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Reconnaissance of South Florida to assess damages, planned responses, and future needs in the commercial fisheries stemming from Hurricane Andrew

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Quick Response Research Report #59

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RECONNAISSANCE OF SOUTH FLORIDA TO ASSESS DAMAGES, PLANNED RESPONSES, AND FUTURE NEEDS IN THE COMMERCIAL FISHERIES STEMMING FROM HURRICANE ANDREW

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by

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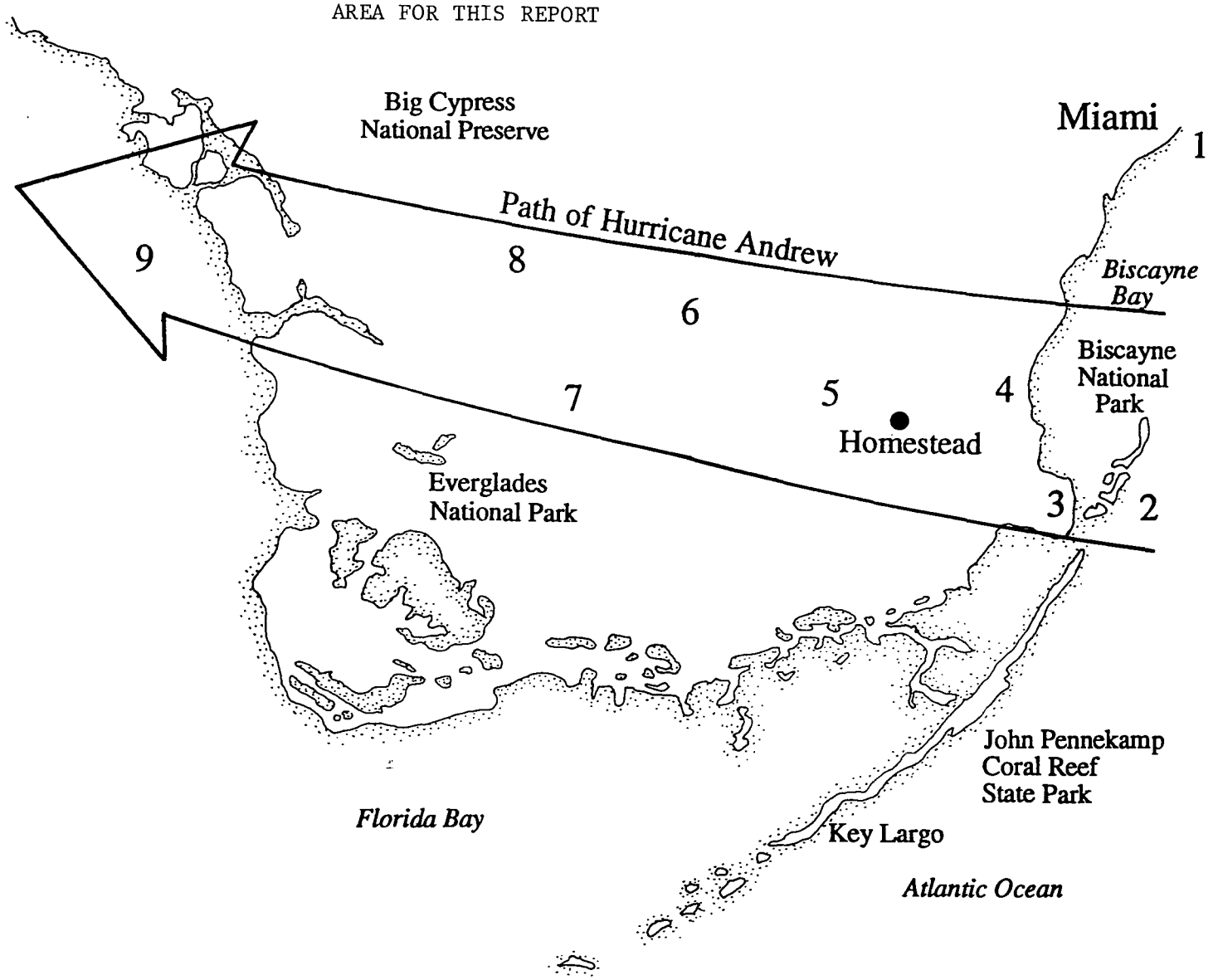
FIGURE 1: SOUTH FLORIDA, THE AREA IMPACTED BY HURRICANE ANDREW AND SURROUNDING REGION, AND THE STUDY AREA FOR THIS REPORT



1. Artificial reefs heavily damaged and moved.
2. Offshore coral reefs may be destroyed or damaged; heavy loss of lobster traps.
3. Seagrass communities had minor direct damage but may be affected by erosion and increased nutrients from runoff.
4. Mangroves flattened, uprooted, or defoliated.
5. Exotic tree species damaged but expected to spread widely and rapidly.
6. Hardwood hammocks heavily damaged or destroyed.
7. Sawgrass visibly unaffected.
8. Moderate to minor pineland and cypress tree damage.
9. Mangrove damage from north of Cape Sable to south of Ten Thousand Islands.

Adapted from T. Grantham, Miami Herald 09-08-92

When we heard that Hurricane Andrew had slammed into the south Florida coastline early in the morning of August 24, 1992, bringing steady winds between 135 and 155 MPH, gusts as high as 170 MPH, spawning even more destructive tornado winds, killing several dozen people, and leaving in its wake approximately 20 billion dollars in property damage, we assumed there must have been correspondingly devastating impacts on south Florida's commercial fisheries and fishing peoples (Aide 1993: 1, and Sun-Sentinel 1992). And, later that same day, when television news began to broadcast pictures of Andrew's horrible destruction, we figured that commercial fishing peoples in the region must have suffered severe impacts indeed. Certainly, a storm as violent and intense as Hurricane Andrew must have exacted a tragic toll from south Florida's commercial fishing peoples.

