

May 8, 2007

President Kinsey and the Marin County Board of Supervisors:

My name is Dr. Corey Goodman. Thank you for allowing me to provide scientific testimony concerning the environmental impact of Drake's Bay Oyster Company (owned and operated by Kevin Lunny) on Drake's Estero, located within the Point Reyes National Seashore (PRNS). Due to limited time, my verbal presentation at the hearing will be a highly abridged version of this written testimony. My conclusions are clear: in contrast to the unsubstantiated claims made in numerous popular press articles, the actual scientific data present no compelling reason to remove the oyster farm from Drake's Estero.

I have spent my entire life as a scientist. I spent 25 years as a Professor, first on the faculty of Stanford University in the Department of Biological Sciences, and then at U.C. Berkeley in the Department of Molecular and Cell Biology. I've started two biotech companies and am currently CEO of one of those companies, Renovis. I've published over 200 peer-reviewed papers in major scientific journals. In 1983, I received the Alan T. Waterman Award from the National Science Board, an honor bestowed upon only one young scientist each year across the entire country. In 1995 I was elected a member of the National Academy of Sciences. I spent over a decade serving on the Board of Life Sciences of the National Research Council, the committee that sponsors most of the environmental studies for the federal government including the EPA. I chaired the BLS for 6 years until my term ended last summer. I also serve on the California Council of Science and Technology which advises our state government about science issues important to our environment, education, health, and economy.

My approach to public policy is simple – I am data driven. I believe that public policy decisions can and should be informed by quality science. But this must be science conducted rigorously, without agendas or conflicts-of-interest. The political process can be dangerously misled by bad or misused science. One of my greatest concerns when I see science being invoked in public policy debates is to make sure that it is good science and not pseudo-science or -- even worse -- a blatant misuse of science.

I have lived in West Marin since 1993. I have watched a number of environmental issues get debated at the interface of science and public policy, and have become involved on several occasions when I thought that public policy decisions were being intentionally misled by bad or misused science. My wife and I purchased a local ranch in 2001, and were recently delighted to have the County approve our plan to develop the agricultural potential of our ranch in harmony with the environment. We look forward to becoming active members of the natural and organic food community of West Marin, with our production of farmstead sheep cheese, and to continue to be good stewards of our land. We are serious environmentalists with strong credentials in what we do locally, and what we support around the world.

I became concerned about a year ago when I read comments in the popular press quoting alleged scientific data and studies that supported the notion that Lunny's oyster farm was degrading the environment of Drake's Estero, that his lease should not be renewed, and that the Estero should become wilderness. If indeed Lunny's oyster farm is doing the bad things I read about, then there is reason for concern. The Estero is an important ecological habitat, and its ecology and biodiversity should be preserved.

As a scientist, I am by nature a skeptic. I don't believe unsupported scientific claims made in the popular press, particularly not when made by people who have a clear agenda. I've seen too many cases in which political agendas drive the misuse of facts (the words "WMD" and "Nigerian yellow cake", along with a former oil company lobbyist editing the federal global warming report, make my point). As a scientist, I want to see that any claim is supported by data that have been published in a proper peer-reviewed journal, and I want to examine the data myself. When I first learned of the purported impact of the oysters on Drake's Estero (as referenced in the popular press), I sought out one of the primary sources – a 2004 master's thesis from U.C. Davis authored by Jesse Wechsler. I was alarmed because the claims in the local paper had little to do with Wechsler's data. This was a stunning case of misquoting science.

That is why I am here today – to set the record straight. It is up to politicians and lawyers to decide about the legal issues of whether Lunny's oyster farm should stay or not. On purely scientific grounds, the data clearly supports the conclusion that there is no scientific reason to kick him out. There is no good evidence that the oyster farm is harming the environment in Drake's Estero. In fact, the data show just the opposite. My only hesitation in coming forward to testify today is the realization that openly expressing my views as a scientist may cause me to come under personal attack by local groups that are determined to remove Lunny's operation from the PRNS. Nevertheless I feel compelled to speak out for good science instructing public policy.

