

# IS16/04 – Source rocks development in offshore Ireland in the context of the new standard lithostratigraphic framework

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Roinn Cumarsáide, Gníomhaithe  
ar son na hAeráide & Comhshaoil  
Department of Communications,  
Climate Action & Environment



# Introduction

## Aim & scope of this presentation

Source rocks offshore Ireland

- Project IS16/04 is in its final stage of completion and the new stratigraphic framework will become available then
- As part of the project, source rock intervals have been identified in context of the new stratigraphy using geochemical data from all drilled wells offshore Ireland
- These identified source rock intervals will be highlighted in the following and detailed descriptions, including their regional distribution are shown for selected intervals

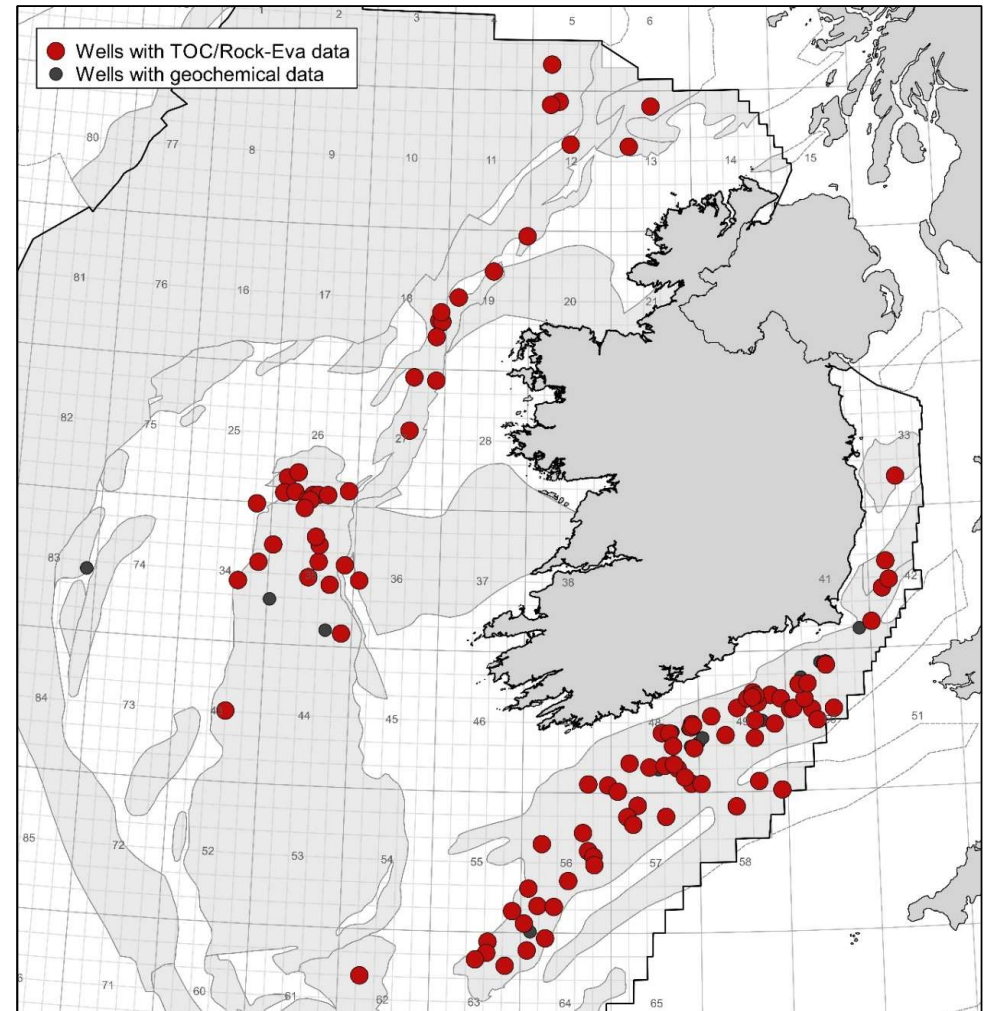
# Geochemical database

## Data availability

- Geochemical data from all available historic reports together with additional data from the ISPSG 16/01 project were compiled into an integrated geochemical database
- The new IS16/04 project stratigraphy was applied
- Total organic carbon (TOC) and Rock-Eval pyrolysis data were considered in the current study
- Data relevant for this study were available for a total of 116 offshore wells, including TOC data for >12,700 samples and Rock-Eval data for >6,450 samples

Overview full geochemical database	Quantity
Wells	146
Samples (total)	18,309
Total Organic Carbon	12,721
Rock-Eval (S1, S2, HI, OI)	6,458

## Offshore Ireland



# Source Rocks

All identified source intervals

## Stratigraphic Overview

Formation	Age/Stage	Rockall	Donegal	Slyne	Porcupine	Irish Mainland Platform	Goban Spur	Fastnet	North Celtic Sea	South Celtic Sea
Gweedore	Ypresian-Thanelian				●●					
Bradán	Albian-Aptian				●●					
Valhall	Aptian-Berriasian	●●?			●●					
Wealden Group	Aptian-Valanginian								●●	
Pike	Valanginian-Berriasian								●●●	
Perch	Berriasian								●●●	
Pollan	Berriasian								●●●	
Dawros	Tithonian-Kimmeridgian	●●		●●						
Dursey	Tithonian				●●●					
Bolus	Kimmeridgian-Oxfordian				●●					
Minard	Oxfordian			●	●●					
Knockadoon	Tithonian								●●	
Baginbun	Kimmeridgian								●●	
Dun Caan Shale	Aalenian-Toarcian			●●						
Tacumshin	Aalenian-Toarcian							●	●	
Whitby Mudstone	Toarcian			●●●			●	●	●●●	
Pabay Shale	Pliensbachian			●●●			●	●	●●	
Glenbeg	Sinemurian						●	●●	●●	●●
Currane	Sinemurian							●	●●	●●
Leane	Hettangian							●	●●	
Blackthorn Group	Asturian-Langsettian		●	●●	●●	●●?				

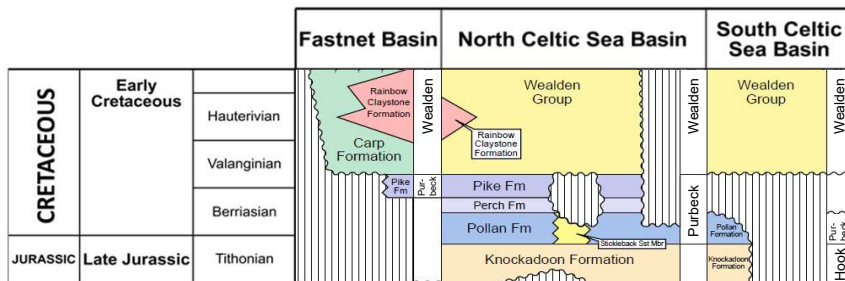
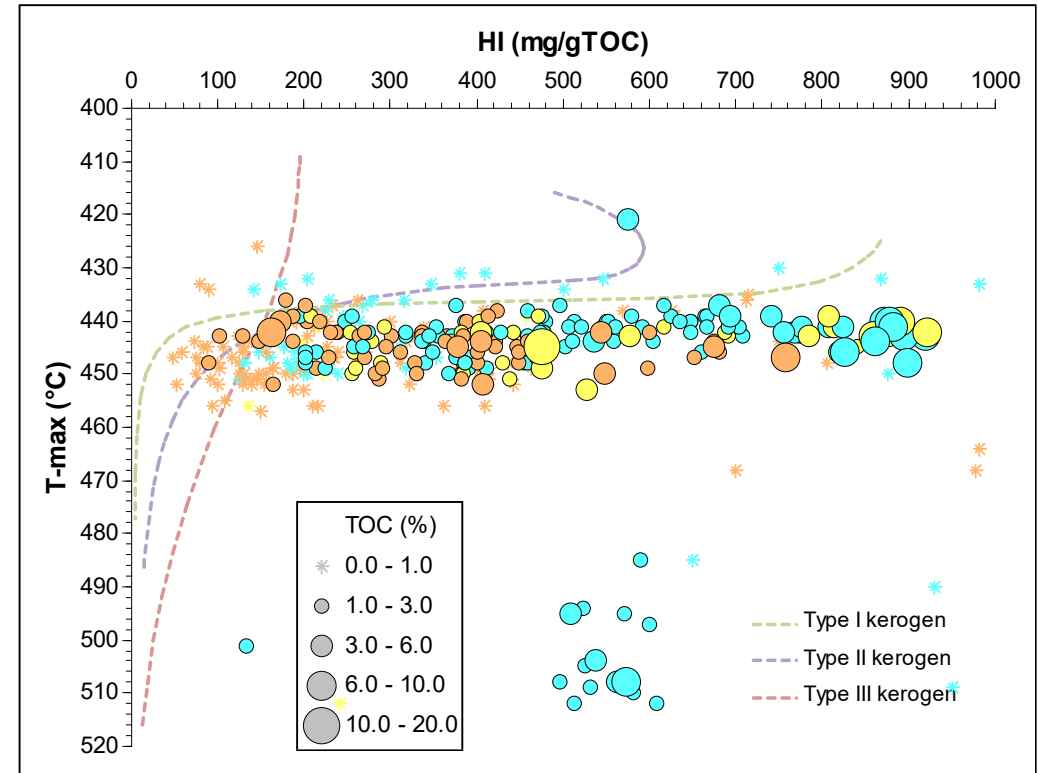
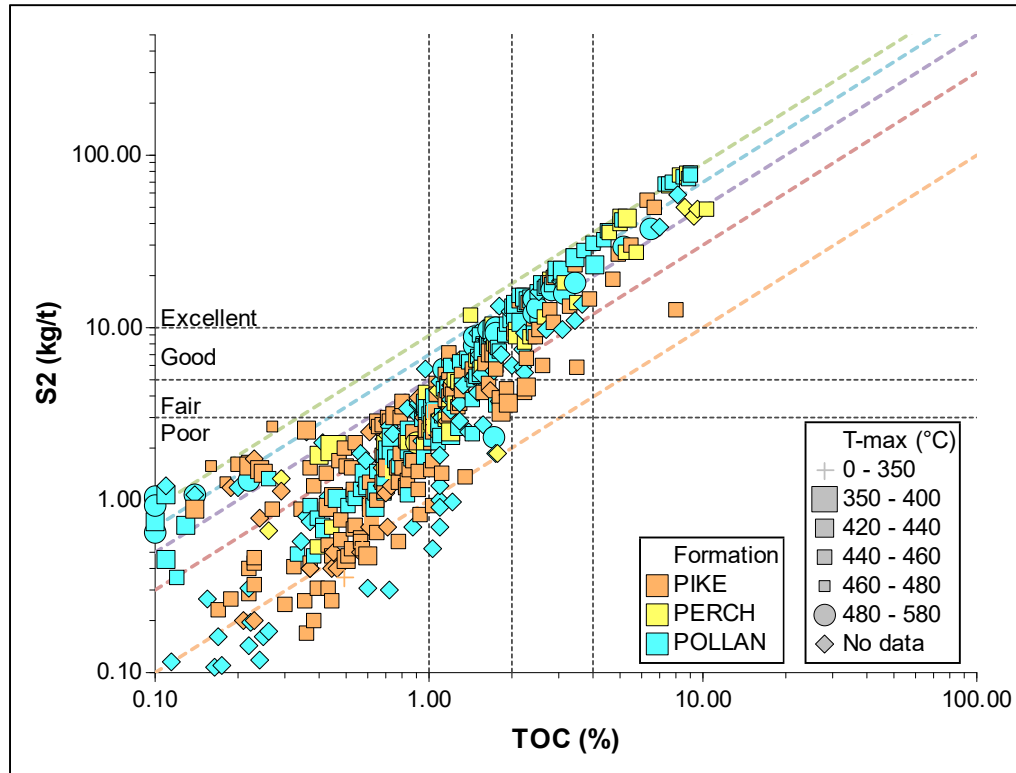
● Limited source potential   ●● Good source potential   ●●● Excellent source potential   ■ Oil potential   ■ Mixed oil & gas potential   ■ gas potential

21 formations with a varying degree of source potential have been identified throughout the different basins offshore Ireland, ranging from Carboniferous to Paleogene in age