Over the next few weeks we drafted proposals and applied for Quick Response Grants from the Natural Hazards Research and Information Applications Center, which is located on the campus of the University of Colorado, Boulder, Colorado. As maritime anthropologists, we are interested in fishing peoples and fishing communities, and we were especially interested in what had happened to south Florida's commercial fishing peoples as a result of Hurricane

Andrew. Eventually, we learned that our proposals had been favorably reviewed and we made plans to leave for south Florida.

We feel that commercial fishing peoples merit special attention when extreme events impact the coastal zones in which they work and live, and mainly for the following reasons: first, commercial fishers are almost always present in such regions; second, they are a distinct and easily recognizable sociocultural and occupational component of the larger coastal population; and third, their high degree of dependency on coastal resources and facilities leaves them particularly vulnerable to extreme events occurring in the coastal zones in which they work and live.

For studying the problems of commercial fishers, we have found the concept of the "natural-resource community" to be very useful (see Dyer, Gill, and Picou (1992). In the fisheries, we define "natural-resource communities" as peoples whose economic welfare and sociocultural identities are similarly articulated with, and dependent upon, certain marine resources. In this sense, a "fishing community" may include peoples living in a named, nucleated settlement, which obviously has a great deal of fishing industry, as well as dispersed commercial fishers living here and there along a

coastline who do not live in a particular settlement. What is important is that fishers in either situation have much in common, and for purposes of assessing their problems and needs it is useful to conceptualize them as natural-resource communities--as defined above.

Because of the linearity of coastlines, marine fishers are often dispersed, at least to some degree. Moreover, when they are few in number, highly dispersed, and there is no visible settlement that might be described as a "fishing community" in conventional terms, such peoples may be neglected or overlooked when extreme events impact the coastlines where they work and live. Thus, by defining the commercial-fishing "community" as peoples who are highly articulated with certain marine resources, there is less chance that such people will be overlooked--such as when assessing the impact of an extreme event in a coastal zone.

We also feel that conventional definitions of "the fisheries" must be expanded, such that these are primarily thought of as human sociocultural and economic phenomena, rather than merely as a marine realm or a stock of marine life in a particular marine realm. Thus, terms such as "the Biscayne Bay fishery" or "the spiny-lobster fishery," should automatically imply the presence of human fishers working there, since without

human activity in a marine realm there is no fishery there per se.

There is also another, more general reason why we feel commercial fishing peoples deserve special attention when extreme events occur in coastal regions. And this is simply that in spite of their empirical reality, their sociocultural attributes, and their economic importance, they are otherwise often overlooked and neglected when extreme events impact coastal areas. Indeed, now that the first phase of our study of the impacts of Hurricane Andrew on south Florida's commercial fishing peoples is complete, we are even more firm in this conviction.

As maritime anthropologists, we made a good team in our study in south Florida. Dr. McGoodwin has specialized in marine fisheries since the early 1970's, has conducted research concerning fisheries policies under the auspices of the Woods Hole Oceanographic Institution and the Food and Agriculture Organization of the United Nations, and has extensive field experience working among fishing peoples in a variety of cultural settings. His recent book, Crisis in the World's Fisheries: People, Problems, and Policies (McGoodwin 1990) has received critical acclaim for urging that new, more inclusive, and more humanistic approaches be tried

out in fisheries management. Dr. Dyer also brings important field experience, training, and insights to the study of commercial fishing peoples. Currently he serves on the Gulf of Mexico Fisheries Management Council (GOMFMC), a component of the National Marine Fisheries Services' fisheries-management system which has responsibility for recommending management policies for south Florida's fisheries (among others). This position has provided Dr. Dyer with a large number of contacts with other professionals in the natural-resources management "establishment" in south Florida. He also holds a degree in Fisheries Biology, as well as an advanced degree in Marine Ecology--some rare credentials among maritime anthropologists.

Prior to our departure

Prior to leaving we made several telephone calls in order to set up appointments for interviews with state and federal officials working in south Florida, as well as to learn what we could about the situation there in advance of our arrival. We contacted agency representatives of the Florida Department of Natural Resources (DNR), the Southeast Fisheries Center of the National Marine Fisheries Service (NMFS), the local FEMA response team assigned to natural resources, various

participants in the commercial fishing industry, and other local residents of Miami and Dade county. We also read everything we could in order to familiarize ourselves with the region and Hurricane Andrew's impact.

Our plan was to spend nearly a week in south Florida and to interview as many governmental and scientific authorities as we could, as well as people in the commercial fishing industry. We also planned to visit as many sites as possible so that we could get a general idea of the hurricane's impact on the region's commercial fishing peoples, as well as an understanding of their most immediate needs in the storm's aftermath.

Just prior to our departure we read a curious item in National Fisherman, the main journal of record for the commercial fishing industry in the English-speaking countries (Fee 1992: 12). The article, which cited a biologist from the Florida DNR, portrayed Hurricane Andrew's impact on south Florida's commercial fishers as minimal. "This was not the storm" that scientists had predicted for years would hit south Florida, the DNR biologist was quoted as saying. Elsewhere, regarding Andrew's impact on south Florida's commercial fishing industry, the article stated that "most of south Florida's commercial fishing industry was untouched by it," and "...commercial fishermen were wide-eyed over

their good luck." Local marine biologists were also cited as expressing regrets that the storm had not had more impact on the sea floor in the region, which, they said, had long been denied the beneficial, cleansing effects that a major storm might provide.

Thus, as we prepared to leave we wondered whether we would find any significant impacts on south Florida's commercial fishing peoples to study. Could it be that a storm of the reported magnitude of Hurricane Andrew had struck this populous coastline, and yet the region's commercial fishers had come through practically unscathed, as the article had said?

In the field

We arrived in south Florida on October 31, 1992, and promptly got underway. The first thing we did was to make a quick inspection of as many places as we could see along the most severely impacted part of the coast, and overall we found the devastation to be far worse than we had anticipated. All the photographs and televised news we had seen prior to leaving for our trip had fallen far short of conveying the actual extent and severity of the storm on south Florida and its local inhabitants.

