

Mary, Mephistopheles, Machiavelli, and Menhaden

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Made in United States of America

Reprinted from TRANSACTIONS OF THE AMERICAN FISHERIES SOCIETY

Vol. 100, No. 4, October 1971

pp. 804-812

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INTRODUCTION

For many thousands of years man has had the ability to think complex thoughts. Whether or not interpreters of man's story have taken note of it, there must often have been some insight and concern about what man, through his numbers and his actions, was doing to his environment and thus to himself. If we knew the full story, we could—if we wished to do so—stratify it temporally into cultural periods of enlightenment and into ages of darkness, or regionally at some point in time into advanced and backward cultures. From an ecological viewpoint we might classify the North America of the last hundred years as dominated by a backward culture that threatened to plunge the world into a particularly black period of ecological darkness.

These were the first hundred years of the American Fisheries Society. Did we meet in our centenary to commemorate those of our society who suffered the establishment's rejection in their struggles to redirect and transform some of the destructive forces during such an unhappy era? We could have named many of our society, but we had never publicly recognized the radical dimensions in their concerns and did not do so on the occasion of the centennial celebrations. Could this have been a ceremonial welcome of the dawning of a new era? For some few, perhaps; many members have neither a vision of nor a longing for a new way of life. Many fishery biologists would be embarrassed to be seen in the camp of those dedicated to the cause of an ecological rebirth of our culture.

Perhaps it is a mistake to attach any significance to centenaries. We recognize ten as a good number because we do have ten fin-

gers. Ten tens must be a very good number indeed. And so, all hail one hundred.

The world seems—and in fact is—a much more dynamic phenomenon than was the world of 1870. Events that loom before us wash over us at rates an order of magnitude faster now. It seems all is in perpetually accelerating flux. Examples usually provided to illustrate this observation are the continued shortening of the minimum time interval necessary for an advanced military system to destroy us all, the increasing speed of communications and travel, the shortening of the useful lifetime of scientific papers, textbooks, and educational curricula.

More appropriate indicators of flux for fisheries people would be examples from biology, ecology, fisheries technology. We have accepted the geologist's inference that our continents are floating about, sometimes break apart and again bump into each other, and their migrations now help us to understand some odd distribution patterns of fish. We see the total evolutionary process as very dynamic indeed—even to the extent that we sometimes find the old relatively static species concept too constraining for practical purposes. There are few if any natural resources within our biosphere that cannot be tapped within a few months of a decision to do so, and then exhausted or overexploited within a few years. We have seen what had appeared to be firmly entrenched large natural communities transform or disintegrate in a decade or two, sometimes with the final extinction of some of the species involved. Some of us are even willing to entertain the hypothesis that we can, by being thoughtless, radically alter our world's climate and thus the whole biosphere. What is now very soon becomes ancient history.

Myriads of "important" processes and events are happening all the time. Unfortunately most of them are either bad or nearly irrelevant in an ultimate—i.e. in an ecological—context. I have referred to some of them below. The headings of Mary, Mephistopheles, Machiavelli, and Menhaden were selected for a number of reasons. I like the letter M. The terms have a general conceptual parallel to Fishing, Famine, Prudence, Pill but not in that order. Thirdly, so many of to-day's events are bad because of ancient human weaknesses and errors.

MARY

History and mythology have few personalities that are venerated with such general unanimity as is Mary, the mother of Jesus of Nazareth. She was evidently a good mother in what must have been very trying times, particularly with a radical son who chose not to take up the fight against overt imperialism in a culture where anti-imperialism was a popular cause. Rather than debunk I commiserate with her in that—presumably through no fault of her own—her persona came to be spun into the mythology of a cult that eventually became powerful within the Christian church and within western culture. It came to be generally accepted that a virgin was immaculate, we were conceived in sin, to engage in coitus was morally tolerable only for purposes of procreation, to practice coitus after taking precautions to reduce the risk of conception was a dangerous sin, etc., etc.

