8-18-1960

# Preliminary Observations on the Fauna and Flora of Eastern Shore Oyster Beds, 1960

Sewell H. Hopkins

# Preliminary Observations on the Fauna and Flora of Eastern Shore Oyster Beds, 1960.

Sewell H. Hopkins, August 18, 1960

During the period June 20 -- August 18, 1960, the writer was engaged in survey of the ecological makeup of oyster communities on both the bay side and the sea side of the two Eastern Shore counties of Virginia. Most field studies were made during the regular trips to check mortality in oyster trays at 3 sea side and 6 bay side stations. Some collections were also made during trips to examine planter's beds, or on special collecting trips. Records of previous collections by Mr. H. D. Hoese are also included. Most of the material collected during the current summer has not yet been sorted out for study: this report is based on (1) Hoese's records (2) my own field notes, made at the time specimens were collected, and (3) laboratory study of a few groups, mainly encrusting Bryozoa and sponges.

In general, sea side localities are very much alike in ecological condition and fauna and flora. The principal variation is an increase in number of species as you go from inshore stations toward the ocean inlets, once you get out of the *Spartina* marsh itself. On the other hand, the bayside creeks differ conspicuously, not only in salinity, (which generally decreases as you go north) but in type of bottom, depth, exposure to wave action, turbidity, etc. The rich flora and fauna of Little Gulf and Cherrystone Inlet stations is due not only to the southern (seaward) location of the creeks, but to the fact that these stations are outside of the creeks proper and are separated from the open Chesapeake Bay by a sand bar or narrow marsh point only; also these stations are near eelgrass flats (surrounded by eelgrass in the case of Little Gulf).

Except for the Gulf and Cherrystone stations, the oyster-bed community (flora and fauna) of the bay side creeks is of a more impoverished or low-salinity ???? than would be expected from the proximity to the mouth of the Chesapeake Bay; in other words, some of the species found in the Bay at the mouth of each creek seems to be excluded from the creek itself, presumably by lower salinity or by periods of low salinity within the creek. This was somewhat surprising to me, in view of the shortness of the miniature estuaries and the small size of the fresh-water streams that run into them. If, as I suppose, the ??? ???? is flooding with fresh water for short periods following heavy local rainfall, the local precipitation and run-off are very important factors in making these creeks suitable for oyster production. Accordingly, the damming of local streams to make impoundments of ponds for agricultural irrigation may have important effects on ecological conditions affecting oysters in the creeks.

## Aquatic Plants

Algae:

*Ulva* or sea lettuce, known locally as "salad" occurs at all sea side stations except Machipongo River and at all bay side stations except Messongo Creek. Especially dense growths of *Ulva* rivalling bay side *Zostera* growths in amount of bottom surface covered, were seen in Hog Island Bay, where oystermen claim mortality from smothering by "salad" at times. Swash Bay has similar growths recently.

A branching, antler-like, slightly fleshy gelatinous and slightly translucent red alga, possibly a species of *Gracillaria*, was also very abundant along with *Ulva* on Hog Island Bay oyster grounds. It also occurs with *Zostera* in Cherrystone Inlet and Little Gulf.

A very finely branched delicate brown alga was also seen at Little Gulf (and at some other places where no record was made).

A *Fucus*-like brown alga with flat, branching fronds containing small bladder-like floats was seen in Hog Island Bay near Rogue Island and near Cobb Island (attached), and also in Wachapreague inlet (floating). No references on sea weeks was available at the Wachapreague laboratory, so the description "fucus-like" is based on memory of the *Fucus* seen on the New England coast.

Flowering Plants:

*Zostera marina*, eelgrass, grows in all of the bay side creeks where oysters are under observation except Messongo (i. e., in Cherrystone Inlet, Little Gulf, Hungars Creek, Nandua Creek, Occahannock Creek, and Chesconnessex Creek). It was also observed by Hoese at Crystal Beach on the Chesapeake Bay near Chesconnessex Creek. It has not been seen anywhere on the sea side and everyone we have questioned denied that there is any left anywhere on the sea side.

A plant thought to be *Zostera nana*, dwarf eelgrass, was seen just inshore of the main eelgrass growth at Little Gulf and Crystal Beach.

*Ruppia maritima*, widgeon grass, or what was thought bo be this species was seen at Little Gulf, Crystal Beach, and Chesconnessex Creek.

## Porifera

Boring Sponges

The general statement can be made that on the sea side few

oysters have any boring sponges, but most of the sponges that do occur in oysters and old shells are *Cliona celata*. The other 3 Virginia species, *C. lobata*, *C. truitti*, and *C. vastifica*, occur in sea side bays but are relatively rare. The oysters in the bay side creeks, on the other hand, nearly all have boring sponges (143 of the 157 examined), but very few (probably none in most creeks) have *Cliona celata*. It some creeks (Cherrystone and Ocohannock) *Cliona lobata* predominates, while others have a predominance of *C. truitti*. Only 3 of the 150 bay side oysters examined had C. celata, and only 8 had *C. vastifica*.

Other than the sea side, and local sources, the main source of oysters planted in bay side creeks is James River. A sample of 147 seed oysters and culch shells from James River (probably Wreck Shoal) contained only 2 *Cliona celata* (both in old shells) and no C. lobata; 29 had either *C. vastifica* or *C. truitti* (not differentiated because it takes large samples and much time find enough spirasters to make sure which of these species you have). 7 shells were so old that not enough spicules for identification were seen, and 109 had no boring sponges. All *Cliona* in this sample had been dead approximately one year, for there was no extension of the sponge galleries into new shell that grew in the summer of 1960.

