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## **Spit-System Facies Model - Can This Be Used to Reinterpret Some of the Isolated Shelf Sandstone Ridges in the Cretaceous Western Interior Seaway, USA?\***

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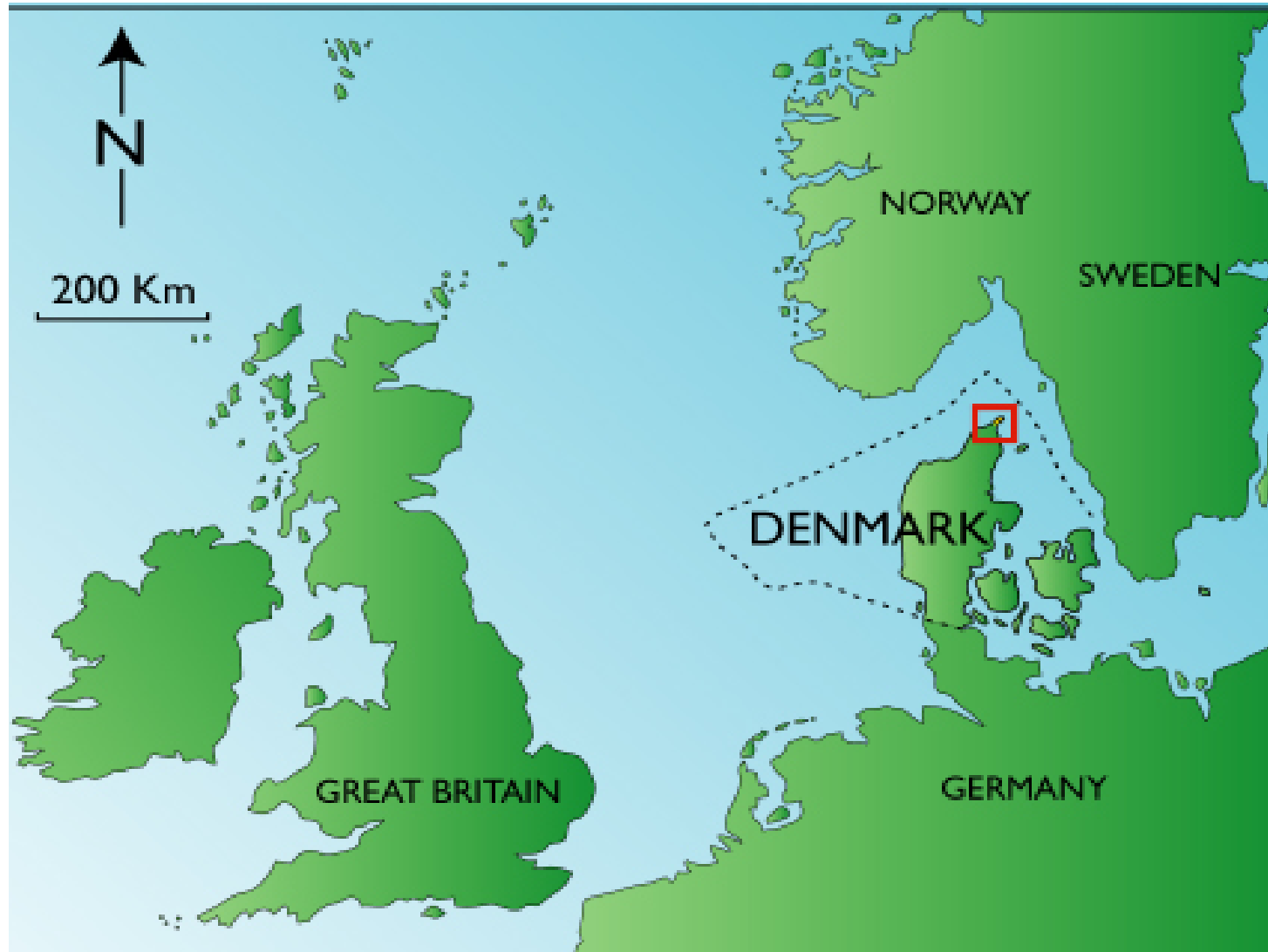
\*Adapted from oral presentation at AAPG Annual Convention, June 7-10, 2009