Motherhood is indeed a blessed state. The reproductive process seems imbued with intimations of the miraculous to a greater degree than other biological processes—where "miraculous" need not imply anything supernatural. Yet irresponsible motherhood, which now includes most instances of separate motherhood events, is one of the greatest evils of our day. Perhaps the only blacker sin is that of irresponsible fatherhood.

We can and should celebrate connubial coitus and responsible parenthood, and also excoriate irresponsible reproduction. The problem is to distinguish between them. This will be one of the great social problems of all time, and we will not be aided in finding a

solution by deferring to the mores of old anti-sex cults, at least as they find expression today. It may be that an anthropological Desmond Morris may find that this cult's activities had adaptive value during some earlier period—they seem totally counter-adaptive at our point in history.

Of course, it would be poor strategy to roam the world in a hair shirt preaching the sin of irresponsible parenthood. But it is appropriate to talk "sin" when we tangle with the forces of the sex is sin cult. Few people regularly practice this cult's ethic, but some of the few that do have a disproportionately great effect in the political decision-making process. For you and me, a bishop or a moderator may have no special significance simply because he is a bishop or a moderator; but this is not the case with politicians and legislators. Almost certainly the clergyman ranks far higher in the legislator's scale of importance than you do as a naturalist, biologist, or ecologist. And this is a potentially catastrophic weakness in our culture.

A great problem for the planned parenthood and population control movements is that there are no potent *positive* inducements toward low conception rates within the context of our culture. To offer me more leisure time and more material wealth is no significant inducement if I am already thoroughly bored with much of my leisure time and if one of my biggest day-to-day worries is what the stock market is doing. Procreating, begetting, and rearing children does provide some relief from an otherwise blah existence. Perhaps the only hope for a long-term reduction in birth rates and population numbers is in a radically transformed culture that will provide new meanings for living.

Obviously women should be freed. Let us hope that they decide not to become more male-like. Monocultures have their problems as we ecologists well know. But freeing women alone is not necessarily going to change the culture very much in relation to ecological concerns.

The public media are increasingly recognizing the profoundly radical implications in ecology. Some of them hail ecologists as essential, both in the Platonic and pragmatic

senses of that word. In the August 3, 1970 issue of "Life," Wallace Stegner writes that "ecology is more revolutionary in its implications than either civil rights or peace. To realize every aspiration of black and Third World people would be only to redistribute what we have. To get out of Indochina and curb the Pentagon would do no more than return our industrial society to more defensible uses. But ecology, made a guiding principle in our affairs, would turn our society upside down, question its aims, assumptions and methods, alter its mentality, overthrow its gods. And possibly save it from itself."

I had a puzzling experience a year ago. My topic was "Ecological Values" in a seminar course titled "Twentieth Century Values," and we used Shepard and McKinley's "Subversive Science" as our text. The students, from a variety of disciplines, seemed to reach a consensus that religion was a useful and perhaps necessary component of human culture but that the tenets and practices of our western religion were not now very meaningful in such contexts as imperialism, war, freedom, pollution. Courageously (but with trepidation) I asked whether the group could conceive of a rational process of transforming the existing religion or creating a new one. The answer was in effect that they—the younger generation—were of course doing just that, hadn't I noticed?

Are there really forces in our culture that are attempting self-consciously to transform our religion?

Do we see ourselves as the world's most radical radicals, the potential saviors of our culture? We have practiced ecology for one hundred years. What do we say to a sick culture that has given every indication that it is willing to listen to our words?

There is no going back to the trees to start over again, at least not willingly. No ecologist has a clear fully formed vision of a radically different culture from our own that would be a happy one from an ecological viewpoint. We do know that much about our present culture is wrong. Most and perhaps all humans have strong "pro-nature" urges and emotions at least as children and that our

culture suppresses but that could be encouraged and fostered.

Our revolutionary strategy, it seems, is to work at our culture piecemeal and rebuild massive components of it without causing it to sink into chaos and anarchy—and without playing into the hands of some so-called radicals whose analyses are very largely irrelevant to the major issues now confronting western culture. I hasten to add and to emphasize that many contemporary radical groups seem to be converging to a viewpoint sympathetic to that of ecology and with these we can and should develop common fronts. But there still are some bloody-minded and now rather dated fragments of revolutionary movements whose slogans are quite impotent and irrelevant, as is well-recognized by almost all of the younger generation.