From these observations and background knowledge, it is suspected that a predominance of *Cliona truitti* in a bayside creek population indicates that the stocks were originally from James River (or some other low-salinity seed area), while a predominance of *Cliona lobata* indicate that the stock was originally from a local source (one of the bayside creeks) or from the sea side. For instance, the predominance of C. truitti in Little Gulf agrees with Mr. Acuff's statement that the local stock was almost completely depleted and was replaced by James River stock some years ago. Cherrystone Inlet, on the other hand, contains oysters originating from several sources, including the sea side. The yellow drills, *Urosalpinx cinerea*, seen (especially on eelgrass) in Cherrystone Inlet and little Gulf are yellow because of a thin crust of *Cliona celata* covering their shells.

| Water Body | *celata* | *lobata* | *truitti* | *vastifica* | none |
|---|---|---|---|---|---|
| Bay Side: | | | | | |
| Messongo Creek | 0 | 1 | 4 | 0 | 0 |
| Chesconnessex Cr. | 0 | 1 | 24 | 3 | 2 |
| Nandua Creek | 0 | 0 | 13 | 0 | 0 |
| Occohannock Creek | 0 | 16 | 8 | 3 | 2 |
| Hungars Creek | 0 | 1 | 11 | 1 | 0 |
| Little Gulf | 0 | 3 | 24 | 0 | 4 |
| Cherrystone Inlet | 3 | 29 | 7 | 1 | 6 |
| Total (157 shells) | (3) | (51) | (81) | (8) | (14) |

| Sea Side | *celata* | *lobata* | *truitti* | *vastifica* | none |
|---|---|---|---|---|---|
| Outlet Bay | 6 | 1 | 0 | 0 | Most |
| Machipongo River | 1 | 0 | 0 | 0 | Nearly |
| Swash Bay | 0 | 0 | 0 | 0 | all |
| Bradfords Bay | 0 | 2 | 0 | ? | 40 |
| Finney Creek | 12 | 0 | 2 | ? | Most |
| Total | (27) | (3) | (2) | (5) | (Most) |

Other sponges:

*Haliclona permollis* (species not certain):
This sponge occurs as a soft, slightly fuzzy, yellowish-gray crust on eelgrass, spider crabs, oysters and shells; it is probably on most if not all Eastern Shore oyster beds. Its presence was specifically noted on shells from Chesconnessex, Occohannock, Little Gulf and Cherrystone creeks on the bay side, and in Swash Bay on the sea side. Branching erect forms of gray and violet color occur at Little Gulf (August, 1960).

*Halichondria panicea* (species not certain): This is a large, coarse-textured yellow sponge that grows on pilings and bulkheads as well as on oysters. Its presence was specifically noted on oysters and trays at Little Gulf. It also grows on bulkheads of the marina at Wachapreague, and sponges probably of this species have been casually observed elsewhere. Microscopically, this sponge has very long slender oxeas and no other spicules. It or a similar species was found on eelgrass at Crystal Beach near Onancock; also on shells of *Nassarius vibex*.

*Lissodendoryx isodictyalis* (Carter). garlic sponge.
As an encrusting sponge on oysters, this species noted at Little Gulf. It was also found on James River (Wreck Shoat?) culch shell.

*Hymeniacodon heliophila*, "sun sponge"
A coarse-textured, branching, erect sponge on oysters and pilings that is bright red in life but fads to a brownish red, orange, or yellow color when dried, is thought to be this species. No spicules other than stout styles or tylostyles could be found in several specimens examined microscopically. It is very abundant on oysters and shells, and on oyster trays, on the eelgrass flats at Little Gulf. (Acuff's ground).

## Coelenterata

Hydrozoa

*Seratularia* sp. on eelgrass, Cherrystone Inlet and Little Gulf.

*Hydractinia* sp. on shells of mud snails, *N. vibex* and *N. obsoletus*, inhabited by hermit crabs, Little Gulf.

"Tree-like hydrozoan," unidentified, on tray oysters,

Cherrystone Inlet.
"Bush-like hydroid with conspicuous gonangia," on oysters, Hog Island Bay

Scyphozoa

*Dactylometra quinquicirrha* was abundant in some bay side creeks -- these with low-salinity fauna, in summer of 1960. Not noted particularly, but Pungoteague Creek was one that had "sea nettles." *Aurelia aurita flavidula* should also occur in these creeks, but was not noted except in Ocohannock Creek (July 22). No jellyfish were ever seen in sea side bays.

Anthozoa

*Astrangia danae* Agassiz has been noted by Hoese, alive on shells in Yates Channel near Wachapreague. The only specimens I saw were dead ones attached to shells washed up on the beach, on ocean side of Cedar Island.

The common sea anemone that is found on Chesapeake Bay oysters (dark green, light green, yellow- green, yellow, and striped) was seen and collected at a number of locations on both sea side and bay side. The only locations recorded in field notes are Finney Creek (Wachapreague), Little Gulf, Chesconnessex Creek, and Messongo Creek, but specimens were collected at other places also. We used to call all of these anemones *Sagartia luciae*, but I doubt that this is correct.

A very large sea anemone (?) that lives in a tube in mud on oyster beds has been seen in Burtons Bay and Hog Island Bay, but it withdraws so quickly that none has been caught.

Ctenophora

*Mnemiopsis* sp., probably *leidyi*, and *Beroe* sp. have been noted by Hoese. I do not recall seeing any ctenophores; perhaps I saw was them without registering the fact. Sieling reports both *Mnemiopsis* and *Beroe* from Chincoteague Bay.

## Platyhelminthes

Turbellaria, Polycladida:

A polyclad that has the external characteristics of *Stylochus* has been found twice in shells of dead spat in Swash Bay oyster trays. Some have been fixed and preserved by Hoese (summer, 1960).

A polyclad that appears to be different was found by Hoese once in a Chesconnessex Creek oyster tray.

*Stylochus* or a similar form was found in an oyster tray in Occahannock Creek, June 28, 1960.

Nemertea (Rhynchocoela)

Unidentified nemerteans were found among sponge-- and alga-covered oysters near Cobb Island in Hog Island Bay.

Unidentified nemerteans were found in a large yellow sponge (*Halichondria* sp.) ion the bulkhead of the Wachapreague Marina.

