandstone and shales rest conformably on upper Namurian strata. A sandstone of Langsettian age rests unconformably above Arnsbergian strata in well 19/5-1 drilled in the Erris Trough, part of a 51 m-thick sandstone and silty claystone succession lacking coals (Robeson *et al*. 1988).

Duckmantian strata include development of the lowermost Coal Measures succession within the region. In the Porcupine Basin the succession shows a predominance of dark grey claystone with fine-grained sandstone in fining-upward sequences associated with coal, with an increase of siliciclastic rocks towards the western and northern parts of the basin (Tate & Dobson 1989). In the eastern margin of the Porcupine Basin in well 36/16-1, there are 280 m of siltstone with thin coals. In the northern part of the basin Duckmantian strata rest unconformably upon pre-Westphalian strata. In BP 26/28-1 well there are 35 m of conglomerate, deposited above the unconformity, with succeeding 150 m of sandstone with subsidiary siltstone, shale and thin coals and in Chevron 26/27-1b 73 m of grey (occasionally red) measures with 12 coals from upper Duckmantian strata are proved (Robeson *et al*. 1988). In the central part of the Porcupine Basin (Elf well 34/5-1) 90 m of coal measures include 9 coals of Duckmantian age. Typically, the upper Duckmantian succession shows an increase in the number of seams towards the northwest of the basin (Robeson *et al*. 1988). In the Erris Trough (well 19/5-1) 250 m of coal measures, including 16 coal seams, were proved beneath the Permo-Triassic unconformity (Robeson *et al*. 1988). In the Donegal Basin (Texaco well 13/3-1) 309 m of grey siltstone and sandstone with 8 coals were proved (Robeson *et al*. 1988).

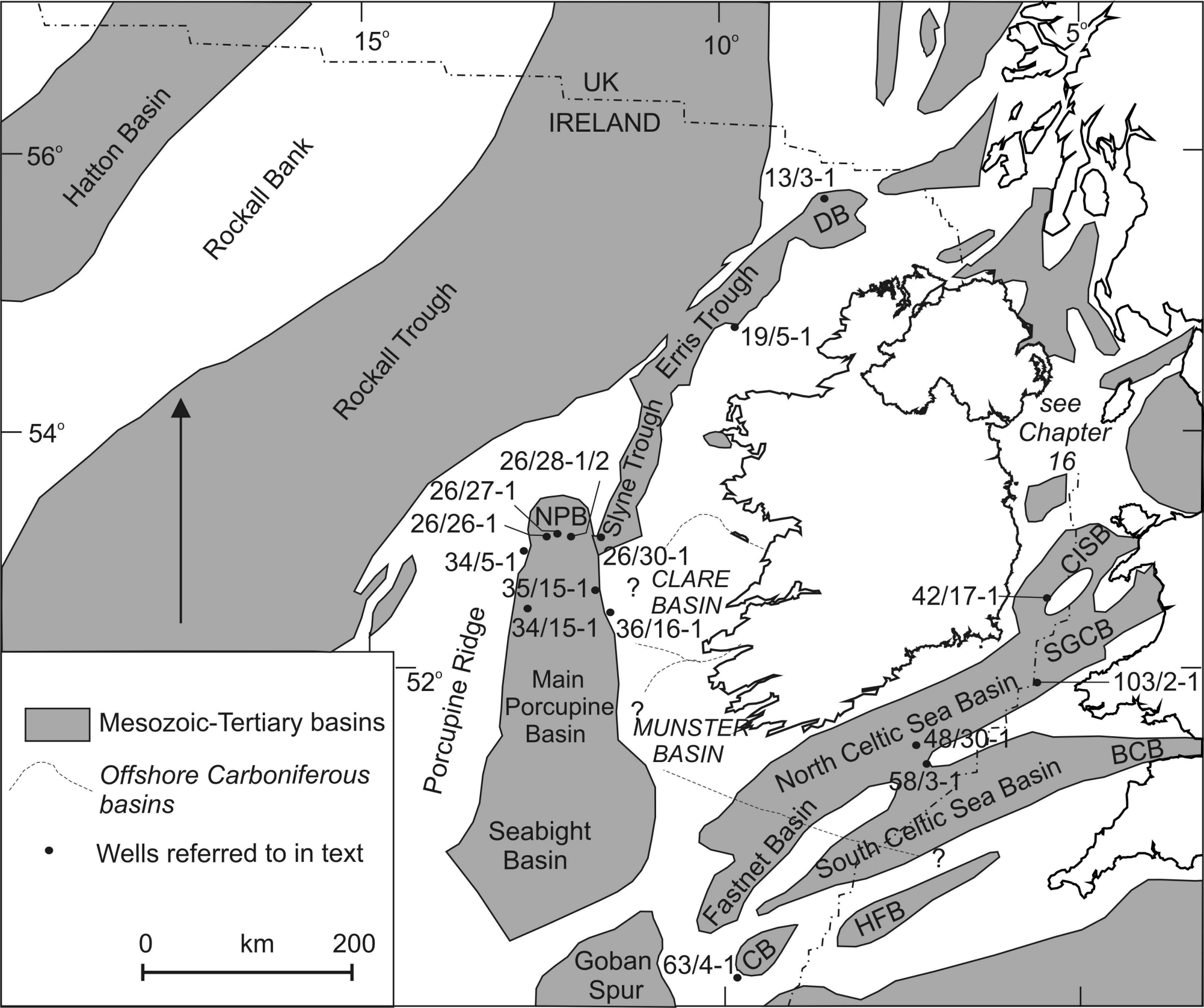
On the west side of the Porcupine Basin (well 34/5-1) there is a 458 m-thick succession of Bolsovian grey measures with 22 coals (Robeson *et al*. 1988). In the north and east sides of the basin (wells 26/27-1b and 36/16-1, respectively) the succession is of similar facies, but thinner. In the north-east of the basin (Phillips well 26/30-1) a 201 m-thick coal-poor succession of sandstone, claystone and shale, in part red, rests unconformably upon granite (Robeson *et al*. 1988). Coals up to 1 m thick are only present in the upper Bolsovian succession. In the Donegal Basin (Texaco well 13/3-1) at least 475 m of grey siltstone and sandstone with 42 coals were proved (Robeson *et al*. 1988).