# Purbeck Group

North Celtic Sea Basin

Lower Cretaceous



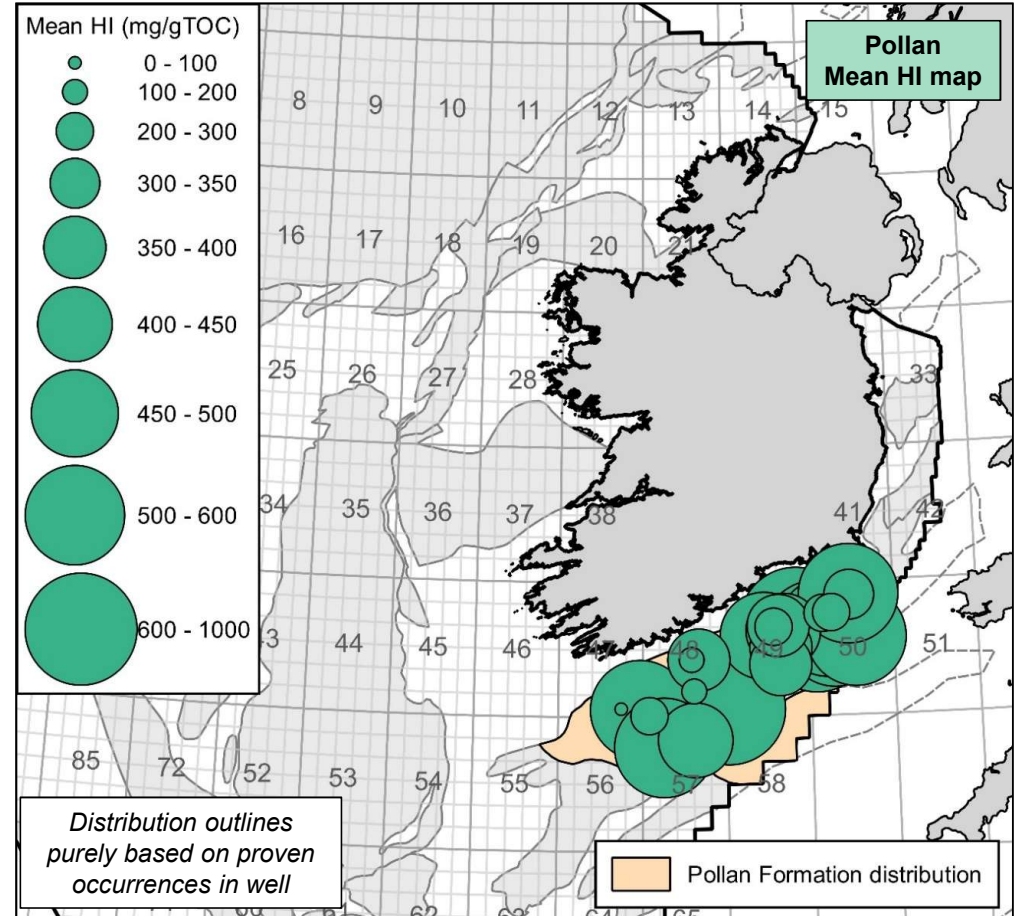
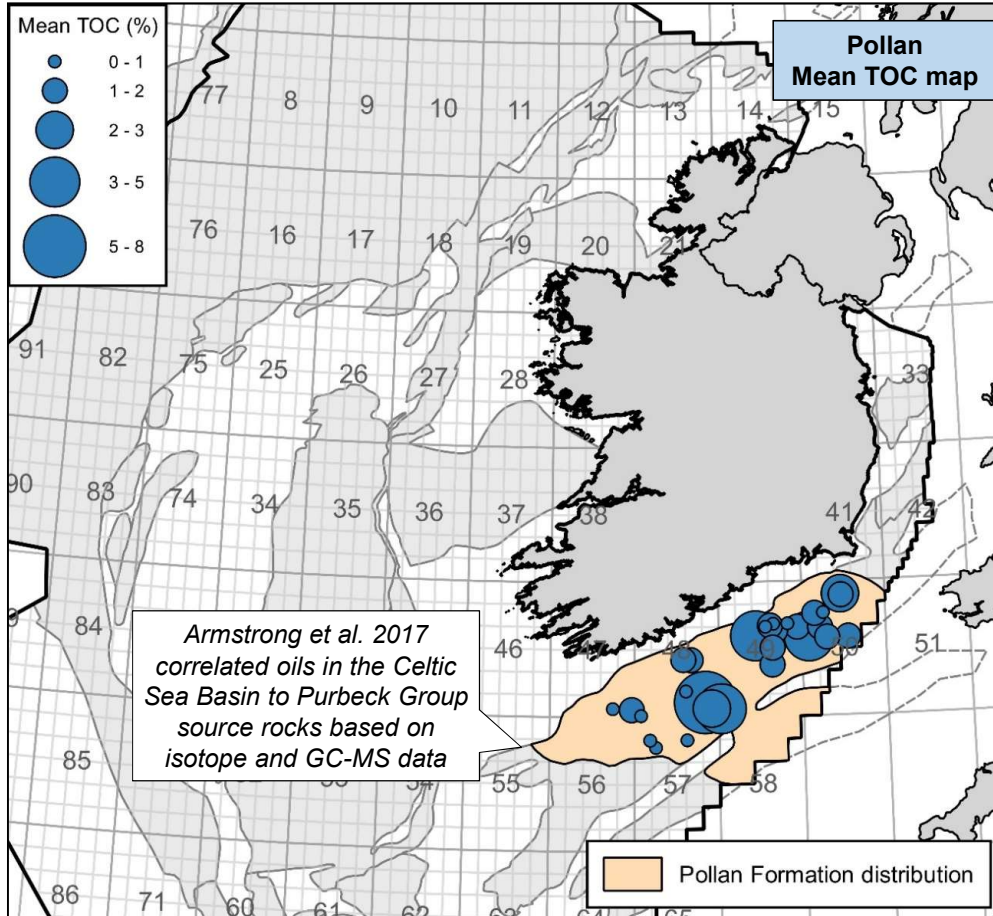
- The Pike, Perch, and Pollan formations of the Purbeck Group show very similar geochemical characteristics
- Excellent oil source potential is seen throughout the Purbeck Group



# Pollan Formation

Purbeck Group

## Mean TOC (%) & Hydrogen Index (mg/gTOC)



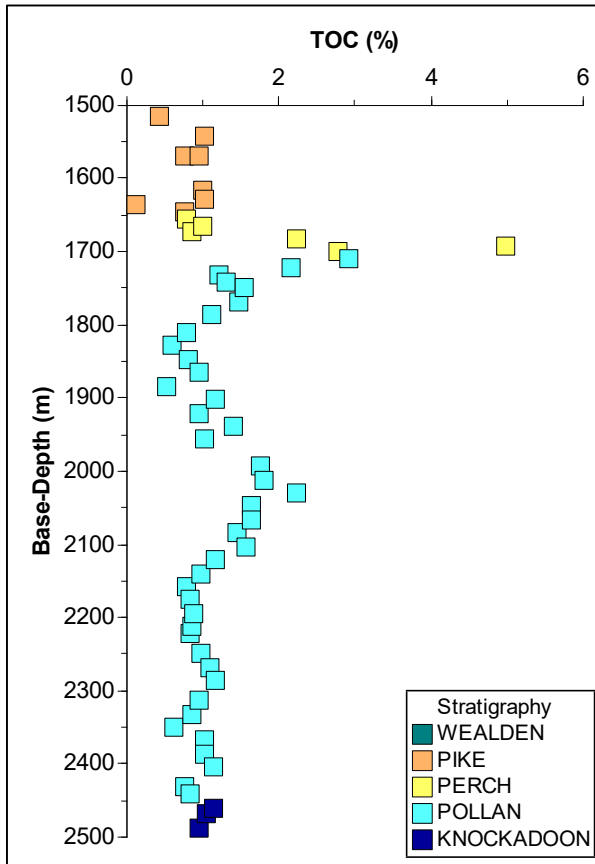
- Organic richness and high Hydrogen Index values are seen throughout the basin
- The Pike and Perch formations show similar characteristics to the Pollan Formation