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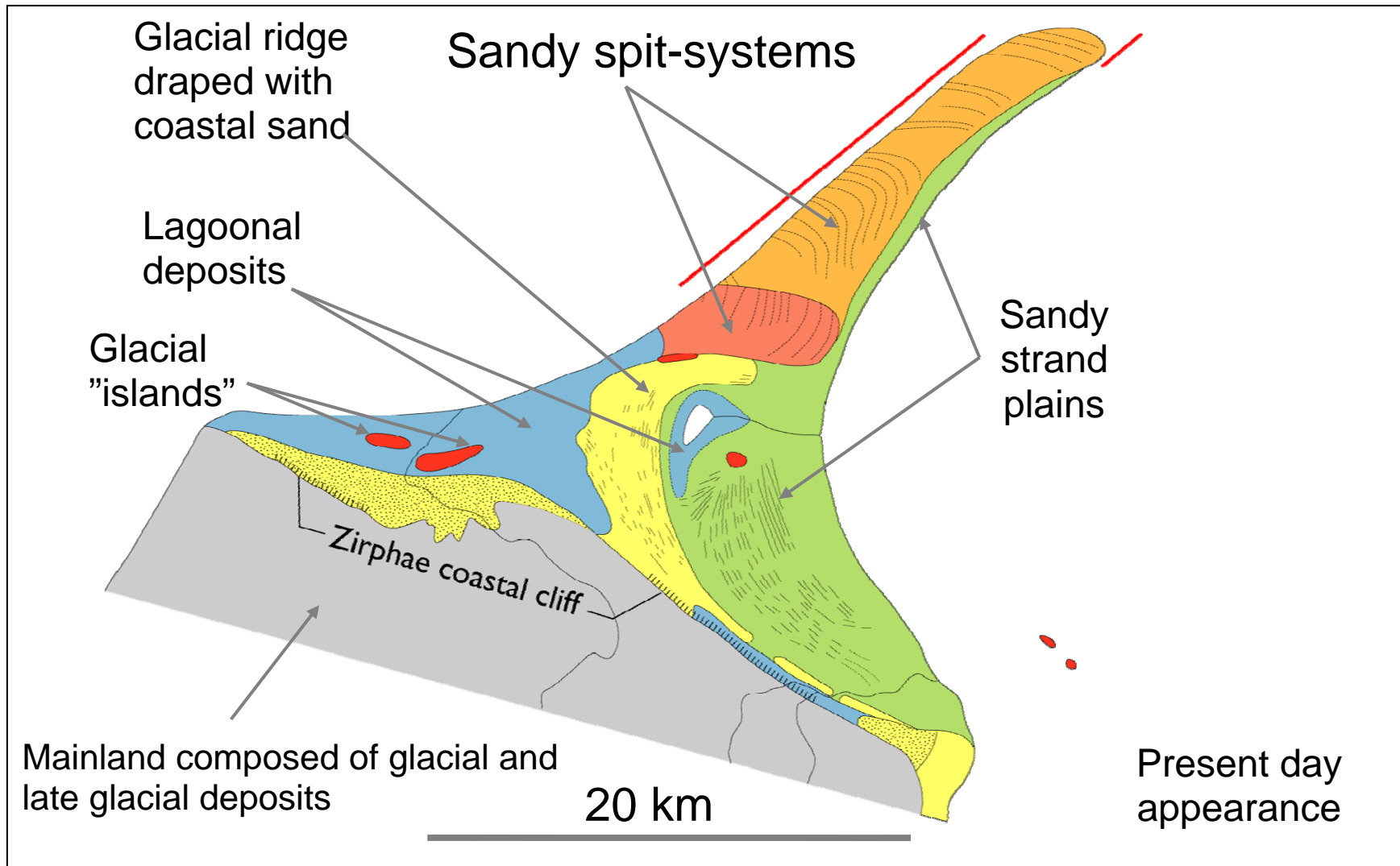
### **Abstract**

