BELOSAEPIA FOSSILS

These coleoid fossils are commonly thought to be the teeth, beaks or jaw parts of various coleiods such as squid and octopods, or even the mouth parts of non-coleoid nautiloids.

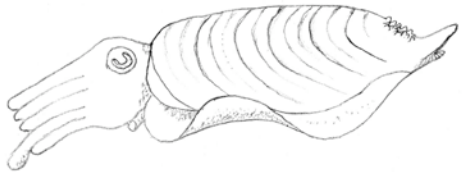
But this is only the heavily calcified portion of the belosaepiid skeleton.

Recent discoveries in central Texas produced exceptionally well-preserved fossils of *Belosaepi*a, including weakly calcified portions of the skeleton containing many chambers and a large proostracum.

BELOSAEPIA SKELETON

The *Belosaepia* skeleton (guard) consists of a solid prong, septate phragmocone with large siphuncle and large thin-walled proostracum. Septa of the phragmocone are thin, easily damaged and rarely preserved.

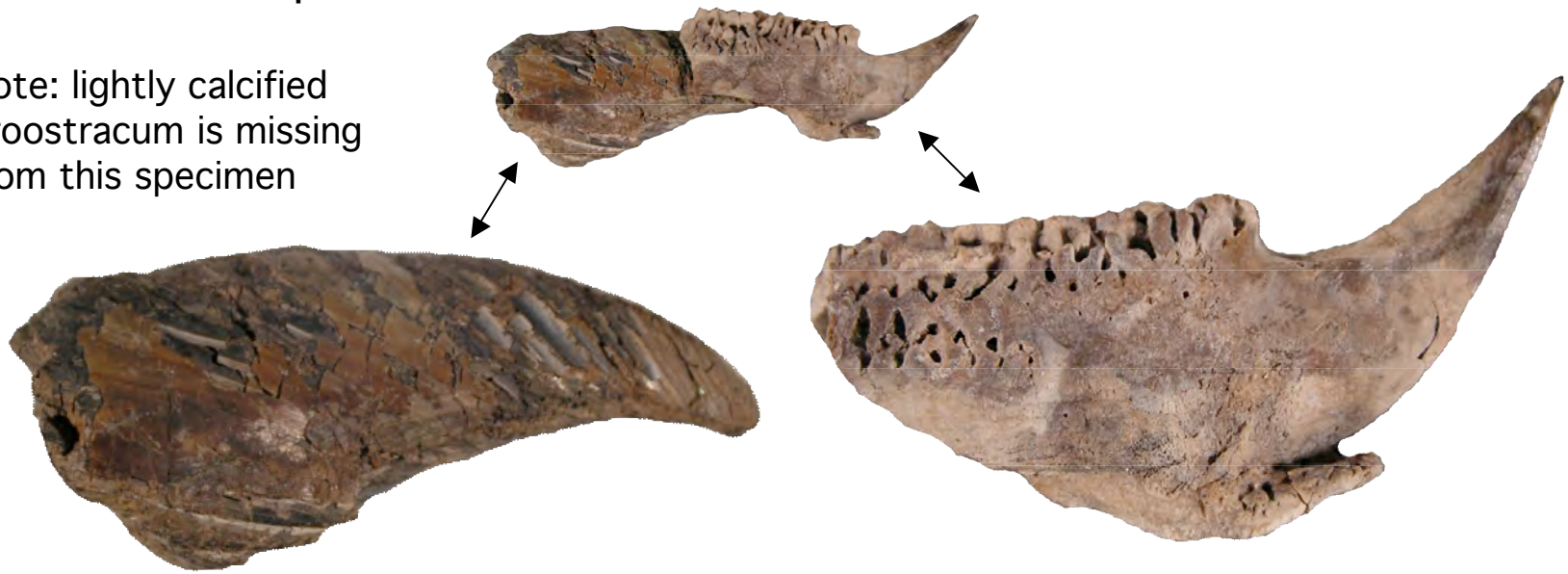
Belosaepia sp., Crockett Fm., late Middle Eocene,
Little Brazos River, Brazos County, Texas Chris Garvie, collector



BELOSAEPIA PRESERVATION

Septa of the phragmocone are thin, easily damaged and destroyed, separating the solid prong portion of the skeleton from the sediment fill of the siphuncle of the skeleton.