# Purbeck Group

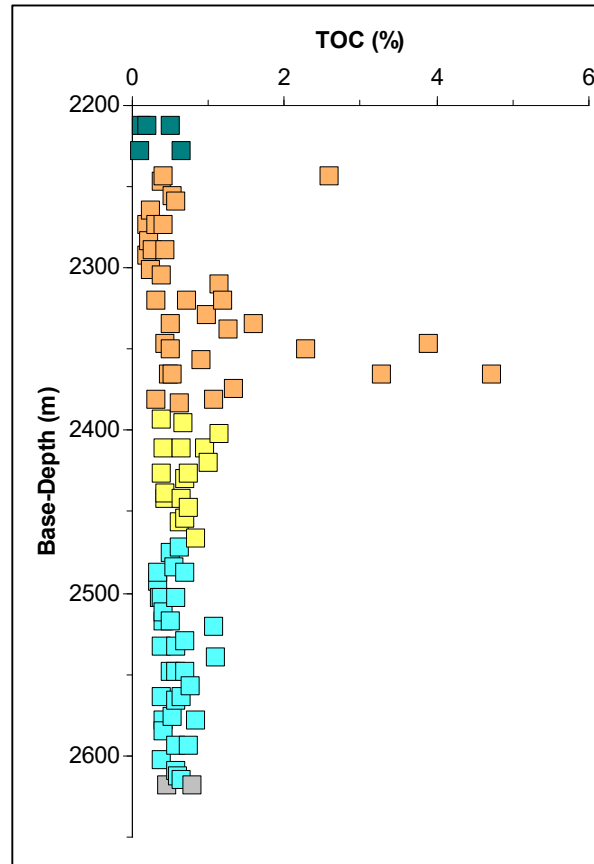
## Variation between wells

Lower Cretaceous

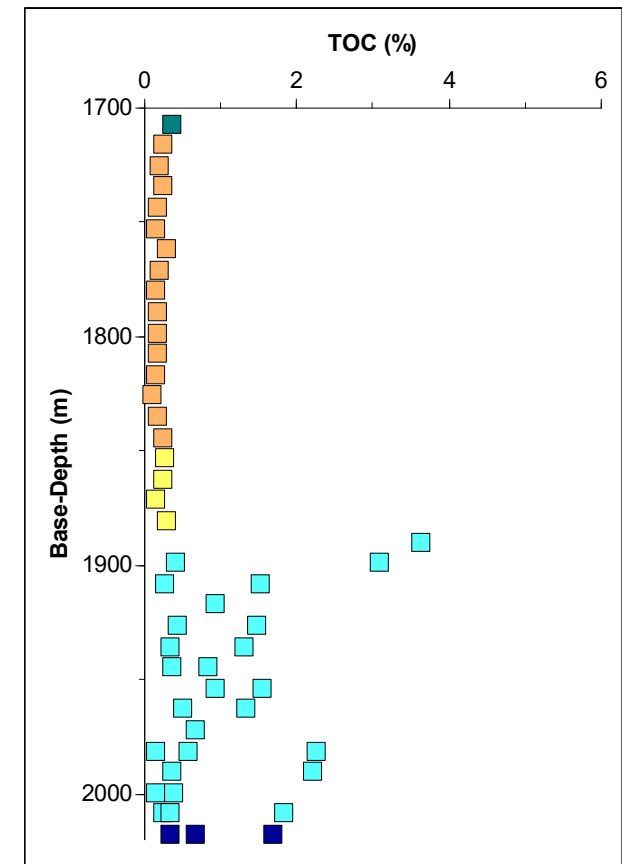
48/19-1A



48/24-1



49/19-1

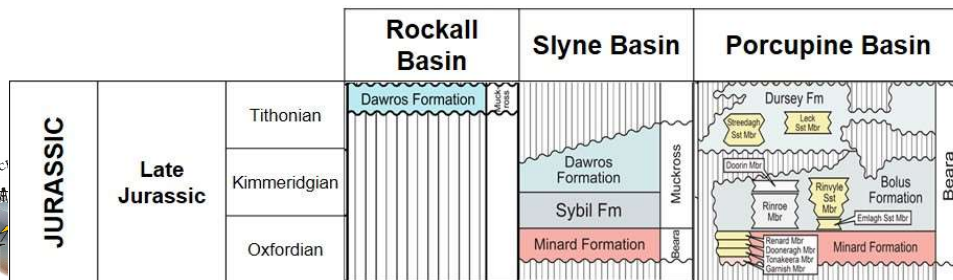
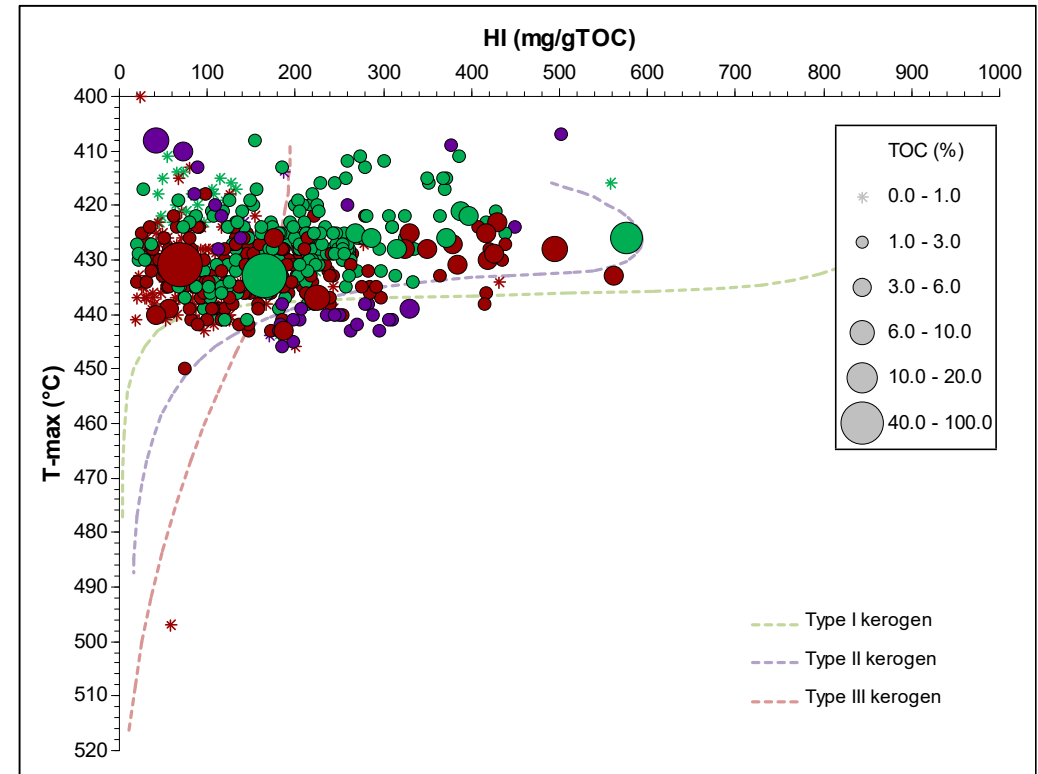
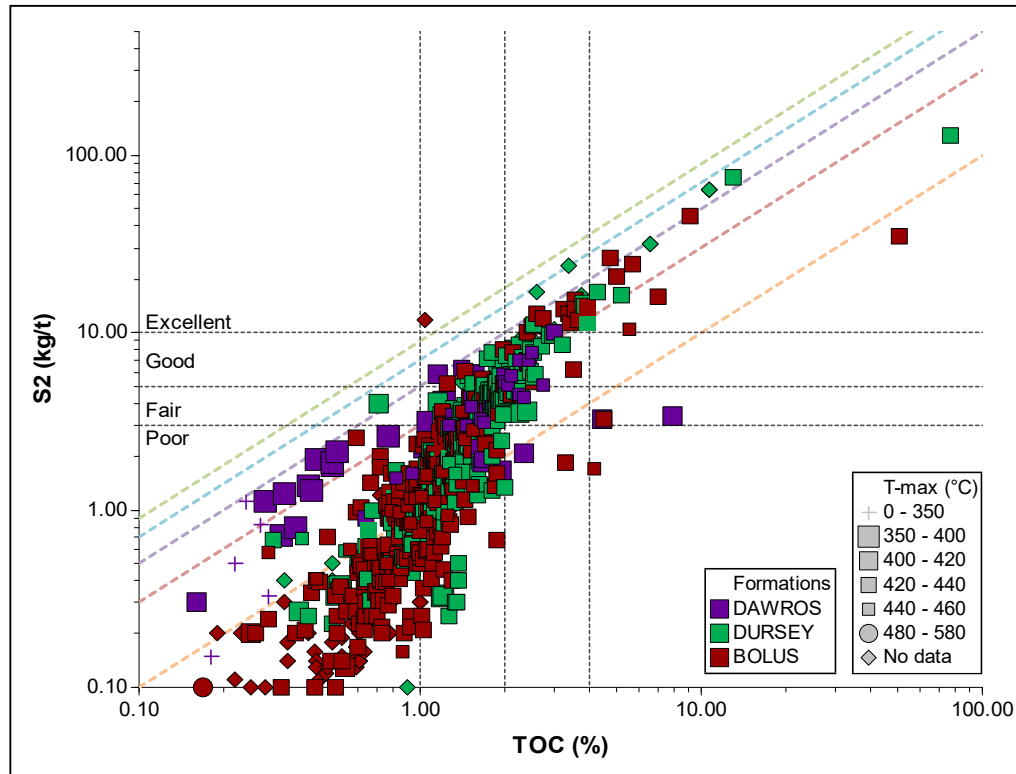


- Although the Pike, Perch, and Pollan formations all show very similar source rock potential, they can show significantly different characteristics in individual wells

# Dawros, Dursey & Bolus formations

Slyne, Rockall, and Porcupine basins

Upper Jurassic



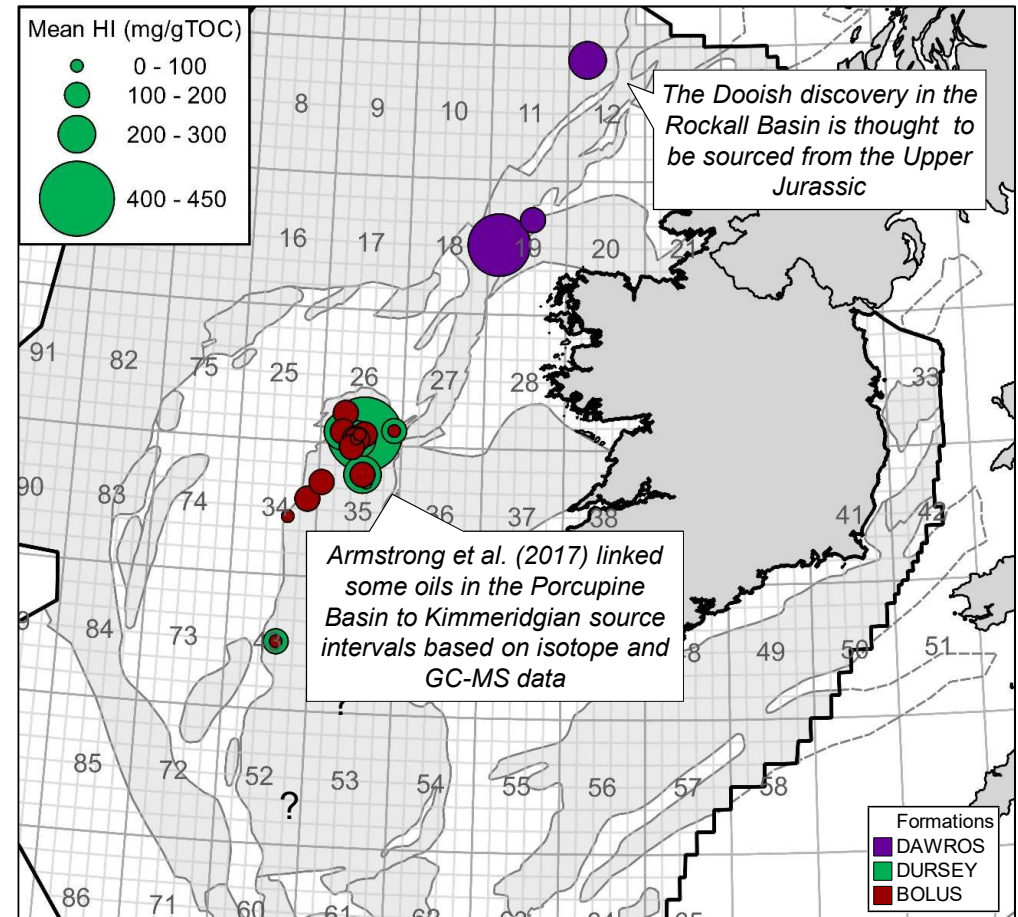
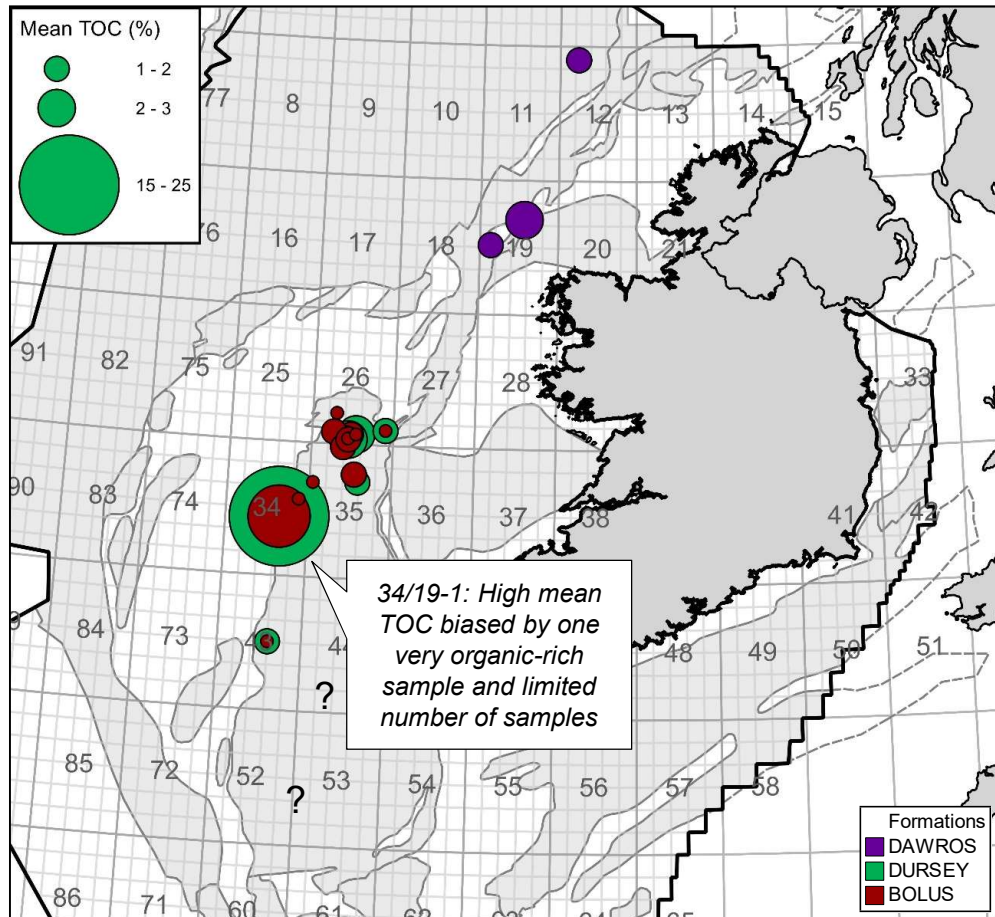
- The Dawros Formation (Rockall & Slyne basins), as well as the Dursey and Bolus formations (Porcupine Basin) all include samples showing source potential
- A quite heterogeneous kerogen composition indicates variable hydrocarbon generative potential