We made this initial reconnaissance in a rented

automobile during our first two days in Florida, spending most of this time interviewing various commercial fishers, learning about how the hurricane had impacted their work and lives, what their immediate needs were, and so forth. We had little trouble gaining entry into practically all of the areas we wanted to see; indeed, we were able to pass freely into some areas which were still off-limits to the general public, and which were being patrolled by state police or federal troops. For the most part, all we had to do was explain what we were doing, show some identification and other documentation indicating what our interests were, and we were allowed to go practically anywhere we wanted.

After this initial phase of our field work we met with officials in various agencies we had contacted prior to our arrival, mixing these appointments in with visits to commercial fishers and fish processors located in, and immediately around, the Miami metropolitan area. Then, near the end of our stay, we travelled to Key Largo, which is south of the hurricane's main impact area, and which various agency officials assured us had not been significantly impacted by the hurricane. In Key Largo we looked over commercial fishing fleets and talked with local fishers and fish processors.

Overall, we conducted interviews with all the governmental authorities we had originally planned to contact, as well as with key respondents in the local fishing industry, including fishers, processors, dock operators, and others involved in the commercial-fishing sector. These interviews were supplemented with telephone interviews of agency representatives of the NMFS, the local FEMA response team assigned to natural resources, the Florida DNR, and local residents of Miami and Dade Counties who had experienced the disaster event. Many of our interviews were conducted as unscheduled, informal dockside intercepts.

Everyone we interviewed was queried in an open manner, and we always began by explaining that we wanted to elicit their perceptions of the impacts of the storm on local, commercial fisheries, as well as what they thought the commercial fishers' most immediate needs for relief were now. Everyone we talked with was given the opportunity to decline to be interviewed, or to supply any other information that he/she might prefer to supply instead.

The foregoing information was supplemented by other information which we gleaned from NMFS's Fishing Trend Reports, news articles, newsletters, and other published material we requested be sent to us after our departure.

We also received lists of commercial fishers for Dade County from the Florida DNR, as well as lists of processors from the NMFS in Miami. Moreover, we have continued to make queries concerning what is being done for south Florida's commercial fishing peoples in the aftermath of Andrew, both in writing and by telephone, right up to the time of this report.

In what follows we first summarize the view of the hurricane's impact on commercial fishers that emerged from out of our meetings with various agency officials and scientists in the area. Overall, they corroborated what we had read in the National Fisherman shortly before we arrived in Florida, that is, that the hurricane's impact on commercial fishers in south Florida had been minimal. After this, we will summarize the view that emerged from our meetings with commercial fishers and fish processors in south Florida. Overall, they provided an opposite view, stressing that the hurricane had wrought severe impacts on them--a view to which we now bear witness.

"Minimal impact," the agencies said

For the most part, the various agencies and research institutions we queried during our study were the ones we assumed would have been highly involved in

assessing the impact of the hurricane on the region's commercial fishing peoples, as well as in coordinating, and implementing relief for those peoples. All of these agencies and research institutions have offices in the Miami area, and all are within an hour's drive, or less, from the center of destruction along the coast.

The Florida DNR. Prior to leaving for our trip we had contacted the Florida DNR in order to learn about the impact of Hurricane Andrew on south Florida's commercial fishing peoples. Instead, that agency provided us with information concerning what might have happened to certain valuable marine stocks, but otherwise had no information concerning the storm's impact on south Florida's commercial fishing peoples. Once we arrived in south Florida and looked into this matter further, we found that this agency still had not produced any reports or any other data concerning the impact of Hurricane Andrew on south Florida's commercial fishing peoples. And, as far as we know, it still has not undertaken any such studies--now nearly 7 months since the storm hit south Florida.

However, we also learned that the Florida DNR is mainly responsible for assessing the status of commercially-valuable marine stocks, as well as other marine-biological conditions, and is not charged with

fisheries management per se. We were given the impression that this agency is mainly responsible for reporting its assessments of stock conditions to the National Marine Fisheries Service, and otherwise leaves most fisheries-management responsibilities, and agency-fisher working relationships, to that federal agency.

The NMFS. We also visited the Southeast Fisheries Center of the National Marine Fisheries Service (NMFS) in Miami, and met with its director and various members of his key staff. Overall, they stressed that the hurricane's impact on fishing peoples in south Florida had been minimal to non-existent, mainly, they said, because there were "almost no commercial fishermen" in the south Florida region. For the most part, they said, south Florida is mainly a recreational fishery, and the few commercial fishers that exist in this region are few in number and very dispersed. Recreational fishers, they told us, had indeed suffered considerable losses, both in terms of lost or badly damaged boats as well as severely damaged boat facilities. However, most of the boat owners had insurance, they told us, and in any event the storm's impact on them could not be seen as particularly grievous since they do not depend on fishing for the livelihoods.

Overall, the personnel we talked with at NMFS in Miami stressed that south Florida's handful of commercial fishers had come through practically unscathed. Curiously, we also learned that nobody who worked in these offices had made any visits to south Florida in order to see what impacts commercial fishers might have suffered. When asked why, they repeated that there simply were not many commercial fishers in the region. And, so far as we know, this agency has still not made any efforts to assess the impact of Hurricane Andrew on south Florida's commercial fishers, nor to learn what is needed in terms of relief and reconstruction.

Near the end of our visit to the NMFS offices in Miami, the officials we met with mentioned an important group of commercial fishers whose boats and processing facilities were berthed along the Miami River, right in downtown Miami. These fished for spiny lobsters, they said, a highly-valuable species, and because their boats all had ridden out the storm safely secured in their berths along the Miami River, they assured us that these fishers had "come through just fine." When we asked if anybody from NMFS had interviewed any of these fishers, one staff member joked with us, saying, "no, how could we, none of us speak Cuban."

The RSMAS. We also visited the Rosentiel School of Marine and Atmospheric Science (RSMAS), which is just across the street from the offices of the Southeast Fisheries Center of the NMFS. RSMAS, Florida's most prestigious marine-science institution, is a part of the University of Miami, and is supported to a great degree by the Sea Grant Research Program of the National Oceanographic and Atmospheric Administration (NOAA). NOAA, of course, also administers the NMFS.

