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Memos and reports on shellfisheries in Virginia, 1972-1975

Jay D. Andrews
Virginia Institute of Marine Science

MEMOS

AND REPORTS ON SHELLFISHERIES IN VIRGINIA

1972-1975

J. D. ANDREWS

VIRGINIA INSTITUTE OF MARINE SCIENCE

GLOUCESTER POINT, VIRGINIA 23062

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Memos

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J. D. Andrews
Virginia Institute Marine Science
Gloucester Point, Virginia
23062

SEED OYSTER PRODUCTION SEASIDE

J. D. Andrews

The crucial problem on Seaside is to avoid heavy predation of seed oysters on intertidal artificial reefs. Drill predation is always present since no economic way of controlling them has been found.

Loosanoff and Mackin pointed out that survival was best in the first foot or two above mean tide. They say setting was best there too but I think it was really survival.

Seaside setting tends to be excessive when successful thereby causing crowding and clumping of oysters. Some planters look on drills as a handy way to thin clumps but this is a wasteful solution at best. Trapping of drills is almost prohibitive in cost. Hand picking results in removal of big drills but really doesn't touch the new year classes growing up. The cost, years ago, was $5 per gallon for an ineffective method of control.

A serious problem is spreading or augmenting natural pops. by planting drills with seed. A sorting conveyor belt and jet wash machine was designed in the 1960's to clean seed of drills before planting. Much easier is to wait until drills migrate down from intertidal reefs in winter, then harvest the top. Methods for carrying seed reefs from one year to another are not worked out. Muddy bottoms provide some barrier relief from drill migrations - they will move 1/4 to 1/2 miles in one season to get to a new source of spat. The planters method is to rent new ground and move to it for a year or two.

Some experience with Seaside planting of Bay "fossil" shells was had by Bagnell in the 1963-66 period but I was not involved. Mr. Hickman probably knows about that period.

Theoretically, all the shell should go back, bushel for bushel. This does not mean effective repletion for my judgment of shell plantings is that it takes 3 to 5 bushels of cultch to produce 1 bushel of seed from public beds here in Chesapeake Bay. Millions of bushels planted only produced 1-2 hundred thousand bushels of seed - partly failure of setting but mostly thick planting - 10,000 bu. per acre.

M E M O

TO: Dr. J. D. Andrews March 21, 1972

FROM: Jackson Davis, Assistant Director JD:at

SUBJECT: REVIEW OF EASTERN SHORE FISHERIES

I have been assigned the task of obtaining an inhouse review and editing for publication as a VIMS document the preliminary report, A Study of the Commercial and Recreational Fisheries of the Eastern Shore of Virginia, Accomack and Northampton Counties, a copy of which is enclosed.

I ask that you critically review the preliminary report and provide me with written comments. Please ignore matters of style and grammar and devote your attention to substantive questions of accuracy and completeness of descriptions, of logic and thoroughness of interpretations, and validity of the conclusions and recommendations. It would be helpful if you would group your comments by chapter. In referring to a specific point, please indicate page and paragraph.

I will compile the comments from the several reviewers and bring them to the attention of the authors for their consideration in revising the various chapters. Unless you specify otherwise, your name will not be on the copy of your comments that the chapter author receives. You may send your comments on Chapter VI, The Finfish Industry, to Dr. Hargis if you wish to maintain the usual anonymity accorded referees.

I will welcome suggestions about general style, format, and organization of the entire report. Please list these in a paragraph headed Editorial Comment. We intend to obtain better illustrations.

Please send your comments to me at your earliest convenience, but not later than 14 April 1972.

M E M O

TO: Dr. Jackson Davis

FROM: Dr. Jay D. Andrews

DATE: March 23, 1972

I was pleasantly surprised by the Eastern Shore report. I think it covers the fisheries rather adequately. It also reads quite well and except for a few mis-spelled words could go as it is.

I feel that more emphasis and projections should be made on tourist or vacationer needs and impact on fisheries -- particularly the shell fisheries which are only briefly mentioned by Rich in his sport fish article. One objective should be a real first-class retail outlet for fresh seafood (1 to 3 places along lower Delmarva. Again this should be a cooperative program that all seafood interests support for promotion as much as profit. The quality and freshness should be very carefully watched. Most people don't know what fresh seafood tastes like. Packaging for "taking home" should include icing and low cost styrofoam containers.

I was most impressed by the chapters I know least about. I thought the summary (by Vic I suppose?) was very well done. Your chapter was a more scientific appraisal of the problems of managing common property resources but I felt like inventories of all these species might cost more than they are worth. Also, it is not clear to me how the sport fish catches can be handled and collected.

I made the most comments on the shell fish chapters. Dexter has very comprehensive records of the oyster fishery but I feel he has omitted several very important activities and events of the past. You will note from the attached notes I wrote in January 1971 when the project was initiated that Dexter and I disagree on handling of public grounds. It may be unwise to advocate releasing public grounds but poaching and predator control are impossible to approach with the present fragmented industry and system. The old "free-fishery" people are passing on and we should look forward to different management regimes (integrated and big enough to stabilize, diversify, and innovate in the industry.) This has happened in Long Island now with one very big seafood subsidiary and a few other rather large companies. This integrated approach was suggested in the report for Wye Institute (Quittmeyers et al) for Seaside of Maryland in which I provided the biological ideas and the alternative choices for the oyster industry. This report is not cited in the present one. I think it would be well to get Christy's book on the properties of common property resources into the report as a reference and perhaps others. Also how about the

Seattle monograph on potential of sea fisheries or chapters thereof and other inventory, management and predictive sources you probably know about on fish.

I did not spend much time on the tables and graphs. Also if the questionnaires were successful, I failed to see much evidence of their results in the monograph. Were they circulated to the authors and was much learned this way?

Mention is made of the escalator hydraulic dredge in the recommendations but nowhere does it make real clear that they are in wide use in Maryland and have been for 10-15 years and of the studies there and by Dexter to check on their effects on clam and oyster beds and populations. Perhaps this is not the place to fight that battle but some mention of the background should precede the recommendation.

Aquaculture gets short shrift except in comments, p 182, of summary. I agree the subject is not mature but probably the best bets are clams and scallops on Eastern Shore where natural setting does not suffice and hatcheries may become feasible. Perhaps the present presentation in the summary is best for now (p 182 is very good!)

lld

Fisheries of Eastern Shore

Critique of Oysters- Haven Manuscript

p28 Seed on Seaside is usually yearlings, growth is rapid and marketing is usually 12-18 months later. Oystermen have often held oysters longer to get large half shells but losses nearly always exceeded growth. Shells are thin and marketable oysters are still subject to drill predation. Often half of oysters dredged for market will be drilled. I think 3 yrs is a bit long for most culture -- ask Mike. Also should mention the very white meats so prized by customers of these salty oysters. The intensive setting distorts shape also.

p29 Should be more descriptive on drill collection -- it is done at low tides and gets mostly mature (big) drills leaving young ones -- planters usually added to price of bounty; should mention rotating screen-drums that were very effective in removing drills from seed at 10¢ a bushel -- most practical control if could find drill-free grounds to plant on. Also transplanting from seed bars (parallel ridges in intertidal zone -- very conspicuous from air) in winter when drills are down below low tide line. "predators no bar to production"?? you should have seen and heard what I have over there -- I disagree. Only heavy spatfalls to feed the drills gave some protection but interfered with growth and marketing.

p30 MSX never caused significant oyster mortalities on Seaside and is probably endemic but does not kill on Seaside. It did wipe out Bayside Creek operations -- must separate the two areas -- they are totally different in most aspects.

OK -- a paragraph says this but opening paragraph misleads.

p57 Last paragraph nowhere yet does author describe the great "seed hunt" on Seaside for Delaware Bay market in period 1950-56. This resulted in selling everything -- shell, mussels, and depleting seed sources. Set failures followed in 1958 and other years? so that seed was scarce. The embargo is by New Jersey and northern states -- it is based on poor results with Seaside seed and fear of disease (MSX) I doubt that they would buy these seed again anyway.

Nowhere does author recognize the patterns of seed transplanting that long persisted on Seaside. The seed supply has always been in the lower Seaside and was regularly moved to Chincoteague area (Tom's Cove, Chincoteague Bay, and most importantly to out-of-state private beds in Maryland and Delaware (Indian Rivers and Rehoboth Bay). Before MSX destroyed these plantings, most big planters had out-of-state arrangements but the oysters were trucked back to Virginia for shucking. This large factor is not recognized in the catch or production records and the decline of Seaside yields.

On the other side of the ledger is a rather large quantity of clumpy seaside oysters trucked to Western Shore for the soup

plants in the 1960's -- where were these recorded as produced? The soup outlet is an important one where shucking costs and early harvesting are problems.

p59 The hydraulic dredges are used in Long Island and on West Coast in various adaptations too. The effects on soft bottoms (vs sandy) are not well known.