Spit-systems may constitute very large elongated reservoir sandstones. The Holocene-Recent Danish Skagen spit-system is 22 km long, 3-7 km wide, and up to 32 m thick. Spit-systems are seldom recognized in the pre-Quaternary sedimentary record compared to their common occurrence along present-day coasts and in Quaternary successions. This lack of recognition may partly be due to the lack of widely accepted depositional models describing the facies characteristics of the spit-systems and their subaqueous platforms in particular. It is important to understand that far the largest part of a large-scale spit-system is deposited below sea level, where up to c. 30 m thick wave-dominated shallow-marine sands can accumulate. The Danish Skagen spit-system provides a unique opportunity for establishing a well constrained depositional model because uplift and erosion have made large windows in outcrops into the preserved facies, while active spit-forming processes can be examined at the young prograding end of the same system. The sedimentary facies of the spit-system are grouped into four principal units consisting from below: 1) thick storm sand beds, 2) dune and bar-trough sediments deposited by waves and longshore currents, 3) beach deposits, and 4) peat beds. These four units form a coarsening- and shallowing-upward sand-dominated succession, up to 32 m thick, which overlies offshore silt and is topped by a diastem overlain by young aeolian dune sand.

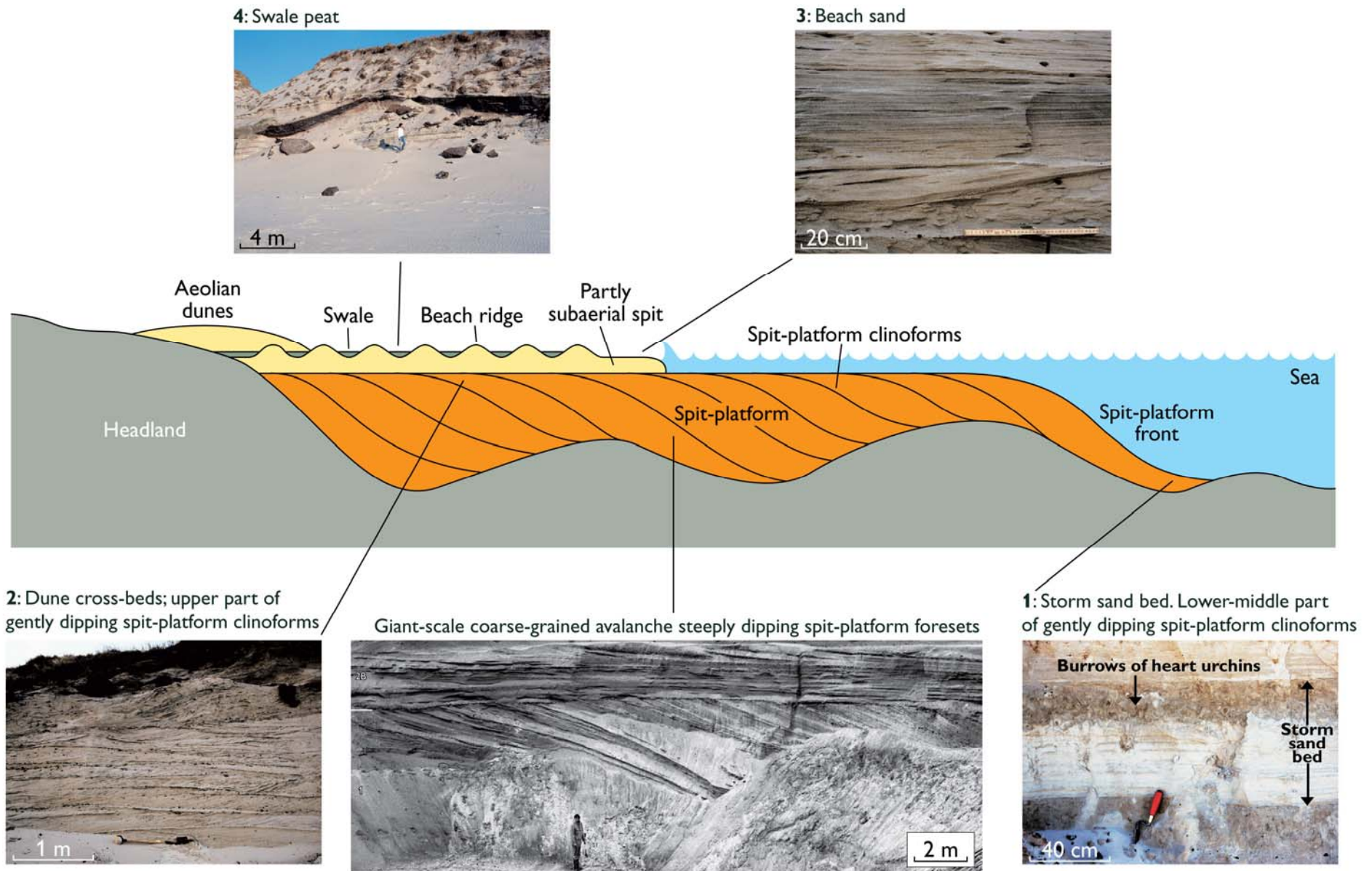
The Cretaceous Western Interior Seaway in North America contains numerous isolated shelf sandstone ridges providing a large amount of hydrocarbons. There has been a long debate on how these sandstone ridges were deposited. We propose yet another interpretation; namely, large sandy spit-systems. The Western Interior Seaway was characterized by strong waves that caused longshore sand drift toward the south and could probably favour the formation of large sandy, southward-prograding spit-systems. Aeolian dune sand, peat beds deposited in swales between beach ridges, and beach sand which characterise the uppermost part of the Danish Skagen spit-system are not recognized in the isolated shelf sandstone ridges in the Cretaceous Western Interior Seaway. These sedimentary units were probably eroded during the following transgression. Only the submarine sedimentary units are preserved after the transgression. During the continued transgression offshore mudstones were deposited on the shallow marine spit units.