# Dawros, Dursey & Bolus formations

Slyne, Rockall, and Porcupine basins

Upper Jurassic



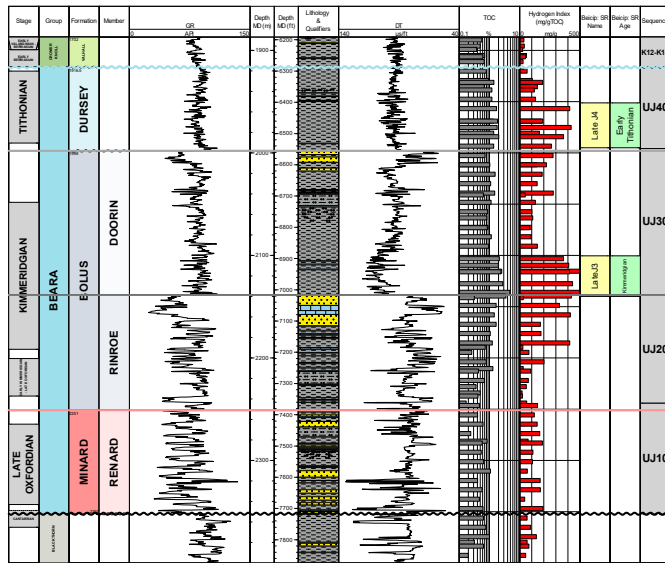
- Very similar mean TOC values for the different formations across the area
- Slightly higher mean Hydrogen Index for Dursey Formation indicate better source potential

# Dursey & Bolus formations

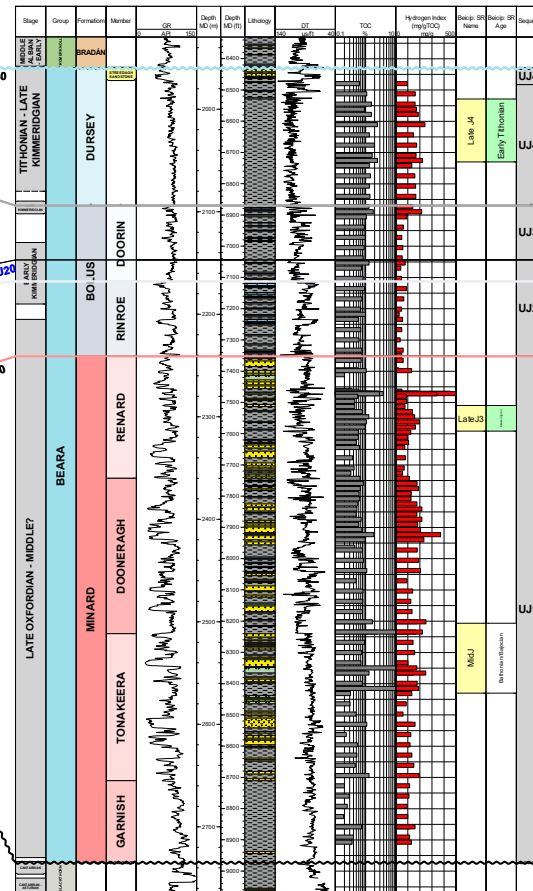
## Well correlation

Upper Jurassic

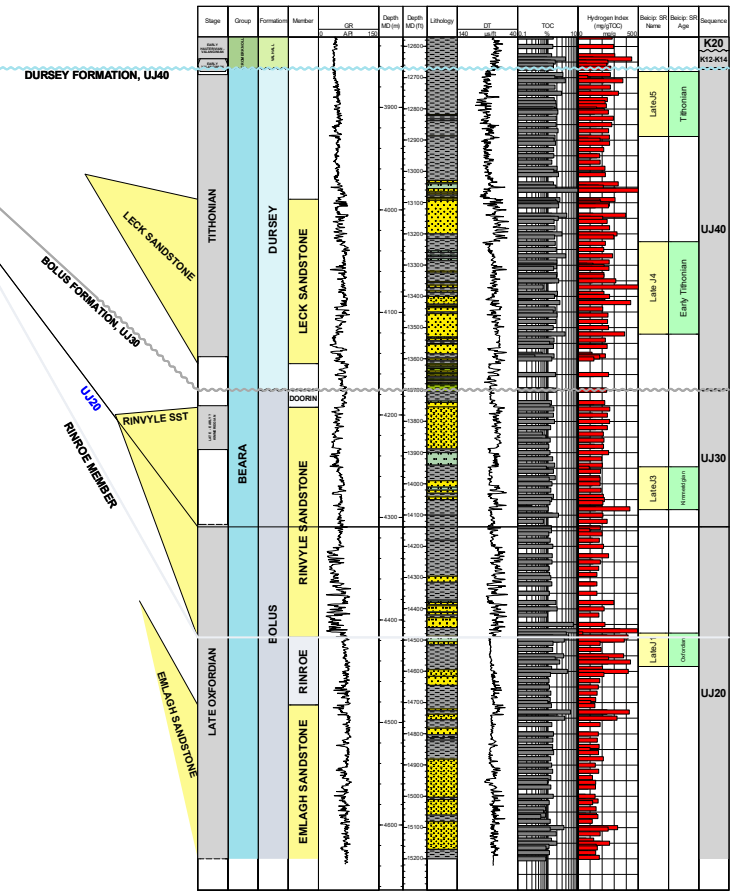
26/27-1B



26/28-1  
(Connemara)



35/8-2  
(Spanish Point)

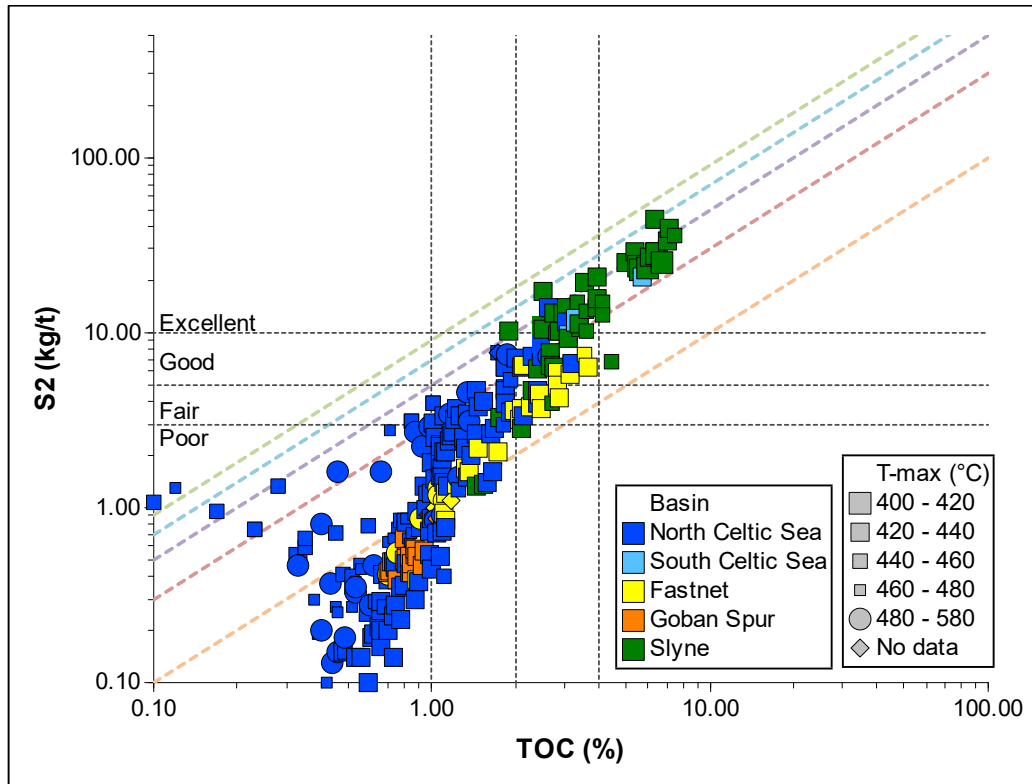


- Organic-rich Dursey Formation intervals with increased Hydrogen Index values fall in the UJ40 sequence across multiple wells
- The best source potential of the Bolus Formation is seen in wells 26/27-1B and 35/8-2, where it corresponds to the upper part of the Rinroe Member and the lower part of the Doorin Member

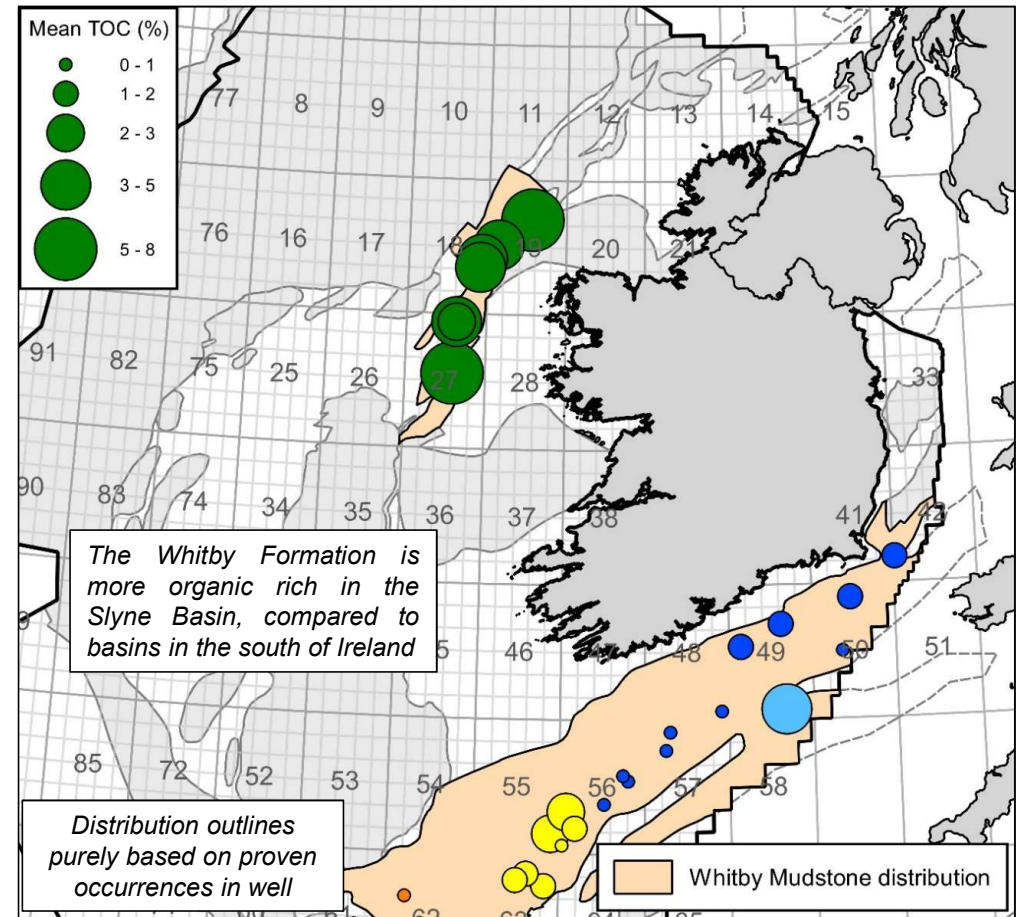
# Whitby Mudstone

Source characteristics: Organic richness/potential

Lower Jurassic



- The Whitby Mudstone represents an organic-rich interval that is present in various basins
- Obvious differences in source character are seen between basins