A heat type oyster opening machine is nearing completion by Wharton et al. at Univ. of Maryland. How about the shucking machine demonstrated by ___nc___? at McGinnis plant. He is still working on it and inquiring what the future of oystering is in Virginia.

wheaton

I don't understand the statement about lack of size uniformity of seaside clumps -- the soup plants are buying James River oysters to mix with Maryland to attain a "count" per can of soup. Canned oysters may have a future with pollution encroaching but it is a cheaper product than fresh-shucked and is a misuse of salty seasides. It would provide stability of market as soup plants have on Western Shore.

p60 Upgrading the processing of oysters is the right direction for seasides. However, at over $2 per lb for oysters in markets now, the future seems linked to luxury products and Long Island has an enormous supply (for them) of oysters nearing market size.

p60 The Delaware story is finally mentioned but is too brief.

p60 Is the author aware that Tom's Cove has been destroyed as an oyster growing area by natural or Wallops Island activites? It was a major source of oysters for Chincoteague houses. I have not seen the survey and interview sheets so don't know recent details.

p61 The habit of "turning out" rented grounds after a few years use (drills accumulate) and the mixture of private and public beds makes the problem of suitable growing grounds quite intense. I'm not sure I agree with the conclusion that public grounds have not higher use than the present system -- so much of it is not really oyster rocks but more of the same kind of ground rented by planters.

p62 No mention has been made of the many irrigation ponds that rob creeks of their fresh water and the canning plants that in the past often caused them to go anaerobic in summer. These have affected Bayside creeks in oyster production.

Resume on Oysters

The account fails to give a good picture of oyster culture in the two very different areas of Bayside Creeks and Seaside Bays and channels. Both are relatively high-salinity areas but especially Seaside. Seaside is strongly influenced by shallow beds (except planting in deep channels which should be mentioned) and wider tidal fluctuations which make oyster culture like South Carolina and quite different from Chesapeake Bay. There is a strong intertidal flavor to the whole operation and use of intertidal areas is essential to insure seed with^out the dense populations of large drills. Seaside oysters are racially different -- selected for rapid growth and early reproduction to contend with diseases and predators. The seed will not grow well in Chesapeake Bay although some were used in Bayside creeks.

The section on diseases and predators is quite adequate although not arranged to make situations clear on first reading. It should definitely be stated that Dermo does not persist hence is no problem on Seaside.

The long section on statistics is excellent and gives more documented detail than has ever been available before. The only changes that are needed involve the pre and post-MSX activities of growing oysters outside the area, exporting seed and its probable effects, and marketing of soup oysters outside the area. All of these tended to reduce production in the 1960's over the 40's and 50's. Hurricanes and storms (Ash-Wed. of 1962) had serious effects on loss of oysters and ground.

The paper fails to give proper emphasis to the advantages and disadvantages of Seaside oysters (Bayside is simply out of production as stated). Seaside has the great asset of heavy regular spatfalls, high quality oysters of salty taste hence should aim for a market to take advantage of this. On the other hand, quick growth and early harvesting are essentials to avoid predators (all size of oysters not just spat) and diseases plus environmental problems.

A major problem on Seaside has been loss of oysters by stealing. It is impossible to protect grounds where adjacent public and private beds are far offshore -- a strong argument for doing away with public grounds except for limited seed areas possibly. The waterman of Eastern Shore are permanent residents and they used to live off the water by oystering, clamming, fishing but now they need income to buy cars & TV sets as well as their boat. Since the big oyster producers are often big farmers in summer, it should be possible for watermen to switch too but apparently they don't. Hence they have seafood work only part of the year and welfare the rest -- a common situation for shuckers for decades.

There is no mention of the period of seed shortage when Seaside oystermen brought seed and market oysters from the Carolinas and Gulf.

It seems that the statistics fall in the middle of biology and culture.

I have not tried to analyze the statistical data -- someone else should do that. My attention was focused on biology and culture.

Hard-clams - Castagna and Haven

This account seems rather complete. It would be well to relate hard-clam production and marketing to surf clams and note the center of production. (competition). I would like to see documentation of the Burton domination of the market with production statistics from various states (See Andrews "Mollusc Fisheries of Chesapeake Bay which could be added as a reference along with Engle 1966).

I get the impression that shell and gravel beds for protection of small seedling clams has been soft-pedaled in this account. I still believe in it and would make more of the potential. Perhaps the method is not yet a part of industry practice but include it in recommendations anyway. P80 on "Predator protection methods ..." is a disappointing statement.

I think a clear and positive statement that hatchery or artificial reproduction of clams is indicated, by the absence of any areas in Virginia that reliably set clams, is needed. Recruitment is the major problem and I fear it cannot be remedied by nature. (I doubt that we have data on the potential of setting before predation, however.)

p 84 Paragraph 2. "few feet to several hundred" is misleading for all of commercial size and abundance are offshore, are they not?

I can't argue with Ropes et al. about two spawnings but I wonder if they are referring to the same offshore deep-water pop. which I saw in spawn in September and would doubt waters were warm enough earlier (before fall mixing down of seasonal thermocline.)

p89 Clam chips -- mention all known products, not etc.

p90 Here again is the irony of an industry moving into an area for low-cost labor availability while oyster houses can't find shuckers. Inflation, and people problems (all want white collar jobs) are much to blame for seafood industry problems without mechanization.

I think the paper is perhaps too optimistic about surf clams. I don't have details but the reports I have heard and read leave a strong impression of pulse fishing and no one really knows how long an area supply will last. Already in a little over two decades there has been considerable moving north and south and the great beds are off New Jersey. The industry may come and go more quickly than we think although pricewise (now low) there is room for intensive fishing at higher prices.

Make clear very early that this is an <u>offshore</u> in ocean fishery where Virginia has little power to manage or investigate. See Van's early description of range.

Crabs - Van Engel

I find the crab paper well written, good coverage and have no suggestions to offer. If Eastern Shore turns more to recreation as I think it should, then sports fisheries and greater use of basket crabs (despite small size) should be encouraged.

Fish - Davis

I am amazed at catch fluctuations by species (e.g. spot and swellfish). Why? Yearclass fluctuations on short-lived species? (also mackerel and croaker -- latter decline well known but hard to believe the extent!

I am impressed by the section on management regarding a common property resource. These are the same sort of recommendations that Quittmeyer and group (including me as biologist) gave for management of Maryland's fishery resources -- mostly concerned with shellfish. Fragmentation hobbles all seafood industries throughout the vertical structure from sea to market and I suspect the resources will be gone before adequate changes are made. I question whether national policy on forests is as successful as you imply -- look at the ruling on clear cutting that was promptly rescinded.

I have nothing to add to the section on fishes. Oh! I do think you should discuss sport fishing! I see Rich does.

Chapter X Recommendations

Despite a basic potential for higher value products, I think the steam plant may be a good option. It would also solve bacterial problems that are pressing in on us, if the public health people can ever get away from the "super-clean" waters even for cooked seafood. There is almost no way short of full mariculture to produce regularly-shaped oysters for mechanical shucking on Seaside. This is a good summary of the situation. No one knows whether Seaside oysters will grow in Delaware and Chincoteague Bay because no one has monitored for MSX or tested the oysters there for over 10 years. The Indian River and Rehoboth estuaries are not being used for anything now to my knowledge hence an effort to revive their use as growing grounds for Seaside seed is needed The problem with Tangier grounds is poaching and exposure of the beds to storms; not diseases.

Surely there must be a body of experience in Maryland on the effects of the hydraulic dredges by now and Virginia should permit them or give up on clams and oysters. Clam leases are overdue.

The surf clam needs are a Federal responsibility and should remain so. The chief threat is over-fishing.

I firmly indorse a Delmarva Coop -- for marketing at least and hopefully to manage production eventually. I suggested this in my writeup on oysters in January 1971 (copy attached).

This is a very effective summary. The questions on p 186 are quite penetrating. Too often scarcity means more profit for those few favorably situated at the time in a seafood business. This is a short-term view and economics have too long and too often determined the direction of fisheries -- usually to steady decline.

NOTES ON NATIONAL FISHERIES PLAN DRAFT

J. D. Andrews

October 1974

P. 154 I'm suspicious that surf clam stocks are not " in good shape," because of obvious pulse fishing and moves south to get smaller clams shucked. Perhaps recruitment is too sporadic to fish otherwise but has recruitment been adequately monitored?

Oysters

The easiest way to see what is wrong with oyster culture along the East Coast is to look at the structure and methods of industry in other countries and even the West Coast.

1) The industry is fragmented by public and private sectors and too many small entrepreneurs. All sectors are poorly capitalized, mismanaged, and relying upon outmoded traditions of production and marketing. The industry is always scrambling to meet the latest crisis in seed supply, pollution, market decline and public confidence. Quality is extremely variable.

2) Raw oysters do not meet public approval because poor quality control and mishandling destroy confidence. Buying oysters is always a gamble, both in health and edibility aspects. I think most oyster production should be gradually changed to pre-cooked products which will ease and insure adequate handling. Half-shell consumption should be pushed but again with high-quality salty oysters. Facilities for relaying in clean salty waters should be developed for half-shell trade.