While at RSMAS we learned that this institution already had a large-scale proposal in development which entailed an ambitious assessment of the impact of Hurricane Andrew along the south Florida coast. However, this proposal included no plans to study the storm's impact on commercial fishing peoples. The draft proposal we obtained from RSMAS after our visit to Florida indicated that interdisciplinary scientific teams, staffed almost entirely by researchers from RSMAS, were going to investigate the storm's impact on the region's marine biology, geology, water chemistry, and other phenomena reflecting traditional oceanographic concerns. And now, despite our urging that RSMAS broaden its study to include assessments of the storm's impact on commercial fishing peoples, we have had no response, nor any other indications from that

institution, suggesting that it has any plans to do so.

Momentarily, we were encouraged when, after our return from Florida, we received from RSMAS a comprehensive description of the research it planned to undertake, which included a section describing an intent to study the "Boating Community" in south Florida. However, it seems this will mainly entail studying how sunken boats--nearly all from the recreational sector--are now contributing to the pollution of the region's harbors and bays as they slowly leak fuels and lubricants into the water.

The FEMA and the SBA. Two other agencies might have focused some special attention on commercial fishing peoples in south Florida, yet as far as we know have not. These are the Federal Emergency Management Agency (FEMA), and the Small Business Administration (SBA). Perhaps this is understandable, at least in view of the magnitude of destruction Andrew caused compared with the limited resources these agencies had to work with. The FEMA, for example, was overwhelmed with the local populace's needs for such fundamentals as food, clothing, and shelter, and did not have sufficient personnel or other resources that might allow it to address the special needs of a particular occupational sector--such as commercial fishers. Similarly, with

more than 82,000 businesses badly damaged or utterly destroyed in the region, the SBA did not have adequate resources for addressing the problems of any particular business sector, although we did learn of a few loans it made to various commercial fishers (Aide 1993: 1).

Hurricane Andrew's Impact on Florida's Fisheries

Information we have gathered before, during, and after our field study, as well as that which can be inferred from data provided by various governmental agencies, professionals working in Florida's fisheries, and scientific and media sources, all lead to the inescapable conclusion that Hurricane Andrew's impact on Florida's commercial fishers was far more extensive and severe than has been officially acknowledged. Practically everywhere we looked we discovered grievous impacts, and practically every fisherman and processor we talked to had a tragic story to tell. In what follows, we summarize the impacts to Florida's fisheries that we were able to discover in a comparatively short amount of time, and with a comparatively small amount of effort.

General impacts on south Florida's fishing peoples and fishing industry. In general, all fishers, fish processors, and fish marketeers throughout south Florida

(including those located throughout the Florida Keys) experienced severe economic hardships in the months following the storm as a result of drastic declines in demand for the marine products they customarily produced, processed, or traded. Thus, even fishers who otherwise suffered no direct damages from the storm to their vessels, gear, shore facilities, or targeted marine species in the south Florida region, including those located throughout the Florida Keys, were still very adversely impacted by the storm.

This is a less visible but no-less-real adverse impact of the storm on local fishing peoples, which is not as dramatic, perhaps, as boats smashed and sunk at their berths, but no less deadly from a socioeconomic perspective. With more 160,000 people forced to find other places to live immediately following the storm, and 82,000 businesses damaged or destroyed, which brought about widespread unemployment in the impacted region, a large segment of south Florida's populace was left at least temporarily unable to purchase seafoods (Aide 1993: 1). This problem still persists for many members of the fishing industry who live in south Florida, with many fishers who survived the storm more or less intact now finding themselves unable to stay in business. Of course, this in turn has adverse effects

on still more people who work in businesses which serve the fishing industry--those working in boat repair yards, businesses selling fishing gear and other equipment, and so forth.

Impacts on the spiny lobster industry. Spiny lobsters are an important, especially valuable natural resource in southeast Florida, with the nearshore areas of Biscayne Bay and Biscayne National Park (see Figure 1) being major harvest areas for fishers from Dade and Monroe Counties. We interviewed approximately a dozen lobster fishers, as well as key personnel working in a major lobster processing plant along the Miami River docks, asking them about the impacts of Andrew on their fishery.

Overall, we learned, there are approximately 60 fishermen who work as primary producers out of 22 boats along the Miami River. All but two or three of these are from Cuban backgrounds, the remainder being Anglo Americans. They fish for lobster with wooden and wire frame traps which are weighted with concrete and baited with cowhide. These traps cost approximately $16 to $17 each. One boat can work between 800 to 1500 traps, tending around 200 per trip.

These fishermen had many traps out when Andrew hit, and estimate that they lost 70%-80% of them due to the

storm. On average, each fishing boat (which, for the most part, is a distinct business enterprise in this fishery) lost around 1,000 traps, or about $16,000 worth of vital fishing gear in terms of its replacement cost. Recall, on the other hand, that the core staff members of the NMFS we interviewed made no mention of any serious losses borne by these fishers as a result of the storm.

The Miami River lobster fishers reported that they had received some aid from the Florida SBA and the FEMA, mainly in the form of small loans for purchasing new lobster traps. The amount of the loans they were deemed eligible for were based on their past catch receipts. Thus, the SBA made an estimate based on past reports of lobster catches, estimated how many traps this corresponded with, and thus determined the extent of loans it would make to each applicant who was seeking to replace lost gear. However, the formula used by the SBA resulted in a gear deficit, since prior to the storm the average catch-per-trap only rarely ran as high as the estimate used by the SBA.

The hurricane was described as a disaster by the fishermen we talked with along the Miami River, since their net loss of traps came about at a time when their local industry was already economically depressed. The

primary cause cited by these local fishers for the economic downturn in the fishery prior to Andrew was over-regulation. In 1991, for example, they paid a gear levy of $0.15 per trap. This levy was raised to $0.50 per trap a few months before the hurricane. The fishermen indicated that they were aware that this increase was an attempt by regulatory officials to decrease overall effort in the fishery, but noted that it had not had that effect. Instead, they said, everybody just paid the increase and kept on fishing as before, or even harder in some cases in an attempt to offset the higher costs posed by the additional levy.