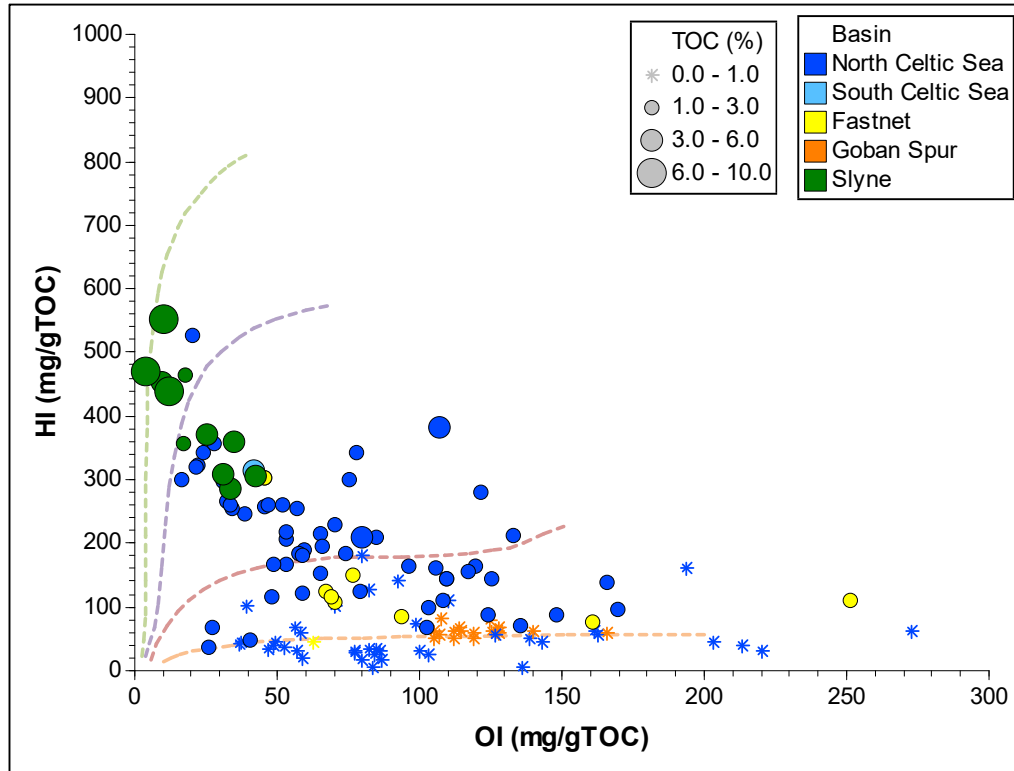




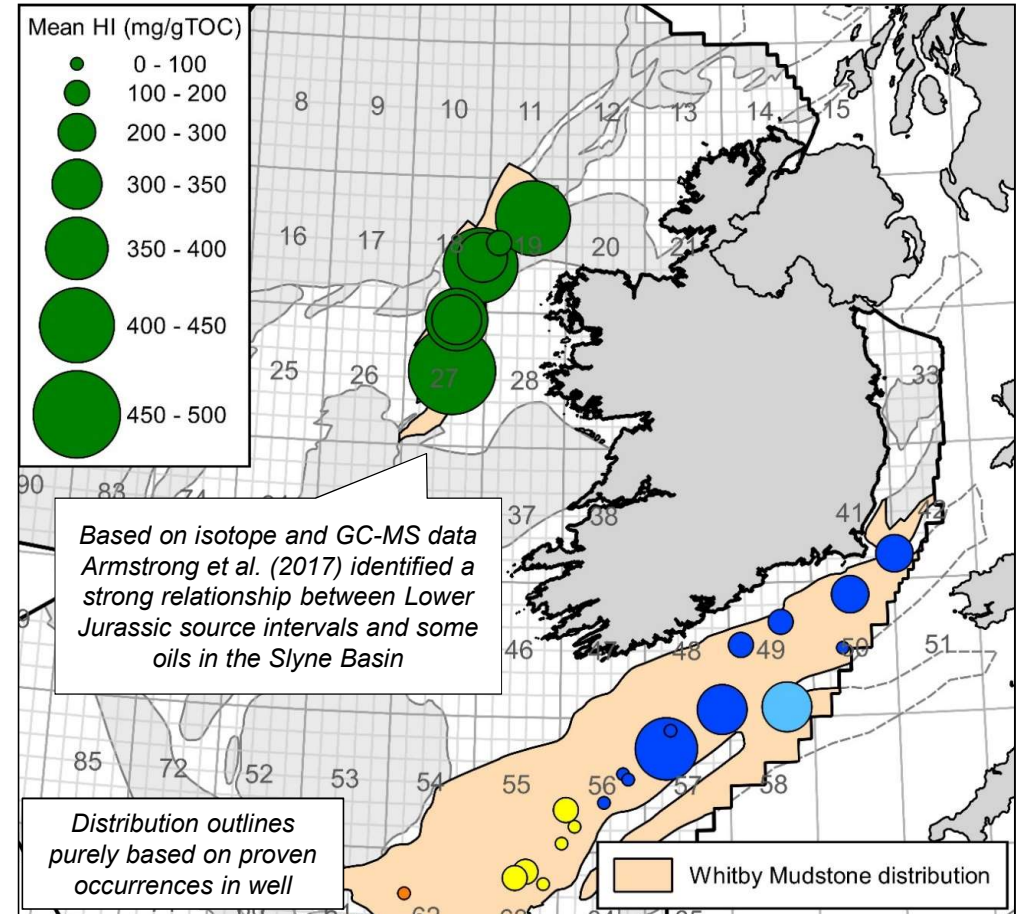
# Whitby Mudstone

## Source characteristics: Kerogen type

Lower Jurassic



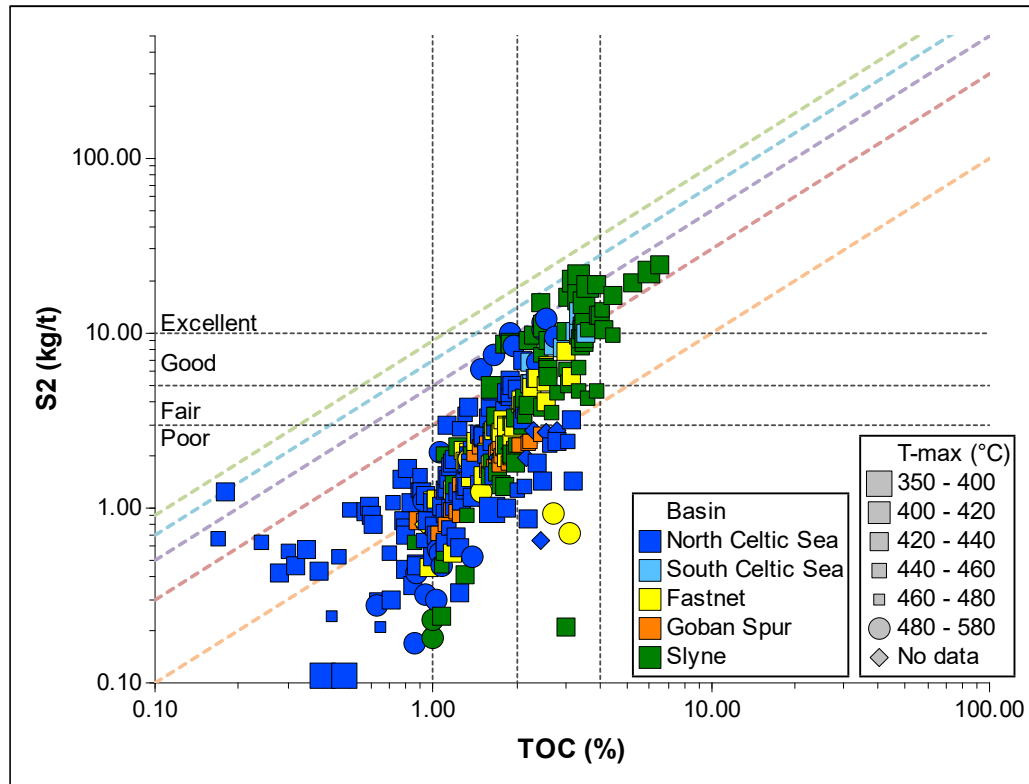
- Excellent oil potential in the Slyne Basin with increased Hydrogen Index values and marine Type II kerogen composition
- Lower hydrocarbon potential in the other basins at similar maturity based on Tmax data



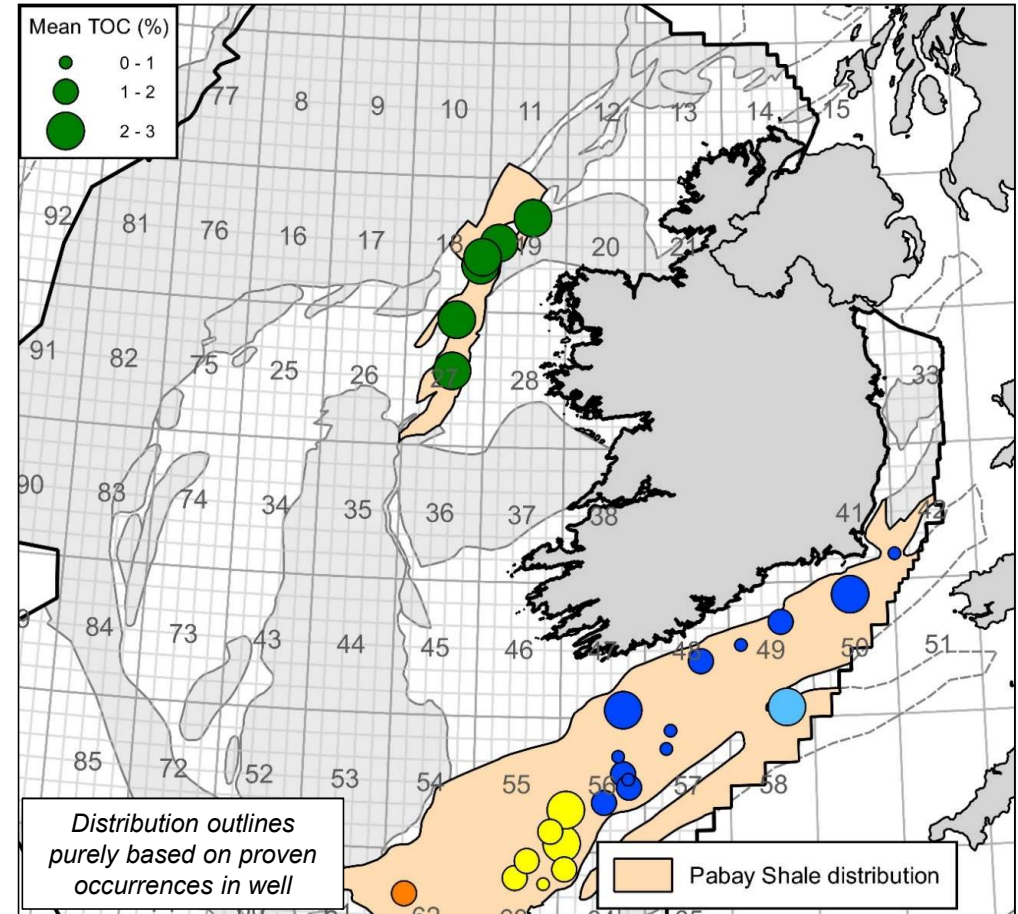
# Pabay Shale

Source characteristics: Organic richness/potential

Lower Jurassic



- Organic-rich samples are found across the area
- Samples with high hydrocarbon yields are especially seen in the Slyne Basin