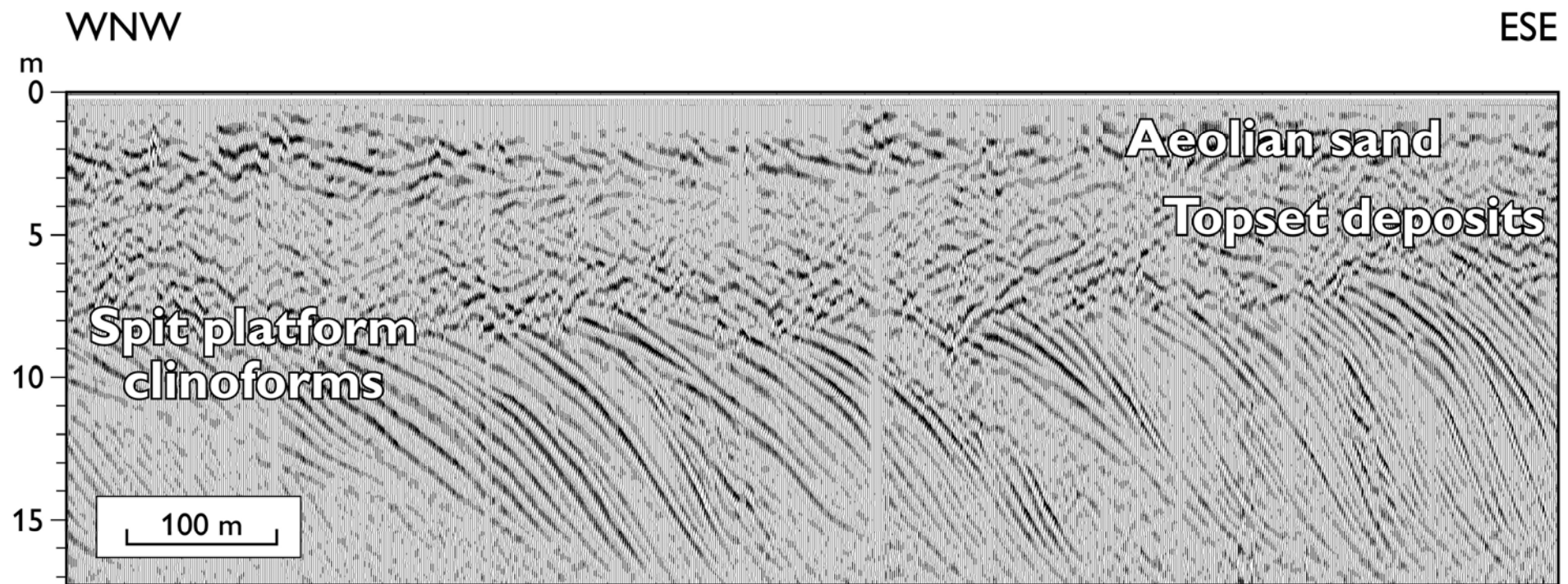
Location map of Skagen spit, on the northern tip of Denmark.