Note: lightly calcified proostracum is missing from this specimen

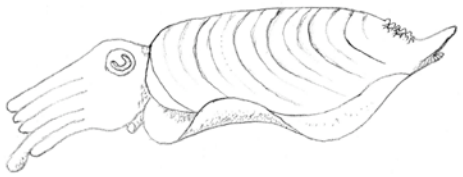


STEINKERN

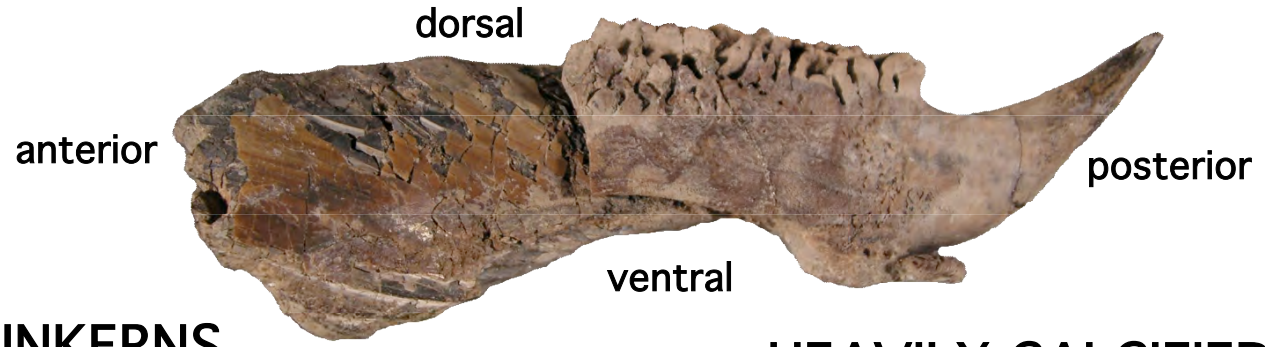
SOLID SKELETON

Belosaepia sp., Crockett Fm., late Middle Eocene,
Little Brazos River, Brazos County, Texas Chris Garvie, collector

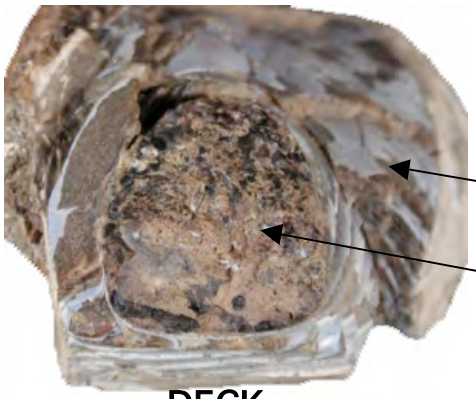
Concretion cementation often occurs in the sediment fill of the siphuncle, producing steinkerns that appear very different from the solid skeleton.