Can we transform our culture piecemeal and rather peacefully? Perhaps, if we can marshal our forces and do it quite rapidly before threatening disasters overtake us. But I am not very hopeful of averting all major ecological consequences of persisting anti-ecological policies. When the crises do come they will bring with them suffering, and thus trigger social strife. Conventional ad hoc accommodations will be proposed and many of these would only serve to precipitate further crises. Ecologists need a high degree of self-confidence to push through to effective solutions. Do we have that self-confidence? Perhaps that is the role of religion.

Hail Mary and Joseph, responsible parents. Hail Jesus born on a bed of straw, in community with sheep and donkeys and doves and dogs and with friendly stars in the heavens. Hail every responsible mother and every responsible father and then welcome and cherish intensely every new child. And as with the miraculous eyes of the child let us again see rocks and raindrops and tadpoles and trees and the minnows of the brook as friends and as family. The earth is good, and life is good; let us affirm them.

MEPHISTOPHELES

Our culture, untransformed, seems destined for an unhappy fate. We can identify a series of Faustian trade offs made long ago, in which

long-term goals were repeatedly and progressively sacrificed for the sake of more proximate temptations. The long-term goal was the indefinitely long persistence of our species in moderate numbers and in relative stability and security within a community of many other species. With great impatience we pursued the temptation of creative self-realization, or of conspicuous self-worship, or of personal salvation to an other-worldly destiny.

One of the earliest of these events that have led to our present state was the acceptance of the Platonic dichotomy between essence and matter. To this basic split was added a series of parallel dichotomies such as God and Devil, good and evil, sacred and secular, spiritual and physical, soul and body. Early Judao-Christianity was dissociated to fit into this $n \times 2$ non-randomized complete block and came eventually to be profoundly anti-environment, since the environment was assigned to one of the Devil's half of these boxes.

Lynn White, the medievalist historian, has proposed that technology was permitted free reign in aiding western man's acquisitive exploitive tendencies partly because the church had quite successfully destroyed belief in nature deities. That animistic or pantheistic aspects of ancient religions probably had great adaptive significance would not have occurred to church fathers steeped in their philosophical system. Instead, characteristics that have adaptive value either to the existing world or to a future physical world, would presumably have been identified as evil.

If Christian leaders had rejected wealth and luxury consistent with early Christian writings, we may never have had our present eruption of mindless technology. But self-consistency has never been a dominant characteristic of organized Christianity. It was acceptable and even virtuous to amass fortunes through organizational or technological skills so long as a proportion was duly presented to people of the church.

Thus there were no effective cultural or religious curbs, a century ago, on the manner in which our non-human environment could be exploited in the acquisition of personal "wealth." In fact there were few curbs on how other humans could be exploited, witness

slavery and the activities of the American robber barons. Most of us now accept the idea that black people and immigrant laborers have certain inalienable rights. Very few of us are willing even to consider whether other species or non-living components of the environment might also have inalienable rights, as is implicit in old religions.

In the Faustian allegory, our technological revolution of the past century has been one of the recent manifestations of a Mephistopheles whose activities can be traced back to the Platonic dualisms.

We are still so bemused by our current Faustian diversion that we cannot really conceive of the possibility that more and better technology may not *of itself* solve the negative effects of what we are now doing. Ultimately the practical question—whether more conventional technology is or is not all that is needed—hinges on whether humans as a whole will spontaneously opt for (a) a decreasing population size as they attain technological competence, or (b) for a progressively decreasing level of resource use and a lower standard of living as conventionally measured, or (c) for both of these. If one or both of (a) and (b) occur "naturally" as a consequence of more of the same kind of technology, then perhaps more technology is all that we need. But it seems to me that neither can be expected to be a purely "natural" consequence simply of present trends or more conventional technology. Even if they were, there would still be a lag period of a number of generations before they would make themselves felt.