Good science is independent and unbiased, and is funded by sources that do not have an agenda. The problem with much (but not all) of the available research on Drake's Estero is that it was funded by the Park Service, co-designed and/or co-authored by a Park Service scientist (Sarah Allen), and carried out (in 2 of 3 cases) by graduate students who were or had been Park Service employees. Given the clear agenda of Don Neubacher, the Superintendent of the PRNS, to remove Lunny's oyster farm from Drake's Estero, it is inappropriate for him to fund these studies, have his employees carry them out, and then for him or others to claim that the interpretation of these results represents unbiased science. Allen, a PRNS Scientist, has published a number of good peer-reviewed papers over the years from her studies on pinnipeds along the coast. She is clearly an expert on this topic. But her recent reviews and columns concerning the impact of the oyster farm on Drake's Estero are seriously flawed. Each new claim made by Allen in Park Service publications or the popular press is more extreme and biased than the last, and as a body of work represents the politicization of the scientific process. Allen co-authored an article on the oysters and Drake's Estero in the Pt. Reyes Light a week ago without noting her employment. Most troubling is the fact, as I will show you, that all of the claims made in her Point Reyes Light article are refuted by her own published data.

The disconnect between scientific data and the popular press

Let me begin my scientific critique by sharing with you what I learned from the first paper I read on Drake's Estero. Jesse Wechsler studied the impact of the oyster farm on the ecology of Drake's Estero for his 2004 Master's degree thesis at the University of California, Davis under the guidance of Professor Deborah Elliott-Fisk. As a warning of potential bias, you should know that Wechsler had been an employee of the PRNS before switching to get his master's degree at U.C. Davis, and that his study was funded by the NPS. His study of Drake's Estero is entitled:

Assessing the Relationship between the Ichthyofauna and Oyster Mariculture in a Shallow Coastal Embayment, Drake's Estero, Point Reyes National Seashore.

Wechsler set out to examine the impact of oyster mariculture on Drake's Estero. His study focused on fish community abundance, species diversity, and species composition between December 2002 and January 2004. He compared Schooner Bay, an arm of Drake's Estero that has supported commercial oyster culture for over 70 years, to Estero de Limantour, a geographically isolated "wilderness" reference arm of the Estero without oyster culture.

Wechsler's study, funded by the National Park Service, and conducted with the support and assistance of the PRNS staff (where he previously worked), began with the following hypothesis:

Because studies have shown that bivalve mariculture can affect the biological, physical, and chemical characteristics of an aquatic ecosystem, I hypothesized that adjacent to the Drake's Estero oyster racks: (a) fish species diversity would be reduced, (b) fish abundance would be reduced, (c) fish species richness would be decreased, and (d) a few tolerant species would dominate the fish community.

This was the hypothesis that the PRNS apparently hoped he would confirm. However, the data did not support this hypothesis, and Wechsler concluded:

I found no statistically significant differences in fish abundance or species richness among the sampling locations, which indicated that the oyster farm had not exerted a noticeable effect on the ichthyofauna of Drake's Estero.

Interestingly, species diversity and richness were greatest close to the oyster racks, which indicated that the physical structure of the oyster racks provided resources for a variety of fish species (e.g., feeding opportunities and/or refuge). He concluded:

Because species richness and species diversity were greatest in the samples taken adjacent to the oyster racks, it is likely that the physical structure associated with the oyster mariculture facility has enhanced habitat complexity, thereby providing additional resources (e.g., cover and feeding opportunities) for fish.