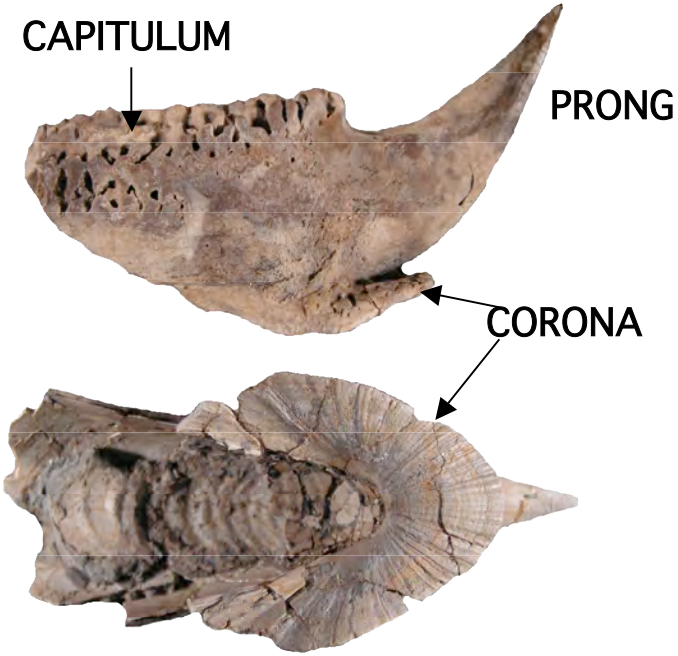
BELOSAEPIA SKELETON CHARACTERS



STEINKERNS



HEAVILY CALCIFIED AREA

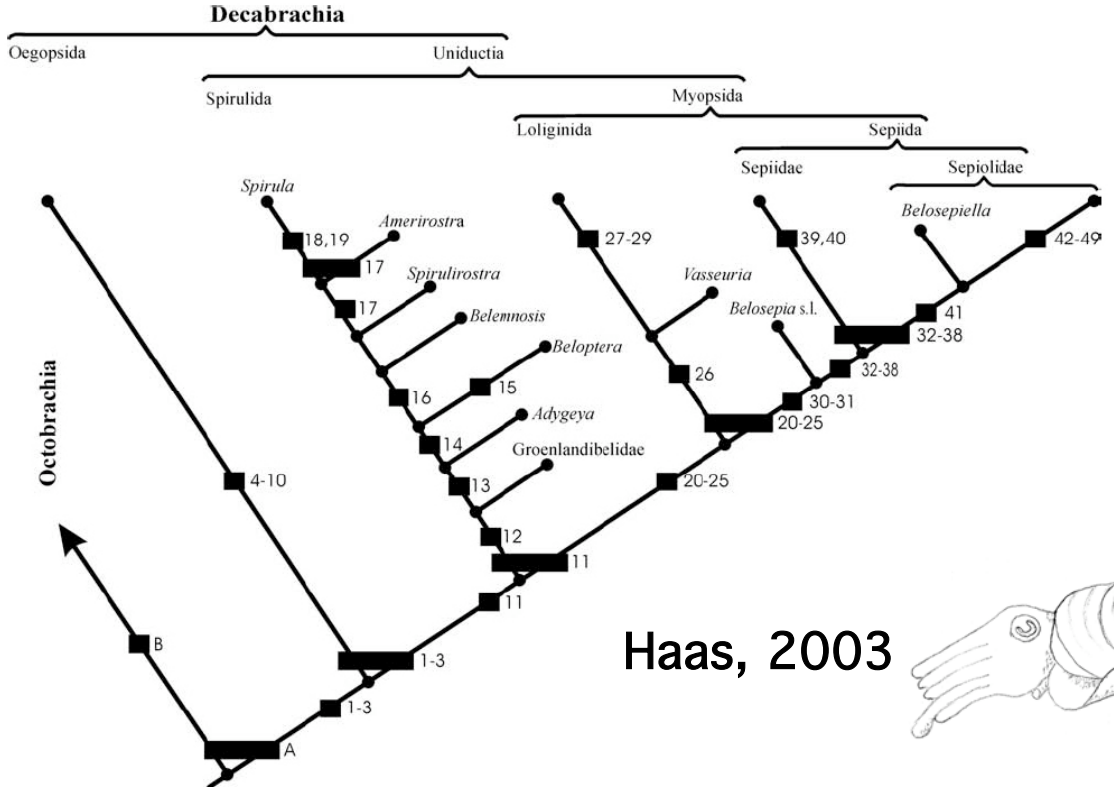


These are exceptionally well preserved for *Belosaepia* fossils. Although incomplete, they reveal several distinctive characters.

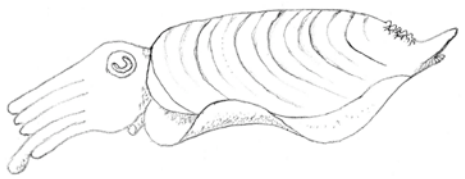
PHYLOGENY

Belosaepia fossils do not have structures like that of a squid's beak.
- not shaped to function as a jaw or jaw part
- has overgrowths that indicate origin as an endoskeleton
- composed (partly) of solid aragonite
- contains a phragmocone

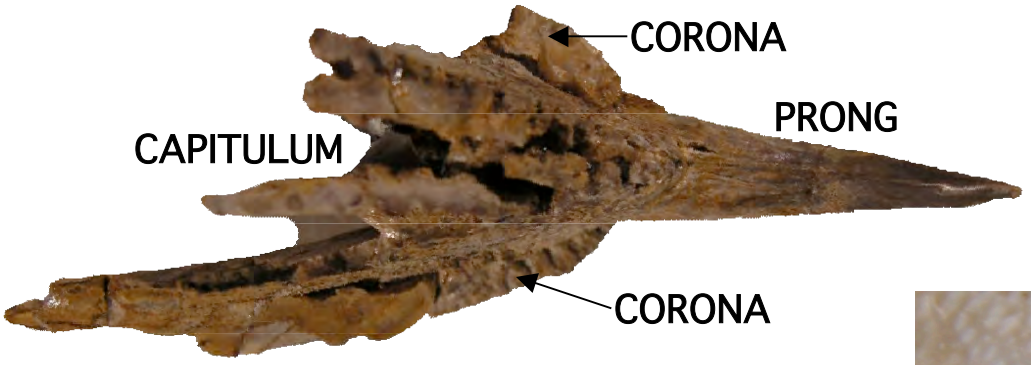
Comparison with the phragmocone of modern *Sepia* indicates a similarity and relationship with that animal, as indicated in the phyletic construct of Haas, 2003