Whatever can or cannot be expected to flow naturally from conventional technological competence, everything now points to rapidly accelerating deleterious side-effects on the environment from the technology now in use. We are working assiduously to convert all the world to the western world-view and ethic. Like the snake that led Eve to realize that she was naked, we have taken it upon ourselves to tell all the people of the Third World that they are not only naked, but also poor and benighted. Having convinced them of this, we triumphantly announce that technology can save them—not a new technology but rather the well tried, reliable conventional technol-

ogy. We proffer a kind of technology that we as ecologists find so revolting.

There are a few straws in the wind that the Third World may have begun to reconsider the advantages of a culture that depends basically on conspicuous consumption. At FAO's Second World Food Congress in June 1970 a delegate from a less-developed country poignantly if semi-humorously pleaded that "rich countries" consider a moratorium on further conventional development of their own and other countries in view of the inevitable threat of such development to the biosphere as a whole. Before proceeding any further, western people should expend great efforts at taming their technology.

Also at the Second World Food Congress, many young people of the Third World indicated more interest and concern with social structure than with the alleged advantages of conventional technology. They were particularly interested in developing and fostering rural institutions having learned perhaps that the western conurbations—which have developed hand in hand with our technological prowess—are not fit as environments for humans.

Perhaps such occasional whispered dissent will one day explode into a rage against what we—as missionaries to volunteer technicians to international developers to international civil servants—have done and are doing not only to other human cultures but to all of earthly creation.

Among all the professions within western culture, fishery biologists should from experience be the most knowledgeable about what are conventional technology's deleterious effects on the environment. A large proportion of the papers in our *Transactions* deal with this problem, particularly in recent years. There have been studies upon studies of the effects on aquatic species and communities of eroded soil from farms and roads, of sawdust, farm fertilizers, metals, phenols, fibers, oil, detergents, radioactive materials, pesticides, smoke, heat. All of these enter as technological waste products into the aquatic environment. Who amongst us has not at some time been concerned with BOD, LD₅₀, synergism, fish kills, etc.

We have fought to have corrective technology applied to this or that case of pollution. We have won many small battles, but have been losing the war. It should have been clear fifty years ago that our strategy would not win us the victory. Starting in the 1880's, Samuel Wilmot—one of the first members of our society—began a long fight to keep sawdust out of Canadian lakes and streams. He was forceful and eloquent; his writing resembles that of the ecoevangelists of our own day. Eventually raw sawdust was no longer dumped into lakes and streams. On the face of it, Wilmot had won. But papermills continued to dump increasingly vast amounts of wood fiber and bark into rivers, and how do these differ ecologically from sawdust? Secondly some of the stream communities that Wilmot fought so valiantly to save from sawdust or rehabilitate were very soon destroyed by other materials.

I have concerned myself with Lake Erie for some years, and in particular have taken the time to read earlier literature on it. During the past century there have always been concerned people fighting to minimize the effects of pollution on the lake community. The literature contains many biological analyses, as well as social and political appeals, through these decades, dedicated to stem the onslaught of pollution. But Lake Erie has been transformed—the earlier community has died out and has been replaced by a much less desirable association from man's viewpoint. This in spite of the fact that many influential fisheries people and others tried to prevent the destruction of the community by attacking one pollutant after another as some of the effects of each became apparent.

Amongst our members there have been hundreds of Horatios who have defended individual streams and lakes against particular pollutants. Where legions of defenders may have won a victory, hundreds merely slowed the advance of the mindless monster. And it is still advancing, though perhaps not as triumphantly as in past decades.

The industrial-technological process can generate and spew forth far more new pollutants in a year than the small corps of pollution biologists can possibly screen ecologically.

To continue to cooperate with such governmental policies is to accept ultimate and total defeat.

Surely we understand enough about the effects of pollution on ecological communities that we do not have to undertake a two-year study before we can judge whether almost any kind of hypothetical waste product would or would not have deleterious effects, or to state what many of those effects would likely be. Most generally, we must surely have a consensus here that the great majority if not all industrial wastes do adversely affect some valued characteristics of the communities into which they are dumped. Any ecological advantages are in general more than offset by disadvantages. But we act as though this is not so, perhaps because of our own almost complete personal commitment to industrial technology, or because we follow the legal dictum that all wastes are assumed innocent unless proven guilty. How foolish!