One small nemertean was found on oysters in a Messongo Creek tray, June 29, 1960.

Bryozoa

Four species of encrusting bryozoans have been recognized on the Eastern Shore so far: *Schizoporella unicornis* (Johnston), *Membranipora crustulenta* (Pallas), *Acanthodosis tenuis* (Deser), and *Alcyonidium polyeum* (Massali). Identifications were made with the aid of Osburn (1944). "A Survey of the Bryozoa of Chesapeake Bay," Chesapeake Biological Laboratory Publication No. 63.

*Schizoporella unicornis* has been found only on the sea side, where it is the common encrusting bryozoan and often covers old shells with many layers of calcareous crust. Laboratory identifications have been made on specimens from Bradfords bay, Swash Bay, Finney Creek near Wachapreague, and Hog Island Bay (several locations).

*Alcyonidium polyeum* forms a soft crust on oysters in sea side bays and in the saltier creeks of the bay side. Laboratory identifications were made on specimens from Swash Bay (sea side) and from Cherrystone Inlet and Little Gulf (bay side).

*Membranipora crustulenta* and *Acanthodesia tenuis* have been found on the bay side only. Both have been identified on oysters from Occohannock Creek, Little Gulf, and Cherrystone Inlet. *M. crustulenta* has been seen also on culch shells (in experimental shell strings) in Messongo Creek, and on *Brachidontes recurvus* in the same creek.

*Alcyonidium verrilli*, a large erect branching colony of firm gelatinous texture, was found August 18, 1960, at Little Gulf. A violet-colored sponge, *Haliclona permollis*, was overgrowing part of the colony.

## Aschelminthes

Nematoda:

Very numerous free-living nematodes were seen on oysters, and especially among sponges and algae on oyster, in Hog Island Bay, Little Gulf, and other places not recorded. There seems to be one predominant species or genus, with others occurring more rarely. Most belong to the order Enoploidea.

Annelida

Numerous polychaetes were seen wherever oysters were examined, but no attempt was made to identify species because of lack of the essential literature. Specimens have been collected

and preserved for study by experts such a Olga Hartman and Marian Pettibone. Field notes show the Following:

*Polydora*, probably *P. websteri*, burrowing in shells, and causing mud blisters under inside lining, was recorded at Occohannock Creek (fairly abundant), Cherrystone Inlet and Chesconnessex Creek. I have no record or recollection of *Polydora* on sea side oysters, but it is probably present in small numbers in some places.

Nereids of the typical form represented by *Nereis virens* were seen on and among oysters at Occohannock Creek (very numerous), Messongo Creek (especially numerous, and most common type of annelid), Chesconnessex Creek, Nandua Creek, Little Gulf, and probably other places where they were not recorded. The general impression is that nereids increase as salinity decrease, going from lower bay-side creeks up to Messongo.

A very fragile, slender, bright green polychaete was especially abundant on oysters at Chesconnessex Creek, where it was the commonest annelid, and at Nandua Creek. If seen elsewhere it was not recorded.

Serpulids, with curving calcareous tubes, probably *Hydroides dianthes*, were seen at Chesconnessex Creek (however, here most tubes were inhabited by other annelids, not serpulids), Nandua Creek, (very abundant, large) Cherrystone Inlet (where all tubes were small), Little Gulf (not numerous), and Swash Bay (an old shell). Hoese says most of the serpulids on tray oysters set last fall. In Chesconnessex the worms apparently grew rapidly and built tubes, then most died off. the heaviest coating of calcareous worm tubes was in Nandua Creek, on old oysters.

In Occohannock Creek, the most abundant annelid is a short, stout worm with numerous tentacles that lives in a membranous tube, coated with mud, on oysters. This is called "mud-tube worm" in field notes. It covers most of the surface of oysters in Occohannock Creek trays. The same worm occurs at Messongo Creek (few), Chesconnessex Creek (not very numerous), Cherrystone Creek, Little Gulf, and possibly other places where it was not recorded.

Scale worms, annelids with dorsal surface covered by two rows of scales, were collected at Little Gulf and at Hog Island Bay (near Cobb Island). Only a few were found at each place. They probably occur in small numbers at other high salinity locations.

## Arthropoda

### Pycnogonida:

Numerous pycnogonids (sea spiders), apparently all of one species, were found among oysters and sponges collected at Rogue Island in Hog Island Bay.

### Xiphosura:

*Limulus polyphemus*, which is common and grows to a large size in Chincoteague Bay according to Sieling, has been seen only once in our area. Hoese picked up a 3-inch specimen in October,

1959, at Cherrystone Inlet.

Crustacea:

Combining my field notes with Hoese's records, the distribution of the commoner crustaceans, known so far, is as follows:

*Libinia dubia*, spider crab, at Rogue Island in Hog Island Bay, Yates Channel, Outlet Bay, and Swash Bay on the sea side; at Cherrystone Creek on the bay side. Not observed at other bay side creeks, even at Little Gulf where several hours have been spent collecting on eelgrass flats, but crab potters do catch some at Little Gulf.

*Pagurus longicarpus*, hermit crab. (species should be checked) This small crab, in shells of mud covered with *Hydractinia*, has been recorded in my field notes as present at Little Gulf only. No doubt it would be found elsewhere if a search was made on eelgrass flats and along shores. It is not closely associated with oysters, as a rule.

*Pinnotheres ostreum*, oyster crab. Hoese records it from Bradfords Bay, Yates Channel, Swash Bay, Cobb Island Bay, and Machipongo River on the sea side; I saw an oyster crab in Hog Island Bay in one of Bowen's South Carolina oysters. One the bay side, Hoese records *P. ostreum* from Hungars Creek and Little Gulf.

*Callinectes sapidus*, blue crab. Though not usually recorded in field notes, this is everywhere during the warm months.

*Cancer irroratus*, common rock crab. Not seen in summer, but Hoese found it frequently in sea side oyster trays in winter and until April in spring. Many dried carapaces of large rock crabs were seen on the ocean beach of Cedar Island in July. Dredges catch many in winter.