3) Vertical integration of production is necessary to control wide-swinging seed and marketing conditions which cause price fluctuations. There is virtually no private seed-producing industry on the East Coast as there is in Japan, West Coast, France, Australia etc.

4) A revolution in state and federal policies and laws to stimulate private investment should be at the heart of any national fishery plan - for oysters. Political management out of the public till is ineffective and inefficient as in all enterprises. Subsidies are not the answer, but conditions that encourage large capital investment are, hopefully. Leases should be offered on good seed and growing grounds in large units and in packages that insure diversity of use, need and risk to grow oysters (both seed and growing ground and both low- and high-salinity areas). Excepting riparian plots, inadequate use should be reason for cancellation of leases. There should also be completely co-ordinated laws and regulations between Maryland and Virginia e.g., to insure that entry is available to capital-intensive companies throughout Chesapeake Bay and free access to seed, grounds and markets.

I think the plan in outline form has touched nearly all the problems of oyster culture. I'm not so sure that their optimistic estimates that 20 and 10 times as much production could come from leasing of public beds and off-bottom culture can be achieved, but I agree that the public fishery has little hope of improvement - actually is declining steadily. The summary is quite good in listing the essential changes needed.

I don't know what is meant by relocate oyster farms but I would recommend reorganizing them to get out the piddlers and extra middle men (repackers), and re-orient the marketing system. I still think that conserving cultch is essential in the Chesapeake area at least and that it should by law be returned to oyster beds.

Other Mollusks

Mya and Mercenaria should produce far more seafood than they do and I see the problems mostly as one of protecting the young from predators followed by early harvests. I have repeatedly asked in program reviews of Maine's Sea Grant program why more effort is not given to mussels. It is an undeveloped resource of great potential.

SOUP-OYSTERS IN VIRGINIA

J. D. Andrews

15 Nov. 1976

I have defended the soup-oyster business in Virginia because it provides a relatively firm demand to stabilize natural fluctuations in supply. Also the industry should provide a high quality product to all consumers regardless of distance from the oceans and the product has long shelf life by seafood standards. It should not compete strongly among consumers with other uses of oysters.

However, as practiced in Virginia, Campbell Soup Co. has been autocratic, parismonious and quite unwilling to consider conservation of oyster resources. I used to have annual talks with their sales representative (production?) but nothing ever came of my suggestions. They seem to be firmly stuck on the use of small oysters which creates problems for the producing industry. Other soup companies (West Coast) cut oysters into pieces by necessity - why not Campbell? To attain small meats, they bought James River seed oysters for years despite the usual poor meat quality of these oysters. This is not only a waste of good seed oysters but a misuse of a natural resource. One or two months in another environment would double the yield - not to mention growth in the first year - after planting. Now they are buying Seaside "brush" seed very cheaply and apparently wasting much of it.

I think the Virginia MRC has an obligation to insure use of public oysters in a way that prevents harvesting poor oysters and "raked up" seed and shell from Seaside. Difficult as it may be to

write rules of harvesting, an effort should be made to protect the seed supply of planters and shuckers who operate long term in a conservation-oriented manner. The bootstrap operators out for a quick buck, who have no concern for the public beds and their future, should be barred. One way would be to fix an export tax, sufficient to replant shells, on all oysters carried out of Eastern Shore. It is too bad that growers over there did not establish their own steaming plant.

I would encourage early harvesting of oysters, expecially on Eastern Shore because of disease and predator losses and fast growth, but not before they have passed thru the most rapid growth phase in their culture. Sorting is difficult because of clumpy, elongate oysters; it is easiest accomplished for the soup market after extraction of meats. This is too late to save small seed oysters.

The season of operation of soup houses is restricted and dictated by Campbell Soup. Again with their disregard of the quality of oyster meats, they tend to run in fall and winter and shut down in spring when oysters attain maximum fatness. Supply, demand, labor and weather are factors working against any delay until late spring but it would insure maximum yield of limited oyster stocks.

I do not suggest imposing strict regulations on a private operation, but often they consider only profit and convenience for themselves. If the MRC were to put the soup oyster industry (involving Campbell for they run it) on their agenda for discussion and look at conservation of oyster stocks and their efficient use along with industry needs, some changes might occur.

Mike tells me that seed oysters may be scarce but setting is usually good yet and there appear to be adequate brood oysters to maintain it. However, planting of shell on public seed beds is imperative and some control of subsequent harvesting should be exercised on shell-planted beds. It is strange that seed supply should be inadequate now that the immense quantities formerly sent from lower Seaside to Chincoteague and Delaware embayments are not now transplanted. The scraping of brush seed, shell and all, which occurred in the early 1950's to stock Delaware Bay beds should not be allowed to occur again.

I think Campbell Soup should be encouraged to buy planted stocks that are in danger of losses by disease (lower Bay) or that have not reached market size for other reasons but that are in <u>good condition</u>. They will have to pay more but should get higher yields. Since they pay by meat yields, the planter should obtain reasonable returns. A planter here in the York River did this successfully for several years after MSX invaded the area. There must be no penalties for large or small size. If the company does this, MRC should enjoin them against it!

M E M O

TO: Dr. Davis

FROM: J. D. Andrews

DATE: 8 November 1972

SUBJECT: Legislation

If MRC is to adequately manage shellfish resources, they must have power to determine the times, areas, and harvests for the various public grounds. If they must await new laws for each crisis (MSX, Agnes, big sets, little ones) then it will be too late to act. If on major issues, that mix politics, economics and biology, they feel unable to conserve the resource, then they should push for laws that safeguard the resources. For example, seed areas are so vital to oyster production that no other use should be allowed, hence, if it cannot be done by MRC action, these areas should be designated seed areas by law and require replanting as if polluted (James River, particularly).

The needs and wishes of tongers and planters tend to dominate and dictate seasons, catches, and public ground policies. The resource and its continuity should be the prime factor. I think the MRC should be much more forceful and active in setting seasons and uses of public oyster beds. If oysters are poor, close until conditions improve. If market is lacking close (mid-winter usually) do likewise. Good crops should be opened at optimal short periods for best yield, prices and harvesting conditions. This will be essential to gather meaningful statistics on the value of repletion activities (transplants of seed oysters e.g.).

Soup oyster plants desiring small oysters (read poor oysters that shrink, in practice) should not be allowed to rob seed areas at a low price. Let MRC figure out how to stop this by law or commission regulations.

Oyster tongers move around a lot according to prices, catches, demand and some personal factors. The MRC should plan harvesting to utilize resources at their best time by limiting areas and times of activity or rather concentrating it area by area. As a rough example, seed oysters should be taken in early fall (October) and late winter (March or April). Working of public grounds for market oysters should be concentrated late in fall and early winter, after oysters have fattened fully and to coincide with major market periods (Thanksgiving and Xmas). Hence, ideally some such program as follows would ensue. Open a sector of James River in October for 2 weeks then open a second sector for 2 weeks. All tongers would be forced to concentrate in these areas easing policing and statistics. Then open Rappahannock market beds in Nov. and Dec. until Xmas market is over. In late March or April, open another sector of James for seed or if possible

use instead Piankatank and Great Wicomico as seed sources for 2 or 3 weeks only (already a practice). Close public grounds by 1 May and permit private planters to have a season of fat oysters. In the past they have sold "around" the public seasons -- before when poor and after when hot. These minipulations by MRC should be flexible by years and within given operations. If market or tonging fails close promptly. If a heavy set occurs on market oysters, close until the young oysters can be culled with minimal losses. If disease threatens, move the oysters to low salinities.

Rivers and beds should be manipulated to get best prices for tongers and planters as well as good yields. I realize these proposals will be difficult to carry out when over half our oysters are coming from Maryland.

Basically these suggestions are designed to institute oyster farming instead of hunting. Laws that will facilitate this are required and if the MRC does not have power to stop abuses they should seek it from the General Assembly.

The MRC should also seek authority to rent, lease loan (use whatever name seems most acceptable) public beds for private use. This activity should begin rather innocuously with permits to place shellbags on good setting public seed beds for 3 to 6 months and finally evolve to rental of rather barren bottom for growth or fattening at a handsome price -- $50 to $100 per acre per year. Virginia has thousands of acres of unused ground.

I would push for laws that designate all shell grown or minded in Virginia waters as public property and forbid the use of shell for other purposes. This sounds drastic but lime comes from many other sources and it is wasteful to dump it in roads or use it as road base. I am referring to shells from privately shucked oysters as well as public and only oysters sold to be eaten in half-shell trade would be exempt. We are very short of shell. It should be unlawful to transport shell out of Virginia until such time as Chesapeake fisheries are operated as a unit (reciprocity from Maryland).

I would push for a law that limits sale of seed oysters to Potomac River Commission except in quantities and quality matched by Maryland. This seems rough and self-abusing but Maryland has not been responsive or cooperative. I am aware that our shell plantings are now dependent upon Maryland and MRC may consider this bad diplomacy and not in our best interests now.