It is clear—if I may digress briefly—that our legal systems have serious weaknesses, and need to be transformed. Every industrialist's lawyer knows that scientific inference presented as scientific inference will not stand up in a court of law, basically because the practice of Western law is too archaic to accommodate scientific reasoning. So we undertake all sorts of pseudo-scientific, pseudo-legal activities to accommodate a rickety legal process. And we remain pathetically submissive in these degrading circumstances.

Besides being irrational, present policies on pollution are also unjust. All of society is now paying immense direct and hidden costs for pollution with net benefits to only a part of society. Besides the social costs involved in environmental degradation there are also the *direct costs of government sponsored pollution research and abatement measures*. This is clearly unjust. The people as a whole should be responsible only for the costs of routine enforcement of laws that have placed the expense of pollution research and control measures squarely on the creators of pollution. The polluters would in turn pass on these costs as best they could to the consumers of their products and services.

We might well go one step further and question not only the social cost of pollution, but also the social value of the products produced. This is a highly rational exercise at a time when entrepreneurs are as much concerned with creating wants as they are with satisfying needs. It is also good political strategy. Now that some people are beginning to consider whether we can much longer tolerate the internal combustion engine or the private automobile, the car manufacturers have suddenly noticed that the environment is more than just roads, parking lots, and garages. Let us demand that public and private agencies that generate electricity cease to spend large sums to induce people to increase consumption of electricity so that they in turn can build more generating installations—with consequences to the environment that we know and abhor.

Who better to make these points clearly and forcefully than members of the American Fisheries Society who have done so much of the dirty work, often at low pay with mean facilities in uncomfortable surroundings by contrast to those of the industrialist-entrepreneurs. Society is ready to listen. Have we been ridiculed so often that we no longer have the courage to speak, even to a sympathetic audience?

My negative comments have been directed at *conventional* technology—the kind that originally developed independently of science and is still largely uninfluenced by ecological science. Technology is the application for practical purposes of insights about the workings of natural forces. A marriage between physical and chemical scientists on the one hand, and technologists (engineers) on the other was effectively consummated about a century ago. The scientists have always remained the submissive partner of that union, as was clearly demonstrated again in the priorities within the moon-shot program. We ecologists have not yet been totally seduced into joining technology's harem of scientists, and we should make it clear that any future relationship between us will be strictly on our terms. That we must accept a relationship is clear, since present technologists left to their own devices would bring down destruction on all of us.

Unlike the physical and chemical scientists, ecological and evolutionary scientists do ask the question: Why? To the extent that we can find answers to the question, we have a scientific basis for ethics. It would be a mistake to think that we now have an adequate basis for a practical ethical guide for all of technology, but it would be a far graver mistake to ignore such partial insights as we already have. We should seriously consider the implications that ecologists as scientists can speak of "ought." In this sense ecological technology becomes ethics. An ecological conscience should never accept as a basic premise that technological development is usually a good thing. It is the tacit acceptance of this premise that has kept fishery biologists the culturally submissive lot that we are.

Faust ultimately broke Mephistopheles' hold on him, unwittingly, by resolutely turning his back to the temptations that triggered the earlier commitment. Perhaps ecological doom is not inevitable.

MACHIAVELLI

In "The Prince" the father of modern political science and technocracy addressed the problem of how to be efficient politically. Tell the good technocrat your wants and he will help you to satisfy them *efficiently*.

Most members of the AFS are civil servants—in fact, almost all are if we include university employees as civil servants one step removed from political accountability. Aside from the small proportion of radicals or Horatios amongst us, we are run-of-the-mill, docile technocrats. Like Machiavelli and the non-ecological natural scientists, the good civil servant and technocrat does not ask the question, Why?