*Panopeus herbesti*, mud crab. Hoese records this species only from Hungars Creek and Little Gulf, but thinks it may occur on the sea side also. Collected near Rogue Island in Hog Island Bay on June 23, 1960.

*Eurypanopeus depressus*, mud crab. Recorded by Hoese from Swash Bay, Yates Channel, Hog Island Bay, and Outlet Bay on the seaside, and Chesconnessex Creek. Hungars Creek, and Little Gulf on the bay side. found also in Finney Creek at Wachapreague.

*Neopanope texana*, mud crab. Recorded by Hoese from Swash Bay, Yates, Channel, Hog Island Bay, and Outlet Bay on the sea side, and from Chesconnesex Creek, Occohannock Creek, Hungars Creek, and Cherrystone Inlet on the bay side.

*Rithropanopeus harrissii*, mud crab. Recorded by Hoese from Messongo Creek, Chesconnessex Creek, and Occohannock Creek on the bay side and from a tray of James River oysters in Swash Bay (two specimens). This is the most common mud crab in Occohannock Creek and northward, while Neopanope and Eurypanopeus are the common mud crabs in Northhampton County creeks, and on the seaside.

Several other crabs have been observed that are not associated with oysters: *Sesarma cinereum*, wood crab, on land and docks; at least two species of *Uca*, mud flats and marshes;

*Ocypoda albicans*, ghost crab on dunes and beach, Cedar Island; *Ovalipes ocellatus*, lady crab in surf zone, Cedar Island; *Arenaeus cribrarius*, sand crab, in surf zone, Cedar Island (one juvenile).

*Crago septemspinosus*, snapping shrimp recorded by Hoese at Swash Bay on the sea side and at Little Gulf on the bay side.

*Penaeus duorarum*, pink shrimp is represented by two specimens, (1 juvenile, 1 adult) caught in autumn of 1959 at Little Gulf.

*Palaemonetes* sp., grass shrimp or glass shrimp, in oyster trays and in eelgrass, Little Gulf. Probably occurs at other stations also.

*Caprella* sp. amphipods, attached (clinging to sea weeds, sponges, oysters, etc. Recorded by Hopkins at Cherrystone Creek and Hog Island Bay. The inventory of material collected, when completed, will show that it was present at other stations also.

Gammaridae (suborder of amphipods) were collected at many places. No attempt to identify them has been made. Preserved specimens will be sent to a specialist.

Isopods were collected at several stations. Places where isopods were mentioned in field notes include Cherrystone Inlet and Little Gulf where there are eelgrass flats around or near tray locations.

Barnacles, *Balanus* sp., were collected at Messongo Creek (few), Machipongo River on sea side (few, and probably other locations on both sides. Barnacles were not considered to be abundant at any place visited in the summer of 1960. A number of specimens were preserved for future identification of specimens.

## Mollusca

Amphineura (Polyplacophora):

*Chaetopleura apiculata*, chiton, was collected in Hog Island Bay, on oysters.

Gastropoda:

*Eupleura caudata*, called "flat screwborer" by sea side oystermen, has been collected on oysters in Swash Bay and Hog Island Bay. None was seen alive on bay side, but there were shells of large Eupleura in Mr. Harris's boat at Ballard's landing on Cherrystone Inlet (or King's Creek).

*Urosalpinx cinerea*, "screwborer" of Eastern Shore oystermen, "drill" of others. Recorded from Swash Bay, Yates Channel, Hog Island Bay, Machipongo River, Outlet Bay, Bradford's Bay, and Finney Creek on sea side, and from Hungars Creek, Little Gulf and Cherrystone Inlet on bay side. One June 28, 1960, 2 large *Urosalpinx* of the sea side type were found alive in an oyster tray in Occohannock Creek, where drills are not supposed to live; there were probably recent introductions, possibly by some prankster. The drills on the bay side, even at Cherrystone Inlet and Little Gulf, are conspicuously smaller than full-grown or

even half-grown sea side drills. Freshly-laid eggs were seen in June and July at several locations, including Machipongo River (July 1) and Chesconnessex Creek (where local people say there are no drills).

*Polinices duplicata*, sand collar snail or clam drill. Many shells occur on the Cedar Island beach.

*Nassarius obsoletus*, eroded mud snail, was numerous on mud between clumps on man-mad "oyster rocks" exposed at low tide, at Rogue Island in Hog Island Bay, June 23. It was found on eelgrass flats at Crystal Beach near Onancock (by Hoese) and at Little Gulf. It is not associated with oysters except by chance, but was laying eggs on trays at Wachapreague in late May, according to Hoese.

*Nassarius vibex*, mottled mud snail, was abundant at Rogue Island on shells with 1 year old seed attached, just above low tide level. It was also found on oysters at Outlet Bay. It is caught along with drills in drill traps (chicken-wire cages of oyster spat and seed) in sea side bays. It also occurs on bay side eelgrass flats, along with *N. obsoletus*, at Crystal Beach and Little Gulf.

*Anachis avara*,"greedy dove shell," was very abundant on oysters near rogue Island and Cobb Island in Hog Island Bay in June and July, and was caught along with other snails in drill traps. A few were collected on the inshore edge of an eelgrass flat, among scattered oysters and shells, in Little Gulf (July 8).

*Mitrella lunata*, "lunar dove shell" was abundant on oysters at Rogue Island in Hog Island Bay in June, and was found on oysters in Outlet Bay in September 1959 and June 1960. Many were found on tray oysters in Little Gulf in July, and more were collected from eelgrass between the trays and the shore.

*Triphora perversa nigrocincta*. This "left handed" snail was represented by one small specimen found on eelgrass among scattered oysters at Little Gulf July 8.

*Crepidula fornicata*, slipper limpet or boat shell, is recorded on oysters at Swash Bay, Outlet Bay, and Hog Island Bay; it probably occurs at many other places on the sea side. On the bay side it has been found at Hungars Creek, Little Gulf, and Cherrystone Inlet.