The study also examined eelgrass beds in light of the concern in coastal environments that oyster facilities might lead to a loss of eelgrass beds. Wechsler reported that

eelgrass beds are prevalent throughout the Drake's Estero ecosystem, and that the normal distribution of eelgrass beds in Schooner Bay indicated that its productivity was not affected significantly by oyster mariculture. He did find that eelgrass growth is restricted directly beneath the oyster racks due to light attenuation, but he went on to suggest that this could be alleviated simply by changing the spacing between the oyster lines. Wechsler also studied the impact of the oyster farm on water quality. He found no indications of any deterioration in water quality adjacent to the oyster racks.

Wechsler's thesis was funded by the National Park Service. It is reasonable to assume that Neubacher wanted Wechsler to find major impacts of the oysters on the local ecology. However, he concluded that oyster mariculture in the Estero:

- has had no negative impact on eelgrass beds;
- has had no negative impact on the diversity and abundance of fish species;
- has provided habitat for many fish species for both feeding and refuge leading to an increase in fish species richness; and
- has had no negative impact on water quality.

In short, there is substantial evidence suggesting that the oyster farm has had no negative impact on the ecology of Drake's Estero. Moreover, there is evidence that the oyster facility has positively impacted the richness of a number of fish species, and that removing the oyster facility from Drake's Estero would eliminate an important structural feature supporting the Estero's native fish biodiversity.

Scientific claims in the local popular press

As I mentioned above, Dr. Sarah Allen, a PNRS scientist, recently was first author (along with Jules Evens and John Kelly) of a column in the April 26, 2007 issue of the Pt. Reyes Light entitled *Coastal Wilderness: The Naturalist*. Their article made four major claims to support their conclusion that Lunny's oyster farm has been degrading Drake's Estero and should be removed:

- 1) EELGRASS: *"Eelgrass beds, which provide critically important feeding and nursery habitat for invertebrates, fishes, and birds, are especially vulnerable to oyster operations."*
- 2) SEDIMENT: *"Research has identified oyster feces as the primary source of sediment in the Estero, and this sediment smothers native species."*
- 3) INVASIVE TUNICATE: *"One highly invasive non-native species, a sponge-like colonial tunicate (Didemnum spp. A), is now commonly found on oyster racks and shells in the Estero and could substantially alter the ecology of the estuary."*
- 4) SEAL PUPS: *"One study in the Estero documented that seals were disturbed on 29% of the days surveyed and that primary sources were fisherman (38%) and boats (28%). This year, hundreds of oyster bags are located on harbor seal pupping sites and seal presence there has dropped dramatically."*

These same claims appeared in a more provocative fashion a few days later in the May 1, 2007 issue of the Coastal Post in an article entitled *Save Drakes Estero* by an

undisclosed group of authors from the Sierra Club of West Marin, EAC, National Parks Conservation Association, Audobon Society, and Wilderness Watch.

My sources of scientific data

My analysis uses data from published studies and other available data, much of which comes from studies done or sponsored by Sarah Allen. My sources are:

Jesse Wechsler's 2004 master's thesis from U.C. Davis;

Sarah Allen and Deborah Elliott-Fisk's March 2005 review for PRNS of Wechsler's and two other U.C. Davis master's theses;

Sarah Allen's co-authored 2006 Harbor Seal Monitoring report for the NPS;

William Sydeman and Sarah Allen's peer-reviewed 1999 publication on the dynamics of local pinniped populations in the journal *Marine Mammal Science*;

Data from Mary Carman at Woods Hole Oceanographic Institute (a world expert on *Didemnum* invasive colonial tunicates);

Data from Tom Moore, Department Fish & Game, and the PRNS on Drake's Estero eelgrass beds from 1991 to 2007; and

Roberto Anima's 1991 U.S.G.S. report on pollution studies of Drake's Estero.

One note of caution. What often happens when I make such an analysis is that the agency being criticized begins quoting "new data" that have been neither peer-reviewed nor published in the scientific literature. Beware of sudden claims of such new data. Anyone asked to respond to such claims should insist on being given access to the complete database, not just the cherry-picked tidbits being thrown out, and should check for bias and seek independent review.