A great majority of us have willingly taken an oath of office and have accepted a tradition which in fact—if not in theory—denies us the right to participate effectively in public discussion of important political issues. A similar statement can be made for wildlife, soil, and forestry ecologists. Canadian civil servants generally accept a role that is even more submissive than that of the American, since the Canadian political system has not

used the system of public hearings where civil servants of different agencies have an opportunity to clash openly. But this is a matter of degree, and the American civil servant who disagrees too publicly with his agency's or his government's policies finds that there are penalties involved.

Note the implications of the following sequence of statements. We ecologists and fishery biologists have radically broad insights into the major modern crises. Society wants to hear from us. Most are civil servants and therefore cannot speak directly to society.

How curious, that society's servants cannot speak to society! Oh yes, we generate many memos and position papers that go up the long ladder of authority. Some actually get to the top—into the hands of a senior politician who got elected and rose to the top because he is thoroughly at home and essentially at peace with the existing culture's mores.

How many fisheries biologists are taking an active role in today's ecological revolution? Who is drafting the major governmental position papers on the environment? Fisheries biologists? Hardly! We are concerned with other issues.

On one question we have rather frequently risked direct political involvement. Should a particular fish stock remain open to commercial exploitation, or should it be reserved for—equally commercial—sportsmen interests? This is a real gut issue!

We become bad civil servants over the commercial versus sport issue perhaps because we were attracted to our profession by conventional sportsman inclinations. Aldo Leopold may have been right when he suggested years ago that humans had deep-seated urges to fish, hunt, kill. Had he read Desmond Morris, he may have restricted that generalization to the human male. It does sound reasonable in an ethological-evolutionary context. If a fairly high proportion of members in AFS have particularly strong urges of this kind, it would help explain an otherwise puzzling experience I have had repeatedly over the past few years.

It seemed obvious to me—as it did to some other members of our Society—that the usual approach to managing, or not managing, sports fisheries could not succeed in providing good

sport consistently for years on end. The large predators were the first to be removed from a virgin stock and were thereafter maintained at low densities. But the large predators are what keep the community organized and fairly stable to the advantage of the large predators. Why not try to fish these highly preferred large predators with gear that would usually not seriously injure them. After playing them and landing them and taking a picture—if you are the kind that likes to brag—return them to their habitat. Catch and eat the smaller tastier ones, perhaps even of the same species, but do return the big fish. This is the sort of non-consumptive multiple use that we preach so fervently in other contexts.

Well, I have tried to talk various junior and senior fish managers into trying experimental management of this kind with bass, pike, muskellunge, and walleye—it probably would not work well with summer caught lake trout. It has worked reasonably well with some brook trout streams in spite of lack of interest on the part of most of us. Why not try it? My suggestion has usually, but not always, been greeted by a surprised and embarrassed look—as though I had proposed that we engage in some propaganda for quite unnatural behavior. The mumbled response has usually involved a guess that it would not be accepted by sportsmen. And that was that!

If there is some ancestral killer urge, I suggest that we work at mastering it, since it seems to be counter-adaptive now. Most men can master the equally ancient urge to court just any young lady whose buttocks bounce engagingly under her mini-skirt. (If we humans were not so numerous, it would be less frequently necessary to check such urges.)

Returning to the broader problems of our complicity in an amoral technocracy, a general condemnation of AFS members would be unwarranted. Besides the lonely Horatios, we have long had committees on ecological matters—committees with large components of civil servants. They have reported regularly at annual and regional meetings and a small devoted minority of members was always present to vote to accept their reports. Some of those reports can be found in fine print in the unread parts of our *Transactions*.

Let us become more concerned and involved. If the existing political machinery cannot cope with an ecological ethic, so much the worse for that machinery.

MENHADEN

Western European countries were plagued with food shortages and some famines during the nineteenth century. Governments encouraged attempts to solve underlying problems and consequently encouraged the fish hatchery movement that began about 1850. Young fish reared from eggs in hatcheries were then stocked in the wild in order that the rivers and lakes should teem again with inexhaustible stores of the finny tribe. Glowing accounts of what could be expected gained converts in North America and these eventually banded together to form our society.