*Crepidula plana*, flat slipper limpet is recorded from Swash Bay and Hog Island Bay and probably occurs on oysters and other shells on most of the sea side. On the bay side it has been found on oysters and eelgrass at Little Gulf.

*Crepidula convexa*, convex slipper limpet, is recorded only from eelgrass at Little Gulf.

*Diadora cayonensis*, keyhole limpet, has been found at Swash Bay and Hog Island Bay, on oysters. It has not been noted on the bay side.

*Littorina irrorata*, periwinkle, is abundant on Spartan in marshes on both sides of the peninsula. It has been found on oysters at Swash Bay.

*Busycon canaliculatum*, conch or whelk, was found once at

Outlet Bay and once at Little Gulf, according to Hoese. Shells are common on Cedar Island Beach.

*Odostomia impressa* (species not certain) has been collected at Outlet Bay, Rogue Island in Hog Island Bay, Bradfords Bay, and Little Gulf. It was not common anywhere.

*Bittium alternatum* (?). A small snail that occurs in millions on eelgrass in the Little Gulf may be this species or it may belong to the Rissoidae. References on hand are not adequate to identify this snail with certainty. The same snail was found on eelgrass at Crystal Beach near Onancock by Hoese.

*Thais haemostoma haysae*, southern drill or oyster conch. One large specimen found alive on Arnold Smith's ground in Hog Island Bay, was given to the laboratory in June 1960.(It had been picked up sometime during late spring). "Buzz" Terry said he had picked up live ones in other years (but not this year) on Hog Island Bay oyster beds, and had seen living "southern drills" caught by trawlers off Chincoteague.

Pelecypoda:

*Crassostrea virginica* is the only oyster known to occur on sea side and bay side.

*Anomia simplex*, jingle shell, is recorded from Swash Bay, Yates Channel, and Hog Island Bay on the sea side, and from Cherrystone Inlet and Little Gulf on the Bay side.

*Brachidontes recurvus*, hooked mussel, is recorded from Messongo Creek, Chesconnessex Creek, Occohannock Creek, and Nandua Creek on the bay side. It is not native to the sea side, but Hoese says hooked mussels transplanted on oysters live several months in sea side water (in trays of James River oysters for instance). The largest ones, up to 48mm. long, were found in Messongo Creek (the least saline creek).

*Brachidontes exustus*, scorched mussel, and indication of high-salinity water in the south, was imported on South Carolina oysters planted in March, during freezing weather, but survived on oysters planted in April. Several living mussels of this species were found August 11 on South Carolina oysters that had been in a tray in Cherrystone Inlet since April 1960.

*Mytilus edulis*, black or blue mussel, has not been found in sea side bays so far, but many living specimens attached to sea weeds were seen, washed up on the Cedar Island beach, June 16, 1960.

*Volsella demissa*, ribbed mussel, usually found in marshes among *Spartina* clumps, also occurs attached to oysters, especially in crevices of oyster clusters. As an epizoite on oysters it has been seen in Finney Creek at Wachapreague, and in Swash Bay, on the sea side, and in Hungars Creek and Little Gulf on the bay side. In Finney Creek, ribbed mussels sometimes overgrow, smother out, and replace coon oysters along the banks of marsh drains.

*Mercenaria mercenaria*, hard clam, occurs in channels of sea side water-ways and among oysters on both natural and man-made "rocks". Specimens are not obtained without digging form them, so

we have no records of their occurrence. One hard clam was dug up at Little Gulf. Clammers were often seen catching clams by digging up or by patent-tonging on the sea side, and by raking in bayside creeks. Hoese says hard clams occur in Hungars and all creeks south of Hungars Creek.

*Noetia ponderosa*, ponderous ark, or blood clam, is often dredged with oysters by oysters planters on the sea side in winter. A large living specimen was tonged below low tide level just off a natural "rock" in Bradfords Bay, July 22, 1960; this clam was heavily infested by trophozoites of Hexamita or a very similar flagellate. Hoese says *Noetia* is the commonest clam on oyster beds in the vicinity of Wachapreague. He dug many in Burtons Bay.

*Anadara ovalis*, blood clam or ark, is also dredged by Wachapreague oystermen in winter.

*Tagelus plebeius*, stubby razor clam, was dug up alive by Hoese on a mud flat in Bradfords Bay. Shells, with valves still attached at hinge, are often seen on oyster beds on the sea side and in Little Gulf.

*Ensis directus*, razor or jackknife clam, has not been seen in sea side bays, but one live specimen was due near low tide level in Little Gulf. Piles of empty shells, many still with valves joined at hinge, drift up on the ocean beach at Cedar Island and the bay beach at the Kiptopeke Ferry landing.

*Aqueipecten irradians*, bay scallop, once very abundant on the sea side, practically disappeared about 1931 when the eelgrass died, and has never come back. A few live scallops were obtained by Hoese in Cobb Island Bay in autumn or winter and kept for some time in aquaria. A few live ones were reported seen last winter Wachapreague oystermen.

*Spisula solidissima*, surf clams, do not occur in bays, but many empty shells, large and small, are washed ashore on the ocean beach of Cedar Island. One living surf clam of small size was caught in the surf zone of Cedar Island beach on July 16, 1960. Many old oyster shells were piled on the beach along with surf clam shells, and example of the kind of paradox geologists have to entangle, if they can.

## Echinodermata

Asteroidea:

*Asterias forbesi*, common starfish, was not seen during this survey but had been reported by Mackin 1944-1945 as present well inside of Wachapreague Inlet. Crab dredgers catch large numbers of starfish while dredging crabs in deep water in lower Chesapeake Bay.

Echinoidea:

*Arbacia punctulata* or a very similar species, was seen near Cobb Island in Hog Island Bay July 19, 1960. Local oystermen believe that the "pincushion" as they call this sea urchin, kills many oysters, or at least spat and coon oysters. Sieling reports seeing large masses of Arbacia dredged from oyster beds in Hog

Island Bay some years ago.