Now, they stated, even though the total number of traps being utilized was much less than the number being utilized prior to the storm, the "government" was maintaining the levy at the same, pre-storm level. They expressed anger about this, saying they had no idea what the money goes for. They also bitterly complained that foreign fishermen, mainly Nicaraguans and Mexicans, were not taxed as highly and were allowed to fish more freely, and with more effective gear. Overall, they lamented that they had been in an adversarial relationship with fishery officials from the DNR and the NMFS for a long time.

Indeed, catch data we have subsequently obtained

indicates that their catches were stable over at least three years prior to the hurricane, perhaps indicating a healthy, or at least stable, lobster stock, and calling to question the need to increase the levies on their traps prior to the storm. Regardless, whether the fishery was actually healthy or depressed prior to Andrew, catch data following the hurricane leave no doubt that it had a devastating impact on this fishery.

One processor showed us daily-activity reports indicating unusually large catches of lobster during the last three days of fishing before Andrew hit, and then, immediately after the disaster his data indicated that the lobsters had all but disappeared from the fishing grounds. And, even by mid-February, six months after Andrew swept through the region's lobster fisheries, catches were still unusually low, leading one DNR official to characterize the season as overall "very poor."

Recently, we have also learned (and opposite from what DNR biologists reported immediately following the storm) that bottom substrates in the lobster fishery were severely impacted by the storm, perhaps with devastating consequences for lobster stocks. Whether this disruption of the sea floor has greatly reduced overall lobster stocks, or instead only greatly altered

their customary migration routes, making it difficult for fishers to locate them, is uncertain. Whatever is the case, Hurricane Andrew had a devastating impact on this region's overall lobster catches, and it is an adverse impact which persists today.

Our informants along the Miami River also told us that all fishermen, from Miami all the way down to Key West, had been hurt by the storm. The spiny lobster, they told us, was similarly important to fishers throughout the Florida Keys. Thus, late in our visit to south Florida, we travelled to Key Largo, the north-most of the major Keys, which had otherwise been missed by Andrew's strong winds, in order to see what impact the storm had, if any, on commercial fishing there.

In most of the Keys, we learned, electricity had not been available for general public use for up to three weeks following the storm. Commercial fishers, as well as fish processors, who were otherwise unharmed by the storm, were temporarily put out of business. Fishers, for example, had nobody to sell their products to due to the lack of cold-storage, while processors were put out of operation for the same reason. Moreover, processors lost most of the stored products they had on hand due to spoilage. As a port agent from Monroe County reported on August 27, three days after

the hurricane hit:

> Hurricane Andrew has severely limited all fishing in the keys beginning on the 22nd when warnings were first posted. Although the keys were spared a direct hit, the storm still dealt a blow to the fishing industry. In the upper keys, early reports indicated some craft and many lobster traps were destroyed. And, the shoreside infrastructure that escaped damage was still non-functional due to power outages and transport problems. Even fishermen in the lower keys were idled by Andrew. That was because most dealers held their boats at the dock until logistics with those few buyers still operational were arranged.

After a three-week hiatus in fishing activity, a handful of processors in the keys were able to resume operations by promising to provide ice to the regional populace at fixed prices in return for being given priority in the restoration of electrical power. Otherwise, most processors--and a large number of fishers--remained closed and out of operation, with many remaining so at the time of this report. As mentioned above, with such drastically decreased demand for the

seafoods they customarily processed, many found themselves economically unable to resume business operations.

As of February, 1993, the spiny lobster catch was still well below average throughout south Florida, including the keys. Most local fishery officials feel the reason is Andrew's disturbance of seafloor bottom substrates, which has in turn altered normal lobster migration patterns. Thus, we may conclude that Hurricane Andrew had a severe and extensive impact on south Florida's important spiny lobster industry--an impact which is still being felt now. Moreover, the extent of damage to this fishery alone suggests that the initial reports of minimal damage to fisheries in south Florida were considerably underestimated. And now, more than half a year since the hurricane swept through south Florida, while earnest efforts are underway to determine the hurricane's overall impact on marine environments and marine-biological resources, we are aware of no studies which are similarly underway to determine the social and economic impacts of the storm on the region's commercial fishing populace, much less their current needs for relief and reconstruction.

Impacts on the bait-shrimp industry. Bait-shrimp fishers sell their catches to recreational fishers. We

interviewed bait fishers working out of the large recreational marinas in Coconut Grove in metropolitan Miami, as well as at the Black Point marina, south down the coast, approximately where the center of the eye of the storm came ashore.

The Black Point marina suffered the most severe damages we saw anywhere along the Florida coastline. All its facilities, and all the recreational fishing boats kept there, were severely damaged, with most of the recreational boats being a complete loss.

The fishing vessels used by bait fishermen working at Black Point came through somewhat better. All 15 of the "bait boats" operating out of this marina had been severely damaged, and several were a complete loss. That proportionately more of the commercial boats than the recreational ones came through in at least salvageable condition can be attributed to the commercial fishermen's greater experience and knowledge concerning how to secure their boats against extreme storms, and also because most commercial fishermen lived near the marina and were able to get there well before the storm hit the coast. Most of the recreational boat owners, on the other hand, had not come to the marina to secure their boats before the storm hit. Nevertheless, when we visited this area--two months after the

storm--only 2 of the bait boats were operational, while the rest were either undergoing repairs or waiting for their owners to find sufficient resources to begin repairs on them.

While all the fishermen we interviewed at Black Point stated that they had sustained considerable damage to their fishing craft, they were emphatic that repairs were being hampered by the lack of financial assistance from agencies which they felt should be responsible for helping them. Several fishermen commented that nobody from the "fisheries service" (i.e., the NMFS) had ever come around to talk to them about damages they had sustained, or to ask what their particular problems and needs were in the aftermath of the storm. When they heard that we would be meeting with the core staff at the NMFS regional offices in Miami, one group of fishermen urged us to "tell them we're hurting."