It was perhaps natural that fish culturists and fishery overseers should follow the conventional agricultural wisdom and move species from one habitat to another with as little concern about deleterious consequences as a child toddling through mud puddles.

The bright cornucopian vision of plenty through fish culture and species introductions gradually dimmed over the decades. Somehow it failed to work out the way the dreamers had prophesied. No other set of simple objectives ever again caught our society's fancy. A movement to close sunfish and perch hatcheries and liberalize regulations on panfish stirred some interest during the 1940's. And the 1960's can perhaps be called the decade of pollution studies.

It seems surprising that we as a society have never really become very concerned about the collapse of stocks, the transformation of communities, and the extinction of fish species. Unlike the bird fanciers, we have very little if any subjective concern about the welfare of fish. Everybody knows and cares about the fight to preserve the whooping cranes, who even among fishery biologists cares that the blue pike's flame has recently been extinguished.

In North America the process of stock and species extinction began over two hundred years ago and has accelerated in the ensuing decades. Think of the rivers, lakes, and coastal

areas well-known to yourself and compare them now to what they were a hundred years ago. There are exceptions as with some of the Pacific salmon runs for which fishery biologists devised successful management methods and also succeeded in having them applied.

It may be a tautology to state that the structure of a community tends to deform, become unstable, and transform as stresses on it build up. (How else does one measure stress than by its effect on structural relationships?) That there are a variety of effects on stocks and communities as exploitation or pollution stresses intensify is common knowledge. Many of these effects we recognize as undesirable. In spite of their general occurrence, we have not really studied these stresses as stresses on the community. Limnologists have done rather more with the process of eutrophication as the result of the stress of nutrient enrichment.

On the basis of some early evidence in studies recently begun, it seems that the recruitment of stocks in general becomes more variable as the exploitive pressure increases. This finding, if it is valid, would have an interesting implication. As a fishery builds toward the stock assessor's prediction of optimum yield, the year-to-year catches from these stocks tend to fluctuate with increasing amplitude. If such instability is economically or socially undesirable—as it is usually taken to be—then we have here an additional cost that should be taken into account in arriving at the estimate of stock size and fishing strategy to provide optimum yield.

It may be possible to derive models for optimizing yield that do take instability effects into account, at least for large fisheries. It would not likely be economically feasible to do so for small fisheries—conventional stock assessment theory is even now too expensive to use as a practical guide for most small fisheries. What can we offer as a science of small fisheries?

In fact, there have long been fragments of such a science though they have never been gathered together in a theoretical framework. Examples are the methods of managing ponds in the southeastern United States, and trout

stream management methods throughout the world.

These methods start with tentative inferences or implicit assumptions about the structure of desirable communities and attempt to manage them to maintain a certain "balance." A better term might be "homeostasis." These traditions deserve the support of much more intensive scientific study. Other complex systems—human physiology from a medical viewpoint, a nation's business from an economic viewpoint, complex machinery from a mechanic's viewpoint—are now managed by an approach that makes a series of relatively simple observations or measurements, infers the likely causes of any stress symptoms, and prescribes—usually simple—remedies.

A great deal of modern ecological thought on the structure of communities, as well as many of our own peculiarly fisheries inferences, should be immediately relevant to an understanding of community homeostasis. There would be great advantages in developing such an approach. In emphasizing stability the approach would tend to ensure a concern for stability—which is long overdue since species and communities are among the few truly non-renewable resources on our planet. Secondly, it would be less difficult to communicate with other professionals, politicians, or laymen if we were to use concepts that they now already understand in the context of medical, economic, political, or mechanical systems. Thirdly, it would provide a bridge between an enlightened, ecological conscience, and appropriate long-term management procedures in a broader context than that available in current economic practice.

CONCLUSION

We of the American Fisheries Society should join with other ecologists and radicals in the struggle to transform western culture into something more thoroughly human than the one now passing away. What the world of 2070 will be may depend to a very significant degree on what *we* of the AFS do in the 1970's.

Hail Mary. Damn Mephistopheles. Damn Machiavelli. Hail Menhaden.