Analysis of the four major scientific claims against the oyster farm

Claim #1: EELGRASS

Eelgrass is vulnerable to oyster farm; as a result, eelgrass is impaired in the Estero.

Claim from Allen's et al. article in the April 26, 2007 Pt. Reyes Light:

Eelgrass beds, which provide critically important feeding and nursery habitat for invertebrates, fishes, and birds, are especially vulnerable to oyster operations.

Related claim from Sierra Club & EAC et al. article in the May 1, 2007 Coastal Post:

DBOC's [Drake's Bay Oyster Company's] oyster structures directly impair eelgrass habitat by reducing the quantity of light necessary for eelgrass growth.

In contrast to the claims in the local popular press, the evidence shows that the eelgrass beds are healthy and that they have significantly expanded in their coverage from 1991 to 2007. The Department of Fish and Game (DFG), in collaboration with the PRNS, have used high-resolution aerial photographs of Drake's Estero at low tides from 1991

and 2007 to compare the extent of the eelgrass coverage. In 1991, there were 367.8 acres of eelgrass in Drake's Estero, whereas in 2007 there are 736.3 acres, a doubling of the coverage, with eelgrass growing closer to and surrounding the oyster racks. Moreover, independent scientists from both DFG and U.C.'s California Sea Grant have reported that the eelgrass beds appear very healthy. This is good news, since along the California coast, eelgrass beds have otherwise been retreating and are in decline.

In Wechsler's 2004 master's thesis at U.C. Davis, he writes:

A major concern in coastal environments is the loss of eelgrass beds that results from encroaching development. ... Eelgrass beds are prevalent throughout the Drakes Estero ecosystem. A qualitative look at the distribution of eelgrass beds in Schooner Bay indicated that its productivity was not affected substantially by oyster mariculture; however eelgrass growth is restricted directly beneath the oyster racks due to light attenuation. Adjusting the spacing between oyster lines would likely restore productivity under the racks, and could allow oysters and eelgrass to be grown in concert.

In Allen and Elliott-Fisk's 2005 report to the NPS, including their review of the three master's theses from U.C. Davis (including Wechsler's), they write:

We found the oyster racks to have no pronounced impacts on the eelgrass beds, which existed both under and away from the racks as an incredibly rich habitat type.

They go on to write of the "prolific eelgrass beds in Drakes Estero." In conclusion, it appears as if the eelgrass beds are healthy, expanding, and providing excellent habitats for many of the Estero's fish and invertebrates. This is good news for the Estero.

Claim #2: SEDIMENT

Oyster feces are primary source of sediment in the Estero and smother native species

Claim from Allen's et al. article in the April 26, 2007 Pt. Reyes Light:

Research has identified oyster feces as the primary source of sediment in the Estero, and this sediment smothers native species.

Related claim from Sierra Club & EAC et al. article in the May 1, 2007 Coastal Post:

Furthermore oyster feces add sediments to the eelgrass beds of the Estero. Researchers from the U.S. Geological Survey identified the feces of oysters - as much as a metric ton per 60 meter square oyster raft - as the primary source of sedimentation, which degrades eelgrass habitat and its ability to support abundant marine life.

This claim also is not supported by the published data. Moreover, the statement in the Coastal Post is misleading. Their reference to the U.S.G.S. research could easily lead a reader to think that they are referring to specific data from Drake's Estero, and a specific U.S.G.S. concern about the Estero's eelgrass. These numbers do indeed come from a U.S.G.S. report from Roberto Anima in 1991 entitled:

Pollution Studies of Drakes Estero, and Abbotts Lagoon

But the numbers (1 metric ton per 60 meter square oyster raft) are not from U.S.G.S. researchers, and more important, they do not come from Drake's Estero. Rather, on page 94 of the U.S.G.S. report, Anima refers to a 1955 paper from Ito and Imai published in a Japanese journal (Tohoku J. Agr. Res., 5: 251-268) on an oyster bed in Japan entitled:

Ecology of oyster bed. I. On the decline of productivity due to repeated culture.