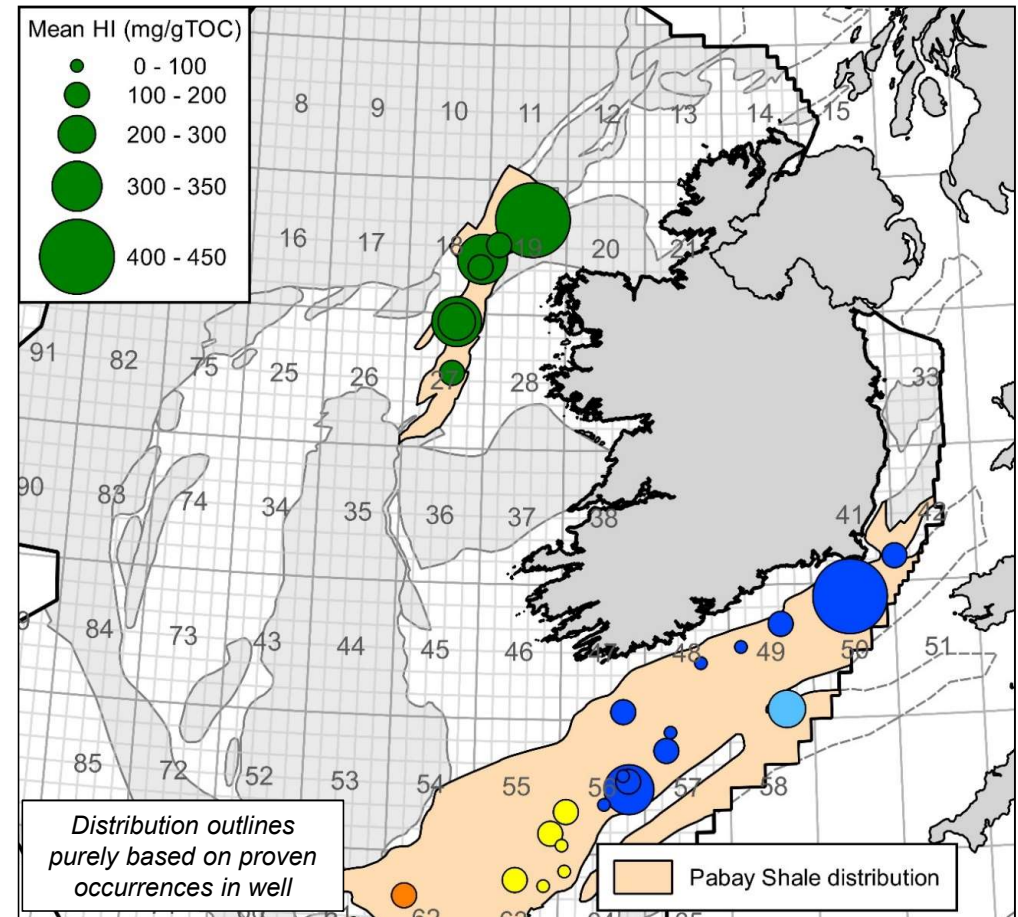
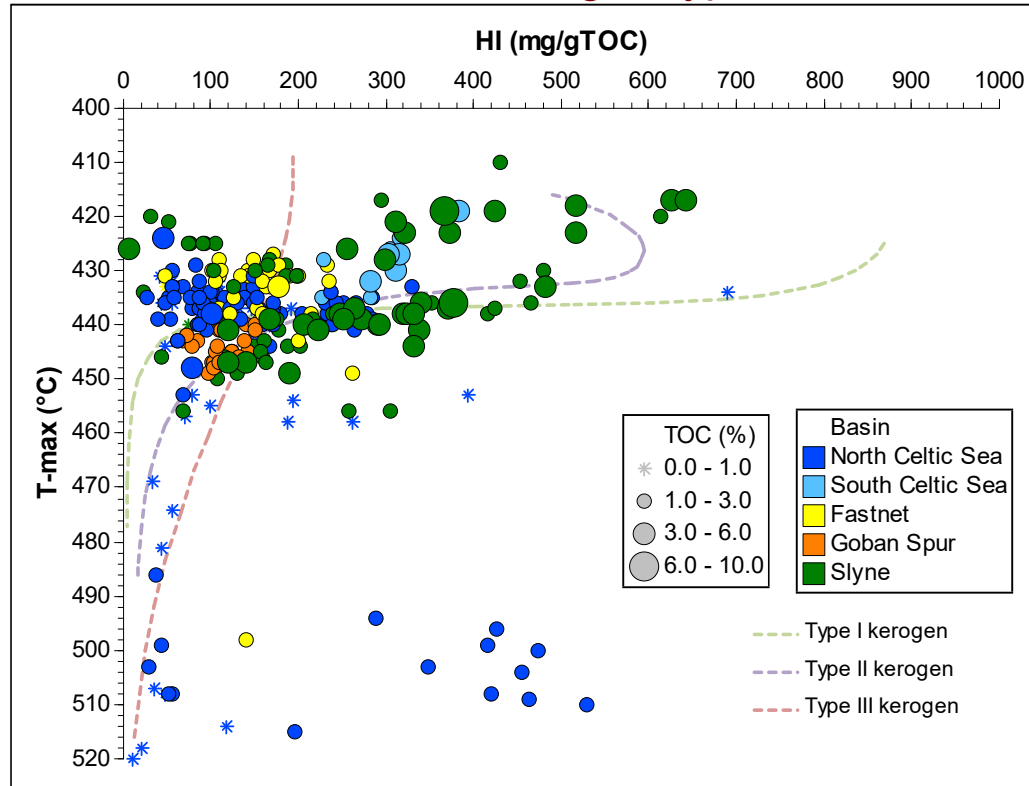




# Pabay Shale

## Source characteristics: Kerogen type

Lower Jurassic

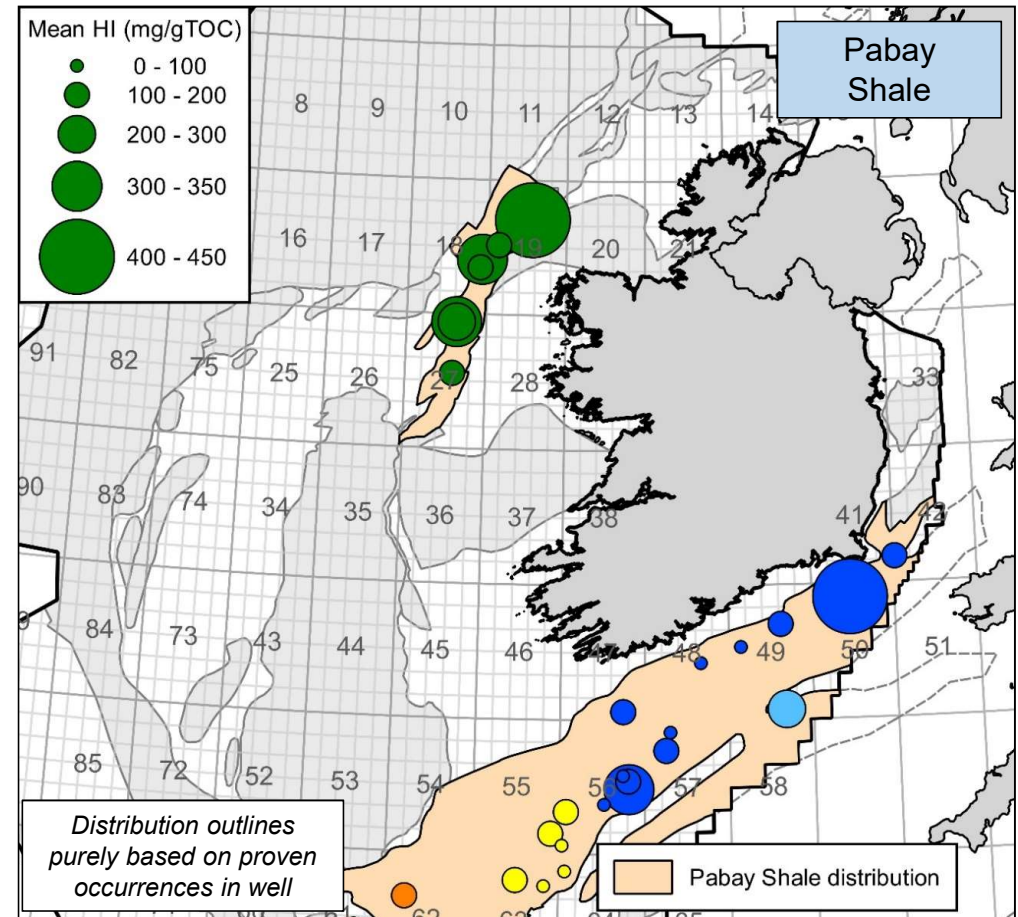
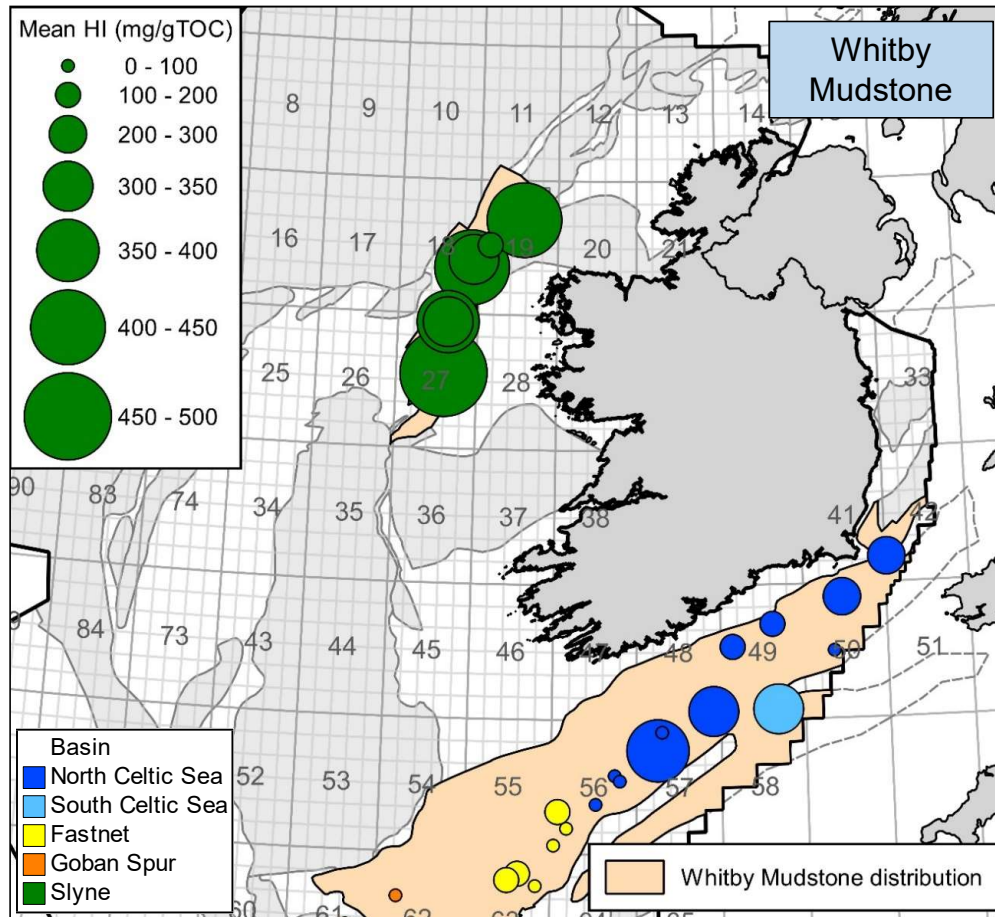


- Increased Hydrogen Index values and a marine Type II kerogen composition in the Slyne Basin
- Mainly Type III kerogen in the other basins indicating samples are more gas prone