At the Black Point marina the nearly complete loss of the recreational fishing boats there had brought extreme hardship to local bait fishermen. Even the dozen or so bait fishermen who were back in operation found that without recreational customers to buy their catches they were effectively left with no market for their production.

One fisherman we spoke with was particularly

informative concerning how grievously the hurricane had impacted he and his family, as well as how they had secured relief from various agencies. After securing his two boats somewhat inshore of the Black Point marina, he described how he, his wife, and their four small children had survived the storm by taking shelter in their nearby home. The house was totally destroyed, he said, yet miraculously they had all survived with only minor injuries. In spite of this, he was emphatic that he would never again choose to ride out a hurricane by taking shelter in his own home if he could otherwise find shelter out of the storm's direct path instead. Afterwards, he said he and his family found relief in one of the tents the FEMA helped erect for peoples left homeless by the storm, and eventually, after being helped by relatives and friends, they returned to their own house site and began reconstruction there.

This young man, as well as several friends who crewed with him, were busily repairing his one, remaining boat when we interviewed him. He said it would be another two weeks before his boat would be operational, and that had the hurricane not hit this region he might be making as much as $2,000 per week. Brown shrimp, he stated, were currently very abundant, but because of damages to his boat he was not able to

fish for them, and even if he could he was uncertain whether he could sell his catches. He also expressed concern about the long-term effects on bait-shrimp stocks which might result from the massive destruction of the mangroves in his vicinity, which, he emphasized, were the rearing grounds for the shrimp he targeted. Indeed, as we talked with him we were amazed to see the extent of destruction of the mangrove stands nearby, which looked for all the world like a tangle of millions of sticks and limbs, with no green leaves showing.

Particularly interesting was his telling us how he had raised funds to help with repairs on his boat. Apparently, he and his family had received aid for basic living needs from the FEMA, but otherwise had received no help, nor any queries concerning needs for help, from any agencies which might have helped him to resume fishing activities sooner. Thus, he credited the persistence of his wife, who, he said, had stayed on the telephone and refused to become ensnared in bureaucratic red tape, for eventually prying some loan money out of the SBA, which he was now using to repair his one, remaining fishing boat. His cohorts, he said, had received nothing.

By comparison, the bait fishermen working out of the Coconut Grove marina in greater Miami reported a

decreased demand for their products ever since the storm, but otherwise stated that their losses were minor compared with those suffered by their counterparts working out of the Black point marina. Otherwise, and like their counterparts at Black Point, they similarly expressed concern over what effect the storm might have on future shrimp-stock levels stemming from destruction of mangrove habitats along the coast.

Impacts on artificial reefs. Artificial reefs deployed along southeast Florida's coastline are important to the region's commercial and recreational fishers, as well as other components of the state's recreational sector such as the diving industry. Artificial reefs consist of sunken vessels or other man-made structures, such as old oil rigs, and greatly increase the productivity of marine life practically anywhere they are located.

Among the twenty-six major artificial reefs situated in the region hit by Andrew, twenty-two were damaged, fifteen severely. Those severely damaged included the Arida (flattened and crushed), the Almirante (turned upside down), the Miracles Express (reduced to rubble), the Tarpon, and the Belzona Barge, which remains completely missing, even now! Concerning the Belzona Barge, Ben Mostkof, Artificial Reef Coordinator in south

Florida stated:

> This was a barge two-thirds the length of a football field. It was so large that it took five minutes to swim its length. It's not the kind of thing you would think would just disappear (Mostkof 1992).

The artificial reefs which have been placed off the Dade coast from the Broward line to Homestead are the backbone of the local diving industry--including both its recreational and commercial sectors. Important commercial and recreational species which are found in and around these reefs include jacks, snapper, sea bass, and grouper.

The devastation wrought on artificial reefs is also clear evidence that seafloor configurations were severely modified by the force of Andrew in the impact area, a finding which is clearly opposite to what was reported in National Fisherman shortly after the storm. Robert Arnove, a Miami dive captain for 11 years, said the following about the Tarpon, a 165-foot sunken vessel:

> Everything that was alive on the reef was picked clean. It was alive with soft corals, sea fans, and sponges, and now nothing is there. It has been ripped right out of the

> bottom. I swam way north and way south along the reef and it's all the same. It's just devastated. Looking to the future, you have to wonder if it will ever be a viable dive site again (Arnove 1992).

Since Andrew, the destruction of natural coral reefs in south Florida has similarly hurt the local dive economy, both commercial and recreational. Again, this impact was not quickly appreciated by local governmental officials. So far, we have received no assessments of the impact on marine productivity which may have resulted from damages to artificial and natural reefs caused by Andrew, but we feel sure such impact will be seen as very significant once it is fully known.

Impacts on fish processors, wholesalers and retailers. Fish processors and marketeers are an essential link between marine resources and the public, and are indispensable to commercial fishers who rely on them to process and market their catches. As mentioned above, south Florida's fish processors and marketeers were hard hit.

We analyzed information provided to the Florida DNR by all fish processors and marketeers in south Florida who operate either in the directly impacted area, the area immediately surrounding it, or south of it in the

keys. Our data consisted of periodic reports which processors and dealers sent to the DNR after the hurricane. Altogether, 108 reports from fish processors and fishery-products dealers were examined, including 80 from Miami, 3 from Miami Beach, 1 from Coconut Grove, 1 from Coral Gables, 1 from Perrine, 9 from Homestead, 1 from Florida City, 10 from Key Largo, 1 from Tavernier, and 1 from Big Pine Key. Among the 108 reports we examined, a total of 64, or 59%, reported adverse impacts on their businesses stemming from Andrew.

These reported adverse impacts included losses stemming from structural damage, the total loss of facilities, and other losses, including losses of products, electricity, refrigeration capacity, product suppliers, capital (e.g., boats and traps), and income in downtime while repairing facilities. Phrases used to describe these negative impacts included "damaged, not yet open," "victims of Andrew," "destroyed by Andrew," "lost everything," "hit hard," "torn up," "wiped out," and "out of business due to Andrew." As mentioned above, most of the keys lost power for several weeks following the storm, and some dealers are still without electricity and refrigeration capacity even now.