Haas, 2003



HOMOLOGOUS CHARACTERS BELOSAEPIA - SEPIA



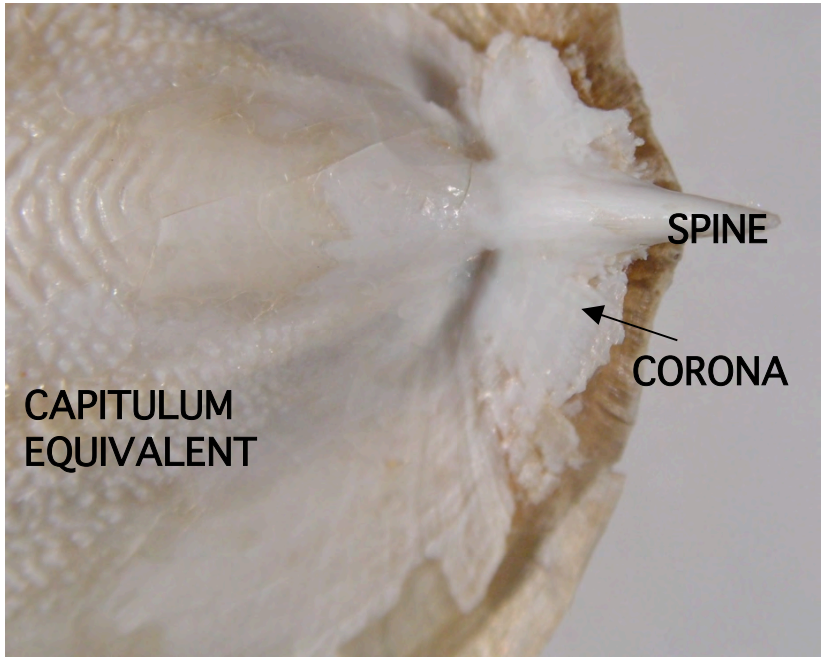
BELOSAEPIA **- Eocene**

Leon County, Texas

Dorsal surface of skeleton

SEPIA **- modern**

UAE, Persian Gulf

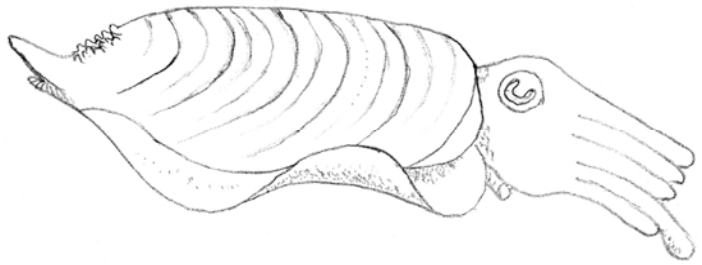


The major *Belosaepia* characters have direct homologies with the cuttlebone of modern *Sepia*.

BELOSAEPIID ANIMAL

Assuming the corona of the belosaepiid fossil corresponds to a similar area of a sepiid cuttlebone and the capitulum corresponds to the roughened attachment area for the sepiid mantle, we can determine that the prong extended postero-dorsally at a sharp angle and that the phragmocone covered most of the viscera.

The ratio between the soft parts and the phragmocone, if similar to that of modern sepiids, allows us to deduce the relative proportions of the body parts.



Note: In this drawing the mantle tissue on posteriodorsal areas is lacking, to show features of the skeleton (prong, proostracum, capitulum and corona). Reconstruction of the anterior tentacles and head is based on features of modern sepiids, not on preserved material.