I would write into the laws inducements for private production of seed -- free shell, not to be planted without further notice, but with a requirement that the shell obtain a certain level of spatfall in two or three years (the govt. pays some for reforesting if a reasonable stand is achieved). Seed oysters could be free of tax at least until private production becomes established. Include some inducements.

I think harvesting methods must change, even if tongers must be forced out of the business, to remain competitive. Therefore MRC should seek broadening of the laws regulating harvesting to permit innovations.

M E M O

TO: Dr. Bender

FROM: J. D. Andrews

DATE: 27 December 1973

SUBJECT: Monitoring Environmental Stresses in York River.

I wish to call your attention to a technique and some past data that may be useful as physiological indicators of overall suitability of the York River environment. In the mid 1950's and thru most of 1960's, we held wild stocks of oysters imported from upper James River (disease-free area) at VIMS Pier for weekly underwater weighing. Our purpose was to measure short-term growth and the occurrence of diseases. Usually 50 or 100 oysters were numbered and weighed weekly. Only the technique has been published and the data are not summarized. I attach a copy of the paper from which you can get an idea of the sensitivity of the method.

I suggest that you consider arranging to monitor York River waters regularly with lots of oysters. Sick oysters could be discarded as they appear and new imports substituted. Two man-hours a week would suffice for cleaning and weighing 50 oysters. After some experience, one can judge the suitability of phytoplankton populations for shellfish growth on a short-term basis and detect phytoplankton blooms ("red tides") very quickly. My experience is that red tides usually appear about 10 July each year and are gone in 4 to 6 wks by 1 Sept. altho in a recent year it persisted longer. I think I have growth data to show that red tides were not as intense in the 1950's. It takes river-wide blooms to stop oyster growth for they feed when water is satisfactory during part of a tidal cycle. I have never experienced deaths of oysters at VIMS that I could attribute to blooms.

I won't try to outline a program at this time. Since oysters are pretty tolerant of pesticides, heavy metals, oil and even physical changes (close until conditions improve), I would think that monitoring at VIMS would suffice. If special areas were considered a problem, the oyster is a good "computer" of bad environment. The facile measurement of pollutants in oysters does not necessarily command them as indicators for more sensitive organisms including their own larvae. If a quick estimate of environment is needed, free spat can be weighed daily with enough precision to be useful (small oysters grow faster and it is shell deposition that we measure). There are seasonal variations in growth, partly temperature effects but probably more quality and quantity of food. Winter months cannot be assessed.

M E M O

TO: Dr. Bender January 2, 1974

FROM: J. D. Andrews JA:at

SUBJECT: OYSTER CULTURE IN YORK RIVER

A short "overview" of shellfish culture in the York River in relation to your list of environmental stresses is offered.

Oyster production is almost lacking in the lower half of the York River and Mobjack Bay now. No private planting is done and public beds are scarce, poorly stocked with oysters and shells, and both MSX and Dermo operate vigorously most years (Dermo got into state seed planting near Pages Rock this summer with heavy losses).

On the positive side are good growth, some rather significant sets in lower river and Mobjack Bay tributaries (1971 and 1973 e.g.). Drills are now at low ebb (present but scarce) and MSX has receded to lower end of system the past two wet years. Fattening of oysters is only moderate most years.

The potential for shellfish culture is too great to write off the river as a wasteland and garbage dump. Mobjack Bay before 1960 had the largest plantings of oysters in Virginia (2-3 million bushels). Its tributaries have potential as seed areas. Dermo has long been absent from Mobjack's large blocks of private planting grounds. No one knows the number or value of private oyster culture in tributaries for home consumption. The creeks are inextricably tied to the river in setting rates, pollution, and will become prime sites if off-bottom mariculture ever becomes a reality.

Joe and Dexter have demonstrated the rather impressive stocks of hard clams available in the lower river and bay.

One could not tote up much tangible shellfish value from the system now, but the potential remains despite diseases, predators, low populations and mis-management of the resource. I think we already have increasing disruption of natural populations (phytoplankton particularly) from nutrient additions. A six-week bloom of Porogentrum in April and May 1973 caused no early oyster growth for the first time in my many years at VIMS.

One tends to concentrate on what appears to be major problems like York Co. Sewage (they project growth from 35,000 people now to 150,000 by 2000) but each of the 13 or so items listed in your December 20th memo contributes its stress and they often sum synergistically. Don't underestimate shellfish importance by present levels of activity. The sytem is relatively clean and intact by comparison with other estuaries. Your overall look at the stresses on the system is essential and the correct approach.

Comments on MARAD Waste Treatment Program

3 January 1974

J. D. Andrews

After reading EIS, and VIMS research proposals, I get the impression this is a hell of a poor way to run and to evaluate a prototype for handling bilge and ballast waters, oily and otherwise unknown. MARAD and most other agencies seem so overwhelmed by the desirable objective of treating wastes not now reclaimed, and the "apparent" cheap land and facilities that "haste and waste" is inevitable.

The whole concept is superficial treatment, then dilution in the York River instead of in the ocean! VIMS is given the almost impossible job of evaluating chronic effects after dilution at arbitrary distances from the discharge.

MARAD proposes to create a lot of barge traffic in the York River to use a facility not designed for the purpose. Why doesn't the Navy retain these buried tanks for storage of fuel when it becomes possible during the next decades of energy crisis. They can no longer fuel up in any port and hence demand civilian supplies.

There is nothing wrong with VIMS running chemical bioassays but first they must build or simulate a pilot plant operation and collect samples from a complete array of cargo and oil transport ships. Then they can start fishing around amongst the thousands of oil-derived organics, detergents, etc. for toxic ones.

The first assumption is wrong! We should not quietly permit any pollution from these sources, yet our choices of test organisms (4 methods) presume that there will be toxins. The choice of four (1) organisms to represent positions in food chains implies pollution is expected even with dilution. Why not test effluents directly and if they are harmful, the program is no go! One could begin testing on AMOCO's effluent before it is diluted with cooling water now. It appears evident that they have a much more sophisticated treatment facility than the "prototype" provided. We have not been without damage from AMOCO although the troubles appear to be related to spills.

I do not concur in the choice of organisms or of life stages for testing because of tolerances and difficulty of testing (time and size (cost!) of facilities). I know little about bioassays, but I would choose oyster larvae (first 48 hrs) and one or more of the nannoplankters John Dupuy uses for food (species isolated locally). If these species do not thrive in Dupuy's set up (essentially filtered standing water), then the raw effluent is harmful.

If we are going to accept dilution, then let it go back to the ocean in the same barges. A prototype for any big-scale continuing operation is always engineered for the purpose. Why not this one?

PRODUCTION OF SUPERIOR OYSTERS FOR MARICULTURE

J. D. Andrews

An accumulation of brood stocks from laboratory breeding and field selection has become an important asset after eight years of genetic studies. Several strains have developed strong resistance to a major oyster disease caused by the pathogen Minchinia nelsoni and some lines exhibit rapid growth and strong genetic traits of shell shape and thickness. Properly manipulated, these inbred strains offer considerable promise for use as brood stocks in mariculture.

Breeding and monitoring of selected lines of genetic stocks has accelerated in the past year. In the past, some 10 to 12 lots of new progeny were added each year, but in 1973 over 30 lots were produced by the Invertebrate Culture laboratory. New food organisms and improved culture techniques increased success with larval broods including inbred sibling pairs. The accumulation of numerous laboratory-bred lots with desirable traits from past yearclasses that are being held for possible breeding has become critical in terms of manpower for monitoring them. This has been complicated by failure of MSX to produce natural infections in 1972 because of low salinities for the first time in 13 years. Therefore, all recent lots must be held an extra year or two to test for disease-resistance and 1973 too, threatens not to provide MSX selection and data on level of resistance. Fortunately, numerous lines with proven resistance are available and their progeny are expected to retain low vulnerability to MSX. Excellent resistance to MSX or Minchinia nelsoni (10% per year) is confirmed, but the disease caused by Dermocystidium continues to decimate most lots when it gets established.

Five generations of close inbreeding (often sibling pairs) coupled with stringent selection have produced wide ranges of phenotypic segregation in progeny. Variable growth rates are most

conspicuous between and within lots, and shell thickness and shell shape have exhibited wide variations. Meat quality and ratio of shell volume to shell cavity were measured in 1973 for the first time.

Selection of breeding lots and individuals is complicated by the wide range of phenotypic traits available. These include fast growth, thin and thick shells (1 to 2 ratio), cupped shells, runty oysters, and most importantly breeding quality. Inbreeding depression is evident in recent lots which poses the problem that large oysters may be heterozygotes and if bred may prolong the fixation of homozygous traits. Over 100 lots of oysters are being held and monitored hence rigid selection of breeding lines must be made in 1973-74.

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Inbreeding has produced oyster lots with extremely variable growth rates, both between and within lots. Selection of desirable breeding lots is complicated by numerous traits with vague or difficult markers (recognition capability). In addition, characters such as shell thickness, meat quality, and shell shape are exhibiting wide variations from one lot to another. Measurements were made in 1973 of new traits for the first time.