In the 1991 U.S.G.S. report, Anima writes:

Ito and Imai (1955) calculated that in Japanese waters a raft of oysters 60 m square would annually produce 0.6 to 1.0 metric tons (dry weight) of fecal material.

The 1991 U.S.G.S. report does not report any impact of oyster feces on sediments in Drake's Estero. This report does comment on U.S.G.S. data as to the origin of sediments in Drake's Estero. Anima writes:

The results of this study indicate that Drakes Estero is a slowly filling system that is being supplied with sediment from the open marine environment, streams, aeolian deposition, biological reworking, and erosion of the surrounding bedrock. Tidal action is playing the dominant role in sediment distribution, erosion of surrounding bedrock, and overall flushing of the system.

I was not surprised to discover that the Sierra Club & EAC reference to the U.S.G.S. and oyster feces in sediments had nothing to do with Drake's Estero, because as mentioned above, the eelgrass coverage has expanded, not contracted, from 1991 to 2007, indicating that oyster feces are not degrading the eelgrass habitat. But there is much more direct data on this topic from Allen and colleagues in their 2005 NPS report.

Allen and Elliott-Fisk, in their 2005 report to the NPS, note that any sediment derived from oyster feces is insignificant compared to the volume of sediment generated by the cyclical decomposition of the eelgrass. They write:

Although pseudofeces from the suspended oysters may contribute to the amount of organic matter below the racks, adding to the system, the amount of organic matter resulting from eelgrass decomposition is likely far greater considering how expansive and dense the beds are within the estuary, making any significant organic inputs from the oysters undetectable in this study.

The relatively small scale of the Johnson's oyster farming operation combined with the hydrologic conditions in Drakes Estero likely dissipate the accumulation of biodeposits (e.g., oyster feces) that other studies have been shown to effect benthic ecology and water quality.

In conclusion, oyster feces are not a problem in Drake's Estero. Eelgrass is thriving, and eelgrass decomposition appears to provide most of the organic input to the sediments.

Claim #3: TUNICATES

An invasive colonial tunicate is on the oyster racks and could dramatically alter the ecology of the Estero.

Claim from Allen's et al. article in the April 26, 2007 Pt. Reyes Light:

*One highly invasive non-native species, a sponge-like colonial tunicate (*Didemnum* spp. A), is now commonly found on oyster racks and shells in the Estero and could substantially alter the ecology of the estuary.*

Related claim from Sierra Club & EAC et al. article in the May 1, 2007 Coastal Post:

*One particularly invasive species found on oyster structures in Drake's Estero is the colonial tunicate (*Didemnum* spp), an aggressive species that could substantially alter Drake's Estero if it colonized the limited hard surfaces of the estero. In the Atlantic, this species has infested and smothered organisms on a 25,000-acre portion of Georges Bank. There is considerable scientific proof that such exotic infestations are decidedly unsafe for the surrounding environment.*

This is a claim that would be serious if it were true. These articles suggest that perhaps this invasive tunicate entered the Estero in non-native oysters imported by the former Johnson's oyster farm. Of course, Lunny produces his own oyster seed and does not import oysters from elsewhere. Nevertheless, we need to determine how serious a threat to the Estero is the presence of this invasive colonial tunicate. Will Drake's Estero become like Georges Bank, heavily overtaken by this tunicate? How serious is this?

Our first insight comes from Allen and Elliott-Fisk's 2005 report to the NPS. They report that *Didemnum* is only found on the hard-substrate wood racks of the oyster farm and nowhere else in the Estero. They write:

Removal of the racks would result in a loss of hardsubstrate for the fouling community organisms which do not naturally exist in the estero.