LIFE HABITS

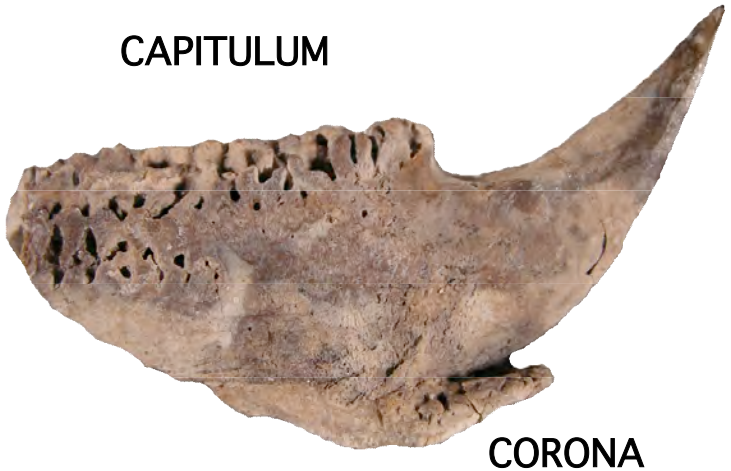
The belosaepiid skeleton is similar enough to the Sepia cuttlebone to indicate a similar body plan for the two groups and consequently to expect a similar life style. Occurrences of belosaepiid fossils in central Texas are primarily in sandy or muddy sediments containing warm-water shallow marine invertebrates and fish. It is reasonable to assume that they were benthic or demersal, like modern sepiids.

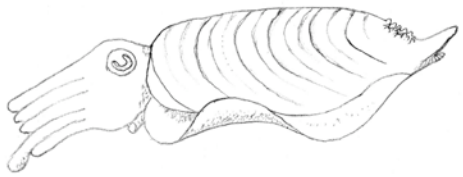
sepiid (cuttlefish), Palau

FORM AND FUNCTION

The solid portion of the belosaepiid skeleton has three characters that are much exaggerated relative to homologous features on sepiid cuttlebones: capitulum, corona and prong.

The **prong** produced a major modification of the body outline and is expected to have had a determinable function for the animal.