Excellent resistance to MSX (10% per year) is confirmed, but Dermocystidium continues to decimate most lots when it gets established. A very large numberof lots of oysters are being monitored (well over 100) and rigid selection of breeding lines must be made in 1973-74.

MOLLUSK STUDIES

Introduction

The dominant event of the year was the occurrence of Tropical Storm Agnes in late June 1972. This storm depressed salinities beyond all previous recorded periods and caused drastic losses of commercial shellfish and extensive changes in distributions of pests and fouling organisms — indeed of all plant and animal groups in Chesapeake Bay. An extremely wet year in 1971 was followed by Agnes and a wet fall in 1972. Losses of oysters were extensive in the James River, the Rappahannock River, and most seriously in the Potomac River. Brood stocks were much reduced and no recruitment occurred in 1972 (failure of setting). Seed and market oysters are in increasingly low supply with greater dependence upon Maryland imports for marketing. The impetus for hatchery production of seed oysters has increased greatly in the past year. Two hatcheries are in production in Virginia and several more large ones are being planned in Chesapeake Bay. The use of hatcheries increases the urgency to obtain superior oysters for broodstocks. Breeding genetic lines of superior oysters is the main thrust of the program in this Department.

EFFECTS OF AGNES ON FOULING ORGANISMS AND PESTS

The low salinities following Agnes pushed mobile species down the Bay and rivers, killed many sedentary organisms, and eliminated many species from large areas of their normal ranges. Most important of the changes was elimination of oyster drills that prey upon young oysters from the Rappahannock River area and drastic reduction in numbers and range in the James and the York rivers. Many years may pass before drills attain their former abundances and distributions during which natural sets could repopulate lower river areas. Sponges, tunicates (sea squirts), and macroscopic algae were decimated in all rivers, but planktonic larvae have already initiated repopulation. The Rappahannock River is the chief beneficiary of the reduction in pest species. Problems with rope grass (hydroids) on crab pots, lines and pilings were encountered as these low-salinity species flourished in lower river areas. A paper describing the effects of Agnes on epifaunal species is to be published in Chesapeake Science in November 1973.

The nutrients added to Chesapeake Bay by excessive runoff have resulted in well-conditioned oysters, but also they created problems. In April and early May 1973 an extraordinary bloom of the naked dinoflagellate Prorocentrum prevented spring growth of oysters for about 6 weeks - an unprecedented occurrence. Summer blooms of dinoflagellates (reddish water) also disrupt shellfish growth for extensive periods during hot weather.

SERVICES

Tropical Storm Agnes demanded a lot of field and survey work on shellfish mortalities , hydrography, and fouling studies in 1972-73. The fouling studies have been summarized for publication, but much follow-up work to record the redistribution of displaced species must be done for several years. The situation is most unusual and may not occur again for centuries, hence the urgency.

The advent of hatcheries with "free" spat, that may be shipped by the millions at 2 to 3 mm size to anywhere on earth, plus the world-wide shortage of oysters is encouraging shellfish producers to make or consider introductions of exotic species or to transplant non-adapted races to fill market needs. Strong opposition by this Department to uncontrolled imports was voiced in a panel discussion of the subject at the National Shellfisheries Meeting in New Orleans in June 1973. The Pacific oyster is being planted in Western Europe (France mostly) in recent years in large quantities and disease problems have occurred simultaneously. The European scientists are now concerned, and the states along the Atlantic Coast of North America should be too. Strict laws are needed.

Disease studies of oysters stimulated by MSX epizootics have provided a nucleus of scientists and capabilities that have been utilized in blue crab and other invertebrate epizootics and diseases in recent years. An invited review of oyster diseases was given to the Wildlife Disease Association in a session on diseases of marine organisms and fish.

Dr. Andrews

RESEARCH GOALS AND LONG-RANGE PROGRAMS

Department of Malacology

J. D. Andrews

13 June 1973

The program of breeding, progeny testing, and selection of broodstocks of oysters has the goal of using improved genetic varieties of shellfish in Chesapeake Bay waters just as plant and animals breeders have done for land crops. Attainment of this goal will be more difficult than with farm animals and plants because it is more difficult to control environmental variations in tidal waters. Only the small early stages may be grown in controlled marine environments now. Also, the background of genetic work with shellfish is so lacking, and the number of investigators so few (2 geneticists and 2 selecting breeders) on Eastern Atlantic Coast that progress will be slow.

Ten years of breeding and testing have primarily shown that great genetic improvement is possible. It has also forced improvement and development of techniques of breeding and evaluation. Larval foods are improved, setting time is earlier, and success of inbreeding has increased accordingly. The program has moved from disease-resistance to include all aspects of quality control as objectives in this period. Hatcheries will be the first to use superior broodstock, but it may be possible to manipulate the resulting oysters with increasing effect and hopefully attain dominance over wild breeding stock in a few decades.

(new project)

Virginia Institute of Marine Science
Malacology Department

PROJECT TITLE: FLUCTUATIONS OF FOULING ORGANISMS WITH WEATHER AND IMPACT ON COMMERCIAL MOLLUSK SPECIES

INVESTIGATOR:

J. D. Andrews, Department Head and Senior Marine Scientist

PROJECT SUMMARY:

The dry years of 1963 through 1966 permitted many mesohaline species to move upstream in Chesapeake Bay and become established as pests and competitors. These dry-period communities were dramatically reduced or eliminated in the very wet years of 1971 and 1972 with Hurricane Agnes as a climatic factor. The recovery and readjustment of fouling, epifaunal, and predator species as salinity regimes normalize are informative of community dynamics and important to commercial shellfish species. Monitoring by SCUBA, tray observations and oyster-bed dredging is to be done in limited mesohaline areas for several years.

STATUS:

The effects of Agnes on epifaunal communities has been summarized and accepted by Chesapeake Science for publication. Studies are continuing.

FINANCIAL SUPPORT:

Virginia Institute of Marine Science

INDEX - Fouling organisms (not on list); Taxonomy; mariculture, marine ecology; mollusks; epifauna (not on list:) Infauna (Same); salinity; SCUBA.

Virginia Institute of Marine Science
Malacology Department

PROJECT TITLE: MSX AND SALINITY IN JAMES RIVER SEED AREAS

INVESTIGATOR:

Jay D. Andrews, Department Head and Senior Marine Scientist

PROJECT SUMMARY:

This work was completed and the manuscript written in 1965. It describes the distribution of MSX in 1964 and 1965, a year of maximum penetration of the seed area, and the effects of spring salinities in permitting oysters to reject MSX infections.

STATUS: The manuscript awaits publication in the monograph on the James River.

FINANCIAL SUPPORT:

Virginia Institute of Marine Science

INDEX: James River; Diseases; Oysters; Salinity

Virginia Institute of Marine Science
Malacology Department

PROJECT TITLE: OYSTER SETTING PATTERNS IN VIRGINIA

INVESTIGATOR:

Jay D. Andrews, Department Head and Senior Marine Scientist

PROJECT SUMMARY:

Setting records on weekly, seasonal, and annual basis were kept for a twenty-two year period. The data was tabulated as collected, but explanations and summaries were not written except for the first few years. The data contains information on setting patterns, fouling, changes in populations and predation. It is related mostly to public oyster beds.

STATUS:

The data are organized by rivers; most tables have been completed. Write-up of this data was partially completed, when directed by Division Head in February 1970 to turn over basic data to Mr. Haven (Dept. of Applied Marine Biology)for use in comprehensive review of oyster industry. It was indicated that it would be undesirable to have varying interpretations of the data hence analysis and publication have been suspended indefinitely.

The James River manuscript was completed many years ago and awaits publication in the James River Monograph.

FINANCIAL SUPPORT:

Virginia Institute of Marine Science

INDEX: Setting; Oysters; C. virginica

Virginia Institute of Marine Science
Department of Malacology

PROJECT TITLE: PRODUCTION OF SUPERIOR OYSTERS FOR MARICULTURE-A GENETIC BREEDING PROGRAM

INVESTIGATORS:

Jay D. Andrews, Department Head and Senior Marine Scientist
John L. Dupuy, Associate Marine Scientist, Algal-Larval Culture
Michael Frierman, Research Assistant, Dept. of Malacology

PROJECT SUMMARY:

The objective of this program is to breed, test, and select genetic lines of superior broodstocks of oysters for mariculture in Chesapeake Bay. Several laboratory-bred lines of selected oysters going back to 1964 are available for breeding.

Oysters are selected for rapid growth, superior breeding characteristics, quality of meats and shells, and disease resistance. Progeny testing of pair and group breedings under field conditions is followed by inbreeding and outbreeding to attain broodstocks for hatchery use. Unselected native stocks, both wild and hatchery reared are used as background lots for evaluation of results. Diseases are monitored routinely in test and native stocks.

Hatcheries are being vigorously encouraged to supplement natural seed supplies in Chesapeake Bay following a bay-wide failure of spatfall in 1972. Mariculture requires that brood stock used in hatcheries exhibit disease-resistance, uniformity of shape and quality and rapid growth for early marketing (18 to 24 months). Genetic manipulation of seed stocks and use of cultchless spat in hatcheries and nurseries before planting on natural beds is a major objective.