The presence of this invasive colonial tunicate sounds serious. To get a deeper insight into the ecology of these tunicates, I first turned to the scientific literature, and then to a leading expert on these tunicates, Mary Carman at Woods Hole Oceanographic Institute. She told me that these tunicates are endemic around the world throughout the temperate zone oceans, and exist on hard substrates (wood, concrete, rock, and rubber for example) all along the California coast. Their larvae are in the plankton, making the tides the most likely way they entered and continue to enter Drake's Estero. She concluded that it would have been surprising if *Didemnum* had not been found on Lunny's oyster racks – they would be likely to colonize any wood substrate immersed in Drake's Estero, as they do most hard substrates throughout the temperate oceans.

I asked Carman if *Didemnum* can grow on eelgrass, the dominant substrate in Drake's Estero. She emphatically said no. Not only has it never been found on eelgrass, but she has done an experiment in which she intentionally tried to force it to grow on eelgrass and it would not, evidently due to an acid secreted by the eelgrass blades.

I then probed whether we should be concerned about Drake's Estero developing the kind of problem that has occurred at the Georges Bank. She responded that *Didemnum* would not grow on the sand, silt and mud that make up the substrates in Drake's Estero. The problem at Georges Bank, she explained, is that it has a rock and gravel bottom which is a perfect substrate for *Didemnum* growth.

She added that the only one who should be concerned about the *Didemnum* growth in Drake's Estero is the owner of the oyster racks, as "he may have to replace them someday."

In conclusion, there is no evidence that the *Didemnum* colonial tunicate has a negative effect on the ecology of Drake's Estero. Its larvae are endemic in the plankton, it is found nowhere other than Lunny's oyster racks, it can not and has not spread to any other substrate in the Estero, and thus it is only Lunny's problem and not ours.

Claim #4: SEAL PUPS

The oyster operation is disturbing the harbor seal pupping site and as a result, seal numbers have dropped dramatically.

Claim from Allen's et al. article in the April 26, 2007 Pt. Reyes Light:

One study in the Estero documented that seals were disturbed on 29% of the days surveyed and that primary sources were fisherman (38%) and boats (28%). This year, hundreds of oyster bags are located on harbor seal pupping sites and seal presence there has dropped dramatically.

Related claim from Sierra Club & EAC et al. article in the May 1, 2007 Coastal Post:

The Drakes Estero colony had been growing significantly from the mid 1990s until a few years ago, largely because the level of oyster operations was reduced during that time.

Disturbance of the larger fauna by commercial oyster farming has been documented at Drake's Estero and elsewhere. Harbor seals have been affected by oyster operations because of direct disturbance to seals resting onshore and displacement by oyster bags where seals rest and nurse their young.

If the oyster farm were truly having a significant negative impact on the seal pups, then this would be serious. But is it true? There are two issues we need to explore to verify or refute this claim. First, what has been the dynamic of the harbor seal population in Drake's Estero? And second, what if anything is disturbing the harbor seal pups? To better understand the dynamics of the harbor seal population, I turned to a 1999 paper by William Sydeman and Sarah Allen in the journal *Marine Mammal Science* (v. 15: pgs. 446-461) entitled:

Pinniped Population Dynamics in Central California: Correlations with Sea Surface Temperature and Upwelling Indices

Allen and Sydeman investigated the population of harbor seals and other pinnipeds

along the central California coast over the course of 24 years from 1973 to 1997, and looked at what variables correlate with population size. They write:

Historically, pinniped populations in central California were exploited for fur, oil, and meat, and many animals were killed due to their interactions with commercial fisheries. With implementation of protective measures including the U.S. Marine Mammal Protection Act of 1972, the Endangered Species Act of 1973, and protected status for terrestrial habitats (Farallon National Wildlife Refuge and Point Reyes National Seashore), populations have, in general, recovered significantly.