During our field study we interviewed a major fish processor/dealer in Key Largo concerning the impact of

Andrew. His processing facility had escaped major damage and had participated in the relief effort by supplying badly needed ice to the more severely impacted region immediately to the north. He employed about a dozen workers who processed and marketed the catches of some 50 boats working in the immediate vicinity.

He stated that he was unaware of the extent of damages to the fishing industry south of Key Largo, and angrily stressed that no fisheries' agents had come to assess damages to his operation, nor to assess damages among the fishermen he served. He saw Andrew as a new and heavy burden on an already declining and over-burdened fishery. He blamed this decline on the various regulatory agencies having authority over Florida's fisheries, which, he said, had saddled the commercial fishing industry with a tangle of confusing, contradictory, and ever-changing regulations. The regulatory rules and policies, he said, were so confusing, and so often changed, that he and local fishers had no idea who had the "last word," and overall this had created a situation of such great uncertainty that it was hard for him and local fishers to remain viable commercially. He also complained that fishery officials continuously harassed him and other local fishers, saying they often behaved in a bullying and

retaliatory manner.

Another major concern voiced by this operator was the possibility of severe marine pollution and loss of valuable marine species which may have resulted from the abrupt opening of a major canal (C-111) after Andrew hit, in order to drain excess fresh water from the south end of the Florida peninsula. This canal empties into Barnes Sound, a major fishing area near Key Largo. The operator we talked with in Key Largo expressed concerns that fresh water from this canal had conveyed fertilizers, pesticides, and other chemicals used mainly in south Florida agriculture into Barnes Sound, with potentially disastrous consequences for nearby coral reefs and sea grasses. However, what upset him the most, he said, echoing the spiny-lobster fishers we had talked with along the Miami River, was that nobody from the state or federal agencies who were responsible for the region's fisheries had ever asked him or any other local fishers how they had been impacted by the disaster, nor what their particular needs and problems were in its aftermath.

Impact on the marine-recreational sector. The recreational sector of south Florida's marine fisheries inordinately overshadows the commercial sector in terms of its economic significance and overall participation,

and was severely impacted by Hurricane Andrew. Indeed, one of the most indelible memories of our trip to Florida is the hundreds of crushed and utterly destroyed recreational boats we saw at the Black Point Marina. Certainly the hurricane caused substantial economic losses for recreational boat owners, especially those who were inadequately insured, as well as lost recreational opportunities. Moreover, it caused severe economic losses for the large number of individuals and business which supply and service the recreational boat sector.

While not wishing to minimize the profound aesthetic, recreational, social, and economic losses suffered by south Florida's recreational fishing sector, we felt it necessary to limit our investigation to the region's commercial fishing peoples. That is where our expertise mainly lies, and we also feel that the needs of commercial fishers in the aftermath of an extreme event should take precedence over those of recreationists. This is because commercial fishers ultimately depend on fishing activity for their livelihood, whereas fishing for recreational fishers, however much it enriches their lives, is not as crucial to their overall well being.

An important exception, of course, is charterboat

operators who take clients out for fishing, diving, and other activities. We mention them in this section because they are often regarded by regulatory authorities as a part of the recreational-fishing sector. We regard them as "commercial fishers" because fishing is their means of livelihood. In south Florida, many charterboat operators suffered severe impacts from the hurricane, including lost or damaged vessels, gear, and shore facilities, downtime, and a diminished stream of clients. Many of these operators rely on the abundance of marine species found around southeast Florida's artificial reefs to support their businesses, and thus may not find the marine life as robust there in the near future as it was prior to the storm.

Impacts on fishery habitat, including mangroves, seagrasses, coral reefs, and sea turtle nesting areas. Various government agencies and scientific institutions, including the Florida DNR, the NMFS, the RSMAS, and many others have by now launched investigations concerning Hurricane Andrew's overall impact on the marine environment and important marine resources found in the waters around south Florida. And, not surprisingly, their preliminary reports all suggest that the storm did indeed have a devastating and extensive impact on these environments and resources, which is opposite the

earlier views about the storm's impact which were expressed by certain fisheries' officials in south Florida.

It is not our intention here to elaborate upon these marine-environmental impacts, since our investigation focused mainly on the impacts of the storm on people, and not on marine resources per se. An important point to remember, however, is that practically every report describing damages to south Florida's marine environments, and especially those describing impacts in any region which is designated as a "fishery," almost certainly implies unfavorable consequences for the people who depended on those fisheries for their livelihoods.

Discussion

Clearly, the impact of Hurricane Andrew on commercial fishers living in southeast Florida was more severe than what was suggested in the early reports about the storm. This damage must be appreciated from an holistic perspective of these fisheries, which emphasizes the human actors who are articulated with the various marine resources.

Interesting parallels and contrasts regarding response to impacts on commercial fishers in south

Florida can be drawn from examining the responses to two other extreme events impacting commercial fishers: the Exxon Valdez oil spill (EVOS) in Alaska, and the impact of Hurricane Andrew on commercial fishers in Louisiana (regarding the EVOS, see Dyer 1993a; Dyer, Gill, and Picou 1992; and Picou, Gill, Dyer, and Curry 1992. Regarding Louisiana, see Dyer 1993b).

The EVOS greatly threatened the sustainabilty of Alaskan communities which were highly dependent on renewable fishery resources in their immediate vicinity. However, unlike in Florida, commercial fishers in Alaska were given considerable attention in the aftermath of the EVOS, including extensive assessments of their damages and what their immediate needs were for recovery. Also unlike in Florida, the Alaska-coast natural-resource communities which were impacted by the EVOS, and which depended on fishery resources, differed considerably from the natural-resource communities of commercial fishers in south Florida. For one thing, a higher proportion of Alaska's coastal populace is dependent on local fisheries, and commercial fishers have high visibility along the Alaska coast. Moreover, Alaska's commercial fishers have less competition from recreational fishers.