# Whitby Mudstone vs. Pabay Shale

Lower Jurassic

## Source characteristics

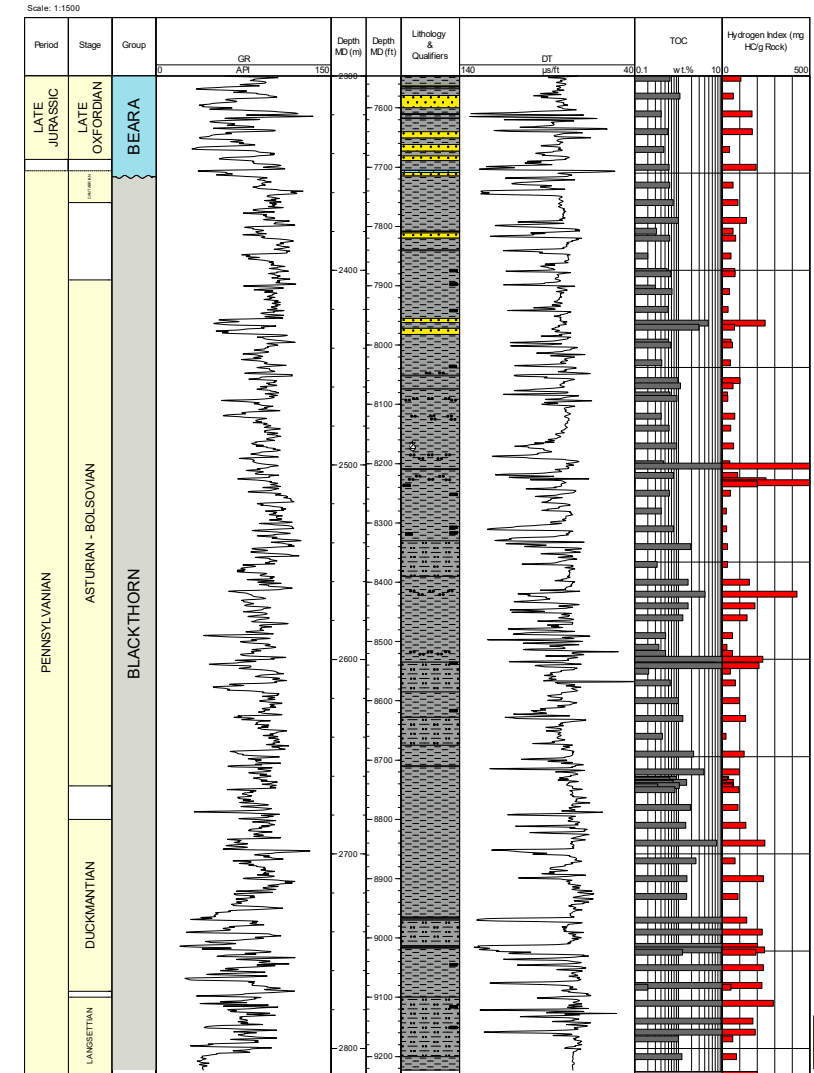
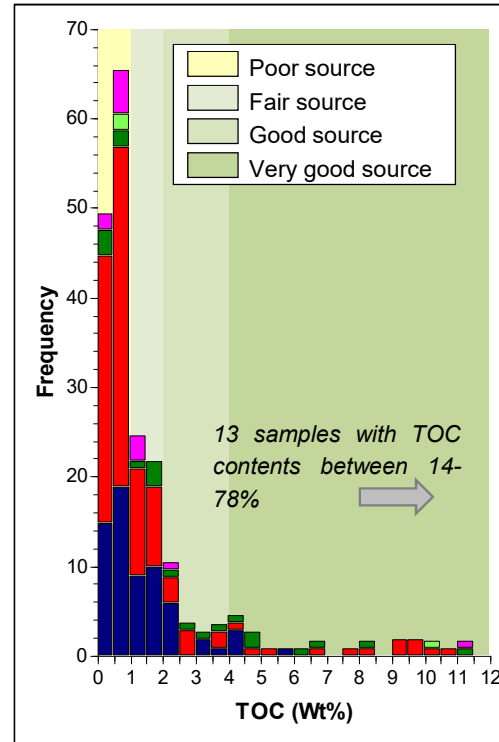
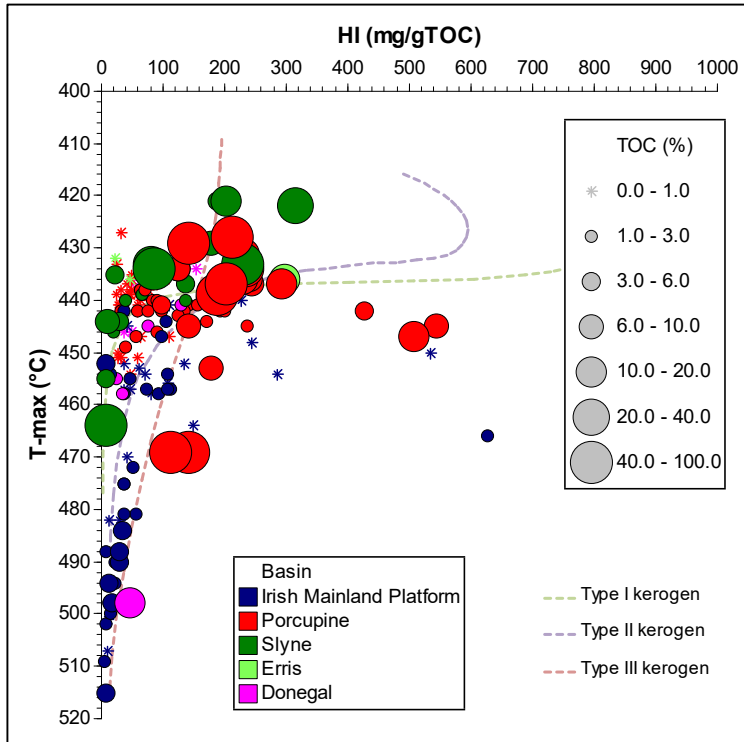


- The two formations show similar trends with increased source potential in the Slyne Basin
  - Overall better source potential is seen for the Whitby Mudstone

# Blackthorn Group

## Source characteristics

✦ 26/27-1B Carboniferous



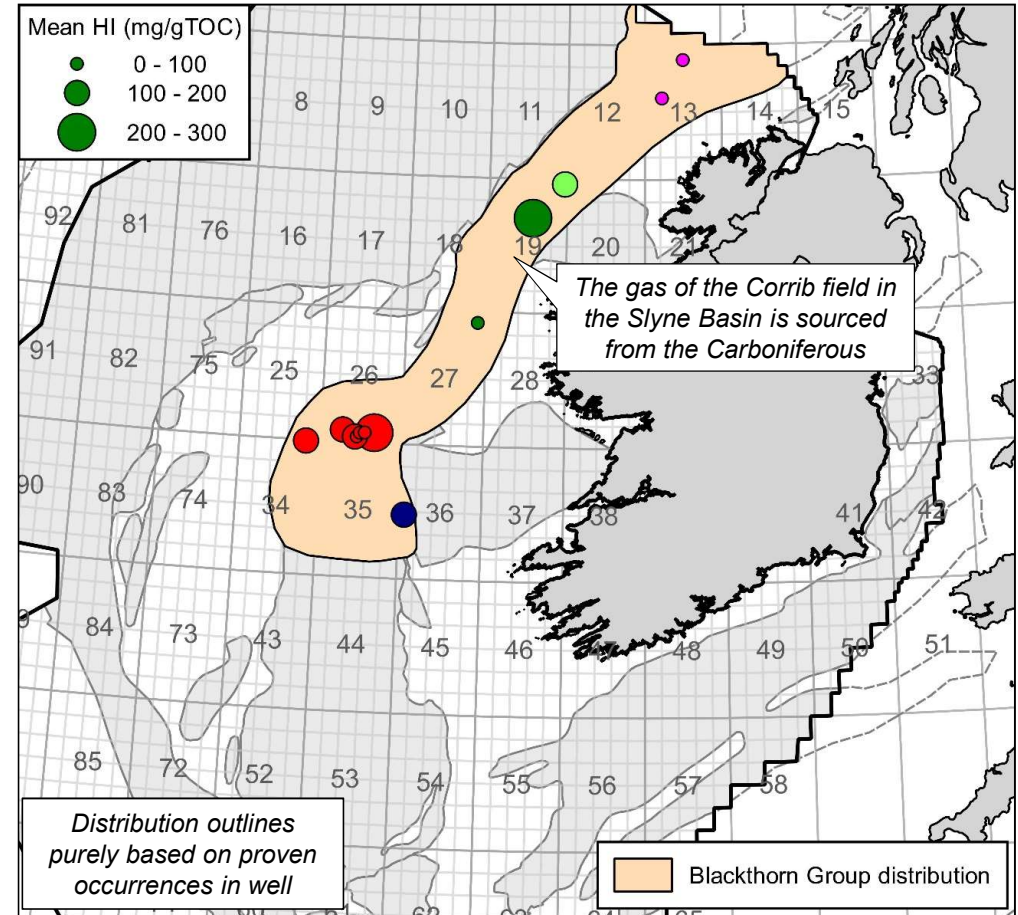
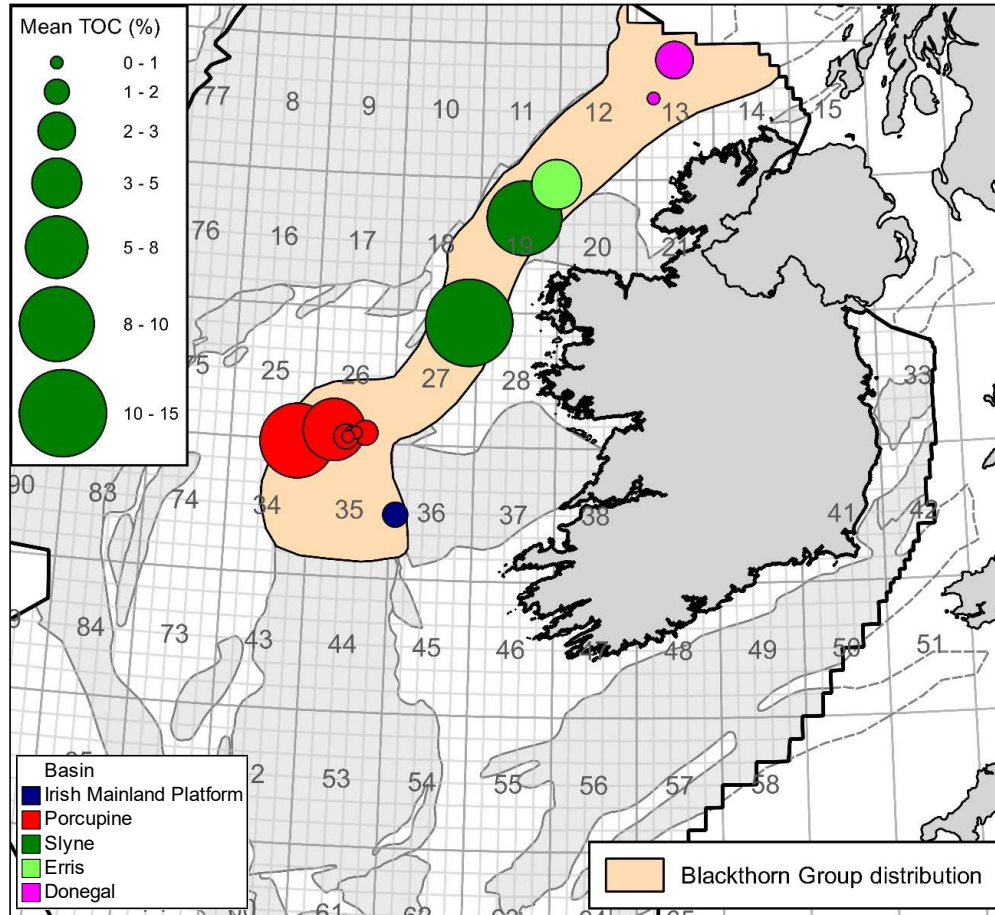
- Organic-rich Blackthorn Group intervals are found across multiple basins
- Samples show a mainly Type III kerogen composition
- Very high maturities in the Irish Margin Platform area likely lowered the original source potential



# Blackthorn Group

## Source characteristics

Carboniferous



- The Blackthorn Group is very organic rich across the area
- Relatively low mean Hydrogen Index values highlight that the interval is mainly gas prone

# Summary

## Source rock potential

21 formations with a varying degree of source potential

Formation	Age/Stage	Rockall	Donegal	Slyne	Porcupine	Irish Mainland Platform	Goban Spur	Fastnet	North Celtic Sea	South Celtic Sea
Gweedore	Ypresian-Thanelian				●●					
Bradán	Albian-Aptian				●●					
Valhall	Aptian-Berriasian	●●?			●●					
Wealden Group	Aptian-Valanginian								●●	
Pike	Valanginian-Berriasian								●●●	
Perch	Berriasian								●●●	
Pollan	Berriasian									
Dawros	Tithonian-Kimmeridgian	●●		●●						
Dursey	Tithonian				●●●					
Bolus	Kimmeridgian-Oxfordian				●●					
Minard	Oxfordian				●●					
Knockadoon	Tithonian								●●	
Baginbun	Kimmeridgian								●●	
Dun Caan Shale	Aalenian-Toarcian			●●						
Tacumshin	Aalenian-Toarcian							●	●	
Whitby Mudstone	Toarcian			●●●			●	●	●●●	
Pabay Shale	Pliensbachian			●●●			●	●	●●	
Glenbeg	Sinemurian						●	●●	●●	●●
Currane	Sinemurian							●	●●	●●
Leane	Hettangian							●	●●	
Blackthorn Group	Asturian-Langsettian		●	●●	●●	●●?				