STATUS:

Active. This program has been active for about ten years. Large genetic variations have been observed, and manipulation of inbred lines to produce hybrid vigor and desired traits is promising.

FINANCIAL SUPPORT:

National Oceanic and Atmospheric Administration
(National Marine Fisheries Service)
National Science Foundation
(RANN Program) (June 1971 - May 1972)
National Oceanic and Atmospheric Administration
(Office of Sea Grant Programs) (March 1973 to Feb. 1974)
Virginia Institute of Marine Science

INDEX: Oysters; Genetics; C. virginica; Mariculture; Hatcheries; Brookstocks

NOTES ON BLACK BOTTOMS IN RAPPAHANNOCK RIVER

14 May 1974

J. D. Andrews

I have heard that the Rappahannock River has blackened bottoms now and that some kind of BOD survey is being conducted. I have experienced this at least three times hence I will recount my understanding of the phenomenon (see 1955 unpublished account of oyster kill in Rappahannock River by Hurricanes Connie and Dianne).

The timing is always mid-May. In 1949 and 1953 it followed very mild winters and excessive runoff. These two conditions are probably linked by the paths of weather fronts. There are several factors that tend to limit mixing, hence oxygen supply on the deeper bottoms which are most affected. It is a period of maximum rate of warming hence increasing BOD after a winters accumulation of organic matter (in situ and brought in with silt by spring flows). The surface water is warm and fresh whereas the resultant salt wedge is cold and relatively salty. Stratification becomes most intense when O_2 demand is greatest and mixing least effective. By mid-May, winter and spring storms for wind mixing have subsided to brief thunderstorms. An abundance of nutrients has previously caused intense blooms of diatoms and dinoflagellates which are dispersed or precipitated by mid-May. Tidal mixing is not very effective in mixing water layers adjacent to the bottom because of stratification, linear flow and bottom drag (slow currents). The load of oxidation demand simply exceeds the supply of O_2 on the immediate bottom and all surfaces (bottom, oysters) go anerobic, thereby killing standing crops of infauna and eipfauna

which exacerbates the situation. What role H_2S has in killing live organisms can only be conjectured but it is probably large once O_2 is depleted for the oysters and bottom muds have a strong H_2S odor. One can scarcely take water samples close enough to the bottom to obtain zero O_2 readings with conventional methods. Yet this is required to form heavy metal sulfides that cause the black color and bleach quickly in air.

Usually oysters can close and remain anaerobic until some O_2 comes along but durations of the condition are almost impossible to measure. Suffice it to warn that apparent survival of mid-May black bottom conditions does not relieve the threat of accentuated low oxygens later in the summer when deep waters regularly exhibit low O_2 levels every summer. In 1953, oysters died after 1 June when improved bottom conditions misled us to believe the danger was over.

M E M O

TO: Dr. Jackson Davis May 14, 1973

FROM: J. D. Andrews ✓ JD:at

SUBJECT: O_2 DEPLETION AND BLACK MUD

The O_2 depletion reported in the news release is not as simple as this account implies. I have witnessed several "black bottom" crises in the Rappahannock River and have written descriptions of them. They always occur in early May when temperatures are rising rapidly, winter accumulations of organic matter on the bottom must be oxidized, freshwater flow is at a peak typically, hence vertical stratification occurs and blooms result from high nutrients. H_2S is produced and heavy metal sulfides coat everything black. Once initiated, the condition is self-feeding for other organisms are killed. One year oysters were killed in the Rappahannock River later in the summer by low oxygens.

We have been noticing black mud in our oyster trays for the past two weeks (off the bottom a foot). The mud is highly sulfurous and smelly. Polydora ligni helps collect the mud in our trays but is only moderately abundant this year. We had quite a lot of windy days in April this year which makes the phenomena even more striking.

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M E M O

TO: Dr. Jackson Davis March 28, 1973

FROM: J. D. Andrews JDA:at

SUBJECT: INVASIONS OF CORBICULA FLUMINEA

This small freshwater clam has been in the western US for some 30 to 40 years and one of some 6 or 7 species may be native there. It has had dramatic effects on water quality, power plants, and irrigation systems. It prefers sandy or gravelly bottoms and occurs in great densities (hundreds per sq. ft.). The clam is slow in growth taking 3 to 5 years to reach 30 mm in the Tennessee Valley. Young of the year may reach only about 6 mm hence most clams found are "tiny" as Abbott states.

About 15 years ago (1957?), the clam was found in TVA territory and quickly spread throughout the system. It has been a pest there too. It is very hardy, will live under severe exposure, and became a problem for one cement company using river sand by popping out of finished cement surfaces.

The clam is ideally equipped for dispersal being hermaphroditic and brooding its larvae. It was discovered between miles 40 and 70 in the James River in 1971 by Bob Diaz or some of Bender's group. The largest clam taken was 27 mm and may be as much as 5 years old. Brehmer is concerned that it may become established in the S. Anna River and stop up the power plant condensers, etc.

The clam is thick-shelled and shell erosion nearly always occurs because the yellow periostracum is lost near the umbones. The clam is eaten by ducks, turtles, flatworms, sheepshead (drum) and Asiatic people.

The clam may be spread by waterfowl, dredgings, and people in such ways as aquaria. It would be pointless to legislate against it. We talked about publicity this morning (to put down Abbott's publicity) but even that may be unwise.

It provides no threat to the marine environment except possibly indirect ones such as nutrient storage and possibly massive kills.

Others here have more intimate knowledge of the clam than I do. Hence, I have not attempted a literature study and the paper I have is 12 years old. It should be collected for museum deposit since the shape is quite variable and the species somewhat uncertain.

M E M O

TO: Dr. Jackson Davis March 28, 1973

FROM: J. D. Andrews JA:at

SUBJECT: DECLINE OF OYSTER POPULATIONS IN UPPER JAMES RIVER AFTER AGNES SURVEYS WERE STOPPED

Curtis found Horsehead Bar (several places) to have deteriorated greatly since our last visit there about six months ago. Losses from Agnes were not too severe, but persistent low salinities have kept oysters very poor. Now at the end of winter when oysters try to feed, they are too weak, (even if salinities are suitable) and many are dead and dying. Boxes are abundant, live oysters scarce, and all are weak. Whereas we usually collect some 3000 oysters in a day, this year we got only 12-1500. The mussels seem quite healthy.

The critical period for the seed area with all its weak oysters is from now to the 1st of June. If salinities persist below 5 o/oo thru the usual 1 May low-salinity peak, we may lose many more oysters.

If valuable information on salinities and organisms changes become available to you, I would appreciate knowing to help plan surveys of fouling as a follow up on Agnes.

M E M O

TO: Dr. Davis January 9, 1973

FROM: ~~Jackson Davis~~ J. D. Andrews JDA:at

SUBJECT: MANUSCRIPT ON THE JAMES RIVER SEED AREA

Published in 1982, Special Report 261 Applied Marine Sci.

This manuscript was prepared in the 1960's and last revised in 1969. It covers setting records from 1946 thru 1967. It was prepared for the James River Monograph hence has an organization revolving around pre- and post-MSX differences. It was intended to be a summary of my data and interpretations of setting in Virginia's most important seed oyster area.

I am requesting that it be placed in Special Scientific Reports or other suitable series to make it available for reference and use by other scientists.

The manuscript is long with many tables (10) and figures (22), hence would be very difficult and costly to publish. To make it available without reproducing costly xerox or other copying, I suggest that it be microfilmed by MERRMS. Thereafter microfiche copies could be loaned or sold cheaply. This would not prejudice publication of the manuscript in the James River Monograph when money becomes available to do this.

Much money and effort have gone into these data collections, compilations and analyses. It distresses me that they are not available for use.

OYSTER DISEASE TAKES A HOLIDAY IN 1972

(MSX fails in 13th year)

In 1959, a new disease of oysters appeared in lower Chesapeake Bay caused by a protozoan organism called MSX or Minchinia nelsoni. For twelve consecutive years, MSX killed each year about 50% of James River seed oysters planted in the lower bay or held in monitoring trays. Large acreages of private beds have not been planted for over ten years because of this disease. Most oysters are now grown in low-salinity areas where the disease does not occur.

Now, in the thirteenth year of its history, MSX failed to cause an appreciable loss of test oysters. The relief may be quite temporary. Hurricane Agnes which killed so many oysters in the upper parts of Chesapeake Bay and its tributary streams with freshened waters, also reduced salinities in the three major Virginia rivers where MSX is usually active. Low salinities prevented new infections and permitted oysters to overcome those already initiated.

VIMS scientists are awaiting the summer of 1973 expectantly to see if the unknown sources of MSX infective material have also been affected. The disease has never been transmitted from one oyster to another under laboratory conditions. Expectations are not too great, for a few late cases of MSX appeared in the fall of 1972 when salinities were approaching normal levels.