## Chordata

Urochorda

Several other sea squirts have been collected and preserved for future identification, but there is only one that is abundant and widely distributed: *Molgula manhattensis*, which is recorded from Hog Island Bay (few), Cherrystone Inlet (in deeper water),, Little Gulf (few) on James River tray, Hungars Creek (few on oysters, very numerous on tray of S. C. oysters), Occohannock Creek (abundant), and Messongo Creek (not numerous).

*Amaroucium* sp. was common in Swash Bay last autumn.

Vertebrata

Hoese will report later on fishes. The following table shows the distribution he has recorded for fishes commonly found on oyster beds or in oyster trays.

| Locality | Name of Fish ** (X indicates presence) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sea Side | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Swash | | | | | x | x | | x |
| Yates Ch. | | x | | | | | | |
| Hog Is. Bay | x | | | x | | | | |
| Outlet | x | | | | x | | | |
| Bay Side* | | | | | | | | |
| Cherrystone | x | | | | x | x | x | x |
| Gulf | x | | x | x | x | x | x | x |
| Hungars | x | | | x | x | x | x | |
| Occohannock | x | | | | x | | x | |
| Chesconnessex | x | | x | | x | | x | |
| Messongo | x | | x | | x | | x | |

*Bayside locations are listed from south to north, or in order of decreasing salinity.

** Two other species, *Lutianus griseus* and *Centropristes striatus* have been recorded from the Gulf and Swash Bay.

1=*Gobiosoma bosci*, 2=*Gobiosoma ginsburgi*, 3=*Gobiesox strumosus*, 4=*Lactophrys*, 5=*Opsanus tau*, 6=*Hypsoblennius hentzi*, 7=*Chasmodes bosquianus*, 8= *Tautoga onitis*

# ADDENDA

H. D. Hoese

## A brief Description of Eastern Shore Waters, with Notes on Hydrography and the Fisheries

The Eastern Shore of Virginia is the lower part of the Delaware peninsula and forms the more southern 70 miles of land separating Chesapeake Bay from the Atlantic Ocean. On the western shore over a dozen creeks and many smaller indentation of Chesapeake Bay drain a very small area of the peninsula. These creeks are only a few miles in length and many smaller tributaries are dammed for irrigation. The bottoms of these creeks are largely mud, but near the mouth are sandy and merge with sandy beaches which are characteristic of the western shore of Chesapeake Bay. Oysters and crabs are fished commercially in all bayside creeks and hard clams are fished in the saltier creeks, chiefly from Hungars southward. In the bay proper the salt-loving forms such as clams extend further up the bay than they do in the creeks, but their limits are not well known. Several pound nets operate along the western shore, most in the Cape Charles vicinity. There is also a small eel fishery. Chief sports and commercial fishes are striped bass, croaker, spot, spotted and gray trout, tautogs, drum, sea bass, flounder, and a few other species.

In contrast the seaside is composed of small shallow bays separated from the Atlantic Ocean by sandy barrier islands. These islands are divided by relatively narrow, but deep tidal inlets, and many places are marked by washover channels. These bays are composed largely of barren mud flats, *Spartina* marsh, and scattered oyster reefs. The upper levels of the intertidal area are characterized by mussels, *Modiolus demissus*. The intertidal is typically either an oyster reef community or is populated by fiddler crabs. Below this is the subtidal community which merges somewhat with the intertidal at high tide. The tide differential is about 4 1/2 feet, varying some at different points.

A few small creeks drain into seaside bays, but only the Machipongo River contributes more than insignificant amounts of fresh water. Salinities in the bays seldom fall below $30^0/_{00}$, and then only for short periods of time immediately after heavy rainfall. Salinity in these bays is almost always between 30 and $33^0/_{00}$, and once after a heavy rain was as low as $18.4^0/_{00}$/ The saltier lower bayside creeks range from about 19 to $25^0/_{00}$ and the fresher upper peninsula creeks from about 13 to $19^0/_{00}$. The tide is gradually damped on these creeks progressing up the bay and in some creeks is less than one foot.

Oysters, crabs, and clams are fished commercially in all seaside areas and there is a small fishery in a few areas for croaker, spot, drum, flounder and a few other incidental species. A winter fishery for mackerel (*Scomber scombrus*) and silver hake (*Merluccius bilinearis*) is conducted by party boat operators out

of Wachapreague Inlet. The chief catch for the small sports fishery at Chincoteague, Wachapreague, and Quinby has been flounder, *Paralichthys dentatus*, for the past two summers. Other species such as spot, croaker, silver perch, bluefish, and whiting are often taken. In the late spring black and red drum a fished near the inlets and on the ocean beaches. Offshore catches during the summer are predominately bluefish, bluefin tuna, dolphin, sea bass, false albacore, common bonito, spanish mackerel, white marlin, and occasionally striped bass and a few other species.

A small shark fishery operates out of Willis Wharf using gill nets near the Great Machipongo Inlet in Hog Island Bay. The only two species observed in the fishery have been *Carcharhinus milberti* and *Carcharias taurus* of all sizes. These are butchered at Willis Wharf and sold through the fish house at Wachapreague as steakfish. Large sharks are sometimes caught in the evening for sport off the dock at Wachapreague and Willis Wharf. Other sharks which have been observed in seaside bays are *Mustelus canis*, *Squalus acanthias*, and *Sphyrna zygaena*, but only the first species along with *C. milberti* seems to be very common.

Seaside bays seem to be changing in depth and configuration, with many areas once intertidal now subtidal. These changes are probably due to storms, erosion from tidal currents, and the gradual lowering of oyster reefs by dredging, besides the more normal causes-compaction of the sediment and sea level rise. Tidal currents rapidly enter through the inlets and up the deep channels to finally cover the highest intertidal areas. As the tide recedes, many small channels are formed in intertidal areas and the sediment washed into the deeper channels. Some effects on these bays other than the loss of scallops must have accompanied loss of eelgrass in the early 1930's. Some sediment may have been formerly trapped by grass flats, so sedimentation patterns may have changed to some degree. Besides, the fauna must have been much richer in species as is shown by the rich eelgrass fauna in Chesapeake Bay where the salinity is much lower.