The situation in Louisiana was similar to that in

Alaska. As in Alaska, commercial fishing peoples in Louisiana who were impacted by Hurricane Andrew are a highly visible and economically important component of the coastal population. Indeed, commercial fishing in Louisiana is regarded as very important to the economic welfare of the state as a whole. Commercial fishing activity also overshadows recreational fishing in terms of its economic importance in Louisiana, with Louisiana's commercial fishers experiencing less competition with the recreational sector than do their counterparts in south Florida.

Hurricane Andrew's impact on commercial fishing peoples in Louisiana was quickly assessed by state and federal agencies, and problems among fishers, processors, and their families were responded to in a comprehensive and effective manner. Knowing full well the importance of the commercial fisheries in the state, various agencies in Louisiana immediately launched projects to account for the enormous losses in the state's fishing industry brought about by the storm. Support for Louisiana's commercial fishers was also taken up by various state representatives, including Senator Tauzin, who sought exemptions from certain regulations which fishermen felt might hinder their abilities to recuperate from the hurricane's impacts.

In sum, we feel the following factors explain the almost non-response to the damages and needs of south Florida's commercial fishers stemming from Hurricane Andrew:

1. The low visibility of commercial fishers in south Florida, owing to their geographic dispersion, and integration with a far larger urban, suburban, and exurban populace scattered along the south Florida coast.

2. The low numbers of commercial fishers in south Florida relative to the size of the total human populace in the region. Recall that one of the NMFS officials we interviewed in Miami had said that there were "almost no commercial fishermen" along Florida's southeast coast. Perhaps the reality of "almost no commercial fishermen" was conducive to producing a mindset among fisheries' authorities that there were not enough fishing people to worry about.

Because our trip involved little more than a brief reconnaissance, we do not have exhaustive data concerning how many commercial fishing people there were in south Florida when the hurricane hit. Nevertheless, we feel certain that in the aggregate these constituted a significant population. By counting licensed fishers, processors, and marketeers for whom we do have reliable

data, and adding their estimated numbers of dependents, we feel there were more than a thousand people in the directly impacted region of south Florida who depended on commercial fishing before the hurricane hit. And, if we consider all fishers and their dependents in south Florida, including the keys, who were adversely impacted by Hurricane Andrew, then we feel these amounted to several thousand people.

3. The large number of recreational fishers in south Florida as compared with commercial fishers, their greater visibility, and especially their greater ability to influence fisheries-management assessments, policies, and regulations. As Dr. William W. Fox, current director of the National Marine Fisheries Service and former head of the Florida Marine Fisheries Commission has said of Florida's fisheries, "I think you'll find that most of our regulations were oriented toward recreational fishing" (Fox 1990: 44).

4. Longstanding antipathy and adversarial relationships between participants in the commercial fishing industry and various governmental agents who are responsible for managing the fisheries. Unfortunately, this has prompted feelings of apathy and futility among both groups concerning any benefits that might accrue from initiating communications with one another.

5. No municipal, city, county, regional, state, or federal agencies acknowledged responsibility for assessing the impacts of the storm on the commercial fishing industry, nor for determining what was needed in the way of relief and recovery assistance following the event. A FEMA representative we spoke with in south Florida, when we asked him if he felt there was a need for someone to address the impacts of Hurricane Andrew on natural resource users--including specific occupational groups such as commercial fishers--agreed that there was definitely such a need, and that this represented a deficiency in the response capabilities of the FEMA.

6. Unconcern, and perhaps antipathy, for commercial fishing peoples in the local marine-science community. When we visited the main offices of the RSMAS, the only concern regarding commercial fishers we saw was negative, consisting of leaflets posted on entrance doors and interior bulletin boards which urged a ban on commercial fisher's use of certain types of nets. Moreover, although we have corresponded with the RSMAS since our visit, urging that it include a study of commercial fishers in its proposed interdisciplinary project to study the impacts of Andrew in south Florida, we are unaware it has any plans to do so.

We also visited the University of Miami main campus while we were in Florida, but were unable to learn of any faculty members there who were conducting studies of the hurricane's impact on south Florida's commercial fishers.

7. An erroneous view which appeared in the print and other media in the early aftermath of the event, which greatly underestimated the storm's impacts on the fisheries, and which, perhaps, was subsequently reified by some authorities as justification for not concerning themselves any further.

Recommendations

Among the various agencies of the U.S. federal government, the NMFS is the one which should take responsibility for assessing impacts and needs of commercial fishing peoples stemming from extreme natural and technological events. This agency already has an organizational structure with established networks of communications between the fisheries in coastal regions and its central headquarters. Moreover, it has more information, and more experience working with commercial fishing peoples, than any other agency in the federal government. Thus, a component should be developed within this agency which will concern itself with

extreme events in coastal areas, and especially with the impacts of such events on commercial fishing peoples. This component should also work closely with other federal agencies including the FEMA and the SBA, as well as with state and local agencies having interests in local fisheries.

The Fisheries Conservation and Management Act of 1976 (now simply know as the "Magnuson Act," after the name of its original sponsor) mandates that the NMFS concern itself not only with the welfare of fishery resources, but also with the welfare of fishing peoples. Thus, the act requires that the NMFS consider social impacts in the formulation of fishery-management policies. Unfortunately, however, there is no legislation (or, at least, none that we are aware of) which specifically requires the NMFS to assess impacts and to assist commercial fishing peoples in the aftermath of extreme events which impact the fisheries.

We feel the NMFS has remained unduly focused on fishery resources, rather than on what should be their first concern--fishing peoples--and continues to define its role and principal responsibilities as lying mainly in the realm of marine conservation, rather than in promoting the well being of maritime people (see Fox 1990: 44-45).

Our conclusions are drawn from little more than a brief field trip by two investigators to this region, as well as extensive queries through correspondence both before our trip and continuing ever since. And, while we do not have quantitatively comprehensive data which measures and assesses the overall impact of Hurricane Andrew on south Florida's commercial fishing peoples, we feel we have conclusive proof that this impact was very serious indeed.

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