They report that population levels increased significantly from 1973 into the 1990's, and then leveled off during the mid 1990's. They write:

The central California harbor seal population has grown considerably over the past two decades, as it has throughout much of the eastern North Pacific Ocean, but the rate of increase has declined in recent years. Habitat saturation and/or prey limitation may be influencing the population dynamics of harbor seals.

They report that in the later part of their study period, once habitat saturation had been achieved, other variables controlled the variation in harbor seal numbers. What factors appear most important? They suggest that food availability, predation both in the sea from sharks and on land from terrestrial mammals, interference from drift and set nets, and limits of undisturbed habitat. Nowhere in their paper do they sound an alarm about the oyster farm in Drake's Estero. Interestingly, the continued increase in the adult harbor seal and seal pup population in Drake's Estero increased in the early to mid 1990's during the period in which the oyster production was at its all time high.

To get a better sense of the harbor seal numbers since 1999, I turned to another report co-authored by Sarah Allen. In 2006, Jeannine Manna, Dale Roberts, Dave Press, and Sarah Allen authored an annual report for the National Park Service entitled:

Harbor Seal Monitoring, San Francisco Bay Area

While the focus of this report is the harbor seal population during the 2006 season, it made significant comparisons to 2005, and moreover compared data from 1997 to 2006.

In contrast to the dramatic increase in harbor seals from 1973 until 1997, from 1997 to 2006, the population of harbor seals in central California did not increase, consistent with the conclusions of Sydeman and Allen in 1999 that by the late 1990's the population had reached a steady state. Rather, the number of adults and pups from year-to-year fluctuates. Manna, Roberts, Press, and Allen argue that these fluctuations correlate with food availability. They write:

The decline in the overall number of pups produced in 2006 compared to the previous five years may be related to changes in marine conditions. Upwelling was much reduced in 2006 and similar to 2005, resulting in reduced krill, which in turn may have affected food availability for harbor seals.

Nevertheless, the number of pups increased in Drake's Estero from 2005 to 2006, in contrast to the general trend. Moreover, of their 8 major pupping sites, in 2006, Drake's Estero had the highest maximum count, 347 seal pups. There is nothing in this harbor seal report that suggests that Drake's Estero harbor seal population is anything other than healthy and thriving. There is no mention of disturbances from the oyster farm. There is no trend of a decrease in seals or pups as the oyster farm increased in size

during the past couple of years. In contrast, certain locations, such as Tomales Bay, have seen a dramatic increase in disturbances from 2003 to 2006, due most likely to the increased number of people in motorboats and non-motorboats (kayaks and canoes) going out to visit the seals and their pups.

In summary, the answer to our first question is that the population of adult harbor seals and their pups in Drake's Estero has reached a steady-state, now fluctuates with conditions of food availability and predation, and shows no negative correlation with the oyster farm. But how about the second question: who is disturbing the pups? To read the claims in the local popular press, you would be led to believe that Lunny's oyster farm and oyster workers are the major source of disturbance to the harbor seal pups. The first hint that this claim might not be right comes from the fact that the number of dead pups observed in 2006 at Drake's Estero was not significantly different from any of the other pupping sites. But let's not infer the answer. It is better to look at the data on who is disturbing the seal pups. First let's look at what the authors write about disturbances in Drake's Estero:

33 surveys were completed at Drake's Estero between March 1st and July 31st. Drake's Estero had a high pup count of 347 the week of May 1st, and a peak molt count of 1,228 the week of July 3rd. Drake's Estero had the highest pup and molt numbers, and one of the highest levels of disturbance, 0.97 disturbances per survey. Park regulations allow kayaks and canoes back in Drake's Estero after July 1st. After that date 50% of disturbances were a result of these non-motorboats. Prior to July 1st most disturbances were of unknown cause, 47%. Surveyors documented a bobcat and a coyote disturbing seals on sandbars in Drake's Estero. Other sources included low flying large birds such as turkey vultures, hikers and clam diggers on Limantour and Drake's Beaches, and kayaks after July at the end of the seasonal closure.