**Upper Cretaceous:**  
No significant source potential identified

**Upper Jurassic:**  
Good hydrocarbon potential

**Lower Cretaceous:**  
Excellent potential

**Upper Jurassic:**  
Good hydrocarbon potential

**Lower Jurassic:**  
Mixed oil and gas to gas potential

**Lower Jurassic:**  
Excellent oil potential

**Carboniferous:**  
Gas potential

**Triassic:**  
No significant source potential identified

**Permian and pre-Carboniferous:**  
Lack of data not allowing source characterisation

● Limited source potential ●● Good source potential ●●● Excellent source potential ● Oil potential ● Mixed oil & gas potential ● gas potential



# Acknowledgements

Project IS 16/04

- We thank the Petroleum Affairs Division (PAD) (of the Department of Communications, Climate Action & Environment), and PIP for support and permission to present the project
- Project IS 16/04 was funded by the Irish Shelf Petroleum Studies Group comprising the following companies; AzEire Petroleum, BP Exploration Operating Co Ltd, Cairn Energy Plc, Chevron North Sea Limited, ENI Ireland BV, Equinor (UK) Ltd., Europa Oil & Gas Plc, ExxonMobil E&P Ireland (Offshore) Ltd, Maersk Oil North Sea UK Ltd, Nexen Petroleum UK Ltd, Petroleum Affairs Division (PAD) of the Department of Communications, Climate Action and Environment, Providence Resources Plc, Repsol Exploración SA, San Leon Energy Plc, Serica Energy Plc, Shell E&P Ireland Ltd, Sosina Exploration Ltd, Tullow Oil Plc, and Woodside Energy (Ireland) Pty Ltd



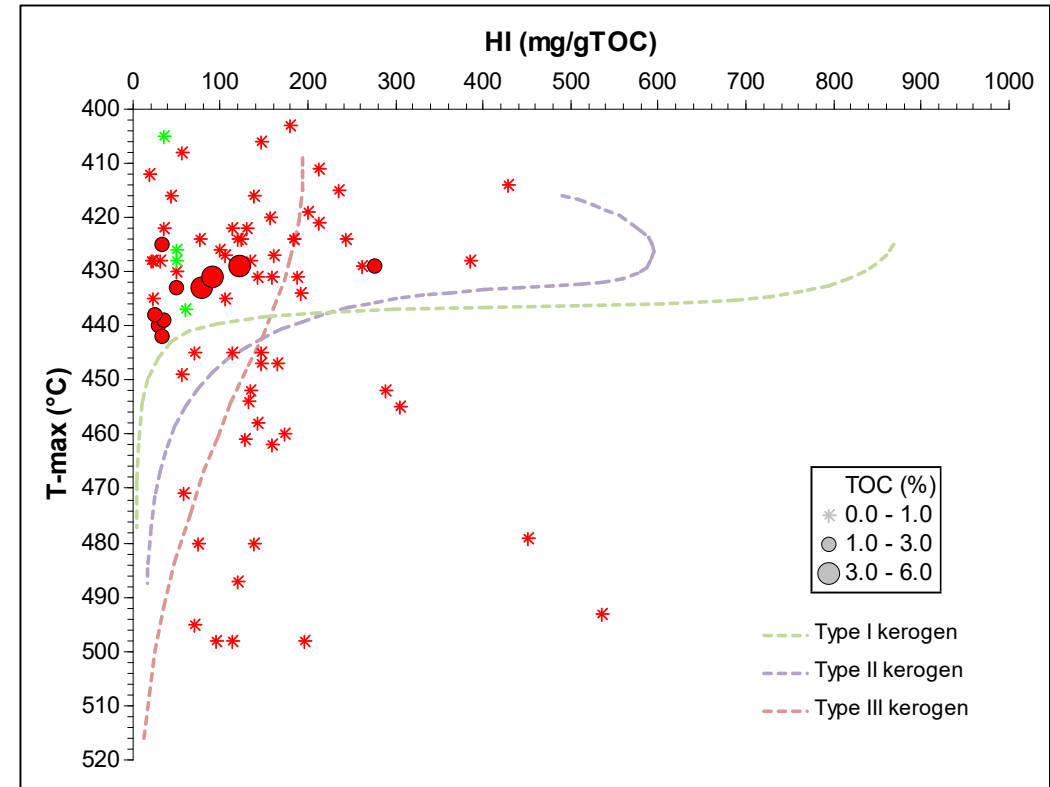
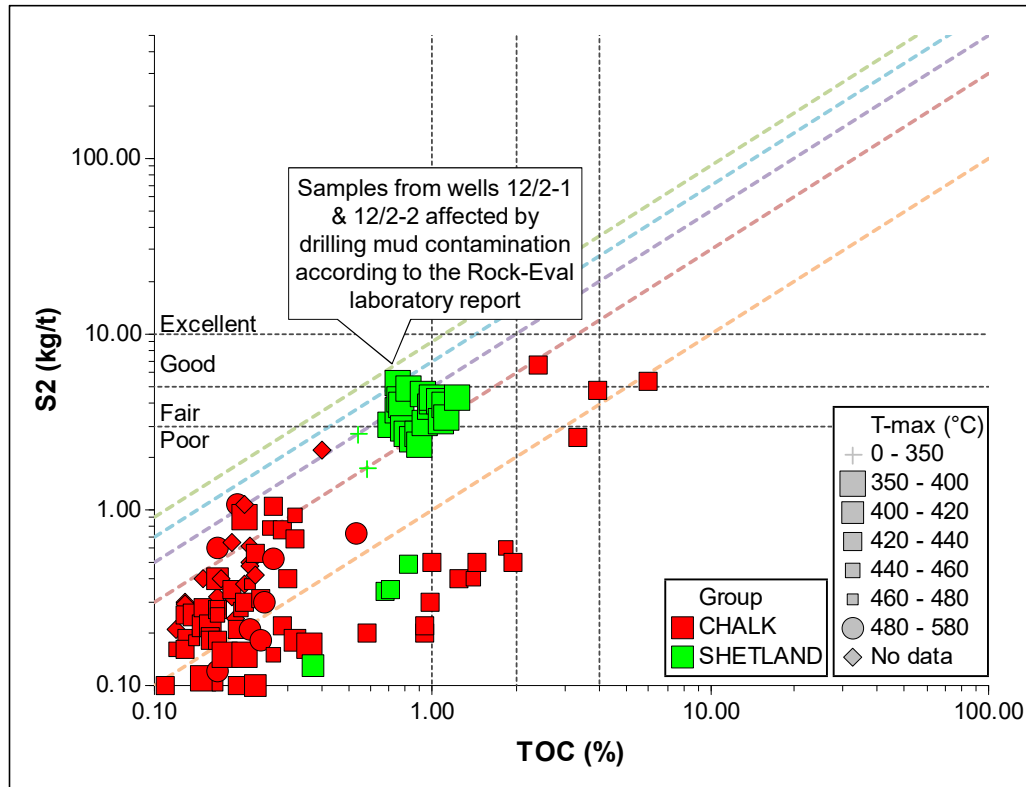
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# Upper Cretaceous

No identified source intervals

Offshore Ireland

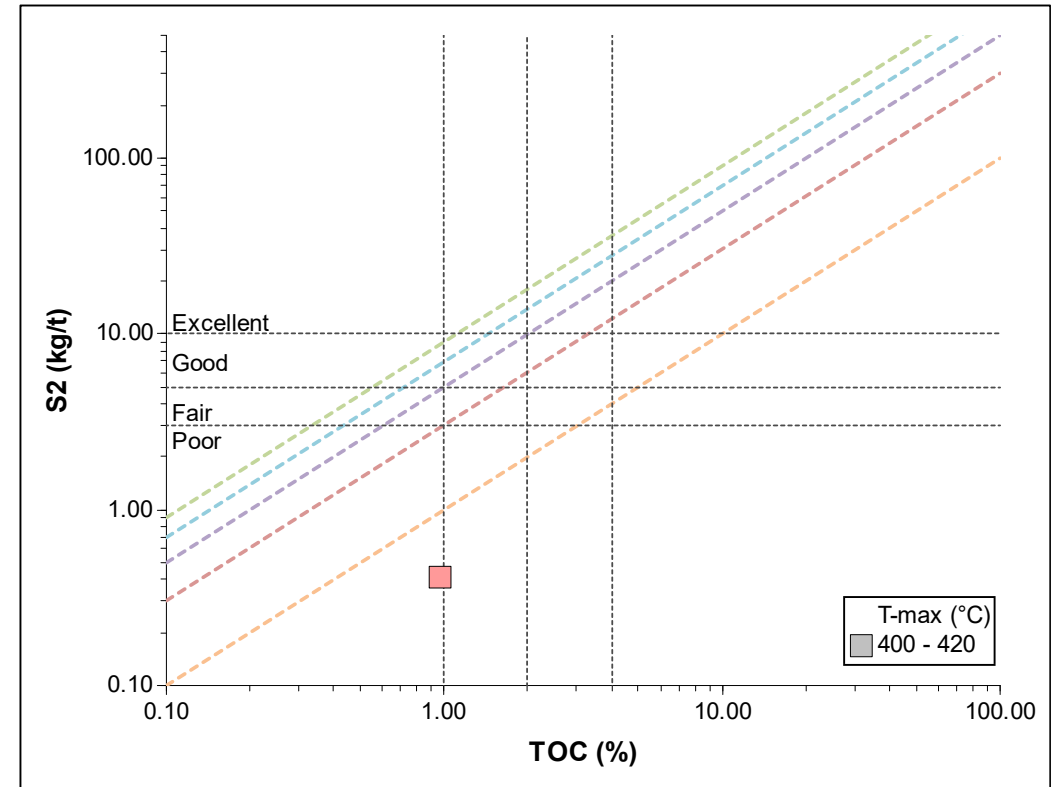
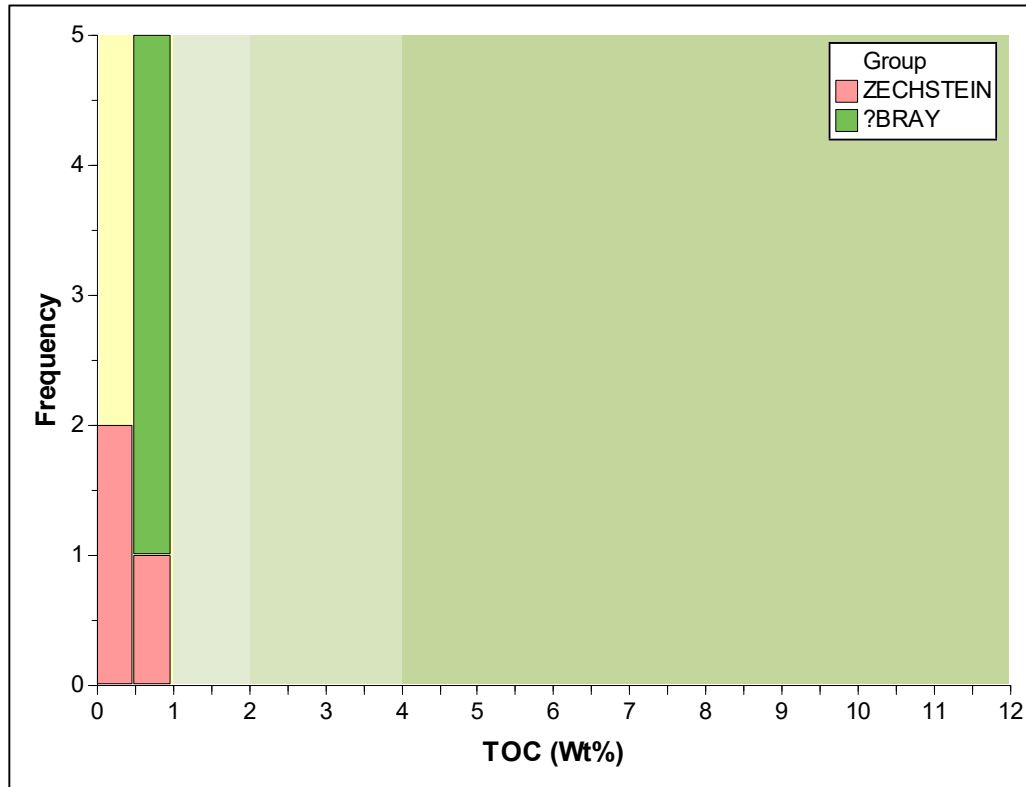


- The Upper Cretaceous includes formations of the Chalk and Shetland Groups
  - Based on the available geochemical data no source potential has been identified

# Permian and pre-Carboniferous

Offshore Ireland

Lack of data in the available database



- Data availability for the Permian, as well as pre-Carboniferous intervals was very limited and thus did not allow to draw reliable conclusions on source rock characteristics