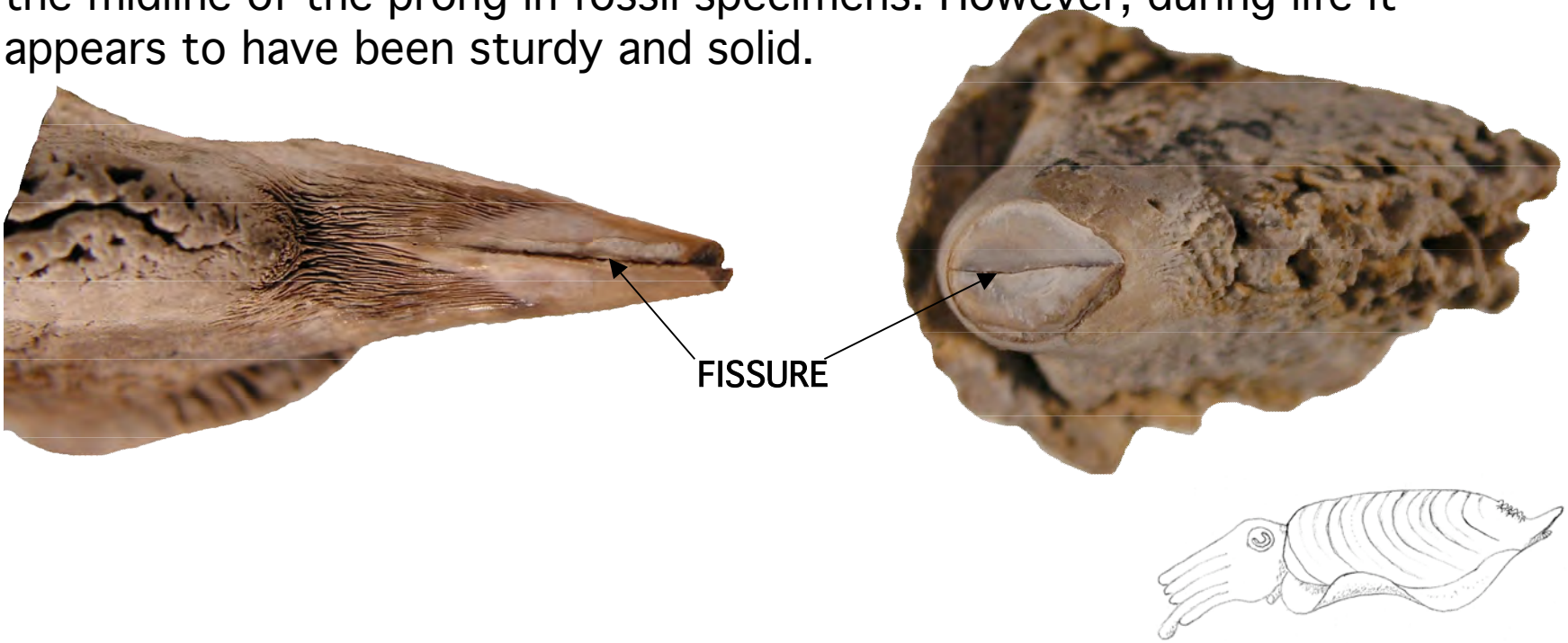




BELOSAEPIID PRONG

What was the function of the solid posterior prong? The chambered phragmocone would have provided buoyancy, as it does in other cephalopods, but there is nothing comparable to the large prong in living coleoids. The density of the fossil suggests that it was heavy in life.

A thin fissure within the prong suggests that it was secreted by two lobes of the mantle. This is a plane of weakness, causing splitting along the midline of the prong in fossil specimens. However, during life it appears to have been sturdy and solid.



FUNCTION OF THE PRONG

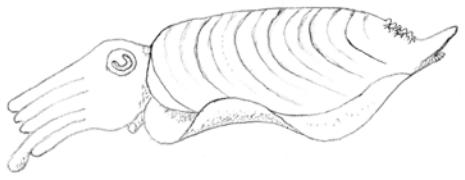
Three possible functions of the prong:

Trim weight: in swimming, the heavy posterior area might have served as a balancing weight for the buoyant middle phragmocone.
Probably important, but does not explain the shape.

Defensive: possible, but in the wrong position. Unlikely.

Excavation: use as a digging tool to enable the animal to quickly bury itself in sediment of the seafloor.
Probably important; living animals have comparable characters

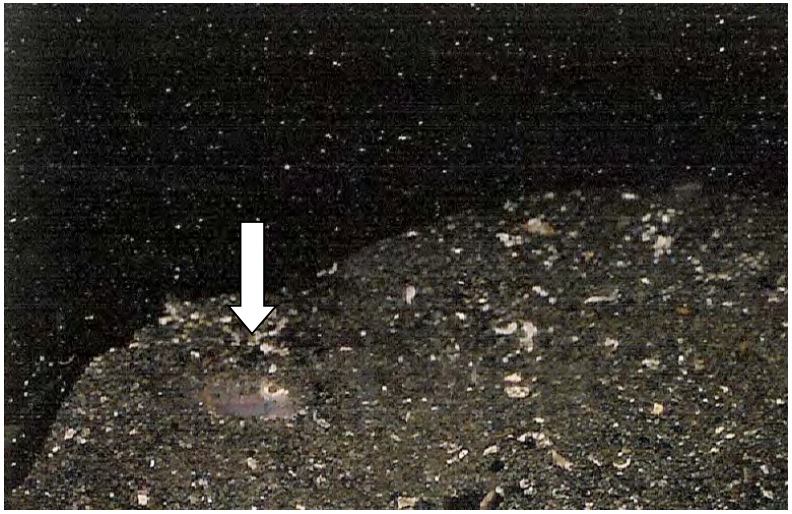
We think that the prong may have aided the animal in digging into the sediment for protection, posterior end first.



DIGGING INTO SUBSTRATE

Modern squids, rossiids (relatives of sepiids) and a few cuttlefish dig backwards into sediment, leaving the eyes and an opening for respiration exposed.

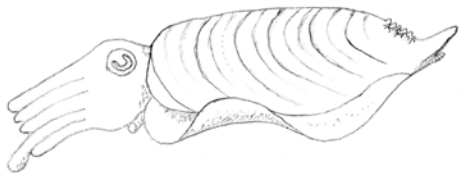
Rossiid cuttlefish (*Rossia pacifica*)



Rossiid cuttlefish (*Rossia pacifica*) covered with sediment
(arrow points to eye)

DIGGING STICKS

The location and shape of the prong is not unique. Modern crabs of the family Leucosiidae possess one or more curved, prong-like posterior spines, and dig backward into the sediment. Digging sticks of ancient agricultural societies also are curved.



CONCLUSIONS

1) We believe that the structure of the prong and heavily mineralized posterior interior skeleton of the belosepaeids shows greatest similarity to the cuttlebone of modern sepiids.

2) The development of the prong and adjacent areas represents specialization among the belosaepiids not seen in modern sepiids.

3) While belosaepiids and modern sepiids share a common ancestry, the belosaepiids are not ancestral to living sepioids and went extinct at or soon after the end of the Eocene.