Proposed Pocomoke River -- Chincoteague Bay Canal
Note by Sewell H. Hopkins, July 26, 1960

On our July 25 trip to Snow Hill Landing and Franklin City, Hoese and I heard that there is a project to cut a canal through from Pocomoke River, near Snow Hill to Chincoteague Bay presumable for small boat navigation. Tom Carter said Dr. R. V. Truitt was backing this project and had stated that the canal would not adversely affect either Pocomoke Sound or Chincoteague Bay.

If this project is actually carried through, it will presumable result in fresh water flowing from upper Pocomoke River into Chincoteague Bay, causing some lowering of salinity, at least locally. Salinity in Pocomoke Sound would probably not be raised much, as the water diverted would be only a small part

of the present drainage into this sound.

Shell Dredging in Maryland Part of Tangier Sound
Note by Sewell H. Hopkins, July 26, 1960

On July 25 when Hoese and I visited the Franklin City laboratory, Tom Carter told me that a commercial shell dredger, using a suction dredge with a 24 in intake, is dredging buried shell from the bottom of Tangier Sound under supervision of the Maryland Department of Tidewater Fisheries. "Dr. Bird" is to report on this at the Baltimore meeting. According to contract, the Dept. of Tidewater fisheries gets the first shells and these are now being planted as fast as they are dredged and washed. When state needs are satisfied, the contractor is to dredge several hundred thousand (bushels ? tons ?) for himself, as his pay for supplying the state with shells for culch.

Carter showed me 2 buckets of shells from Tangier Sound shell dredge. About half had *Cliona* holes, nearly all of small types, but there were a few with *C. celata* penetrations. Eight shells were brought back to Wachapreague for identification of the species of *Cliona*.

Thallophytes on Oyster Shells
Note by Sewell H. Hopkins, July 26, 1960

While dissecting oyster shells for *Polydora* and examining shell fragments microscopically for *Cliona* I have ben impressed by the universal presence and abundance of Thallophytes, either algae (yellowish pigment is usually present) or fungi, in the shell tunneled by boring animals. A branching filamentous form is always present in these shells. Remembering the "Dutch shell disease" studied by Korringa, I wonder if these shell-inhabiting Thallophytes could play any part in oyster diseases -- perhaps even be part of the life cycle (correspond to laboratory -- culture forms of some other pathogenic fungi).

Notes on Hard Clams on the Seaside of Virginia and Maryland
by Sewell H. Hopkins, July 26, 1960

No special attention has been paid to clamming, but a few men have been seen catching clams by various means from time to time, and there is one clams buyer at Wachapreague.

On July 19 two patent-tong boats were seen catching clams in the Machipongo River channel between Willis Wharf and Hog Island Bay. These boats harbor at Willis Wharf. Nat Terry had told me earlier that every once in a while some patent tonger discovers a large population of clams in the channel and soon a large fleet of boats moves in "from Mathews County" and gradually thins the clams down until everybody quits; then after a few years someone discovers that the clams have recovered and another fleet comes

in. The patent tongers seen on July 19 were making very good catches (compared to those I've watched working in York River).

Fred Sieling on July 25 told us that for the last 2 or 3 years boats have been dredging clams (with oyster dredges) on the east side of Chincoteague Bay in Maryland. By putting barrels of water, etc. on stern, they get propeller deep enough to aid the dredge in digging clams out of the sandy bottom Fred wants to check on the effect of this dredging on population by using a hydraulic dredge like the one used at Solomons.

Clams increased tremendously after the 1933 storms opened the inlet at Ocean City.

Tom Carver has some very small (5 mm. ?) clams in an aquarium, some of Loosanoff's "hybrids". We discussed differences between *M. mercenaria* and *M. campechiensis* are agreed that there is no certainty that these are good species. Tom said he found overlapping in every character that had been mentioned as a specific distinction, and pointed out that this is the zone where ranges of norther and southern species would be expected to overlap.

Effect of Shell-Planting on Abundance of Fishes

Fred Sieling and his crew at Snow Hill Landing have been carrying on an experiment on the effect of shells on fish catches. There are four experimental areas of about 2 acres each. One was planted with shells the first year (leaving 3 controls) and one of the control areas was planted the second year (to compare the year before and year after planting). Trays are fished on each area). Fred says data show a very significant increase in catch of fish during the year after shells are planted. Shells are scattered on bottom evenly, not piled.

If the fish biologist at VFL have time for more projects, this or something like it might be worth considering. Such a project could be elaborated or refined in a number of ways.

Oyster Culture in the Maryland Part of Chincoteague Bay
Note by Sewell H. Hopkins, July 26, 1960

On July 25, I asked Fred Sieling where seed for northern Chincoteague Bay came from He said most came from bay side Maryland around Cambridge and Oxford, some used to come from James River and some still comes from the Virginia sea side bays. He and colleagues have shown that seed in commercial quantity can be produced locally on suspended culch, but drills (half *Urosalpinx* half *Eupleura*) kill spat on bottom-planted shells. It is mainly inertia of tradition that keeps Maryland planters from catching growing their own seed, he thinks. So far, there has been no commercial set this year. (However, at Franklin City we were shown shells with a good set of 1960 spat, and these were said to come from within 1/2 mile of one of Sieling's stations). Fred said there are very few oysters planted in the Maryland part

of the bay now, he thought because planters were worried by mortality stories and afraid to risk much money buying and planting seed. However, he has found very little mortality (other than oysters drilled) either in trays or on beds in 1960 so far.

Franklin City biologists said there had been 3 surveys of Chincoteague Bay for Dermo (But not by them). A few cases of Dermo were found on 1 survey, none at all on the other 2 surveys.