This contradicts Allen's column in the Light and the Sierra Club & EAC article in the Coastal Post, both of which lead the reader to conclude that Lunny's oyster farm is the major source of disturbance to the harbor seal pups in Drake's Estero. But the actual published data from the most recent season (2006) says just the opposite. Allen's data-collectors report that it is non-motorboats – namely kayaks and canoes – that are the major source of disturbances, along with hikers, clam diggers, predators (bobcats and coyotes), and turkey vultures. Nowhere are oyster harvesters listed.

In conclusion, this claim is invalid. There is no evidence to support the notion that Lunny's oyster farm is negatively impacting the harbor seal pupping site. The numbers are at a steady state, there are no more pups being abandoned here as compared to other sites, and it is the PRNS tourists in kayaks, canoes, on foot, or digging clams that are, along with natural predators, causing the most disturbance of the pups.

Conclusions

The scientific data suggest that the four major claims made by the PRNS and its scientist Sarah Allen concerning the purported negative impact of Lunny's oyster farm on the ecology of Drake's Estero are incorrect. Most troubling is that the evidence refuting these claims comes largely from their own published data. The scientific record is clear: there is no evidence that Lunny's oyster farm is having a negative impact on the eelgrass, sediment, or harbor seal pups. And the presence of the colonial tunicate on his oyster racks is his problem, not ours – they are not impacting the rest of the Estero.

It saddens me that many of the local environmental groups have blindly supported these false claims. In the May 1, 2007 Coastal Post article entitled Save Drakes Estero, the undisclosed group of authors from the Sierra Club & EAC write:

Unfortunately, significant misinformation has been distributed about the effects of large-scale oyster operation on Drake's Estero.

Ironically, if we compare the claims from Allen and the Sierra Club & EAC vs. the scientific data, it is they who have distributed the significant misinformation. Some of the most extreme misinformation has come from Gordon Bennett, Chair of the Marin Chapter of the Sierra Club. In the May 2006 issue of the Yodeler, the Sierra Club S.F. Bay Chapter newspaper, he writes:

Local residents report that Johnson Oyster spread pesticides in the Estero to eradicate native mollusks and eel-grass beds. The Drakes Oyster profits from this prior environmental crime, and clearly intends to continue to do so.

This is not data. This is unsubstantiated hearsay. And it is inconsistent with the data from the Department of Fish and Game and the Pt. Reyes National Seashore about the expansion and health of the eelgrass beds in the Estero (see above on eelgrass claim).

The late Senator Daniel Patrick Moynihan, Democrat from New York, once said:

Everyone is entitled to their own opinion, but not their own facts.

People have a right to their opinion that Lunny's oyster farm should be kicked out of the Estero. But the scientific facts are clear: there is no compelling scientific reason to do so.

Additional Comment: Can Drake's Estero be wilderness?

Whether the word "wilderness" is biologically relevant to apply to the Estero in isolation is an issue that I do not have adequate space to address here. In brief, the Wilderness Act of 1964 considers the minimal size of a wilderness area to be 5000 acres. The Estero is 2270 acres. Since 1964, biologists have become more sophisticated about what is needed to be a sustainable ecosystem, and have learned that to be a true wilderness often requires many tens of thousands of acres for sustainable reproduction of the largest predators. It makes little sense to call Drake's Estero a wilderness when it is surrounded by a watershed with 2,000 cattle on 6 or more ranches, and with roads and towns nearby. To be a wilderness would require enough land for the predators of the seal pups to be as sustainable as the harbor seals. Unless the PRNS plans to turn the entire Park and its surrounding environment including Inverness into "wilderness", it is hard to see how this concept applies to the Estero.

Thank you very much for your attention. I appreciate the opportunity to present this scientific testimony and I look forward to answering your questions. Please do not hesitate to contact me if you have further questions or would like clarification. I can be most easily reached at goodman@renovis.com.

Corey S. Goodman, Ph.D.