Asturian strata show an upward transition from grey measures of fine-grained, carbonaceous sandstone, interbedded with siltstone, claystone, limestone and thin coals to red beds. 427 m of grey measures were proved on the eastern margin of the Porcupine Basin (well 36/16-1), whereas on the west and north-west side of the basin (wells 34/5-1 and 26/27-1b, respectively) secondary reddening is evident beneath the Mesozoic unconformity. At the north end of the basin (well 26/28-1 and 26/28-2) the 275 m-thick succession is coal-poor, with fine- to coarse-grained sandstone and some development of red beds (Robeson *et al*. 1988). In the Donegal Basin (Texaco well 13/3-1) 164 m of coal-poor siltstone and sandstone with thick tuff units occur below the Mesozoic unconformity (Robeson *et al*. 1988).

Stephanian

Thin Stephanian successions of grey and red-brown mudstone, subordinate sandstone and traces of coal have been proved in wells 34/5-1 in the west of the Porcupine Basin, and 26/28-1 and 26/28-2 in the north. Stephanian strata are absent from the east of the basin (Croker & Shannon 1987; Robeson *et al*. 1988). The 106 m-thick Stephanian to Autunian succession in Deminex 34/15-1 includes sandstone with glauconite and intraclast-rich limestone. The succession is interpreted as to have accumulated in a marginal marine to

freshwater environment such as a muddy alluvial swamp (Tate & Dobson 1989). In the Donegal Basin (Texaco well 13/3-1) upper Asturian to Stephanian strata comprise about 150 m of alternating red and grey to green fine-grained clastic rocks, which in the upper 60 m are interbedded with volcaniclastic deposits (Tate & Dobson 1989).


15°
10°
5°
UK
IRELAND
56°
Hatton Basin
Rockall Bank
Rockall Trough
54°
52°
13/3-1
DB
Erris Trough
19/5-1
Slyne Trough
see
Chapter
16
26/28-1/2
26/27-1
26/26-1
NPB
34/5-1
26/30-1
35/15-1
?
CLARE
BASIN
34/15-1
36/16-1
Porcupine Ridge
Main
Porcupine
Basin
?
MUNSTER
BASIN
Seabight
Basin
CISB
42/17-1
SGCB
103/2-1
North Celtic Sea Basin
48/30-1
BCB
58/3-1
Fastnet Basin
South Celtic Sea Basin
?
HFB
Goban
Spur
63/4-1
CB
Mesozoic-Tertiary basins
Offshore Carboniferous basins
Wells referred to in text
0
km
200