Cow-Nosed Rays or "Bullfish" as Oyster Enemies
Note by Sewell H. Hopkins, July 26, 1960

On July 25, when Dick Hoese and I visited the Maryland laboratory at Snow Hill Landing and the U. S. fish and Wildlife laboratory at Franklin City, both Fred Sieling and Tom Carter told us that the cow-nosed ray of "bullfish" (its local name) presumably *Rhinoptera bonasus*, is an important predator of oysters in Chincoteague Bay. Sieling said he had watched these rays feeding on oysters in shallow water and was certain that they did kill and eat oysters. Carter said they did more damage in Maryland part of Chincoteague Bay, where single oysters were grown for barrel stock, than in the Virginia part of the bay where most oysters were in clusters, and sharp edges discouraged attack by predaceous fishes. Sieling and Carter did not think black drum did any damage in this bay, perhaps because there are few drum now.

The Franklin City biologists also said that local Clammers had "holding beds" for clams staked (with stakes 8 inches apart) to keep out rays, and showed us one such staked area. Some clam dealers also use hog-wire fences to keep out rays, they said. This reminded me of oyster holding grounds in Louisiana, surrounded by Hog-wire fences to keep out black drum.

Sea Urchins as Enemies of Sea Side oysters
Note by Sewell H. Hopkins, July 26, 1960

Harvey Bowen's two oystermen, who showed us the oyster beds near Cobb Island on July 19, claimed that next to "screwborers" the most serious enemy of oysters in that part of Hog Island Bay is the "pincushion" or sea urchin, which sometimes becomes very abundant and kills many oysters. When Dick Hoese expressed doubt, then repeated the statement but added at least the pincushion killed spat and young seed oysters. I do not think this (killing spat) is impossible.

On July 25, when we visited the field station at Snow Hill Landing, Maryland, Fred Sieling told us that Buzz Terry once called him down to Willis Wharf to see the large concentrations of "pincushion" on oyster beds in Hog Island Bay and when they dredged on Terry's beds near Great Machipongo Inlet they caught as much as a bushed of *Arbacia* per dredge haul. Terry thought these were killing his oysters, and Sieling was not sure whether they did or not. Sieling also said there had been enormous

concentrations of *Asterias* in some of the inlets, but he had not found starfish on oysters beds since he had been on the sea side.

Shark Fishery at Willis Wharf
Note by Sewell H. Hopkins, July 26, 1960

If anyone at VFL ever wants any shark material, for instance monogenetic trematodes or tetraphylloid or tetrarhynchoid tapeworms, a convenient place to get it would be the Smith Brothers shark landing at Willis Wharf. Cross over the little bridge just beyond Terry's oyster house and turn sharp left. The wharf where sharks are landed in just across the little branch creek from Terry's oyster house, and a little farther up the creek.

On July 19, Hoese and I saw one of the Smiths land some 30 sharks there, 3 to 8 feet long, mostly two species "sand" and "brown" sharks. Dick looked at them an identified these two species, *Carcharias taurus* and *Carcharhinus milberti*.

The Smiths catch sharks in a large, deep drift gill net that they start near Great Machipongo Inlet and allow to drift up the channel with flood tide. They may fish the ebb tide too, for it was part low tide when we saw them come in. They complained that the 30 sharks they brought in were a poor catch. There are 3 boats fishing, ordinary 30-40 foot deadrise work boats. They have been fishing sharks regularly for 6-8 years. After dressing at dock, sharks are brought to Wachapreague and are marketed as "steak fish" through the Wachapreague fish house.

One of the Smiths got newspaper publicity when his forearm was badly chew by a shark he was removing from the net.

Sharks up to several feet long and several hundred pounds weight have been caught right a the fish house wharf in Wachapreague this summer -- all were caught a night and we did not see them.

Oysters with Rapid Growth of Left Valve,
No Growth or recession of Right Valve
Note by Sewell H. Hopkins, July 26, 1960

A man called "Wandal" and another man, who were fishing "screwborer trays" on Harvey Bowen's oyster ground near Cobb Island in Hog Island Bay, on July 19, called our attention to some oysters about 2 years old that had the left (cupped) valve with sharp edge extended out all around far beyond the edges of the right (flat) valve. In extreme cases the cupped valve had grown so far beyond the flat one, or the flat one had receded so far, that the while inside lining of left valve could be seen all around the edge of the right one. The extending edges of the left valve, meeting no opposition, had curved in around the edges of

the flat valve. This reminds me of one of Laloup's descriptions of *Polydora* damage in Belgian oysters, but in the Hog Island Bay oysters there was no *Polydora* or other boring organism visible. Bowen's man and Buzz Terry think that oysters showing this condition will inevitable die. They say there have always been some oysters showing this condition on the sea side, but there are more this year than ever before. We took some specimens of these "sick" oysters and they are still living in an aquarium in the laboratory.

Since rapid growth of shell edges could occur only when mantle edge is extended and recession of shell accompanied retraction of mantle, I can not understand how growth of one valve and lack of growth or recession of the other could occur at the same time from internal causes. There must be some external agent working on these oysters, perhaps some animal nibbling around the edges of the more vulnerable right valve (?).

**Notes added in transcription (July 2003 by H. D. Hoese)**

The copy I had of this report was so bad that I transcribed it as closely as possible to the original. A few obvious typographical corrections were made, but nothing else was changed. The table on fishes was handwritten so had to be modified slightly.

*Crago* is not the snapping shrimp, but the common sand shrimp. Perhaps something was left out here, because I recall snapping shrimps, but cannot find any record.

I had small meals of pink shrimp caught in eelgrass in the Gulf in the falls of 1960 and 1961. Mr. Accuff told me about these, a species I was familiar with from Texas.

Crabbers reported sometimes catching lobsters, *Homarus americanus*, in their traps. I find no mention in notes, but recall one sold for 50 cents taken from a trap off Wachapreague in either 1960 or 1961, both which were cold winters.