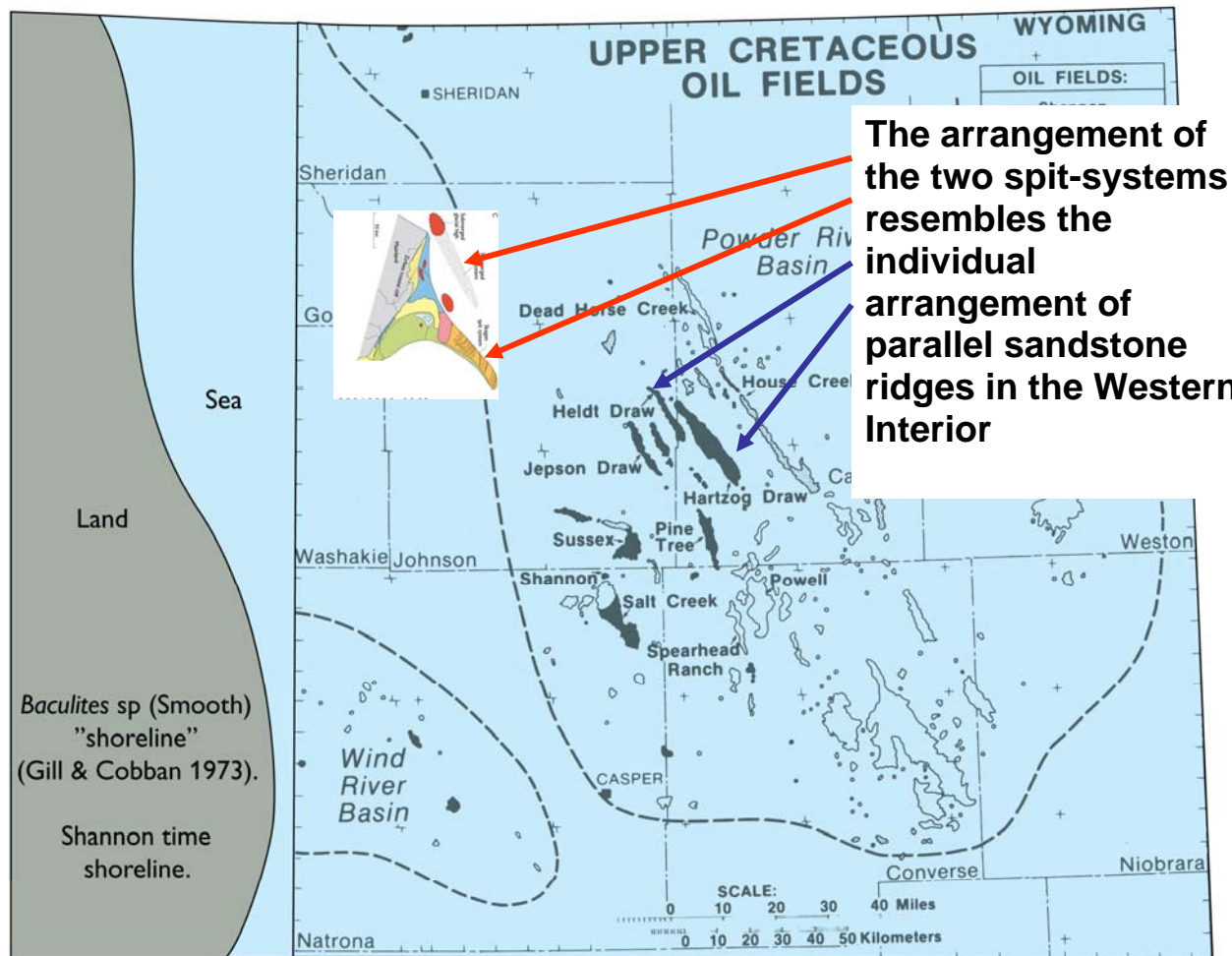
Depositional units of the Skagen Odde coastal feature.



Spit-system units. Subaerial spit constitutes only a small part of the whole spit-system. The largest part, which is deposited below sea level, (lower photographs and spit-platform in cross section), has a much larger potential of preservation than the subaerial spit (upper photographs).



Ground penetrating radar profile parallel to the length of the spit-system, showing the two main morphological units of a spit-system.



Comparison of configuration of Skagen spit with those of oil fields producing from Upper Cretaceous sandstone reservoirs in the Western Interior Seaway.

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