One important change in the behavior of MSX offers some hope of improvement in the future. Beginning in 1968, MSX failed

to produce late-summer infections, hence the infection period was reduced from five to about two months. If this pattern persists, it would allow oystermen to plant in MSX areas in August or September and get about 10 months of growth before June infections occur.

The other alternative is for planters to obtain scarce selected seed from MSX areas, or grow resistant oysters from hatchery seed which is expensive. VIMS has MSX-resistant breeding oysters but they must be spawned and reared in hatcheries to a suitable size for planting. Hatchery seed is more expensive than wild seed oysters at present, hence not readily available.

The other major disease of oysters caused by the fungus Dermocystidium is still active in most high-salinity areas. It persists in infected oysters even in low salinities although it does not kill them. The fungus increased in abundance during the two consecutive warm falls of 1970 and 1971. It kills oysters only during the warm summer months whereas MSX causes deaths throughout the year.

Oystermen may be interested to know that sick oysters are easily picked out of shucked specimens by poorness except during the summer spawning season. Oysters in legged trays used to monitor MSX and Dermocystidium in Virginia's rivers were exceptionally good in condition or "fatness" when sampled in December. Trays in the lower Rappahannock River, the York River t Gloucester Point, and Hampton Bar showed no sick oysters and were estimated to shuck about a gallon per bushel. Condition indices for Rappahannock, Piankatank, and York river lots were

13.0, 13.3 and 10.9 in December respectively (compare with monthly reports for native oysters by Haven in the Bulletin). All the tray oysters were Horsehead, James River seed ~~to begin with~~ imported as disease-free stocks in spring 1972. The oyster diseases do not affect the edibility of the shellfish except that sick oysters are low in stored glycogen or food reserves.

SCUBA on Inshore Wreck Shoal Shellplanting

(250,000 bu. planted in late July)

J. D. Andrews

21 August 1972

Both Curtis and I dived on the MRC shell planting inshore of Wreck Shoal. The planting is well marked by stakes and I was pulled by boat from offshore to inshore across it and back. The bottom is soft sand in this area with no shells or oysters at all. I began in bare sand offshore of the line of stakes and went to bare sand inshore of another line of stakes. Our diving indicated that the shells are mostly confined within the staked area.

My strongest impression is of the shells being covered with a coat of fine silt and detritus that fluffs up at the slightest motion. It was late ebb tide and the depth was 8 to 10 feet but current was not noticeable and visibility was good. There was no appreciable movement of silt near the bottom as I entered new areas being pulled behind the boat. One could use a "flush" board over the shell bed but the silt would settle right back on the shells. This accumulation of about a month cannot be removed in my opinion. I could see small spots of clean shell where crabs or mud toads had burrowed in the shells or where Curtis had been over the bottom. I saw an 18" catfish but recall no other living thing although this is not unexpected while being pulled along close to the bottom at about 1 mile per hour. Actually at times the shells began to blur at that speed and within a foot of the bottom. The silt coating was not stuck on the shells but after

this viewing, I can understand why shells planted during setting attain several times as many spat as early ones.

The distribution of shells on the plot appeared to be quite good, but this is to be expected with a heavy rate of planting. Occasionally shells were thin enough to see the sandy bottom but more commonly they were perhaps a foot deep. I would run a gloved hand into the shells seeking the bottom and find only shells. There were very few bare sand spots except near the borders of the planting. Occasionally I popped to the surface to report bare areas and see where I was, only to return to the bottom and find shells again -- while being towed. At the other extreme, both Curtis and I found shell banks two to three feet high and lower shell ridges were not uncommon. I could not explore the length of these ridges on my survey although Curtis stopped the boat and motor each of the dozen or two times I came up to report. These banks declined abruptly at their edges hence it was easy to see how high they were. These were not common in the middle of the plot and may represent turning or stopping of the barges although Curtis found a big one at the edge running up and down river and I found one running across the river.

Shells do not tend to sink in this sandy bottom although much of the planting is small shells and cinder which is ideal for quality of seed. Once in the 1950's, a small buy boat load of shell was planted even further inshore than this plot and it caught a set but became lost eventually. We were concerned that winter storms would sand over the shells but this plot is of a size that prohibits that although storms may move some shells -- there is nothing to attach

to in the bottom -- only the weight of the shells protects them. This shell bed should persist for many years, especially if an oyster strike occurs to lock the shells in place. I emphasize this because it may take several years to obtain any appreciable number of oysters. I think it would be desirable to sprinkle seed oysters on top the shell planting to try to attract spatfalls. Earlier shell plantings in this vicinity (below) in the 1960's required several years before any appreciable spatfall occurred where as nearby oyster "rocks" were getting better but still light sets.

This was an efficient shell planting from the standpoints of cost and objectives. I can't help but wonder what the effect would have been if this half-million bushels could have been scattered lightly over the producing oyster rocks. The method would have had to be altered drastically. At least a small control would have been informative. I'm afraid shellbags hung over the planting will not reflect the true value of the plantings. Some shellbags filled with the Maryland dredged shell and placed on the planting and offshore on Wreck Shoal may give some idea of the relative availability of setting larvae.

Some shell brought back appears to have no fouling yet although a little "mud" is sticking to the shells. In normal years, I would say that this planting was a month early, but who wishes to go out on a limb with predictions this year. With low salinities and poor almost spawnless oysters, it would seem to take a miracle to get setting in August of 1972, but the stratified transport system now there is

usually found only in September when waters have cooled a little. I can't in all honesty criticize the heavy rate of planting in this area on sandy bottom. I would estimate that somewhere between 10 and 25% of the shell is exposed to setting -- probably closer to the lower figure. The James River differs from other seed areas in its growth characteristics and unfortunately in its setting potential in recent years. One must look upon these plantings as attempts to establish new seed beds. The choices of areas, if not the exact places, meets my approval. If we can be lucky enough to get a good strike, it will be acclaimed a great success. The shells should remain there many years. Our job is to monitor events on the plantings for a number of years. The commitments to shell planting in the James River have always been too little and half-hearted. This represents a major effort and must be followed accordingly.

M E M O

TO: Dr. Jackson Davis August 11, 1975

FROM: J. D. Andrews JDA:at

SUBJECT: NMFS PROJECT BACKLOG

I think we are not giving sufficient attention to the soft and hard clam potential in Virginia. Both have increased in landed value per unit vs the oyster (4¢ + apiece for hard clams and $12 per bushel for Mya with yields of 12 quarts per bushel).

The critical problems are survival of young and methods that would enhance it. The hard clam obviously reproduces best on shelly oyster beds with mud substrata - often abandoned ones. The shelter provided by shells in 15 o/oo salinity and higher seems to be critical to reduce crab predation (witness clamming on Miles' Willoughby Spit abandoned oyster beds and Hampton Bar). Dexter has survey data. Should some shell plantings by State have as primary or auxillary purpose the enhancement of clam production?

The heavy sets of Mya following Agnes and wet years suggest that this species could be cultivated in Virginia. The Sea Grant study on rays should also look at the potential for clam production on shelly public and private grounds. The selection of areas and salinity regimes must be considered in view of ray distribution and activities. Only very casual effort has been made to monitor clam setting although Mya larvae are abundant in the fall in water samples and appear regular and successful in setting.

M E M O

TO: Dr. Jackson Davis May 10, 1974

FROM: J. D. Andrews JDA:at

SUBJECT: LETTER FROM RICHARD W. COLE

I am perplexed as how to answer this letter in view of our new law and my own convictions. They have SSO in Rehoboth Bay and Indian River and Haskin has found it in Delaware Bay. Also there is an old practice (before MSX) of planting Va. seaside "brush" seed in these ocean front waters. Furthermore, I don't understand the need for Va. seed in view of the best sets and oyster prospects in Delaware Bay since Haskin came there over 25 years ago (Haskin to me by phone). I know that most of the seed beds are on the New Jersey side but there must be some setting on Delaware beds. On the other hand I have favored use of Va. Seaside seed in Rehoboth and Indian R. as the habitats and risks are very similar - also in the past the oyster farmers were mostly Virginians!

COMMONWEALTH OF VIRGINIA

VIRGINIA INSTITUTE OF MARINE SCIENCE
GLOUCESTER POINT, VIRGINIA 23062

June 6, 1974

Dr. Richard W. Cole
Fishery Biologist
Department of Natural Resources and
Environmental Control
Dover Delaware 19901

Dear Dr. Cole:

Virginia is now in the process of implementing a new exotic species import law. We have tried to recognize familiar and long-exercised practices of shellfish culture to avoid unnecessary interference and paperwork. We have accepted the transplanting of oysters anywhere in the Chesapeake Bay area as natural and impossible to alter or police. This includes Seaside of Virginia and Maryland. I hold the view that seed oysters from outside of this area should not be planted in Virginia waters except when such import is determined, on a case by case basis, to present no appreciable risk of introducing diseases or pests. The industry is too valuable to hazard damage by careless or accidental importation.

My own attitude is that there should not be large-scale transplanting between regions because of racial differences and the danger of diseases and parasites. I would agree with you that importation of Virginia stocks into Delaware Bay is not desirable even though present diseases (MSX and SSO) are present in both areas. Seed is in short supply in Virginia and Haskin reports excellent sets on N. J. beds in Delaware Bay recently. I don't understand the need or economics of Virginia seed there now.

The seaside bays of Virginia, Maryland and Delaware provide habitats and seed stocks of a distinctive nature. Before MSX there was the long-established culture practice of

planting Virginia seaside "brush" oysters in Rehoboth Bay and Indian River. I believe this region could be treated as an entity and permit transplanting if the economics permit. MSX and SSO were both common in these Delaware seaside estuaries in the early 1960's by my own sampling. It is my impression that these Seaside estuaries in Delaware do not produce their own seed which makes for good growing areas and that the two estuaries are barren of oysters now. I believe the three states should work out mutually beneficial regulations to encourage oyster culture along seaside.

I hope this delayed answer to your letter correctly states Virginia policy but I am sending a copy to Mr. Douglas of the Virginia Commission who may wish to make further comments.

Sincerely,

Jay D. Andrews

J. D. Andrews
Senior Marine Scientist

JDA:at
cc: Honorable James E. Douglas, Jr.

COMMONWEALTH OF VIRGINIA

VIRGINIA INSTITUTE OF MARINE SCIENCE
GLOUCESTER POINT, VIRGINIA 23062

March 16, 1976

Mr. John Hope
Bureau of Shellfish Sanitation
State Health Department
Madison Building
Richmond, Virginia 23219

Dear John:

Enclosed is a list of the most abundant or important species of mollusks found in the mesohaline and polyhaline areas as specified in your telephone call of 15 March 1976. The list applies to the shorelines of Chesapeake Bay and the creeks tributary to them. Other species occur but they are scarce or of little importance to the ecosystems of the area. You may wish to sort out predators for separate treatment. They not only keep fouling organisms partly under control but also destroy the young of commercial species.

There are an infinite number of permutations of effects on the ecosystems that would occur with alterations of abundance, distribution, timing, reproductive rates and periods that could be expected from disturbance of the animals and plants of these areas. The short-lived species usually recover much faster than those of longer life span. However, these alterations are constantly occurring in nature from salinity and temperature changes as well as more subtle regulatory factors.

Sincerely,

J. D. Andrews

J. D. Andrews
Senior Marine Scientist

JDA:at
Enclosure

MOLLUSKS OCCURRING IN AREAS OF OIL SPILLS

15 March 1976

J. D. Andrews

W = Western Shore Chesapeake (Dividing Creek to Thorofare)

E = Eastern Shore Chesapeake (Occohannock Cr. to The Gulf)

Bivalves (Found in both areas unless marked otherwise)

	Anadara transversa - blood or ark clam	
	*Brachidontes recurvus - hooked mussel	(A)
	Anomia simplex - jingle	
	Arcuatula demissa - ribbed mussel	(A)
✓	*Crassostrea virginica - oyster	(A)
	Laevicardium mortoni - Morton's cockle	
✓	*Mercenaria mercenaria - hard clam	(A)
	Gemma gemma - gem clam	
	Petricola pholadiformis -	
E	Spisula solidissima(?) - surf clam	(A)
	*Mulinia lateralis	(A)
	*Macoma balthica -	(A)
	Tagelus plebeius - short razor	(A)
	Ensis directus - razor clam	(A)
✓	*Mya arenaria - soft-shell clam	(A)
	Bankia gouldi - shipworm	

A = abundant, conspicuous or important in food chains

✓ = Food species for man

* = Important food species for blue crabs, fish, snails and other predators - that is, food-chain members.

Snails

Littorina irrorata - periwinkle (A)

Crepidula convexa - slipper shell (A)

Polinices duplicatus - moon snail

Eupleura caudata)
) - drills (A)
Urosalpinx cinerea)

Anachis avara

Mitrella lunata

✓Busycon canaliculatum - conch

Nassarius vibex) (A)
) mud snails
Nassarius obsoletus) (A)

Melampus bidentatus - marsh snail (A)

Bittium varium - in eel grass (A)

Nudibranchs ? - common seasonally

(Several species - errati

These lists consist mostly of common, abundant, or conspicuous species that are mostly widely distributed and found in moderate to high salinities (Polyhaline and Mesohaline). Both areas cover both salinity categories. Some species are found mostly in low salinities or up creeks but are present in the zones prescribed. Some two-thirds of known species are rare or dubiously present in these areas and have been omitted.

MORTALITIES IN JAMES RIVER

17 Nov. 1976

J. D. Andrews

The six samples from public oyster grounds were counted and sampled for mortality and disease prevalences. Capt. Sadler obtained and delivered the samples himself and wisely brought 1/2 bushel licks as they came off the bottom. We had noted some death rate in our Wreck Shoal tray in late September but none on the rock. These samples were collected 19 October 1976.

	Mort. % boxes	Diseases (%) MSX	Dermo	
Nansemond Ridge	22	10	4	1L
High Shoal	9	0	8	1H, 1L
Brown Shoal	12	0	28	2H, M, 4L
White Shoal	16	8	~~16~~ 8	1H, 1L
Thomas Rock	12	10	28	1M, 6L
Wreck Shoal	7	7	0	

Fresh boxes and significant mortalities were found at all stations. The causes are not clearly defined by the samples although I think nearly all deaths may be attributed to one of the two diseases. Prevalence trends of diseases are erratic. This may be partly due to use of random samples of oysters which included some yearlings too small to expect Dermocystidium! In the past both diseases have been more active on the eastern side of the channel and this shows in lower Dermo prevalences at High and White Shoals. Formerly, Dermo was severe at Nansemond Ridge but it has apparently not recovered from low salinities of the early 1970's. Slides for MSX diagnosis are not all available. The preparation of slides

has become extremely erratic and delayed. This is nothing new. It occurred even when we provided a full-time technician and much supply money thru MSX funds but it has become more aggravated this year. There is nothing we can do now and I know how busy they are at Microbiology.

I am trying to fill in our information from tray samples at Brown and Wreck Shoal but these are not ready yet. I'll probably take more samples for MSX but it may be six months before I have results.

I presume both diseases are involved at all beds except Wreck Shoal where MSX is much more likely to be the cause. I can't explain absence of MSX from Brown Shoal and High Shoal except by sampling error. This is an interim report until the situation is clarified.

WINTERKILL OF OYSTERS

10 March 1977

J. D. Andrews

"Winterkill" of oysters is basically smothering. MSX causes end-of-winter losses but Dermo does not. In the absence of disease, conditions which retard or inhibit respiration become the causes of winter mortalities. Oysters become essentially dormant for about 3 months in Chesapeake Bay. During this cold period, respiration continues by shell clapping altho ciliary activity and pumping are essentially stopped. Even shell repair may occur at temperatures of dormancy.

During the warm season oysters can live in habitats not fully suitable for winter conditions by constantly blowing silt and detritus from the shell aperture. Winter storms and ice movement tend to bury or cover oysters on marginal bottoms, especially in shallow waters. Natural beds are shelly and situated in respect to currents, elevation, etc. to minimize silting. The size of oysters and clumps of shell also affect the sinking rate and degree of burying on soft bottoms.

The survival of oysters on public beds and losses on private beds from winter conditions are usual and relate to the predilliction for smothering on inferior bottoms.

The absence of winter losses in trays argues against the theory that cold alone causes deaths. Extreme low water temperatures reduce the ability to exchange water for respiration and long winters increase the stress. The winter of 1976-77 was long because it began a month early. There were no "warm" periods to allow replenishment of winter respiration.

When pressed hard by low salinities or anaerobic conditions (in mud e.g.), oysters can go into anaerobic dormancy in which all ciliary activity stops and Ca is resorbed from the inside surfaces of valves to neutralize the lactic acid of this expensive type of respiration. One can see the etching of the shell under a binocular and determine if these conditions prevailed.

Curtis reports only rare gapers at Point of Shoal, Horsehead Rock, and Rainbow Rock where we have been dredging oysters all week. Low salinities in combination with low temperatures are serious for Ostrea edulis in Europe and probably there is more stress when salinities are low on our oysters.

M E M O

TO: Dr. Jackson Davis April 16, 1973

FROM: J. D. Andrews JD:at

SUBJECT: SOFT CLAMS IN MOBJACK TRIBUTARIES

Roger Moorman called me from his home on the North River to report Mannose washed up on his beach by the bushel. These are last falls set and the clams were alive. They were in wind-rows and he says he has lived in the area 20 years and never seen this before. He says there are no crabs up there and of course the drills are gone. I don't know whether fresh water or crowding or simply washing by strong winds is most responsible. I have seen this wind rowing on the Potomac River where there is a long fetch (also large oysters). Dexter says there are a few on our beaches.

I have told Dexter and will get word to Jon Lucy if Dexter doesn't. Moorman is quite interested and it may be that survival will be great enough to create some kind of fishery (sports anyway) and we should follow the abundance and notify the public.

This is a post Agnes-wet-weather/low-salinity consequence and we should document it.